Wairakei-Whakamaru C Line
Overview - Draft Centreline and Tower Locations

Legend

- Transpower Substations
- Preferred Route
- Draft Tower Positions (23/07/2010)
- Draft Centreline (23/07/2010)
- Existing Wairakei - Whakamaru B Line (To Be Removed)
- Other Transpower Transmission Lines
- Highway
- Road

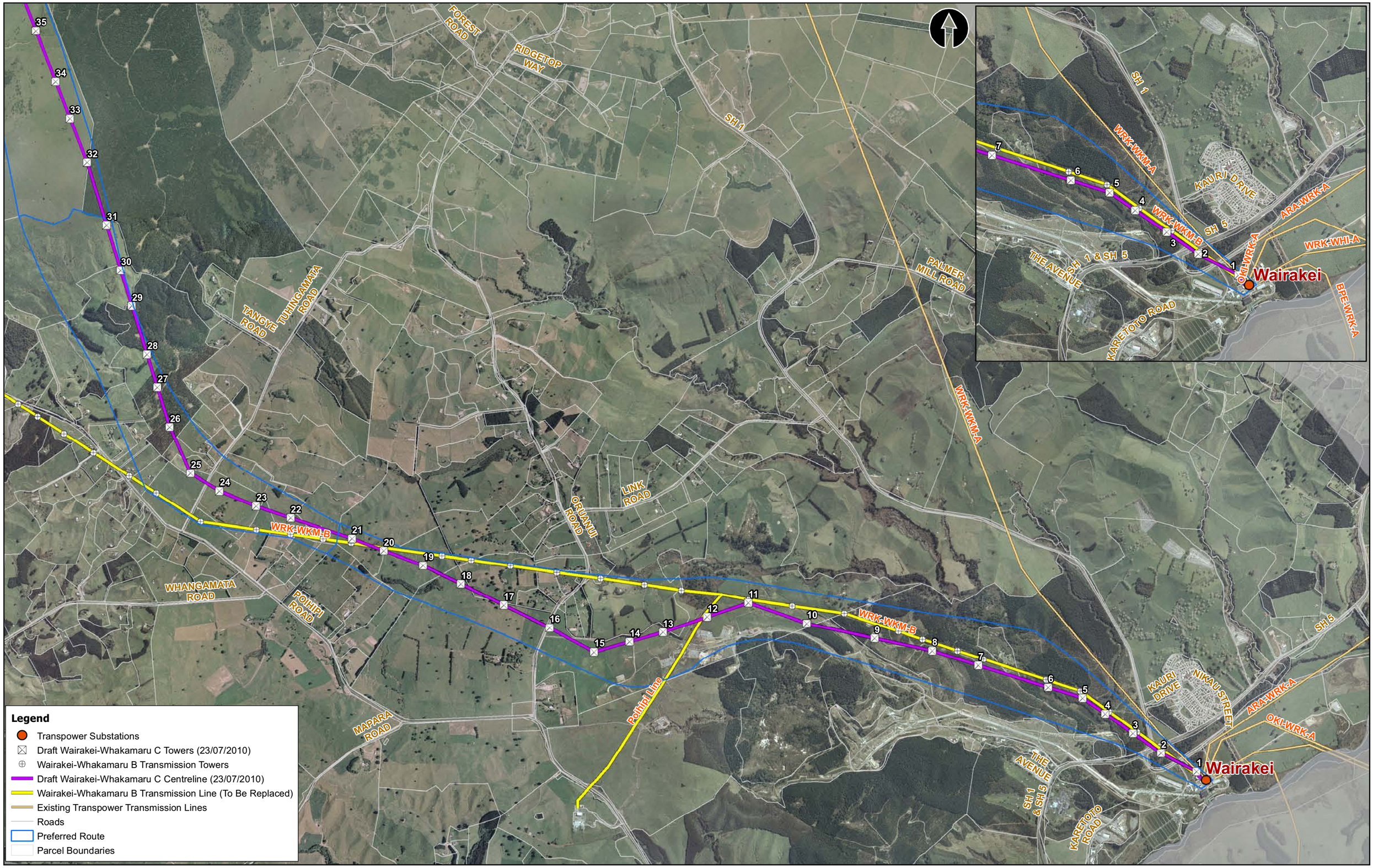
TRANSPOWER

Projection: NZTM 2000 Scale: 1:100,000 Plan Size: A3L

0 1.5 3 6 9 12 Kilometers

Prepared by: ems energy market services

26/07/2010



TRANSPOWER

Projection: NZTM 2000 Scale: 1:30,000 Plan Size: A3L

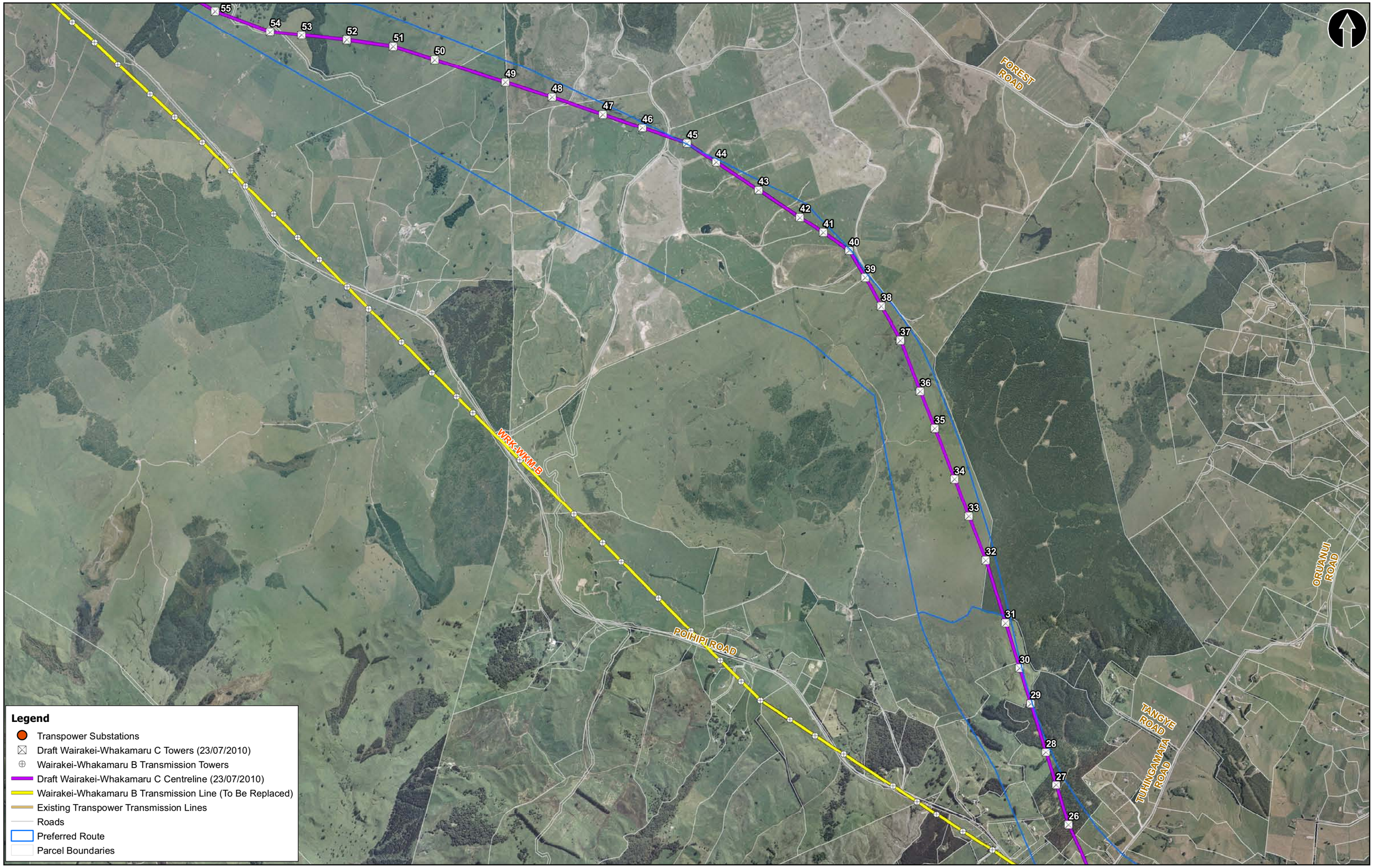
Wairakei-Whakamaru C Line

Map 1 - Draft Centreline and Tower Locations

0 0.5 1 2 3 4 Kilometers

Prepared by:
ems energy market services

27/07/2010



TRANSPOWER

Projection: NZTM 2000 Scale: 1:30,000 Plan Size: A3L

Wairakei-Whakamaru C Line

Map 2 - Draft Centreline and Tower Locations

0 0.5 1 2 3 4 Kilometers

Prepared by:
ems energy market services

27/07/2010

SPENCER ROAD
POKURU ROAD
PAERATA ROAD
KAAHU ROAD
WRK-WWM-B
TIROHANGA ROAD
FOREST ROAD
MAROTIRI ROAD
WERETA ROAD
POIHIPI ROAD

82 81 80 79 78 77 76 75 74 73 72 71 70 69 68A 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50

Legend

- Transpower Substations
- Draft Wairakei-Whakamaru C Towers (23/07/2010)
- Wairakei-Whakamaru B Transmission Towers
- Draft Wairakei-Whakamaru C Centreline (23/07/2010)
- Wairakei-Whakamaru B Transmission Line (To Be Replaced)
- Existing Transpower Transmission Lines
- Roads
- Preferred Route
- Parcel Boundaries

TRANSPOWER

Projection: NZTM 2000 Scale: 1:30,000 Plan Size: A3L

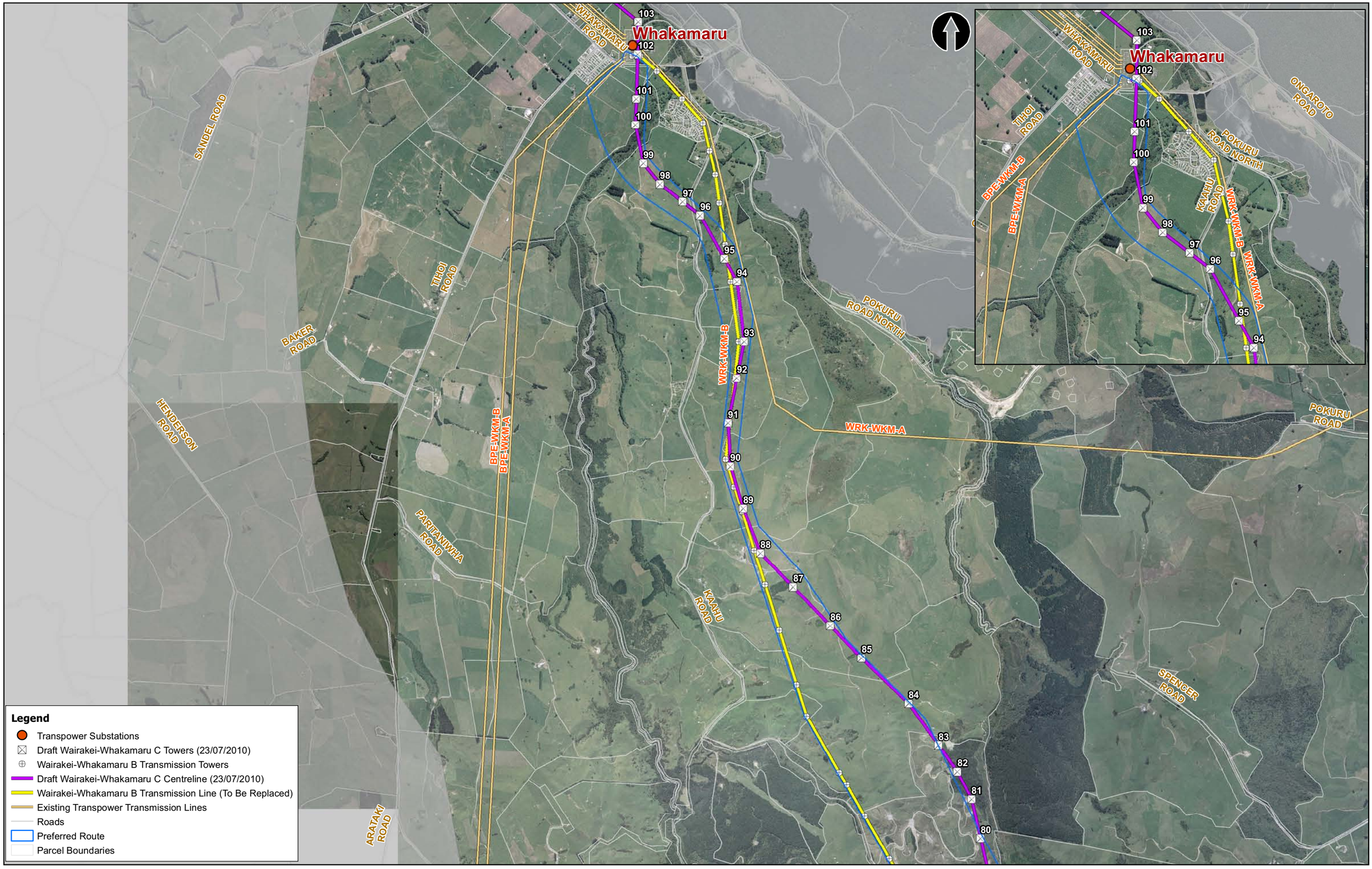
Wairakei-Whakamaru C Line

Map 3 - Draft Centreline and Tower Locations

0 0.5 1 2 3 4 Kilometers

Prepared by:
ems energy market services

27/07/2010



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Projection: NZTM 2000 Scale: 1:30,000 Plan Size: A3L

Wairakei-Whakamaru C Line

Map 4 - Draft Centreline and Tower Locations

0 0.5 1 2 3 4 Kilometers

Prepared by:
ems energy market services

27/07/2010

Report - Draft Centreline and Tower Location

Wairakei – Whakamaru C Line

August 2010

Keeping the energy flowing

TRANSPOWER

Transpower New Zealand Limited The National Grid

APPROVED FOR RELEASE

On behalf of the Environment, Strategy and Approvals Manager

Transpower NZ Ltd

Wairakei-Whakamaru C Line

ENVIRONMENTAL PLANNING SERVICES

REPORT - DRAFT CENTRELINE AND TOWER LOCATION

Prepared for

Transpower New Zealand Limited

by

Boffa Miskell Limited

Boffa Miskell

August 2010

Contents

Executive Summary

This report summarises the outcomes of the fourth part of the route selection process for the proposed replacement Wairakei to Whakamaru 220 kV double-circuit duplex transmission line, and which culminated in the identification of a draft centreline and tower locations.

The draft centreline and tower locations are identified in Figure 1 below and in a series of more detailed maps in Appendix 2. The draft centreline generally follows the alignment; going from Wairakei north-west to Whakamaru:

- From the Wairakei substation the new line generally follows the existing Wairakei – Whakamaru B Line (on the southern side) through the Wairakei Forest towards the proposed Te Mihi Power Station
- As the line exits the western end of the Wairakei Forest, the line deviates to the south of the existing Wairakei – Whakamaru B Line and would be close to the proposed Te Mihi Power Station. The new line would cross Oruanui Road approximately 550 metres to the south of where the existing B Line crosses Oruanui Road
- From Oruanui Road, the new line trends in a north-westerly direction crossing Tuhingamata Road to the north of the existing B Line
- From Tuhingamata Road, the new line heads further away from the existing Wairakei – Whakamaru B Line and Poihipi Road in a north-westerly direction before turning westwards towards Mokai
- At Mokai, the new line traverses to the south of the Mokai community but to the north of the existing Wairakei – Whakamaru B Line and Poihipi Road and continues in a generally westerly direction
- As the new line nears the southern end of Kaahu Road it turns in a north-westerly direction and runs approximately 500 – 1,000 metres to the east of the existing Wairakei – Whakamaru B Line
- At the northern end of Kaahu Road, the new line is located immediately adjacent to the existing Wairakei – Whakamaru B Line
- Passing south of the Whakamaru Village, the new line crosses Kaahu Road and curves around to the north to connect with the Whakamaru substations

This report contains information on the process followed to identify the draft centreline and tower locations, including alternative alignments considered but not preferred, and consultation undertaken on the draft centre and tower locations to date.

Process

This stage involved the following process in identifying the 'draft' centreline and tower locations:

- Site visits and landowner consultation for those properties within the preferred route to identify property and land use features, understand landowner preferences and other site specific issues
- Development of an indicative centreline and tower locations based on information collected from site visits and landowners consultation, as well as survey and engineering information
- Further site visits and consultation with those landowners along the indicative centreline and tower locations to obtain site specific feedback
- Desktop review and field work as required by technical specialists (landscape architect, archaeologist, agricultural specialist, engineers and ecologist) on the indicative centreline and tower locations to identify any site specific issues
- Feedback from the further site visits, affected landowner consultation and review by technical specialists to refine the indicative centreline and tower locations to form the 'draft' centreline and tower locations

Next Steps in process

The next part of this phase of the process will be to continue to consult with affected parties and consult with the wider public on the outcomes of the 'draft' centreline and tower location process and seek feedback. This process will assist us in confirming whether the 'draft' centreline and tower locations are appropriate, identify any issues that require further consideration, and refine the location of the centreline and towers. Once this refinement has occurred, Transpower will seek to obtain the necessary approvals (i.e. designation) and consents under the Resource Management Act.

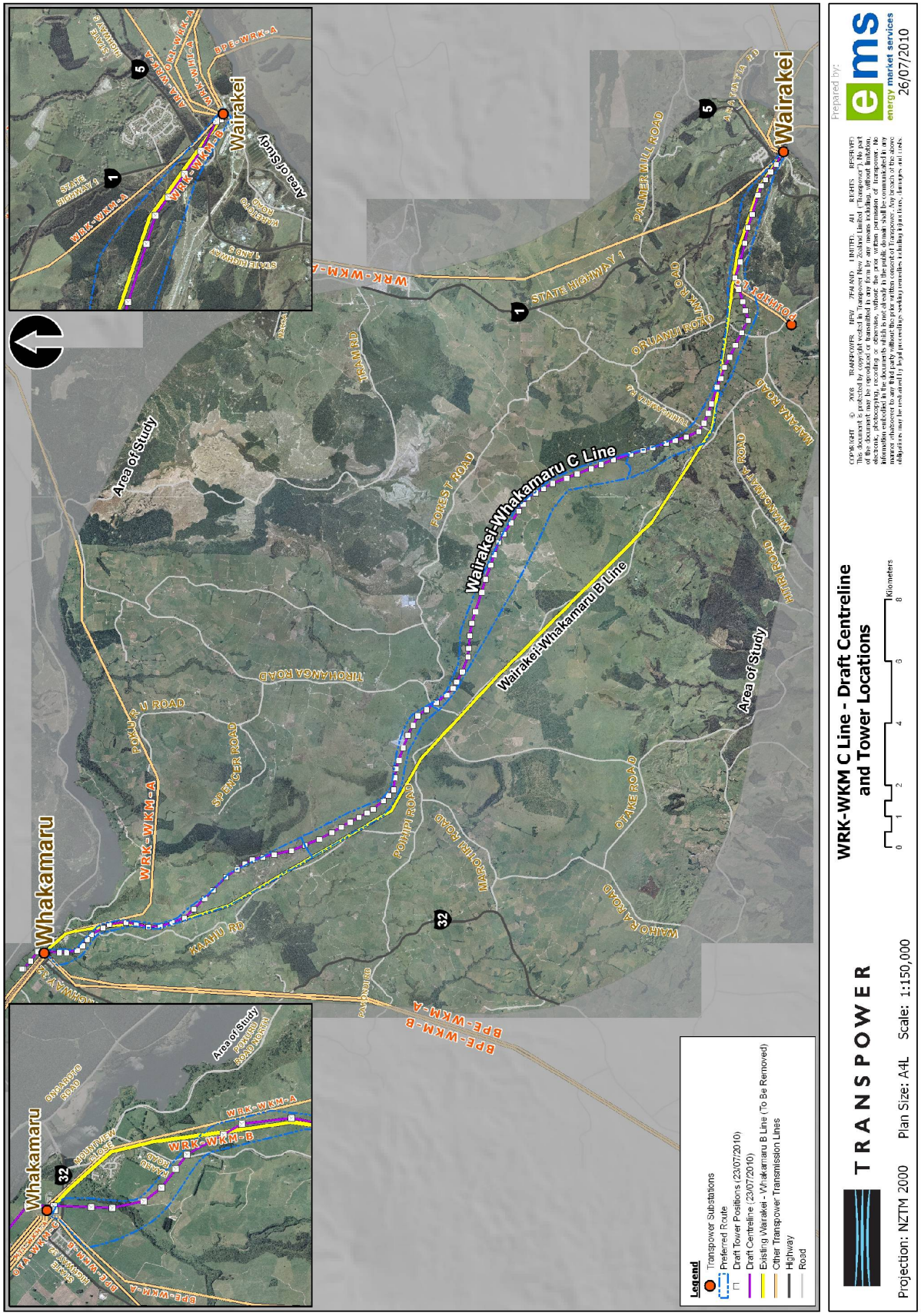


Figure 1: Draft Centreline and Tower Locations

1 Introduction

Transpower New Zealand Limited (Transpower), as owner and operator of the National Grid, has identified the need to enhance the electricity transmission network between the Wairakei and Whakamaru substations. The upgrade proposal is to replace the existing 220 kV single-circuit 'flat top' Wairakei – Whakamaru B Line, which runs adjacent to Poihipi Road for much of its length, with a double-circuit duplex 220 kV transmission line referred to as the Wairakei – Whakamaru C Line (WRK-WKM C Line). This proposal was approved by the Electricity Commission in March 2009.

This Draft Centreline and Tower Location Report follows on from an earlier report; "Preferred Route Report – Wairakei to Whakamaru 220 kV Transmission Line" completed in February 2010. This report contains a summary of the process undertaken, comments received from consultation with landowners and other parties, a description of the preferred centreline and tower locations, and matters identified from technical investigations regarding tower locations.

This work is the fourth and final stage of the route selection process to determine an appropriate centreline for the new line. This process has involved consideration of alternative routes and centrelines as well as identifying measures to avoid, remedy or mitigate the adverse effects of a transmission line for a notice of requirement under the Resource Management Act 1991 (RMA).

1.1 Purpose and Structure of this Report

This report documents the process and outcomes for identifying the 'draft' centreline and tower locations. This Centreline Report is structured as follows:

Chapter 1: Introduction and Background

Chapter 2: Landowner Consultation Process and Issues Raised

Chapter 3: Scoping of Potential Centreline and Alternatives Considered

Chapter 4: Identification and Description of the 'Draft' Centreline and Tower Locations

Chapter 5: Summary

This report also includes a series of plans showing the 'draft' centreline and tower locations. These plans should be read in conjunction with the explanatory text contained in this report.

It is important to note that, while the centreline and tower locations in this report are the preferred alignment and locations, they are subject to refinements from ongoing investigations and consultation. This report is part of the overall route selection process for determining the exact area of land to be designated, and includes a period of further public consultation and final expert investigation to finalise the tower locations.Transpower intends to lodge a Notice of Requirement to designate the area along the centreline and tower locations.

1.2 Overview of the Project

It is proposed to replace the existing 220 kV single-circuit 'flat top' Wairakei to Whakamaru B Line (WRK-WKM B Line) with a double-circuit duplex 220 kV transmission line between the Wairakei and Whakamaru substations. The replacement line is approximately 40 kilometres in length.

The replacement line will comprise double-circuit duplex conductors supported by approximately 105 lattice towers with an average height of 42 metres. The spacing between towers will vary depending on topography and ground clearance requirements. The typical range of spacing between towers is 250 – 500 metres, and the minimum ground clearance for the replacement line is 7.5 metres. The final heights and location of towers will be

determined at the detailed design stage of this project. The tower heights on the existing Wairakei – Whakamaru B line are approximately 25 metres.

A minor extension and changes to the Wairakei Substation will also be required to facilitate the connection of this replacement line at its southern end. Modifications to the Whakamaru Substation and Whakamaru North Substation (to be built) will be required to facilitate the connection of this replacement line at its northern end. The details of substation changes will be included in the Notice of Requirement.

1.3 Route Selection Process

Transpower has developed a generic methodology for identifying new or replacement transmission line routes. This methodology is described as the ACRE process – an acronym for Area-Corridor-Route-Easement investigations, with key decisions being made at each stage using appropriate evaluation techniques, taking into account the information relevant to that stage. A summary description of this route selection process is included in Appendix 1 of this report.

For a transmission line, this process involves a progressive filtering approach, where increasing and more specialised detail is provided on technical, environmental, social and property constraints and features throughout the process to enable the identification of a preferred easement. Once the easement centreline has been identified, the planning approvals (Notice of Requirement for a designation and/or resource consent applications) can be lodged with the relevant local authorities under the RMA for the purpose of securing approvals for the line and any associated works.

The application of route selection process may differ for each project, depending on the nature of the project and the particular circumstances with the Region of Study. While the full extensive route selection process is appropriate to apply where lines are to be constructed over long distances involving a wide area of investigation, more limited investigations and processes can appropriately be applied through a truncated methodology when smaller scale projects are involved. Given the size, dimensions and nature of the Area of Study, it was considered that investigations for the Wairakei–Whakamaru C line should move from the Area stage to the Route stage of the process, as there are no meaningful opportunities to define alternative corridors within the area (i.e., the area in itself could be considered to constitute a large corridor).

This modified ACRE methodology (shown in Figure 2 below) employs a similar systematic process of information collection and analysis in determining an area of interest, broad routes for further evaluation, a systematic choice of route, and a refinement of the route into an alignment as the basis for the Notice of Requirement for a designation.

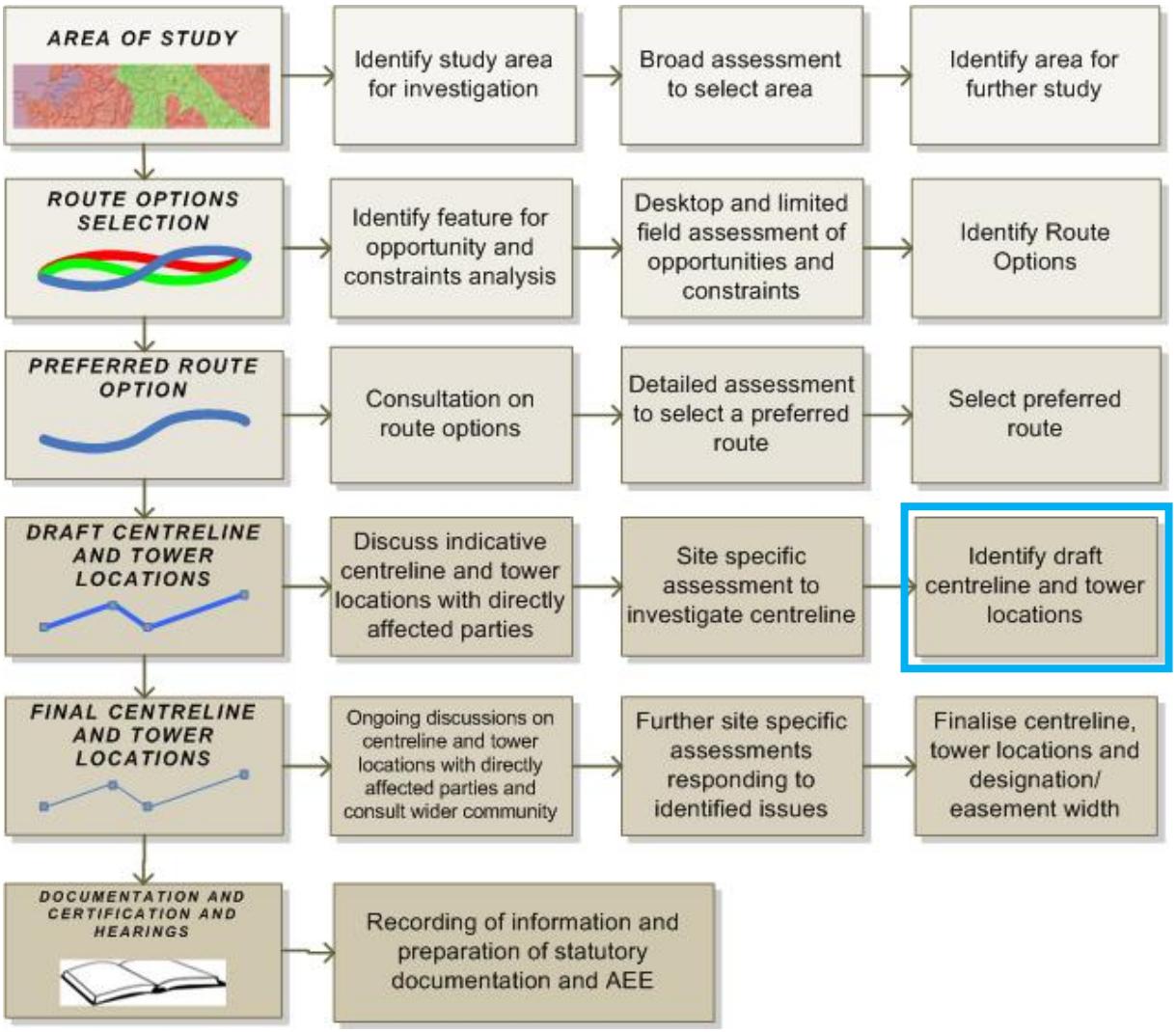


Figure 2: Modified ACRE Methodology for Wairakei – Whakamaru C line project

1.4 Background and Earlier Work

1.4.1 Rationale for Replacement Line

Transpower has been investigating the upgrade of the Wairakei Ring since February 2008. The existing National Grid between Whakamaru, Atiamuri, Wairakei and Poihipi substations (referred to as the Wairakei Ring) is an important part of Transpower's core network. It helps transfer power north and south, while also supplying the Bay of Plenty and Hawke's Bay regions.

The Wairakei Ring comprises two transmission lines, defined in the south by the Wairakei substation and in the north by the Whakamaru substation. The lines connecting these are:

- The Wairakei – Whakamaru A Line between Wairakei, Ohakuri, Atiamuri and Whakamaru; and
- The Wairakei – Whakamaru B Line between Wairakei and Whakamaru via Poihipi Road.

The area contains significant amounts of both existing and proposed renewable energy resources, particularly geothermal and hydro-electricity. The amount of new generation being built in the next four-five years in and around the Taupo Geothermal Region is expected to be in the order of 700 MW (which is equivalent to nearly four

new Wairakei geothermal power stations). These projects will increase the amount of generation injected into the National Grid at the Wairakei substation, and require the enhancement of the local transmission capacity. Beyond the immediate area are also proposed renewable energy generation projects, including major wind energy generation facilities, which will also require the capacity of the Wairakei Ring to be significantly enhanced.

Both existing transmission lines (A and B) are single-circuit 'flat top' lines constructed and operated at 220 kV. The capacity of the transmission assets in the region has already been enhanced with both circuits already thermally upgraded. However, while the existing National Grid in this area is sufficient to cope with existing generation, the transmission of a large amount of new generation could be constrained at peak times.

1.4.2 Identification of Broad Upgrade Options

In May and June 2008, Transpower consulted with key stakeholders on the various assumptions, methodologies and models for the Wairakei Ring. From this consultation and evaluation a long list of options (including both transmission and non-transmission options) for the Wairakei Ring project was developed. The long list of options was refined to the following four possible transmission upgrades that could be implemented for either one or both of the existing two transmission lines:

- Reconductoring of existing lines with a single conductor;
- Duplexing existing lines;
- Constructing a new single-circuit flat top line; and
- Constructing a replacement line, double-circuit.

In August 2008, Transpower began discussing upgrade options and the process for progressing the investigation with community stakeholders in the Wairakei Ring area. The purpose of this community consultation was to ensure that all likely costs, constraints and other issues that could influence the selection of a preferred upgrade option, could be identified before the Grid Investment Test (GIT) analysis was undertaken (see further discussion of the GIT, including definition, in Chapter 2.4). The feedback that Transpower received highlighted the need to keep the community informed and involved about key decisions in the decision-making process, particularly in relation to the selected option and the detailed design of where actual towers and upgrades are proposed.

Other key issues highlighted included concerns in relation to visual impact, the proximity of upgrades/replacement lines to houses and populated areas, and the perceived effect on property values and population health. More detailed information about the consultation feedback at this stage is contained in the Preliminary Social Impact Assessment in the earlier Area Report (See Appendix B of the Area Report on the Project website http://www.gridnewzealand.co.nz/wrk-wkm-publications).

In November 2008, consultation was undertaken with industry stakeholders on Transpower's draft application of the GIT. Feedback on this draft application was incorporated into the final documentation submitted to the Electricity Commission.

In December 2008, Transpower made a formal submission to the Electricity Commission for approval of the costs associated with replacing the existing single-circuit Wairakei – Whakamaru B line with a double-circuit duplex 220 kV Wairakei–Whakamaru C line. This option of constructing a double-circuit line and replacing the existing single-circuit line was considered the most cost effective and efficient solution for the anticipated supply and demand requirements for the Wairakei Ring. On 20 February 2009, the Electricity Commission issued a Notice of Intention to approve the replacement double-circuit duplex 220 kV transmission line between Wairakei and Whakamaru substations, and with no public conference called, the approval is now final.

The project that is the subject of this route selection process is therefore the replacement of the Wairakei to Whakamaru B line (between Wairakei and Whakamaru via Poihipi Road) with a 220kV double-circuit duplex transmission line (referred to as the proposed Wairakei to Whakamaru C line).

1.5 Area of Study

The first phase of the route selection process is to determine the appropriate "Area of Study" in which route options are to be identified. The "Area of Study" was reported on in the *Area Report: Wairakei – Whakamaru C Line* dated 30 June 2009 (See Project website http://www.gridnewzealand.co.nz/wrk-wkm-publications). In defining the location and extent of the Area of Study, a number of matters were considered, including specific features which would have a significant influence on the alignment of the new transmission line. These matters included the location of the existing Wairakei and Whakamaru substations, existing transmission lines and significant technical and environmental constraints (such as the Waikato River and steeper land). The Area of Study is approximately 41 kilometres in length (north-west to south-east) and up to 24 kilometres in width (north-east to south-west). The Area of Study contains the settlements of Wairakei, Mokai, Tirohanga and Whakamaru.

1.6 Route Options Identification

The second phase of the route selection process identified the Route Options to be considered, which were reported on in the *Route Options Report: Wairakei – Whakamaru C Line* dated September 2009 (see Project website http://www.gridnewzealand.co.nz/wrk-wkm-publications). The location and extent of the route options were based on the identification and analysis of opportunities and constraints within the Area of Study. Specific opportunities were identified, such as Transpower owned property, electricity generation sites and the existing B Line. Constraints were analysed to identify areas which could be inappropriate or difficult to locate a transmission line, such as important landscapes, ecological areas, tourist activities, and within or close to residential urban area and schools. This analysis identified areas with the fewest constraints and with potential opportunities for locating the replacement transmission line.

The most significant constraints identified at the Route Options stage were the urban residential areas at Whakamaru (including the adjacent Whakamaru Primary School) and Wairakei, a number of outstanding landscape areas and significant natural areas (ecological areas) identified by Taupo District Council, and the tourist activities at Wairakei. Other important constraints were areas with high landscape values in the northern, eastern and southern sections of the Area of the Study, including identifying areas which had views of Lake Taupo. Lower level constraints were identified which may or may not pose an insurmountable constraint, and for which there was an incomplete state of knowledge from the existing data sources or the need to consult further. These lower level constraints included underground geothermal system, peat soils, and some property ownership patterns and ownership structures.

1.7 Preferred Route

The third phase of the route selection process identified the Preferred Route, which were reported on in the *Preferred Route Report: Wairakei – Whakamaru C Line* dated February 2010 (see Project website http://www.gridnewzealand.co.nz/wrk-wkm-publications). In selecting the preferred route, an assessment of the route options identified in the first Route stage was undertaken. A set of criteria was used to assess each section of the route options taking into account economic, environmental, social and cultural factors. In assessing each of these factors, information collected during the consultation and investigations in the previous phases was considered. This assessment resulted in an overall preferred route being identified which scored best in the multi-criteria evaluation.

The central route option was preferred overall (see Figure 3 below) as parts of it were generally located close to an existing transmission line (WRK-WKM B Line which is to be replaced by this new line), except where it moves away from Poihipi Road. The central route option provided opportunities to locate the new line in areas where the landscape and visual effects would not be as significant, close to existing and proposed electricity generation sites, and is generally located further away from concentrations of dwellings. The other route options were not preferred overall as they would introduce a new transmission line to some areas which do not have major infrastructure facilities, they were in close proximity to some community facilities and concentrations of dwellings, and were a longer distance from existing and proposed electricity generation sites.

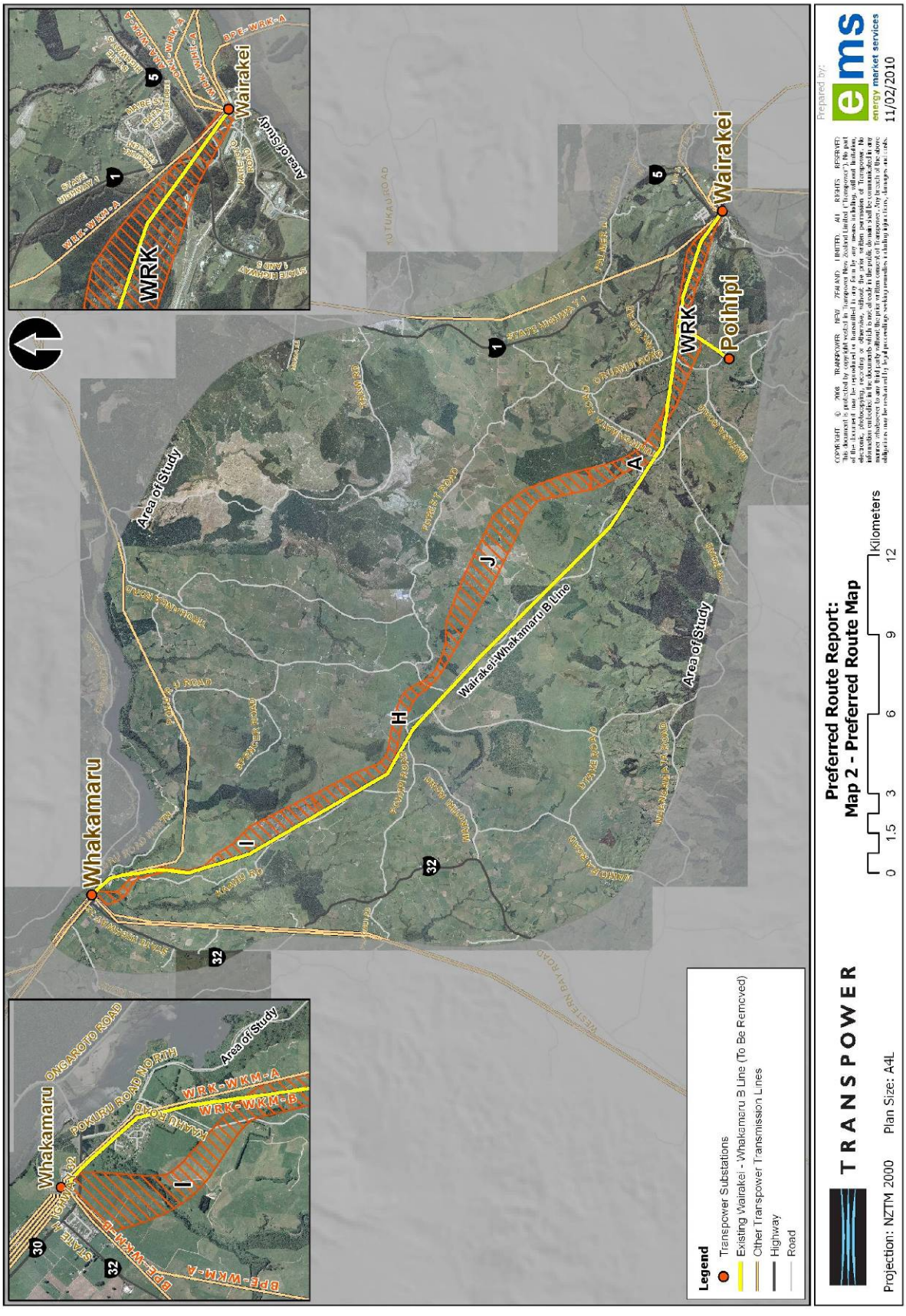


Figure 3: Preferred Route

2 Consultation Process and Issues Raised

2.1 Approach to Consultation

In February 2010, the preferred route for the replacement transmission line was identified. This preferred route was selected following a thorough route selection process which included landowner and wider community consultation on the route options.

The consultation approach from earlier phases of this project was continued for the Preferred Route phase. However, the main focus for this phase of consultation was on landowners within and immediately adjacent to the Preferred Route. The purpose of this phase of consultation was to inform landowners of the location of the Preferred Route and to obtain further information from landowners about specific property issues and features along the Preferred Route. Individual meetings and/or telephone discussions were held with these landowners. Furthermore, it was an opportunity to further explore and discuss issues raised by these landowners raised in earlier consultation that relative to the Preferred Route.

In addition to landowners within or immediately adjacent to the Preferred Route, wider public consultation was undertaken. Information on the preferred route was disseminated to approximately 1000 landowners and interested parties in the original Area of Study. This information was in the form of a summary newsletter (including the preferred route map), a letter and feedback form. Information days were held in Taupo on 8 – 9 April 2010 for interested parties to obtain information and provide an opportunity to ask questions of the project team. In addition, a Transpower 0800 number was available for the public to phone and ask questions. Furthermore, meetings and discussions were held with organisations and communities of interest, including a meeting with the Mokai community on 12 May 2010 to provide an opportunity to discuss the project.

2.2 Issues Raised During Consultation

Below is a summary of the main issues raised during consultation on the Preferred Route. Some of these matters are property specific and may relate to one or more properties, while others are more general in nature.

- Avoid locating the replacement line close to dwellings or directly in front of dwellings (main view lines)
- Avoid locating the replacement line near to farm buildings and other critical farm infrastructure (e.g. airstrips and effluent ponds)
- Awareness of aerial topdressing/spraying flight paths/patterns
- Locate the replacement line where it would cause less disturbance to farming operations (preference for it to located on the edges of farms rather than through the middle)
- Impacts on property values; compensation for loss of productive land and restriction on farming activities
- Avoid sites of significance to tangata whenua, including urupa (cemetery) and prominent hill tops
- Minimise visibility from Mokai Marae
- Keep the replacement line as close as possible to the existing line (which is to be removed)
- Locate the replacement line as far as possible away from the existing line
- Use existing topography and vegetation to screen/hide the replacement line, such as locating the line on lower/enclosed land
- Minimise the amount of vegetation/trees (including plantation forestry) to be removed
- New or upgraded access tracks would need to be constructed to install new line. Need to work with individual landowners to determine best route and design to not only suit line construction, but also to serve the farm in the future
- Avoid areas of planned future development (e.g. farming, commercial, geothermal electricity generation)

- Be located in close proximity to geothermal electricity generation to facilitate easier connection and minimise need for additional transmission line infrastructure
- Concerns about health and safety issues, such as from electro-magnetic fields, electrical interference and noise from replacement line

The above issues have been used to inform the identification and selection of the centreline and tower locations outlined below.

3 Scoping of Potential Centreline and Alternatives Considered

3.1 Design Principles for Scoping Centreline

3.1.1 Indicative Centreline and Tower Locations

The identification of a draft centreline and tower locations has followed on from the identification of the preferred route. The process for identifying the draft centreline and towers locations has involved ongoing consultation with landowners and further engineering and environmental investigations.

As part of the consultation on the preferred route, meetings and discussions were held with landowners along the alignment. During these meetings, preferences for where the centreline/towers could be located were discussed. Field work was also undertaken to consider construction and operational issues for the replacement line.

Preliminary engineering design was also undertaken. This preliminary design was based on aerial survey data and involved computer-aided design packages and review workshops involving a range of technical specialists. This process ensured the preliminary design took into account preferences of landowners, known environmental constraints and issues, and engineering parameters. For example, some landowners requested that towers be located away from some specific flat paddocks/areas. The outcome of this process was an indicative centreline and tower locations which was used as a basis for further discussions with directly affected landowners.

3.1.2 Design Principles and Requirements

In identifying the draft centreline and tower locations a number of design principles and requirements have been applied. While some of these principles and requirements are complementary, some are not and necessitated prioritising. An overall judgement is required to the appropriate centreline and tower locations. Below are the design principles and requirements (no order of importance):

- Locations with least landscape and visual impacts, such as lower elevations and visually enclosed areas, as topography can have a significant influence.
- Minimise sharp angles. Tower placement in locations which minimise the number of towers and excessively tall towers. This approach is to minimise visual impacts.
- Avoid dwellings as far as practicable, particularly concentrations of dwellings
- Minimise tower locations in main view lines/outlook from dwelling
- Retain existing trees/vegetation where this assists in screening towers from dwellings
- Avoid locations close to public viewpoints as far as practicable
- Avoid areas of significant indigenous vegetation
- Minimise disruption to rural land uses, including farm races and other farm infrastructure.
- Compliance with engineering and other technical standards, such as minimum ground clearance requirements. Compliance with these standards protects people's health and safety.

The line design is a careful process of optimising tower height and tower spacing, taking into account topography and other environmental and engineering constraints, while achieving the design principles. An integrated process was followed with inputs from technical specialists informing and checking the centreline and tower locations throughout the process. This process was also informed by feedback received from landowners. In some situations, the specific preferences or requests from landowners are to be balanced with the wider impact of the transmission line, such as minimising the visual impact. It is noted that the tower locations (spacings) and tower heights is related, and minor changes in one location may have significant impacts on other tower locations and heights.

3.2 Centreline Alternatives

In deriving the draft centreline and tower positions, alternative alignments were considered within the confines of the preferred route which was identified in February 2010. This section outlines the principal alternative alignments that were considered but is not an exhaustive list of all the alternatives considered. Many different combinations and/or minor refinements to tower locations have been investigated through the design process. In addition to the alignment of the centreline, different combinations of tower spacings and tower heights were considered, as there is a link between tower heights and tower spacings (generally the taller the tower the greater the spacing). An overall judgement has been made on the optimal combination of tower spacings and tower heights taking into account the design principles.

Below is a summary of the significant alternative centreline alignments and tower locations, within the preferred route, considered and the reasons why they were not selected.

3.2.1 Towers 1 – 25 (Wairakei Substation – Tuhingamata Road)

The existing Wairakei – Whakamaru B line (which is to be removed) is an existing part of the environment in this area. Locating the replacement line on or immediately adjacent to the existing B line was considered from the Wairakei Substation to Tuhingamata Road. Effectively the section of the draft centreline between towers 3 – 8 follows the existing B line on the southern side. Locating the replacement line on the northern side of the existing B line was not considered appropriate as it would cross the Wairakei Thermal Valley Park accommodation area as well as being located closer to an identified significant natural area.

For the section from tower 9 – 20, an alternative centreline was to follow the existing B line. However, this alignment would be located in close proximity to a number of dwellings and smaller rural lifestyle properties. As one of the design principles was to avoid concentrations of dwellings if possible, this alternative centreline was not considered to be appropriate.

3.2.2 Towers 26 – 59 (Tuhingamata Road – Tirohanga Road)

An alternative centreline alignment for towers 24 – 31 was considered which took a more westerly alignment. This alternative alignment would have been further away from some rural lifestyle properties on Tuhingamata Road and potentially had a lower impact on the area of plantation forestry. However, this alternative alignment is located closer to a number of dwellings on Poihipi Road which have an outlook to the north resulting in potentially significant visual impacts on these dwellings.

For the section of line between towers 32 – 61, a more southerly alignment was also considered. This alternative alignment would follow more elevated land which would have a greater landscape and visual impact than the draft centreline located to the north. In addition, this more southerly alignment would be located a greater distance from the potentially expanded geothermal electricity generation area of Mokai, meaning a longer tee-line may be required, which would also have comparatively greater visual impacts than the proposed centreline. Lastly, the alternative southerly alignment could result in greater disruption and/or inconvenience to primary production activities in this area.

3.2.3 Towers 60 – 88 (Tirohanga Road – Kaahu Road)

An alternative centreline closer to the existing Wairakei-Whakamaru B Line was considered. However, this alternative alignment was not considered appropriate as it would have been located closer to dwellings on Kaahu Road and have greater visibility from Kaahu Road, potentially resulting in greater landscape and visual impacts. Due to the elevated and varied topography in parts of this line section and the important landscape values in the vicinity, particular care was taken to locate the centreline and towers where they would have the least landscape and visual impact.

3.2.4 Towers 89 – 105 (Kaahu Road – Whakamaru Substation)

Due to the confined width of the preferred route in this section, no alternative centreline alignments within the previously identified preferred route were considered for this section of line. However, different combinations of tower heights, tower spans and tower numbers were considered.

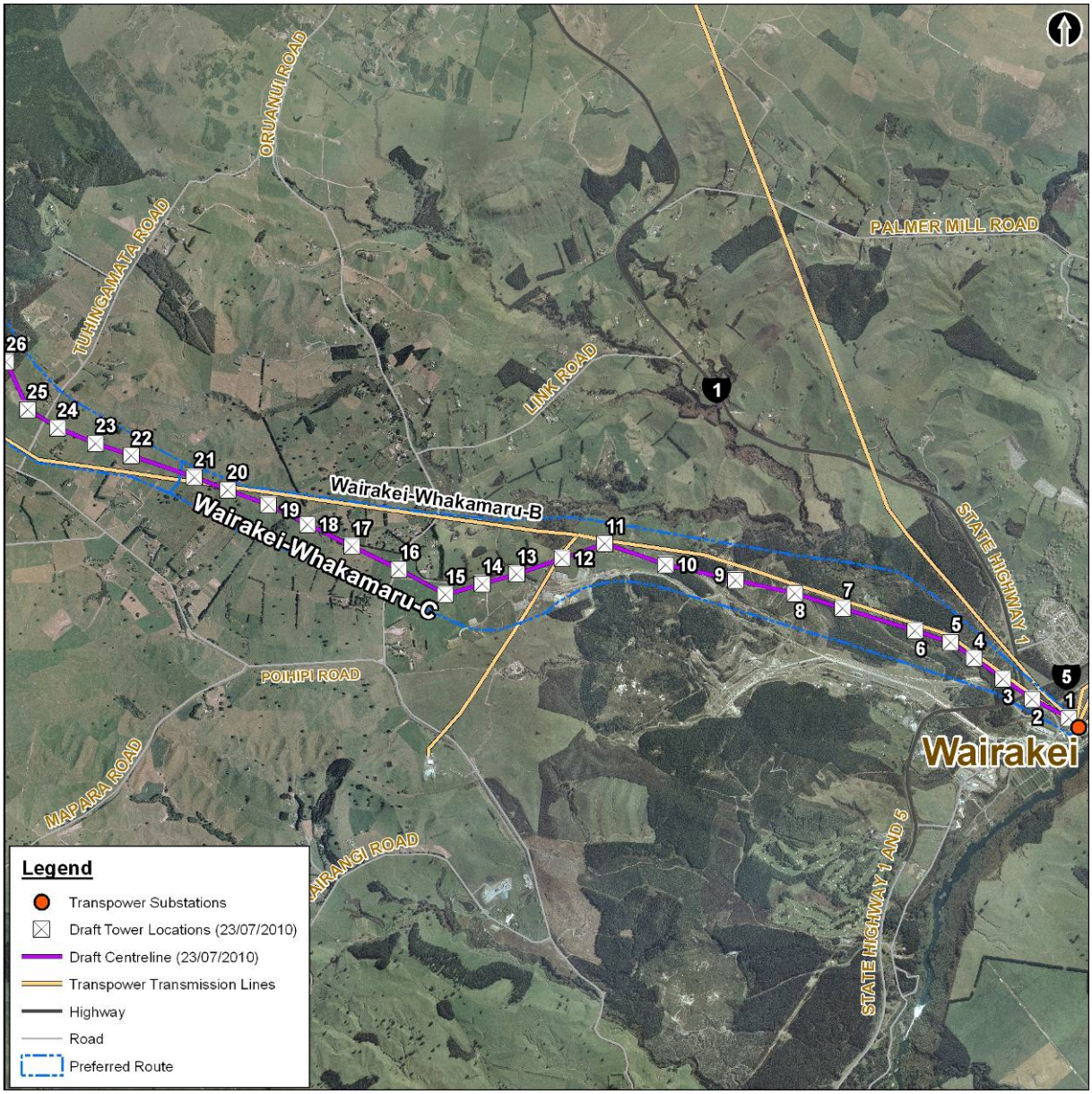
4 Description of the Draft Centreline and Tower Locations

Following the identification of the indicative centreline and tower locations and consideration of local variations, landowners along the indicative centreline were consulted. In addition, engineering and environmental technical specialists reviewed the indicative centreline and tower locations to review any issues with the alignment. This process of seeking input and review by landowners and technical specialists resulted in some minor refinements to the indicative centreline and tower locations. A circular feedback process was followed for making these refinements, with issues identified, possible refinements to the tower locations considered from property, environmental and engineering perspectives, and when consensus reached, the tower location would be retained or moved. It is important to recognise that the transmission line alignment (tower locations and height) is designed as a continuous link, with refinements to a single tower location often resulting in consequential refinements to other towers in the vicinity to ensure the transmission line meets the above design principles.

The information below describes the proposed alignment for the replacement transmission line from Wairakei to Whakamaru. The description is separated into geographic sections to describe the tower locations and the particular features and characteristics within an area. These sections have been defined based on areas with similar topographical, property and environmental considerations. Appendix 2 to this report includes a series of maps with the overall centreline and tower locations as well as section-by-section maps.

The description below also includes some specific details about tower heights and other project components. These details are preliminary only at this stage and are subject to change as more detailed design is undertaken. Confirmation of these project details will be included in the Notices of Requirement and Resource Consent Applications.

4.1 Towers 1 – 25 (Wairakei Substation – Tuhingamata Road)



4.1.1 Description

This section of the line runs from the Wairakei substation west to Tuhingamata Road. The draft centreline generally follows the existing Wairakei – Whakamaru B line (that will be removed following the commissioning of the new C Line) except in the vicinity of Oruanui Road and the proposed Te Mihi geothermal power station.

Towers 1 – 9

Proposed towers 1 and 2 are located where they will effectively replace the existing B Line towers, but are taller (approximately 40 - 46m in height). The C Line then crosses the new roundabout at the intersection of State Highway 1 and State Highway 5.

The draft centreline is then positioned immediately beside the existing B Line (on the southern side) where it crosses the crown-owned land (towers 3 – 9). Towers 3 – 9 are generally located on elevated points in this area, and tower heights are anticipated to range from 38m to 46m.

The crown-owned land has a number of land uses in the vicinity, including pine plantations (portions of which have been recently harvested and replanted), geothermal electricity generation, tourism/accommodation and recreation (walking and mountain biking). Some areas of taller pine plantation would need to be removed.

Given the existing land uses and development in this area (Wairakei Thermal Valley and Wairakei Power Station wells and pipe works) and the presence of the existing B Line, there are limited centreline options between towers 3 – 9. Siting the centreline for the proposed new C Line on the northern side of the existing B Line would directly cross the Wairakei Thermal Valley and further to the south than proposed could impact on the Wairakei Power Station wells and pipe works. While there are surface geothermal features in this general area, the draft centreline and tower locations avoid all surface geothermal features.

Towers 10 – 16

Proposed towers 10 – 16 align towards the location of the proposed Te Mihi Power Station and away from the existing B Line. Particular regard has been had to the location of the Te Mihi Power Station buildings, switchyard, existing and proposed wellheads and drilling sites, construction/lay down areas, and existing and proposed landscaping/mitigation plantings, including various tower locations. The draft centreline alignment is considered to provide ease of connection for the proposed Te Mihi Power Station to the national grid. In addition, this alignment avoids crossing the majority of rural lifestyle properties on Oruanui Road in the vicinity of the existing B line. Proposed towers 10 – 16 are anticipated to range in height from 37m to 51m.

The existing land use in this area is predominantly dry stock grazing. The draft centreline traverses to the south of some existing tall shelterbelts. Some localised removal or trimming of these shelterbelts in the vicinity of tower 13 will be required to achieve minimum clearance for vegetation with the new C Line. Locating the towers slightly further to the south has been investigated in order to retain these trees. However, locations to the south are constrained by works associated with the proposed Te Mihi Power Station. Some small areas of landscape mitigation planting may be required to mitigate the result of the removal of part of the shelter belt.

Towers 17 - 26

From Oruanui Road, the draft centreline heads towards the location of the existing B Line and crosses it in the vicinity of proposed tower 20 (towers 17 – 20). The draft centreline continues then on the northern side of the existing B Line where it crosses Tuhingamata Road approximately 300m to the north of the existing B Line (towers 21 – 24). The draft centreline then turns in a north-westerly direction to an area of pine plantation (towers 25 – 26). Proposed towers 17 – 26 are anticipated to range in height from 34m to 48m.

This alignment generally avoids the main concentration and outlook from dwellings in this area, except in the vicinity of tower 25. The proposed tower locations may be visible from a few dwellings in this area. However, the topography and existing vegetation will minimise the visual effects of the proposed C Line from the majority of dwellings. The predominant land use on the draft centreline in this area is dry stock grazing/pasture and some lifestyle properties. From tower 25 – 26, the draft centreline enters a pine plantation. A portion of the pine plantation will need to be removed for the new C Line.

Alternative centreline and tower locations were considered to the south (generally following the existing B Line) and a second alternative further to the north. The southern alternative (vicinity of the existing B Line) was not considered appropriate as it located closer to a number of dwellings and crosses a number of smaller rural lifestyle properties. This alternative alignment could limit the reasonable use of some of these smaller properties. Similar issues arise with a possible northern alterative alignment with existing dwellings in this area.

4.1.2 Matters Raised During Landowner Discussions and Technical Specialist Investigations

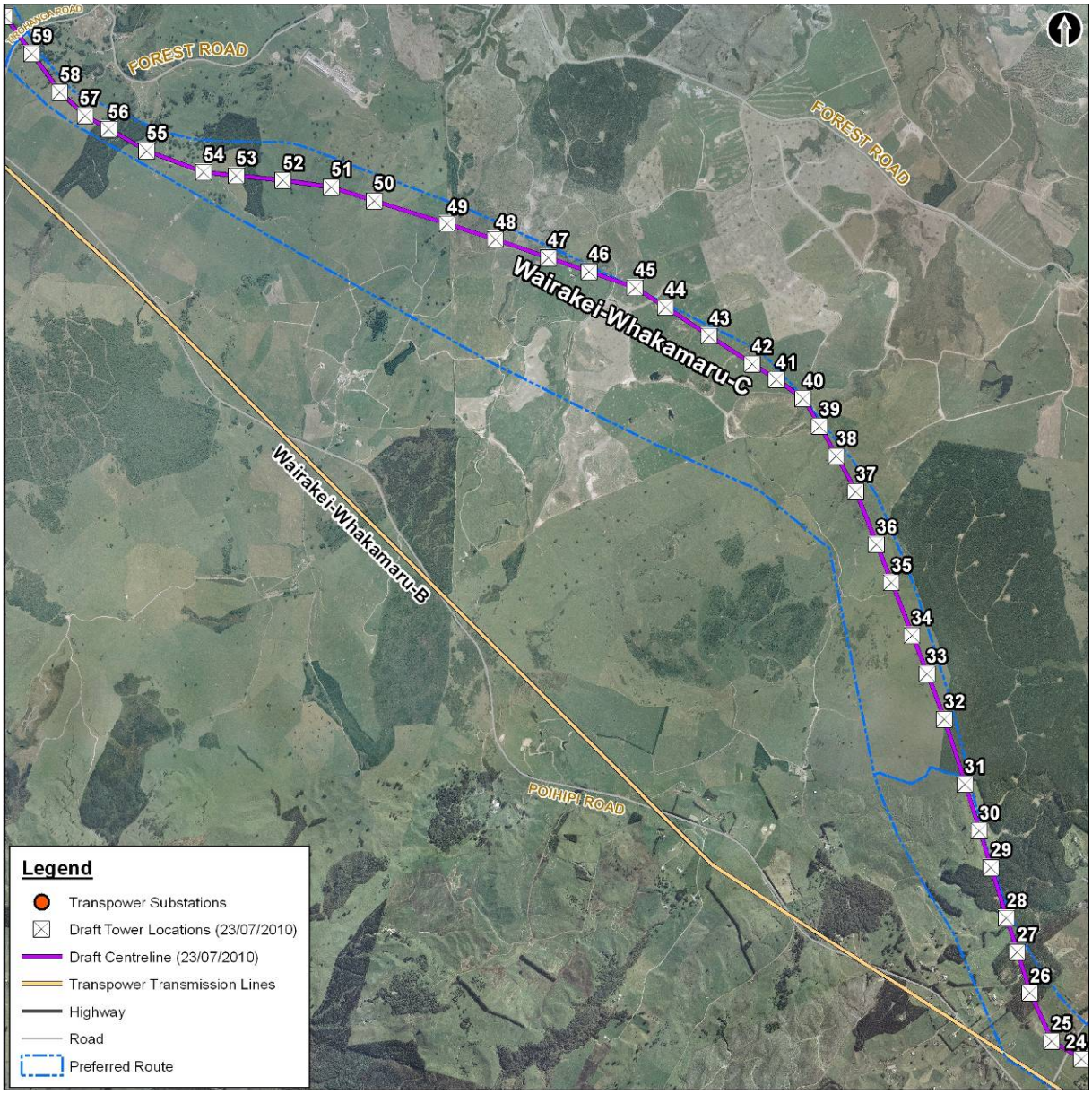
The primary issues raised during consultation for this section of line related to outlook from dwellings (visual effects), impacts on rural/lifestyle activities and relationship to the proposed Te Mihi Power Station. As discussed above, the draft centreline and tower locations minimises the visual effects in terms of avoiding the areas with the greatest number and concentration of dwellings. Tower locations have been selected to avoid main viewshafts from dwellings. In addition, the smaller lifestyle properties have generally been avoided. While it is inevitable that the towers will cross some rural properties, the tower locations selected have considered the impact on primary production activities. Where possible, tower locations are located on the edge of rural properties to minimise effects on primary production activities.

Limited issues have been identified in the investigations undertaken by the range of technical specialists. Wider and local landscape effects have been an integral consideration in selecting the draft centreline and tower locations. The three road crossings are the primary viewpoints where the new C Line would be visible from public areas. The visual effects on local residents have been minimised as far as practicable given the nature and density of landholdings and dwellings in this area. Some mitigation measures may be required for specific dwellings to further mitigate the visual effects. Some localised vegetation clearance may be required. However, this vegetation removal is not considered to have a significant influence on the landscape or visual effects in this location.

The components of the proposed Te Mihi Power Station and steam field have been considered in selecting the tower locations, including construction and operational issues. While there are sites of significance in the vicinity, there are no known archaeological, cultural or ecological sites of significance along the draft centreline or tower locations.

Access for constructing and maintaining the new C Line is anticipated to use existing or proposed roads or tracks in the area. The crown owned land has a network of roads and tracks associated with the pine plantation. The proposed Te Mihi Power Station includes the construction of an access road. For other areas, the new C Line is located close to public roads and farm tracks may be used or temporary access tracks may be constructed. The specific details for access will be determined during the detailed design phase and in agreement with landowners.

4.2 Towers 26 – 59 (Tuhingamata Road – Tirohanga Road)



4.2.1 Description

This section of the line runs from just west of Tuhingamata Road to Tirohanga Road near Mokai. The draft centreline deviates significantly to the north of the existing Wairakei – Whakamaru B line to locate it on lower ground where the landscape and visual impact would be minimised. This alignment also trends the line closer to the geothermal resources near Mokai.

Towers 26 - 36

From Tower 26 the draft centreline heads in a north-westerly direction through an area of pine plantation and dry stock grazing and dairying. Proposed towers 26 – 36 are anticipated to range in height from 34m to 49m. There are some dwellings on rural lifestyle properties in the vicinity of Tower 26. With the removal of some of the pine plantation associated with constructing the new C Line, this vegetation removal may increase visibility of this tower. Further consideration will be given to what extent visual mitigation is required for dwellings in this area.

An alternative centreline option further to the south (closer to the existing B Line) was considered. However, this alternative alignment was not considered appropriate as the wider landscape effects would have been more significant. In addition, this alternative centreline would have crossed or been located closer to a number of rural lifestyle properties and dwellings along Poihipi Road. The social and visual impacts of this alternative centreline alignment on these properties were considered to be more significant than the draft centreline and tower locations.

Towers 37 - 51

Where the preferred route alignment changes from a northerly alignment to a more north-westerly alignment (in the vicinity of proposed towers 36-37), there were effectively two options for the centreline. One option was to follow the northern edge of the preferred route while the second option was to follow the southern edge. A centreline crossing from the northern edge to the southern edge (or vice versa) was not considered appropriate as it would cross a broad open area.

The northern option which trends in a broad curved manner, trending generally north-west-north between towers 37 – 40, then north-west between towers 40 – 48, and then generally west from towers 48 – 51. Proposed towers 37 – 51 are anticipated to range in height from 35m to 48m. The draft centreline and tower locations are located on slightly lower ground in the overall broader landscape, and generally align with the edges of larger farms (but not all properties) and is the furthest distance from the greater number of rural dwellings. The land use in this section of centreline is dairying, including some land which has recently been converted from plantation forestry to dairying.

Towers 52 - 59

From the area to the south of the Mokai Power Station, the draft centreline continues to trend west before curving in a north westerly direction to where it crosses Tirohanga Road approximately 900 metres to the north of the Tirohanga Road/Poihipi Road intersection. Proposed towers 52 - 59 are anticipated to range in height from 35m to 46m.

The draft centreline in this location crosses predominantly dairying and dry stock grazing land, as well as two small areas of pine plantation. There are also a number of scattered indigenous trees in this area, particularly totara. Sections of the pine plantation and some of the indigenous trees would need to be removed and/or trimmed in this area, and suitable replacement plantings are being investigated.

Specific consideration has been given to the impacts of the alignment on the community at Mokai. The draft tower locations are placed in locations where the visual impacts when viewed from Mokai will be minimised, such as selecting lower areas and locations already screened by topography and existing vegetation. Landscape mitigation in the vicinity of Mokai would assist with further reducing the visual and landscape effects of the new C Line. In addition, lower towers in this location have also been considered as a measure to minimise the visual and landscape effects.

4.2.2 Matters Raised During Landowner Discussions and Technical Specialist Investigations

Landowners of the larger farms in this location expressed concern about the loss of productive land and restrictions on land use in the vicinity of the new C Line. Particular concern was expressed about having the new line ‘cut across’ the middle of farms. Taking into account these comments, the draft centreline aims to, as far as practicable, follow the edges of the larger farms in this area, but this cannot be avoided all together.

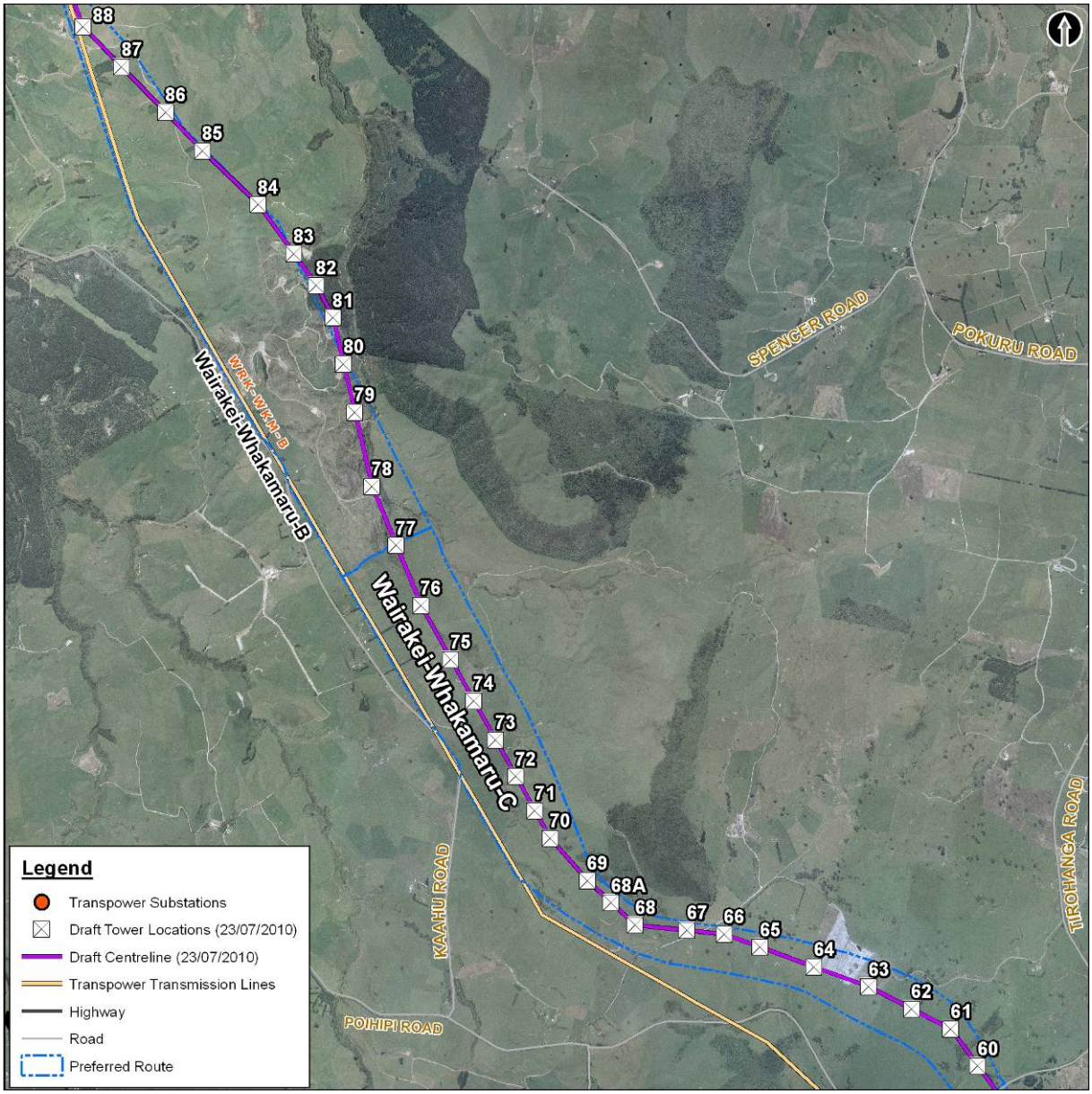
Consultation with people in the Mokai community has already highlighted areas of community and cultural interest. In addition, the visual impact of the new C Line when viewed from the specific locations (e.g. Marae and Pre-School) was also highlighted. As noted above, these matters have been considered in selecting the draft centreline and tower locations.

The airstrip on the Tuaropaki Trust property will be affected by the alignment of the draft centreline. In conjunction with the landowner, alternative arrangements are being investigated to mitigate the impact of the proposed

transmission line on this airstrip. The two primary technical specialist investigations for this section of centreline relate to sites of cultural and historical significance and the landscape and visual impacts on Mokai. In terms of sites of cultural and historical significance, the draft centreline and tower locations avoid all recorded sites in the area. Some refinements have been made to the indicative tower locations to respond to areas which were highlighted. Further landscape assessment is being undertaken to investigate measures to further reduce the visual impact of the new C Line when viewed from Mokai.

Access for constructing and maintaining the new C Line is anticipated to use existing or proposed roads or tracks in the area. As the majority of land in this section of line is operated as large scale dairying or dry stock grazing operations, they generally have a well-developed network of farm tracks. In addition, there are different options available with access from public roads. The specific details for access will be determined during the detailed design phase and in agreement with landowners, such as whether new access tracks (temporary or permanent) are constructed or existing farm tracks upgraded.

4.3 Towers 60 – 88 (Tirohanga Road – Kaahu Road)



4.3.1 Description

This section of the line runs from Tirohanga Road towards the southern end of Kaahu Road. The draft centreline trends back towards the existing Wairakei – Whakamaru B line near Kaahu Road (approximately 400 metres to the east).

Towers 60 – 70

From where the line crosses Tirohanga Road, the draft centreline continues to trend north-west before curving in a more westerly direction to cross a low saddle to the south of the elevated and bush clad land in the Significant Natural Area identified as “Marotiri Road Forest”. Proposed towers 60 – 70 are anticipated to range in height from 34m to 46m. The land use in this area is dairying and dry stock grazing, with relatively few dwellings in the vicinity.

A key consideration in selecting the centreline and tower locations in this area was the wider landscape impacts and effects on the Significant Natural Area. The centreline curves around sloping land with tower locations predominantly located on areas with slightly flatter topography. This approach reduces earthworks in forming a flat platform for the tower and construction works. Particular care has been taken to ensure the draft centreline avoids crossing the 'Marotiri Road Forest' Significant Natural Area. The draft centreline is located immediately to the south of this Significant Natural Area and does not disturb any vegetation within the Significant Natural Area.

Alternative alignments were considered for the section of line between Towers 66 – 70, including siting the towers outside the Significant Natural Area but with the conductors passing through a small section of the Significant Natural Area. However it was determined to achieve the minimum clearance distance between the conductors and existing vegetation it would require either excessively tall towers or removal of vegetation. Neither of these options were considered appropriate.

Towers 71 - 88

From Tower 71, the draft centreline heads in a north-westerly direction generally running parallel to the existing Wairakei – Whakamaru B Line and Kaahu Road. At Tower 76, the draft centreline trends slightly more eastwards than the existing B Line. At Tower 81, the centreline starts to trends in a more westerly direction towards the existing B Line, where Tower 88 is located immediately adjacent to this existing line. Proposed towers 71 – 88 are anticipated to range in height from 34m to 52m. The land use in this area is a mix of dry stock grazing and dairying.

The draft centreline and tower locations are positioned to minimise the wider landscape effects, particularly when viewed from Kaahu Road. An alignment further to the east than the existing B Line and no crossings of Kaahu Road achieves this outcome. In addition, this alignment provides a larger separation distance with the rural dwellings located immediately adjacent to Kaahu Road. The draft centreline and tower locations also seek to minimise disruption to primary production activities by being located on the edges of farms and/or siting towers in locations which avoid farm infrastructure (e.g. farm tracks, water supplies).

An alternative centreline and tower locations were considered to the west (generally following the existing B Line). However, as noted above, this alternative centreline and tower locations were not considered appropriate due to the landscape effects and proximity to dwellings.

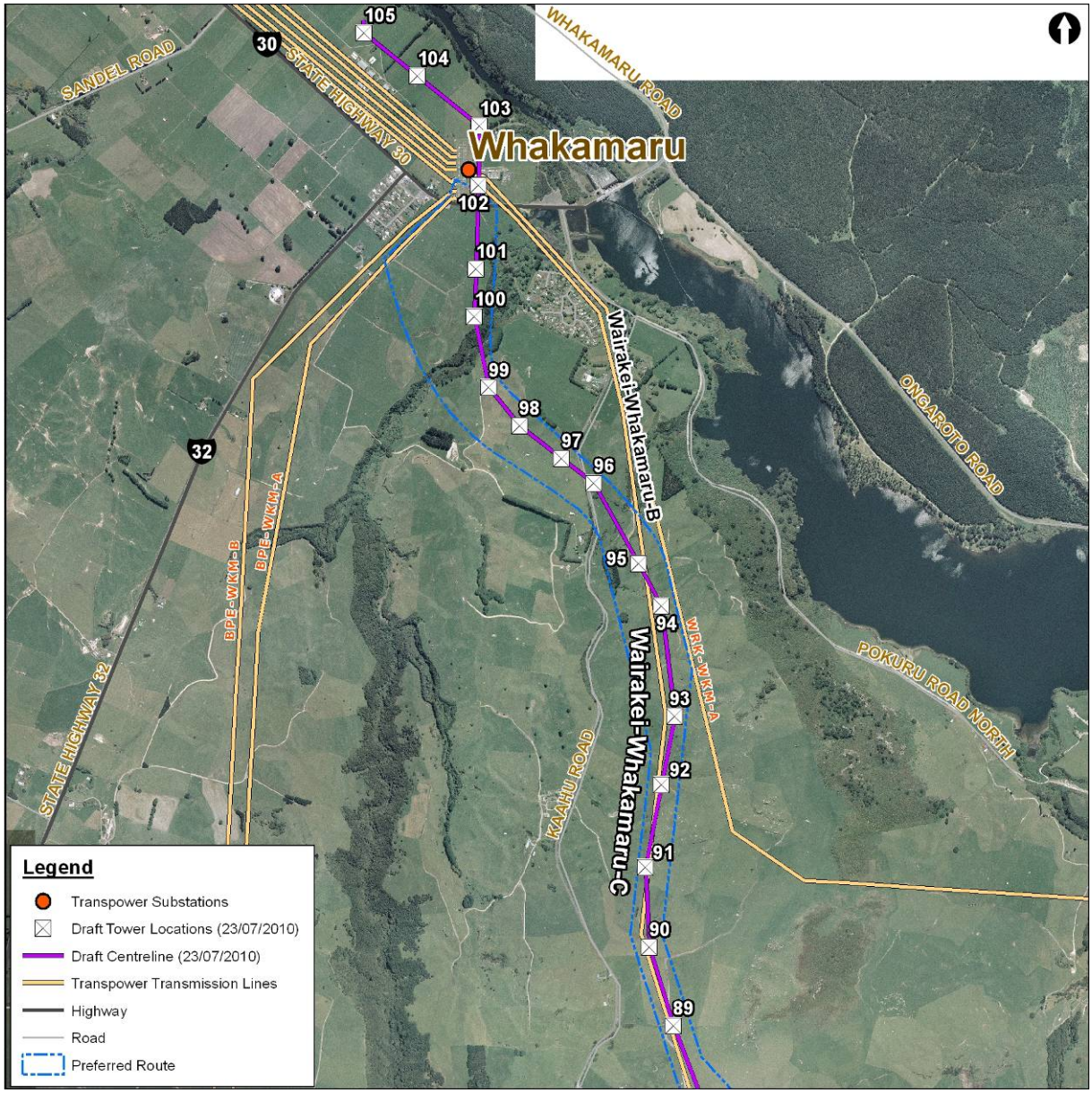
4.3.2 Matters Raised During Landowner Discussions and Technical Specialist Investigations

Landowners in this area were concerned about disruption to primary production activities and the proximity to dwellings. As noted above, by locating the centreline furthest to the east than the existing B Line reduces the potential disruption to primary production activities and is located a greater distance from dwellings.

The wider landscape impacts and effects on sites of cultural and historical significance were the two primary technical specialist investigations for determining the draft centreline for this section. Viewpoints from Kaahu Road were a key consideration with a more eastern alignment preferred to minimise the wider landscape impacts. Further investigations, including literature and field work, was undertaken along this section of line into sites of cultural and historical significance. No evidence was found of sites of cultural or historical significance in the location of the proposed tower sites.

Access for constructing and maintaining the new C Line is anticipated to use existing or proposed roads or tracks in the area. The flatter land generally has a well-developed network of farm tracks on the flatter land, while the steeper land has limited existing access tracks. There are different options available with access from public roads. The specific details for access will be determined during the detailed design phase and in agreement with landowners, such as whether new access tracks (temporary or permanent) are constructed or existing farm tracks upgraded.

4.4 Towers 89 – 105 (Kaahu Road – Whakamaru Substation)



4.4.1 Description

This section of the line runs from mid-way along Kaahu Road to connect with the Whakamaru Substation. The draft centreline generally follows the existing Wairakei – Whakamaru B line except it diverts to the south of Whakamaru Village rather than to the north (as with the existing B Line).

Towers 89 – 94

From Tower 89 the draft centreline heads in a northerly direction very close to the existing B Line alignment. Proposed towers 89 – 94 are anticipated to range in height from 34m to 48m. Land use in this area is a mix of dairying and dry stock grazing.

Landscape impacts have had a significant influence on the tower locations for this section to the potentially significant landscape impacts. A combination of tower locations and tower heights has been applied to minimise the landscape impacts of the new C Line.

Given the narrow width of the preferred route in this area, no alternative centrelines were considered to be appropriate.

Towers 95 – 105

From Tower 94 the draft centreline trends in a north westerly direction to be located to the south of Whakamaru Village. The centreline then heads in a more northerly direction where it connects with the Whakamaru Substation. Proposed towers 95 – 105 are anticipated to range in height from 35m to 53m. The predominant land uses in this area are dairying and dry stock grazing.

The visual and social impacts of the new C Line for residents in Whakamaru Village have been a key consideration in determining the centreline and tower locations. The centreline is to the south of the broad sloping face immediately to the south of Whakamaru Village and Whakamaru School. This elevated land effectively screens the new C Line when viewed from within Whakamaru Village.

The alignment crosses an incised gully between Towers 99 – 100. This gully is heavily vegetated with a few taller trees on its edges likely to require removal to achieve minimum clearance distances. The majority of trees to be removed are exotic species as well as potentially a few indigenous trees (totara) may require removal or trimming.

The existing telecommunications mast immediately to the south of the Whakamaru Substation is proposed to be removed. Removing this mast would allow the new C Line to enter to the eastern side of the Whakamaru Substation. Initially, it is proposed one circuit of the new C Line would connect with the existing Whakamaru Substation and the second circuit would connect to the new Whakamaru North Substation (to be constructed as part of the North Island Grid Upgrade Project).

4.4.2 Matters Raised During Landowner Discussions and Technical Specialist Investigations

Residents of Whakamaru strongly supported an alignment to the south of the existing village. This alignment has been achieved with tower locations on the slightly lower land to the south of the more elevated land immediately to the south of the village.

Landowners within the preferred route expressed concern about disruption to primary production activities and relationship to existing transmission lines. The particular tower locations selected are in an effort to minimise disruption to primary production activities. It is noted that the existing B Line would be removed following commissioning of the new C Line.

The landscape impacts and effects on the vegetation and ecological values of the gully were the two primary technical specialist investigations for determining the draft centreline for this section. As noted above, the alignment to the south of Whakamaru Village seeks to minimise the visual and landscape impacts from the residential areas. The vegetation proposed to be removed on the edges of the gully system are exotic species and are not considered to be ecologically significant.

Access for constructing and maintaining the new C Line is anticipated to use existing or proposed roads or tracks in the area. The flatter land generally has a well-developed network of farm tracks on the flatter land, while the steeper land has limited existing access tracks. There are different options available with access from public roads. The specific details for access will be determined during the detailed design phase and in agreement with landowners, such as whether new access tracks (temporary or permanent) are constructed or existing farm tracks upgraded.

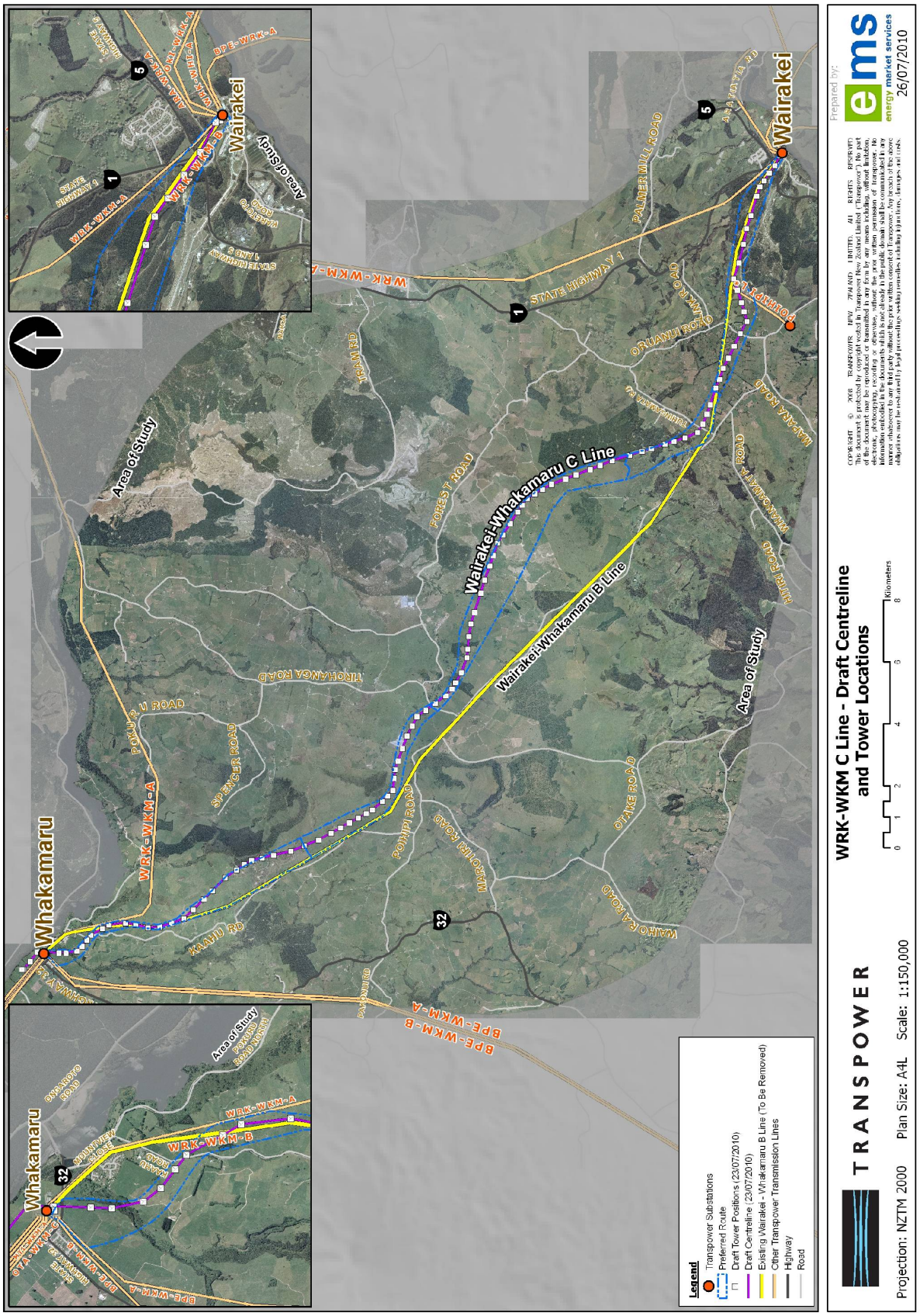


Figure 4: Draft Centreline and Tower Locations

4.5 Next Steps

Ongoing discussions are being held with landowners to address site specific issues. These discussions with landowners may not only relate to the location of towers, but other considerations such as measures to mitigate environmental impacts, access requirements and compensation for landowners where towers are located on their property.

Wider public consultation will also be undertaken to identify any issues the wider community may have with the draft centreline and tower locations. Targeted consultation will also be undertaken with specific groups who have particular interest in this project, such as the community at Mokai and tangata whenua.

The range of technical investigations and assessment will be completed. These assessments will determine the actual or potential effects of this proposal, and include any recommendations on measures to avoid, remedy or mitigate the adverse effects. The assessments would relate to the following matters:

- Landscape and Visual Impacts
- Impacts on Agricultural Activities
- Health Impacts associated with Electro-Magnetic Fields
- Electrical Inference and Other Associated Impacts
- Noise Impacts
- Archaeological Assessment
- Cultural Impacts
- Social Impacts
- Tourism and Recreational Impacts
- Ecological Impacts
- Traffic Impacts
- Construction Impacts

All of the above will be considered before finalising the centreline and tower locations. As part of finalising the centreline, the width of the easement and designation would also be determined. Once these details are confirmed, the Notice of Requirement and Resource Consent Application for the replacement line will be prepared. Transpower will then lodge this notice and application to obtain the necessary approvals (i.e. designation) and consents under the Resource Management Act 1991.

5 Summary

This report provides the outcomes of the fourth stage of the route selection process for the proposed replacement Wairakei to Whakamaru 220 kV double-circuit duplex transmission line. The report is part of a systematic approach (modified ACRE process) to identify a suitable alignment for the replacement transmission line.

The earlier Preferred Route Report identified the preferred overall route in which the replacement transmission line would be located, including an evaluation of the advantages and disadvantages of the previously identified route options.

Consultation has been undertaken with landowners and the wider community about specific issues within the preferred route. This consultation has focused on understanding landowner preferences for tower locations and identifying any specific property issues which influence the siting of transmission lines. Wider community consultation was undertaken to identify any particular locations or issues which were of primary concern to the community.

A number of technical specialists were also involved in investigating specific issues which may influence the tower locations within the preferred route. These technical specialists included property advisors, landscape architect, archaeologist, cultural advisor, ecologist, civil engineers and geotechnical engineers. Based on the findings of these investigations, the tower locations have been determined.

The draft centreline and tower locations are identified on Map 2 in this report and in a series of maps in Appendix 2. Ongoing discussions are being held with landowners and consultation with the wider community on this draft centreline. Refinements will be made to the draft centreline and tower locations were issues are identified and where it does not compromise other factors already considered in determining tower locations.

Following these further discussions, the centreline and tower locations will be confirmed. This confirmed centreline and tower locations will form the basis for preparing the Notice of Requirement and Resource Consent Application, including the accompanying assessment of environmental effects. Transpower will then lodge this document to obtain the necessary approvals and consents under the Resource Management Act 1991.

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Appendix 1: Transpower ACRE Model

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Appendix 2: Draft Centreline and Tower Location Map Series