BEFORE THE BOARD OF INQUIRY

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of applications for resource consent and Notices of Requirement by Transpower New Zealand Limited for the North Island Grid Upgrade Project

---

STATEMENT OF EVIDENCE (2) OF SYLVIA JEAN ALLAN FOR TRANSPOWER NEW ZEALAND LIMITED

(Planning: Resource Management Act Analysis, Overhead Transmission Line, Brownhill Substation and Whakamaru and Whakamaru North Substation)

SIMPSON GRIERSON
D J S LAING / J G A WINCHESTER
TELEPHONE:+64-4-499 4599
FACSIMILE: +64-4-472 6986
DX SX11174 P O BOX 2402
SOLICITORS
WELLINGTON

INTRODUCTION

1. **MY** name is Sylvia Jean Allan. I have the qualifications and experience and role in the North Island Grid Upgrade Project (**the Project**) as set out in my statement of evidence (1).

2. **THIS** is my second brief of evidence. The first has dealt with the application of the ACRE process and identification of routes and sites for parts of the project, particularly for the overhead line and the Brownhill and Whakamaru and Whakamaru North Substation. I also covered the approach to consents adopted at this stage in the process.

Scope of Evidence

3. **IN** this brief of evidence, I provide:

- a brief description and explanation of the Notices of Requirement (**NORs**) and consents required for the overhead transmission line, and the Brownhill and Whakamaru and Whakamaru North substation sites;
- the effects of the project in relation to the overhead transmission line and the substation sites;
- an outline of the statutory framework, including the provisions of the relevant District Plans and Regional Plans, and how the parts of the overall project that I have described relate to the Plans;
- an overall assessment of effects of the project components I am focusing on; and
- commentary relating to RMA Part 2 matters and other matters of relevance to the decisions of the Board of Inquiry on the NORs and consent applications.

Familiarity with Locations and Documents

4. **I** am familiar with the location of the proposed overhead line and the substation sites addressed within this evidence. I have visited the nearest public areas to the alignment along its full length several times, and a selection of specific areas on

private land. I have visited the substation sites several times. I have also been involved in direct consultation during various phases of the project. I am familiar with the NOR and other project documentation.

Relationship to Other Evidence

5. **MY** evidence is complementary to that of Annette McGovern, who focuses on the Pakuranga substation and the underground cable route for which a designation and consents are sought between that substation and the proposed new substation site at Brownhill Road, Whitford, and Paula Hunter, who focuses on the Otahuhu substation and the underground cable route. My evidence has been prepared in the context of other environmental and technical evidence available to the Board on behalf of Transpower.

General Comment

6. **AS** noted in my first statement of evidence, it is my opinion that the planning processes followed for the project, including route identification, consultation, and the range of investigations and decision techniques leading to the NORs and consent applications have been appropriate, and have identified sites and locations for the project's components that have avoided or mitigated adverse effects on the environment. Adverse effects are generally acceptable or can be further avoided, remedied or mitigated. Some effects however remain and are unavoidable in terms of this project.

7. **FURTHER** mitigation of effects can in many instances be achieved through conditions. I will refer to a number of proposed conditions in my evidence. Generally, these are similar to, or expand upon, matters already noted in the NOR documentation, Parts VII, VIII and IX.

8. **WHILE** there are some inconsistencies with the policy framework over the range of statutory planning and resource management documents, given the nature and scale of the infrastructure, and the focus of parts of the documents, that is to be expected. It is not sufficient reason to decline the whole or any part of the project. The upgrade project as a whole is of national importance, and my Part 2 RMA and

Section 171 analyses of the three component parts covered in this evidence, take this into account.

RESOURCE MANAGEMENT ANALYSIS

9. **THIS** section of my evidence relates to the considerations under the Resource Management Act which relate to requirements, consents and proposals subject to call-in under Section 147(4)(b). As there is overlap between the matters to which regard must be had in terms of section 104 for consents, and matters to which particular regard must be had for notices of requirement in terms of section 171, I address both the requirements and the consents sought together for the three components of the project addressed in this evidence.

10. **SECTIONS** 104 and 171 both elevate Part 2 of the RMA to an overarching consideration. Both also require consideration of:

    (a) effects on the environment of allowing the activity;

    (b) relevant provisions of national policy statements (once issued under section 52), the New Zealand Coastal Policy Statement, regional policy statements (operative and proposed) and regional and district plans; and

    (c) other matters that are reasonably necessary to make a decision or a recommendation.

11. **FOR** a requirement, further considerations involve:

    (a) whether adequate consideration has been given to alternative sites, routes or methods of undertaking the work (particularly if the requiring authority does not own the land, or significant adverse effects on the environment are involved); and

    (b) whether the work and designation are reasonably necessary for achieving the objectives of the requiring authority.

12. **MY** evidence now addresses the requirements for the overhead transmission line, Brownhill Substation, and Whakamaru and Whakamaru North Substation in terms of each of the matters listed above, concluding with the Part 2 RMA considerations.

OVERHEAD TRANSMISSION LINE

13. **PARTS** I, II and VIII of the NOR documentation describe the intended designation for the 400kV-capable overhead transmission line between the Brownhill substation in south Auckland, and the Whakamaru and Whakamaru North substations in the south Waikato area. The proposed designated area is some 185 kilometres long and varies in width from a minimum of 65 metres wide to approximately 125 metres wide (depending on the extent of line swing, but also widened in some areas to accommodate dual towers and to address risk associated with plantation forestry). Although Transpower has now purchased some properties as outlined in the evidence of Mr Miles, most of the line length is in a range of other ownerships. Transpower intends to purchase an interest in the land sufficient to construct, operate and maintain the transmission line.

14. **THE** length of the designation crosses the territory of one city and six district councils. The description of the designation to be included in the various district plans is:

> *"The construction, operation, and maintenance of that part of a 400kV-capable transmission line which is within the district, to convey electricity between a proposed new substation site at 149 Brownhill Road in Manukau City and the proposed Whakamaru and Whakamaru North substation in Taupo District, as part of the proposed North Island Grid Upgrade Project, and ancillary activities."*

15. **CONSENTS** are also sought for activities within the designated area which are controlled by the RMA and the two regional councils within whose regions the proposed alignment is located. These consents are described as:

Auckland Region

- Application 347: Land Use Consent for earthworks (including but not limited to benching, foundation excavation, topographic modifications, geotech drilling, backfilling or clean filling) to enable the construction of tower foundations inside and outside any sediment protection control area. Earthworks for roading and tracking to enable access to the tower construction sites inside and outside any sediment protection control area.

- Application 347: Discharge of Contaminants to land from ancillary activities that produce wastewater or washwater, such as:
  - the use of chemical cracking rock breaking techniques
  - dewatering sediment laden water from the trenches
  - the washing of vehicles, plant or machinery
  - geotechnical drilling activities
  - dust suppression
  - concrete laying or reworking, associated with the installation of the tower foundations.

Waikato Region

- Application 116902: Land Use Consent for vegetation clearance and earthworks associated with tower site preparation and access tracks within the Designated Area in High Risk Erosion Areas.
- Application 116903: Discharge Permit for the composting of vegetation (>20m^3 per site) for composting/mulching of vegetation generated through vegetation trimming and clearance.
- Application 116904: Land Use Consent for the drilling of tower foundation below the water table.
- Application 116905: Discharge Permit for the discharge of site water and drilling fluids from drilling activities into surface water.

16. **THE** activities primarily relate to foundations for the towers, but also cover any necessary earthworks which relate to tower foundations or access tracks within the designated area. In Waikato Region, consents relating to the disposal of cleared vegetation and vegetation removal on steep sites are also covered. In Auckland Region, there are some small areas where topographic modification to ensure appropriate ground clearances are also included within the consents sought.

17. **AS** described in the evidence of Transpower's power systems experts, while the project as a whole is staged to meet growing demand, the overhead transmission line is to be built to its full development prior to first commissioning to run as a 220kV line. Only in the year 2034 (approximately) and beyond, is it expected that the line will operate at 400kV capacity. While the increasing capability of the

project will be marked by successive stages of works and development at the substation sites, and in relation to the building of first the Pakuranga to Brownhill underground cable, and then the Otahuhu to Brownhill underground cable, that is not the case with the overhead line. There will be a single construction stage for this part of the project. Subsequent capacity increases will not result in any change in the line.

18. **A** high level of detail has been able to be provided in relation to the design of the line, including the location and height of towers, the generic types of foundations likely to be involved, the construction methodology, and the finished overhead line structure. Because of this, the information is considered adequate in my opinion to comprise an outline plan for the whole length of the line. It is expected that the consent conditions will involve provision of a detailed Construction Management Plan for the project to the regional councils prior to construction commencing. I would expect this information also to be provided to the city and district councils on an informal basis, with the opportunity to comment.

19. **AS** it is located largely on privately-owned land, it is important that landowner issues and concerns are taken into account as far as practicable. While site visits and landowner liaison has been able to be undertaken over much of the line, there are some areas where site visits have not been made because of refusals to grant access. Some flexibility has therefore been sought to be built into the tower locations to allow for small longitudinal changes in the location of the towers (and associated potential height changes). These alterations would not apply to angle towers, where the position can be regarded as fixed. This flexibility also provides for unexpected ground conditions or archaeological or ecological finds, where it would be appropriate to move the tower slightly to avoid an effect. Mr Noble's evidence describes the extent of these provisions.

20. **AS** explained in the NORs, such small changes would not result in adverse effects that are greater than those of the line as included in the Notices. Generally, they would be done for beneficial reasons. Any associated adverse effects (for example, visual change) would be in the de minimis category, and would be expected to be outweighed by the beneficial effect.

Changes Sought Since NOR Lodgement

21. **AS** outlined in the evidence of Mr Noble, a number of changes have arisen as a result of ongoing investigations and landowner liaison in the period since the NORs were lodged. These include a number of small moves within the scope of the flexibility specified in the NOR documentation These are fully detailed in the evidence of Mr Noble.

22. **MR** Noble also details changes to several towers that are outside the scope of the specific flexibility specified within the NOR, but which, in my understanding, will be presented to the Board. These are as follows:

(a) Tower 42, Franklin District NOR; 54 metre movement south along the line;
(b) Tower 43, Franklin District NOR; a height increase of 7 metres (along with a 20 metre movement along the line);
(c) Tower 163, Waikato District NOR; a height increase of 4 metres;
(d) Tower 164, Waikato District NOR; a movement south of 60 metres;
(e) Tower 165, Waikato District NOR; a movement south of 60 metres;
(f) Tower 172, Waikato District NOR; a movement south of 58 metres..

The reasons for the movements are explained in Mr Noble's evidence. The two height changes that exceed the three metres specified in the NOR documents are a consequence of the improved positioning of the towers.

23. **THESE** changes have all have been undertaken at landowner request, and have been assessed by the team described in my first statement of evidence. All changes in my opinion have adverse effects that are minor or less in visual and landscape terms. There are no other consequential adverse effects in any case.

24. **IN** my opinion there are positive benefits (reduced earthworks, reduced visual impact in relation to nearby dwellings, and an increase in the regularity of spacing and height of towers) that support these changes, and there are no apparent consequential adverse effects of any other type.

25. **MR** Lister in his evidence expresses the view that monopoles may be warranted in two locations. The design and appearance of these types of towers are described in his evidence and that of Mr Lake. Mr Lister and Dr Steven assess the visual effects in general terms.

26. **THE** monopoles are intended to mitigate visual impacts.

Summary of Effects on the Environment

27. **AN** extensive assessment of effects on the environment has been provided relating to the overhead transmission line in the NORs Documentation, Part VIII, and in the accompanying specialist reports. Further assessment information is provided in the evidence of the numerous technical experts to the Board. Rather than repeat the assessment, I provide a brief overview opinion on the nature and extent of effects relating first to those associated with the overhead transmission line as a whole, and then to particular issues within the sections of the line. My understanding of the actual and potential effects is that of planning technical expert, and draws on my understanding of the project as a whole, the statutory framework including district and regional plans, the receiving environment through which the line will pass, and the opportunities and prospects for mitigation.

28. **THE** receiving environment for the overhead transmission varies along the length of the line, from south Auckland to Whakamaru. It has been described in overview terms in section 5.1 of Part VIII of the NORs documentation. As explained earlier in this evidence, the ACRE process was applied in an endeavour to identify the route and eventually the alignment with the least impacts on people and the environment. There are however numerous effects remaining, given the length and scale of the line, the topography and the relatively populated nature of the Waikato area. Most pervasive are visual effects. These are best assessed on a section-by-section description, along with a number of other types of site-specific effects. Before setting out that assessment, I comment on the more generic effects of the proposed overhead transmission line during both the construction and operational stages.

General Construction Effects

29. **THE** construction stage for the overhead line was described in the NORs documentation, Part VIII, section 2.7. This described the six stages of construction –access construction, site preparation and vegetation management, foundation construction, tower erection, conductor and earthwire installation, and reinstatement. As regional consents are sought for activities associated with track[1] and foundation construction in both regions, vegetation clearance and disposal, and a small amount of topographic modification, a description of those activities was also included in the two application documents (section 2, as relevant, in each).

30. **THE** construction stage activities will be subject to a considerable amount of analysis at the site level (usually in association with the landowner), as well as early geotechnical testing. Each construction site, and other areas such as lay down areas will be, meticulously planned. As I understand it, there is a series of specific planning exercises which will take place prior to construction commencing. For the overhead line, there will be an overall Construction Management Plan which documents all project control methods, including methods and mechanisms to mitigate effects in practical ways. The contractor, involved in or encountering a specific circumstance during the detailed planning or actual construction, will have a standard procedure or method to follow[2,3].

31. **FOR** each tower site and/or other substantial work area (such as laydown area) there will also be a Site Works Plan. Mr Patrick's evidence provides an example of a site works plan. This is a specific detailed plan giving layout and activity description and also referring to procedures or requirements from the Construction Management Plan. The site planning (through the site work plans) and the overall

---

[1] Track-related regional earthworks consents are only sought within the designated area.

[2] The Construction Management Plan will incorporate provisions from Guidelines such as ARC Technical Publication TP90, the "Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region" and Environment Waikato's 2003 "Design Guidelines for Earthworks, Trackings and Crossings; A Practitioner's Technical Guide to Minor Effects Based Activities", as well as best practice requirements for the use of particular technologies (eg, geotextile use)

[3] The Construction Management Plan is however, intended to include a wider range of responsibilities and protocols, including items such as the protocol (still in draft) attached to Mr Mikaere's evidence, any NZ Historic Places approval requirements, outline Community Liaison and Stakeholder Liaison responsibilities and community information undertakings.

construction management plan are intended to avoid, mitigate and remedy adverse effects on the environment[4].

32. **WHILE** the focus of the activities is at site level and will clearly impact upon directly affected landowners and nearby neighbours, the construction stage also involves effects that will be noticed much further afield, including transport and traffic and visual/landscape changes, as some vegetation is removed and the new towers are constructed. During the construction stage, the ARI-PAK A line will also be removed. The general construction effects are now discussed (in no particular order of significance).

Noise

33. **CONSTRUCTION** noise involves a range of activities, from geotechnical testing early in the process, to stringing of conductors and earth wires by helicopter later in the process. The nature and extent of the noise is as described in Mr Warren's evidence. Mitigation will include limits on working hours to between 7am and 6pm, except in specific circumstances where for example a major concrete pour is taking place or if remedial works of any kind are needed. Generally, the approach will involve compliance with the Construction Noise Standard NZS6803:1999. A key aspect of mitigation will however be landowner, and neighbour community liaison. This will particularly be the case with the use of helicopters. Some animal management may be needed (eg, temporary removal of deer from the vicinity of construction sites), and Transpower will as far as practicable avoid sensitive periods such as calving.

34. **IT** is however inevitable due to the tight construction programme, that some properties may experience construction activities during sensitive periods. Mr Rooney's evidence discusses that the main effect is likely to be mis-mothering which is not a significant issue for dairy activities. Mr Rooney proposes close liaison between landowners and contractors on the basis for avoiding or mitigating

[4] It is my understanding that Transpower has committed to submitting the individual Site Works Plans to the local territorial authority. It would therefore also be logical that the regional councils see this level of detail. The regional councils are expected to have authority over the content of the Construction Management Plan through the conditions of consent for regional consent applications.

effects.

35. **IN** my opinion, overall noise effects may be moderate to significant, but will be localised and temporary. Landowner liaison and community information programmes should adequately manage effects.

Vibration

36. **VIBRATION** will also be localised, and will potentially result from the movement of heavy equipment on softer soils, any foundation pile driving or rock blasting, and the use of implosive conductor jointing methods. While the NORs documentation indicated that only 10% of foundations would involve pile driving or blasting, a review has since indicated that up to 20% may involve pile driving. Generally, distance between dwellings and other work areas, along with liaison with potentially affected people, will be sufficient to mitigate effects of vibration. Where rock blasting or implosive jointing is involved, this will be subject to specific management as part of the Site Works Plan. Again, methods are available to ensure that effects are minor, or at worst, moderate. Effects will however be short-term at any one location.

Dust

37. **DUST** is a potential effect from the range of land disturbance and construction areas. It may not always be practicable to apply methods such as watering, which are typically applied on larger sites close to urban areas. The receiving environment is largely one where levels of dust are accepted (eg, from regularly moving herds on unsealed raceways, from activities associated with tillage, and other such activities), so is not as sensitive to dust effects as, for example, urban areas. Special methods will be applied where a sensitive landuse (such as a horticultural activity) is nearby. Permanent earthwork cut faces and fill areas, near to tower foundations, and areas of topographic modification, will however be hydroseeded as early as practicable. Dust effects are considered to be minor, localised and temporary.

Earthworks

38. **EARTHWORKS**, including cut and fill[5] for access or topographic modification, will be undertaken using best practice for the particular conditions. Finished contours will be designed to be stable and not subject to subsequent erosion. Surplus cleanfill will as far as practicable be disposed of on the affected property, and reinstated with topsoil and grassed or planted. If this is not possible, it will be removed to an approved cleanfill site. As noted above, cut faces will be hydroseeded or otherwise treated as appropriate. Earthworks effects will be minor and localised, although they will result in some permanent changes.

Vegetation Removal

39. **VEGETATION** removal will occur before or during easement survey, construction site clearance and prior to conductor stringing. This may vary from trimming to complete clearance. As with earthworks, consents are required in the Waikato region, if the vegetative material is to be composted over a volume greater than $20m^3$. Vegetation removal will be undertaken by approved contractors. Safety of operation will be the key environmental consideration (ecological effects are noted later). On steeper areas, complete clearance will only be needed in the vicinity of towers associated with earthworks, and in forest areas. Elsewhere, low vegetation will be retained. Where composting of slash material is to be undertaken, long-term stability of the site and leachate management are the main concerns. These will be addressed through selection of appropriate disposal sites, such as formerly excavated areas, or natural ground hollows. Effects will be minor or insignificant.

Effects on Surface and Groundwater

40. **EFFECTS** on groundwater are addressed in the evidence of Mr Kouvelis, and Mr Cameron addresses the means to ensure that surface water quality is not adversely affected due to construction. Although the NORs documentation mentioned the possible use of a well-point method to lower the water table over a wider site area, this is now considered unlikely and consents have not been

sought[6]. Generally, any effects on groundwater will be very localised and temporary. They cease a few days after the foundations are in place. Earthworks at a few towers may involve changes which will permanently but slightly alter groundwater levels in the immediate vicinity, and it is possible that the topographic modifications in the vicinities of towers 9, and between towers 14 and 16A and B, will have a similar effect, as ground surfaces will be permanently lowered. All these areas are elevated and remote, and there will be no adverse effect on the availability or quality and thus use of groundwater.

41. **DISPOSAL** of dewatered groundwater is explained by Mr Patrick in his evidence and will be handled in a similar way to site storm water – that is, it will be discharged to nearly vegetated land and directed away from any nearby streams or wetlands. It will be subject to consideration in the construction management plan and the individual site works plans. Methods may include contouring or bunding, and, at most, on-site settling ponds. Such approaches will, in my opinion, ensure that effects are minor or insignificant throughout the route.

42. **NO** tower is located within a watercourse. However a small number (such as towers 23 and 141) are close to watercourses, and small-scale future river protection treatment may be needed to avoid longer-term scouring of the foundations. At present, consents are not sought: they are envisaged to be a subsequent requirement, following adequate monitoring of the nearby stream beds. If the stream bed and banks are found to be stable, the envisaged protection may not be needed. Should bank protection works be needed, a range of methods, from the placement of gabion baskets to bank sheet piling, may be appropriate. Similarly, some consents may be needed for culverting or bridging on access tracks. As explained earlier, these have not been sought, as the need for them is not yet established. Any design will meet permitted activity standards or obtain consent, and will ensure that physical and ecological values are provided for. Effects are expected to be minor or insignificant.

---

[5] Note, controlled activity consents are required when land is steeper than 25 degrees – eg, within a High Risk Erosion Area in Waikato region, and controlled or discretionary activity consents are required on larger areas of work on gentle slopes (below 15 degrees slopes), or on smaller areas on steeper land in the Auckland region.

[6] Water management associated with tower foundations is expected to meet the permitted activity rules that apply in the Auckland region. In Waikato region, it is part of the controlled activity consent requirement for drilling below the water table (unless reinstatement is completed within two days).

Effects on Existing Utilities

43. **EFFECTS** on existing utilities during the construction stage are addressed in the evidence of Mr Prince, and Mr Patrick. Risks of damage to or interference with established utilities largely relates to the overhead crossings of such utilities, as most site works (other than access tracks) are generally remote from buried utilities. There are established methods of addressing utility crossings so that all effects are avoided. Specific management requirements will be incorporated in the construction management plan. Suspended nets across road, rail and other utilities will be noticeable, and should be the subject of community information in advance.

Traffic Effects

44. **CONSTRUCTION** traffic for the overhead transmission line will move to the sites on the local road network or the State highway system, and will be subject to normal traffic requirements. Any new or modified accesses to the roads will either meet district plan requirements or consents will be obtained. On State highways, Transit NZ's consent will be needed. Mr Prince's evidence addresses the types and effects of construction traffic on road and site accesses. Construction traffic will also affect the properties themselves.

45. **IT** is my understanding that some accesses will follow existing farm access tracks where practicable but a number of new tracks will need to be constructed. This is covered in the evidence of Mr Rasul and Mr Patrick. Depending on the time of the year that construction is undertaken, tracks may not need to be formed – rather pasture can be crossed with minimal disturbance. Methods of managing this are covered in the evidence of Mr Patrick. Overall, it is my opinion that construction traffic will cause only minor, localised and temporary disturbance both on and off the sites. This is likely to be at most a minor to moderate adverse effect, depending on the locality.

Building Removal Effects

46. **REMOVAL** of the six houses and several other buildings[7] from the designated area will be undertaken as part of the construction stage, and will be extremely disruptive to those affected. The overall effect will be different (and less) where a building is replaced or satisfactorily relocated, compared with a situation where a building is permanently removed and not replaced. The latter case is most likely to occur where landowners sell their property to Transpower. All such circumstances are the subject of negotiation between Transpower and the landowner, but it is fair to say that there is no option to leave the buildings in situ: it is an important part of the project that all buildings and structures are removed from the designated area

47. **THE** duration of the construction stage will allow for the construction of replacement buildings, or their managed relocation. Overall, acknowledging the individual significantly disruptive effects, given the length of the line and the populated nature of the south Auckland and Waikato area, it is my opinion that these unavoidable consequences of the alignment comprise an acceptable level of effect. While effects could have been reduced further by realigning the line to avoid dwellings and working sheds, the visual consequences of the invevitable "dog legs" in the alignment would in all cases be significant.

Farming Activity Effects

48. **EFFECTS** on farming activities during the construction stage are addressed in the evidence of Mr Hall. The varying stages of construction will involve a range of effects, depending on the size and type of property and form operation, number of towers, farm layout and ease of relocating stock, time of year that construction is carried out, and the extent of access works tower foundation type. As well as the range of temporary effects, trees may be permanently removed, new or upgraded accesses may be provided, and fences and gates may be permanently adjusted. The ability for Transpower and its contractors to consult with the landowner and to reach agreement will be an important part of minimising effects. Overall, effects on

[7] The Notices of Requirement acknowledged removal of seven dwellings, four dairy sheds and several other sheds. It has since been found that one of the dwellings was actually a substantial outbuilding, reducing the number to six.

farming are expected to be minor, although in relation to some properties they may be moderate.

Effects on Tangata Whenua Values

49. **IN** general, the ACRE process of route identification endeavoured to avoid areas of sensitivity to tangata whenua by avoiding land held in Maori ownership[8], urupa, known waahi tapu, specific settlements and Marae. However, some residual issues remain. These are generally localised and are addressed later in this evidence. An extensive consultation process has provided the basis, along with other investigations, for the cultural impact assessment which was provided in the NORs documentation, Part X, section 6. As discussed in Mr Mikaere's evidence, there will be ongoing engagement with tangata whenua through agreement and actions in terms of the draft protocol provided as an attachment to the cultural impact assessment. As far as I am able to assess the circumstances, effects on cultural values are likely to be minor or insignificant, depending on the location of the line in relation to the areas of value.

Ecological Effects

50. **ECOLOGICAL** effects are largely limited to the effects of vegetation clearance. Direct effects on the few significant waterways to be crossed are avoided by placement of the towers. Minor waterways may be disturbed by upgrading of access tracks. Where that is necessary, any required consents will be obtained and potential effects addressed. Mr Beale's evidence addresses the potential for broad-scale issues such as collision of migrating birds with the conductors or towers, effects on bats, and broad ecological impacts. Crossings of major habitats of waterfowl, where the potential for collisions are considered greatest, are at such an elevated level that this is unlikely. The clearance of rare vegetation or habitats is minimal.

51. **MR** Beale concludes that there are some localised effects of some significance particularly related to loss of continuity of some presently ecologically-connected areas, such as riparian vegetation, and loss of canopy trees. However, the

proposals for mitigation include replacement plantings of appropriate lower-growing species which will assist in restoring some of the reduced ecological values.

Archaeological Effects

52. **AS** with ecological and tangata whenua effects, efforts were made during the ACRE process to avoid areas of known archaeological values. A number of additional sites were identified in the ongoing process, and have been advised to the NZ Archaeological Association. The few known sites in proximity to the alignment will require care, but as far as practicable their disturbance will be able to be avoided. Some areas have been identified as having a reasonable likelihood of further finds, and these will require inspection prior to any site works. A parallel process relating to Historic Places Act authorities provides additional safeguards in terms of both known and unknown sites.

53. **MR DRUSKOVICHS'S** evidence addresses the range of residual issues with known and unknown archaeological sites and recommends specific mitigating actions for a number of locations. Given the length of the route, it is my opinion that, overall, effects on archaeological resources are likely to be minor. There is a range of mitigation measures available, ranging from investigations and recording to slight shifts in tower locations along the alignment. The construction management plan, site works plans (where works are to be undertaken in proximity to known sites), and application of the tangata whenua relationship protocols and any approval requirements from the Historic Places Trust, are all particular measures which can reduce effects on archaeological resources.

54. **MR DRUSKOVICHS'S** evidence also relates to the removal of the ARI-PAK A line, and recommends mitigation in relation to the removal of existing towers from sites and areas which were not accorded the levels of respect applied today to archaeological evidence. As this removal is a consequence of the new line, any "deconstruction" effects are acknowledged. It is my opinion that there may be a net benefit in archaeological terms from the removal of this existing line and the investigation and any additional protection which will be associated with this activity.

[8] It is my understanding that a small number of land parcels in Maori ownership are crossed by the line.

Other Heritage Values

55. **LITTLE** information has come to light during the consultation phases relating to heritage values other than the archaeological sites. There are a number of recognised heritage trees, significant remnant bush areas and a few other items in the vicinity of the line, but these are not directly affected. All identified historic buildings and areas have also been avoided. Historic landscapes including the Hodderville and Waotu landscapes, and the chain of redoubts near Mangatangi have been avoided. The area on the western slopes of Ruru which is crossed by the line has heritage values, which are protected under several QEII Trust covenants. The tower locations do not affect these areas, and the alignment does not cross them. The area is already affected by the ARI-PAK A alignment, and so the additional effects relate only to the larger towers, not the addition of a new element.

Effects on Tourism and Recreation

56. **CONSTRUCTION** effects on tourism and recreation are generally considered to be insignificant as discussed in the evidence of Mr Bamford. Where there may be issues, they are localised and are addressed later in this evidence.

Social Impacts

57. **THERE** will be social impacts of varying significance along the line associated with all stages of planning and construction. These are likely to range from direct interruption (and in the greater cases, loss) of lifestyle, to fear and anxiety and other stresses as a result of unwanted change. In the assessment of effects documentation, I set out the following general review comments in relation to the social impacts which were already apparent in relation to the project and which I saw as continuing through the construction stage:

- *"Claimed health effects from electric magnetic fields are not supported by scientific consensus at the levels of exposure which will be experienced as a result of the line.*

- *Fear of danger and damage from structural failure are addressed through robust design as is required for the towers.*
- *Fear of effects on school rolls and subsequent effects on school viability are unlikely to materialise if an analogy with the expressed fear of effects of cell-sites close to schools holds true (see Appendix 2, section 2 of Part X of the NORs documentation).*
- *Severance effects of any importance (such as where a house and dairy shed are separated by the line, or where the farm worker's dwelling is separated from the remainder of the farm), occur on only a few properties along the length of the line. There are no severance effects on established communities or settlements.*
- *Visual effects are the most pervasive effect of the line, and this will become apparent during the construction phase. Some people will have reduced amenity values, and there may be some reduction in property values in some cases as a result. However, in most cases that effect has been in place from the time of the decision on the preferred route, and the part of the effect that has been due to uncertainty may be reduced once the reality of the line is experienced.*
- *The presence of the line will involve some limitations and restrictions, and requirements for specific behaviour (for example, in use of some equipment) as far as landusers are concerned, both during the construction phase and thereafter.*
- *Subdivision expectations (for retirement income) involve a high degree of uncertainty in most rural locations, and a transmission line is unlikely to be a major influence on their success."*

58. **DR PHILLIPS** and Ms Meade Rose have provided evidence on social impacts of the line, relating to both general and specific impacts. My assessment is in line with theirs: while the impacts are genuinely felt, and may be significant in those personal terms, given the extent of the line, the impacts are minor to moderate.

Landscape and Visual Effects

59. **MR** Lister's evidence on landscape and visual impacts does not distinguish the construction stage effects from the long-term effects. It is, however, during the

construction that the long-term visual impacts and impacts on landscape values will become apparent. In addition, there are a number of specific visual effects which are associated only with the construction stage. These are:

(a) Work associated with tower sites on elevated locations;

(b) Any work associated with new accesses on elevated land;

(c) Tree and other vegetation clearance;

(d) Presence of large equipment, stored materials and work teams.

60. **GENERALLY** these effects will be localised. The visual "busyness" of the work sites will be temporary. The tree clearance will have a semi-permanent effect, as replacement vegetation is likely to be lower. As the construction phase moves towards completion of works at individual sites, and stringing of conductors and earthwires, the visual and landscape impacts of the line will begin to become potentially moderate to significant, depending on the proximity of the viewpoint.

61. **MITIGATION** measures for those living in proximity to the line are covered later in this evidence and in the evidence of Mr Lister. These include planting and other possible works such as screening. It is expected that this mitigation will be carried out during or shortly after the construction stage, but that it will take a number of years for its full benefit to be achieved. Thus the period during and following construction is likely to involve maximum effects, which will reduce over time as the mitigation planting grows and the landscape softening or screening takes effect.

Effects Associated with the Removal of the ARI-PAK A Line

62. **THE** removal of the ARI-PAK A line is not part of the project for which any approvals are needed. However, it is a direct consequence of the designation, and so its effects need to be assessed. The removal of conductors and towers will normally be a low-key operation undertaken without heavy equipment. There will be minor traffic and noise. People may be asked to stay indoors or vacate their dwellings for a few hours, where the lines are particularly close.

63. **THE** intention is to remove the upper part (50cm or so) of the foundations at each of the towers, so the ground surface can be safely reinstated. As noted earlier, where the towers are on archaeological sites, foundation material will largely be left in situ and tower components may be helicoptered out. Site-specific provisions for these sites will be developed in consultation with the landowner, the Historic Places Trust and relevant tangata whenua groups.

Positive/Beneficial Effects

64. **THE** removal of the ARI-PAK A line is the main beneficial effect of the construction phase of the North Island grid Upgrade Project. This benefit only applies in areas where the line will not be replaced by the larger proposed 400kV-capable line (eg, Dannemora through to north of Twilight Road, between south of Hunua and Paparimu Road, between Oreipunga Road and the Arapuni Power Station), and in a few other areas where the proposed new line departs reasonably significantly from the ARI-PAK A alignment.

65. **THERE** are a number of other temporary benefits to the general community during the construction stage in terms of job creation and some beneficial economic impacts in terms of local businesses. Skills developed on the job will provide permanent benefits to those involved.

66. **LOCATION**–specific construction impacts of significance are addressed later in this evidence in relation to each of the route sections. I now briefly comment on the effects of line once operational.

General Operational Effects

67. **IN** my opinion, the overall operational effects of the overhead line, as part of a major project designed to ensure security and reliability of supply to a growing "demand" area, are strongly beneficial. However I acknowledge that there are a number of adverse effects ranging from de minimis through to significant.

68. **THE** adverse operational effects are associated largely with visual impacts. Other aspects are the potential health impacts of electric and magnetic fields associated with the operation of the line, potential effects associated with other electrical phenomena, and the line's potential for radio frequency interference. Also relevant are potential noise effects, permanent effects on farming and other rural uses, ongoing social, cultural, tourism and recreational effects, effects on other utilities, potential effects relating to public and landowner health and safety, and ecological effects. The assessment of many of these effects involves complex technical areas, including areas of management of risk, where considerable expert evidence is before the Board. My evidence is by way of summary.

Visual Effects

69. **AS** noted in part VIII of the NORs documentation, the size and length of the structure means that there are unavoidable visual impacts. These vary along the length of the line, depending on the qualities and characteristics of the receiving environment, including the location and intensity of nearby settlement. The choice of route and alignment within the route has endeavoured to avoid significant adverse effects on the landscape in the widest sense, and in terms of visual impacts on people. A range of principles has been applied in the choice of the tower family and in the alignment, as described by Mr Lister. Overall, the visual and landscape effects will be significant in proximity to the structure and will diminish with distance. Both Mr Lister and Dr Steven discuss areas of greatest impact. These are noted in the section-based assessment of effects of the line, which follows in my evidence. Mr Lister's evidence also describes the methodology for offering site specific mitigation to landowners.

Electrical and Magnetic Fields; Health Effects

70. **ELECTRICAL** and magnetic fields (**EMFs**) are the subject of a range of expert evidence on behalf of Transpower. One of the main areas of concern to the public has been potential health effects. This is addressed in the evidence of several experts, and information is provided ranging from the biophysics of electric and magnetic field interactions with live organisms, including humans and animals, through to human epidemiological studies. Evidence is also provided about the