

THE DEVELOPMENT GUIDE

TRANSPower



GUIDELINES
FOR URBAN
DEVELOPMENT
AROUND THE
NATIONAL GRID

SEEING THE DESIGN
POSSIBILITIES
AROUND TOWERS

HELLO.

Whether you're a seasoned professional or first-time developer, it can appear daunting planning and designing around high voltage transmission lines, so we've put this easy to follow guide together to help you make your design decisions...

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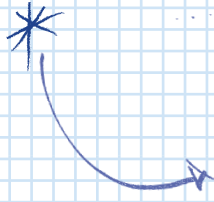
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Quick tip essentials...

to help you make sure you've got the absolute essentials covered. Look out for these handy essential quick tips throughout this development guide.

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INTRODUCTION

Transpower New Zealand Limited (Transpower) is the State-owned enterprise that plans, builds, maintains, owns and operates New Zealand's high voltage electricity transmission network (the National Grid). Transpower is responsible for delivering and maintaining the supply of electricity throughout New Zealand. The National Grid delivers electricity to towns and cities by means of high voltage overhead transmission lines (and sometimes underground cables) that often cross private property.

This guide has been specially developed for:

- Local authorities
- Planners
- Landowners
- Developers
- Surveyors
- Architects
- Landscape architects
- Urban designers

This guide provides information on the types of issues that development near National Grid lines can have on the lines and, conversely, the issues National Grid lines can have on development.

The guide then works through the types of different development, suggests how to address the issues identified, and provides some ideas on how land can be used and developed in ways that are safe and compatible with existing National Grid lines.

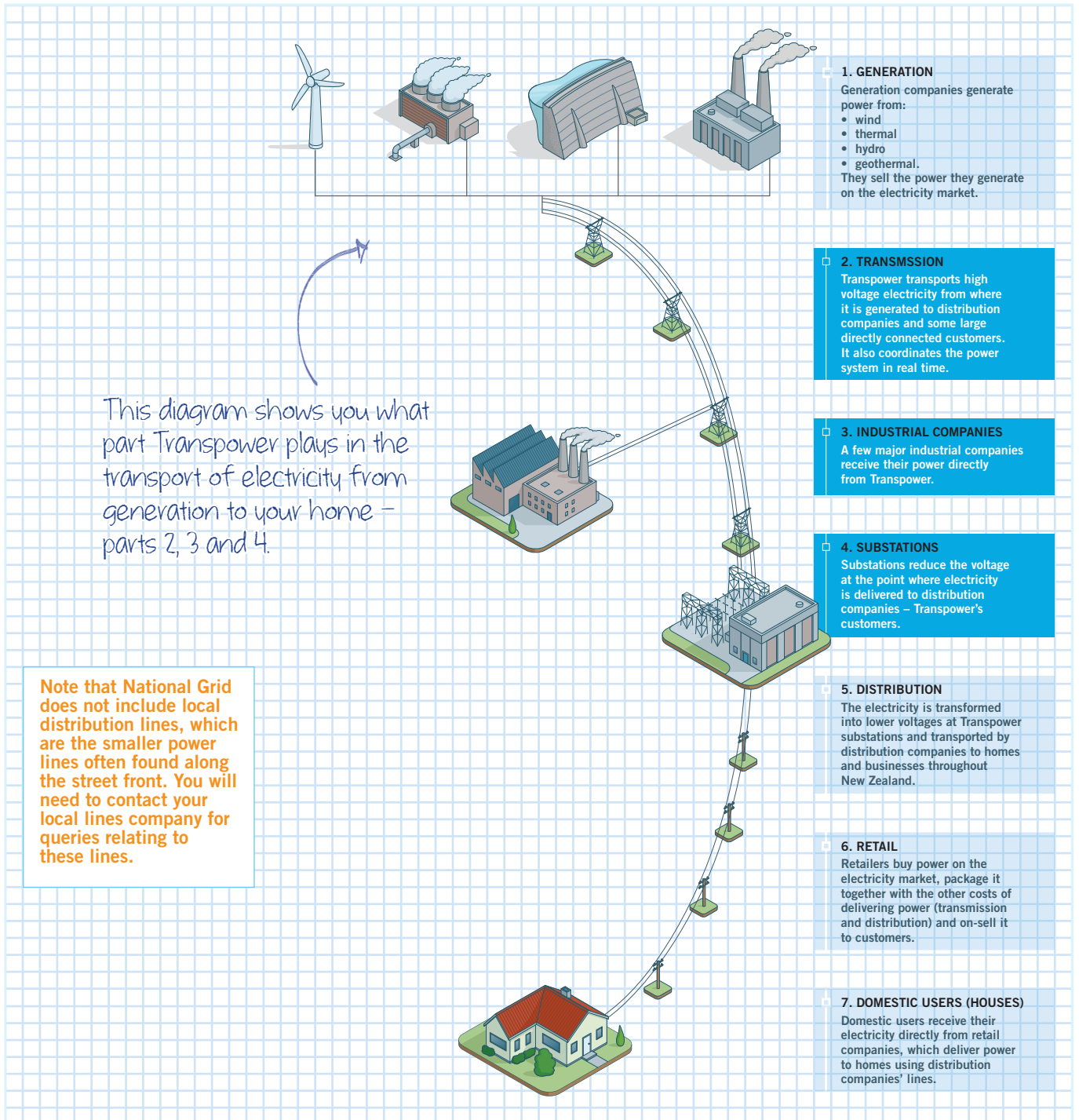
This guide is organised into sections that address different types of land use and development, such as small and large-scale residential, commercial and industrial development. You can work your way through the whole guide or refer to the section relevant to your proposal. The guide can be downloaded as a whole or in separate sections.

The guide is not a complete reference source but is designed to alert you to some of the main issues and key considerations relating to land use and development near National Grid lines.

A key term used in this guide

'National Grid lines' include the conductors (wires), the insulators that the conductors are suspended from, the support structures (towers (pylons) and poles) and their foundations. These are assets used, owned, operated and maintained by Transpower.

* For other frequently used terms, refer to the glossary at the back of this guide.



Remember: Transpower is here to help you.
For any queries, please call us on: **0508 526 369** (LANDOWNER)

or email your development queries to:
transmission.corridor@transpower.co.nz

**Quick tip...essentials*
Transpower
recommends a buffer
corridor of

12
METRES

either side of the centreline
of the transmission line
and 12 metres from any
support structure.



DEVELOPMENT – WHAT ARE THE ISSUES?

Inappropriate development can pose a significant risk to the operation of the National Grid. Electrical and physical hazards due to development and land use can result in line faults or power outages, which have flow on effects for the security of the network. This ultimately affects the operation of the overall electricity system and can be inconvenient and expensive not only to Transpower but to consumers. The main issues are:

- risks of electrical hazard
- risks to National Grid towers and poles
- blocking off access to support structures
- noise, visual effects and inconvenience of landowners and occupiers.



Quick tip...

For more information,
or if you have any
questions, call us on

0508 526 369
(LANDOWNER)



To help with your planning, we have illustrated various different scenarios and colour coded them:

-  Not quite right
-  Working well

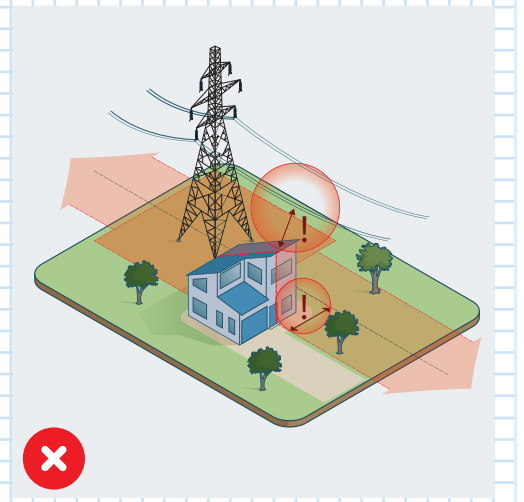
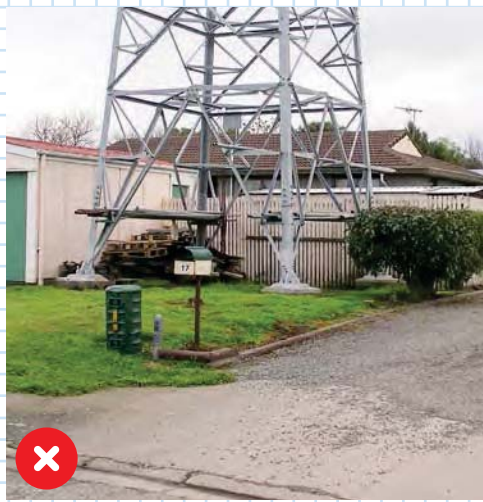
See our glossary for more detailed explanation of a flashover.

Risks of electrical hazards

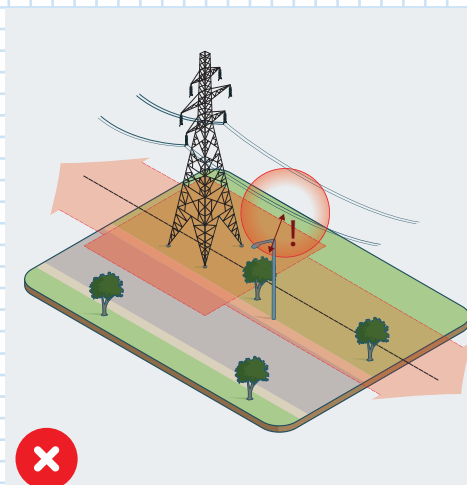
Electrical hazards and shocks can occur due to either direct contact with National Grid lines, or via a 'flashover' where electricity jumps the gap across from the conductor to another object or structure (such as an aerial on a house or a house).

Buildings and structures

Building too close to National Grid lines (including their support structures), and not meeting the required separation distances, can create unsafe situations and increase the risk of electrical hazards to people and property.



Not just buildings are at risk. Other structures, for example, fences, retaining walls, light poles, signs or goal posts, can also increase the risks of electrical hazards. Long runs of metal and wire fencing parallel to National Grid lines can also increase risks as the hazardous voltages can be transferred from the lines to the fence or other structure.



Earthworks

Earthworks under or near to National Grid lines can reduce safe separation distances between the ground and the lines. In the image below, the work around the monopole structure has reduced the safety clearance between the conductors and ground, causing a potential hazard to traffic passing along the new road.

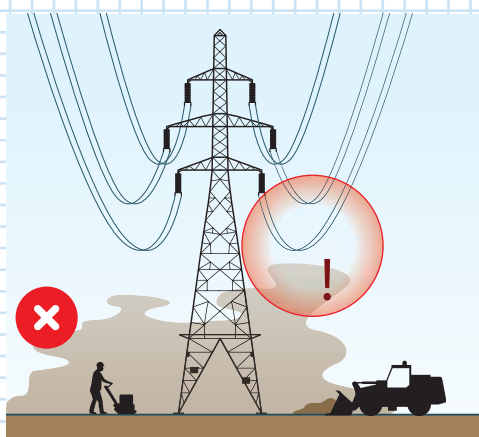
* Want to know more about relevant safe separation distances for you and your development? Call us on

0508 526 369
(LANDOWNER)



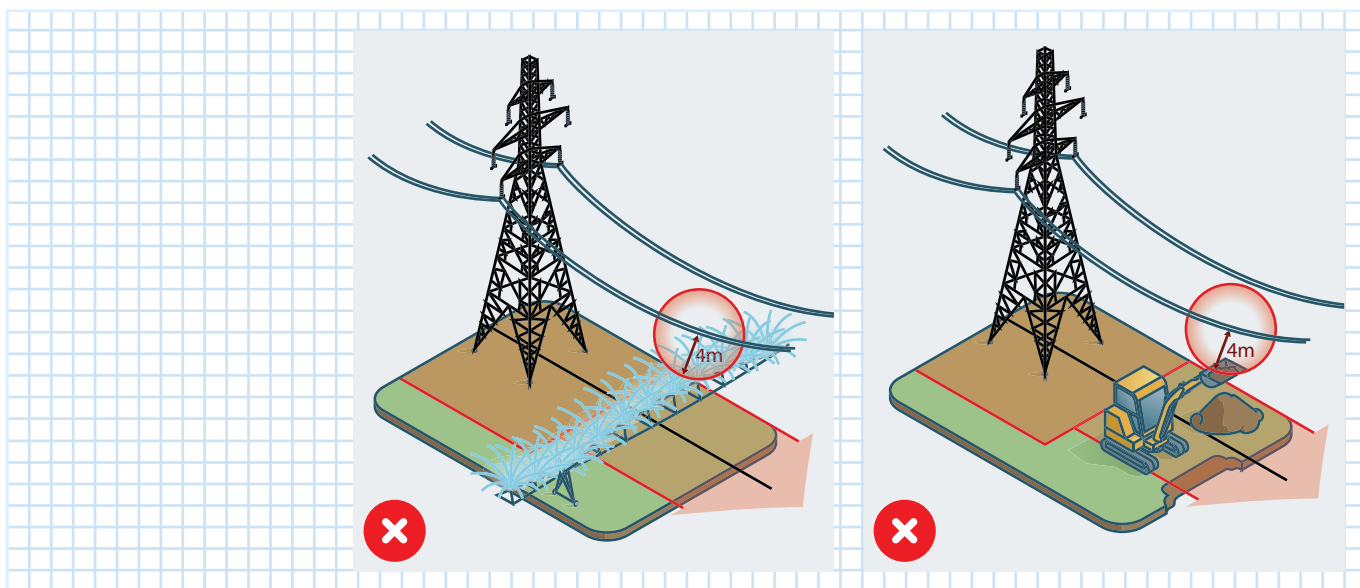
Dust

Dust from construction or day-to-day activities can adversely affect the functioning of the lines and can cause flashovers. Industries that involve particulate or hot gas emissions (such as cement plants and quarries), major earthworks and particularly corrosive emissions can create major issues for National Grid lines, including reducing insulator performance and increasing the risk of flashovers.



Mobile plant/machinery

Use of mobile plant (such as cranes, forklifts, front-end loaders and irrigators) can also pose a hazard to both the lines and the safety of the operators. Work that requires large heavy machinery or mobile plant can also create dangerous situations if safe separation distances are breached. All mobile plant must remain a minimum of 4 metres from the lines at all times.

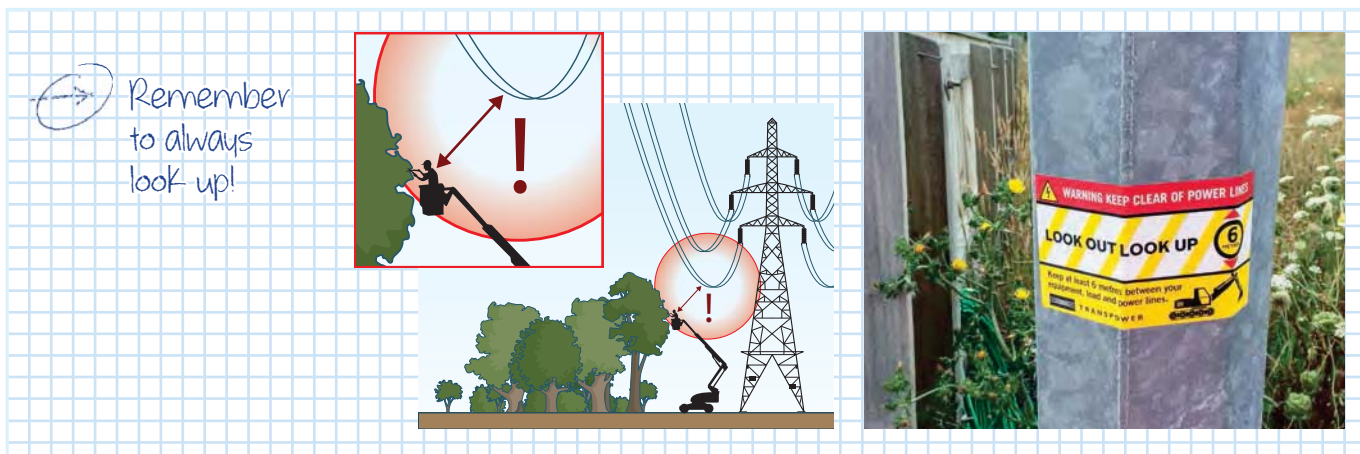


People

National Grid lines carry high voltage electricity. It is extremely important that people working around National Grid lines are aware of the lines and the safe separation distances that need to be maintained between themselves, the tools or equipment they are using, materials they are holding or moving and the conductors (wires). The New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34) sets out safe separation distances for people working near overhead lines. For people working near National Grid lines, the minimum safe approach distance limits are:

- for 110 kV lines and below – 4 metres.
- for 220 kV lines and above – 6 metres.

If you are unsure of the voltage of any line, we recommend you maintain a 6 metres distance from the conductors.

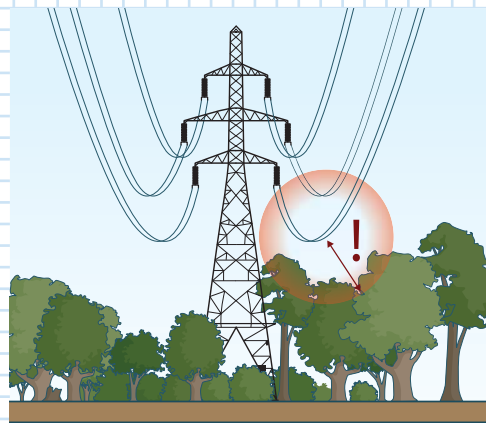


Trees and vegetation

Planting trees too close to National Grid lines can increase risks of electrical hazards and may cause a fault that will affect the operation of the line, injury or death to someone near the tree, or damage to land and property.

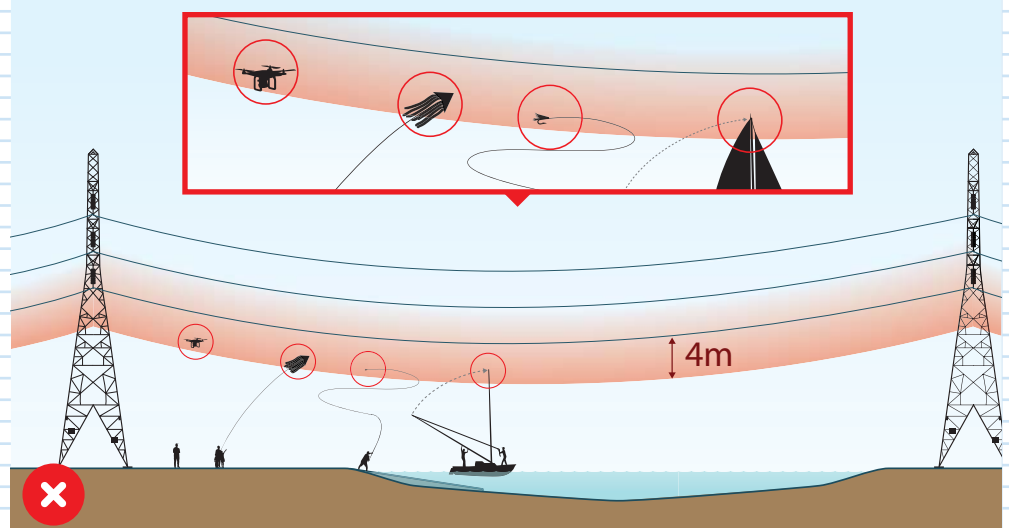
If trees touch high voltage conductors or a flashover occurs, dangerous voltages may arise in the area around the tree or on the tree itself. High voltage electricity flowing into trees can also cause trees to ignite. The effect of a tree fire can be very severe in rural and forest areas, as well as threatening human and animal life.

* Refer to Section 10 of this guide for additional advice on planting near the National Grid.



Other activities

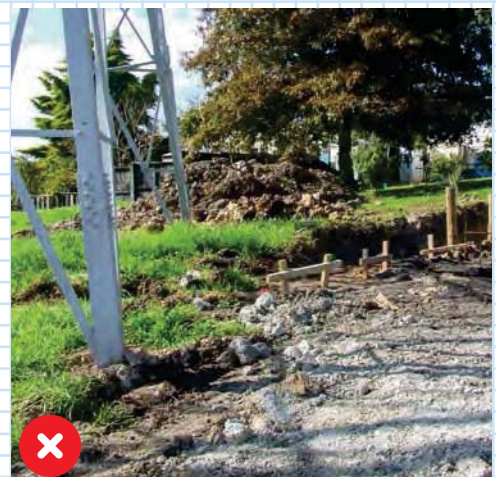
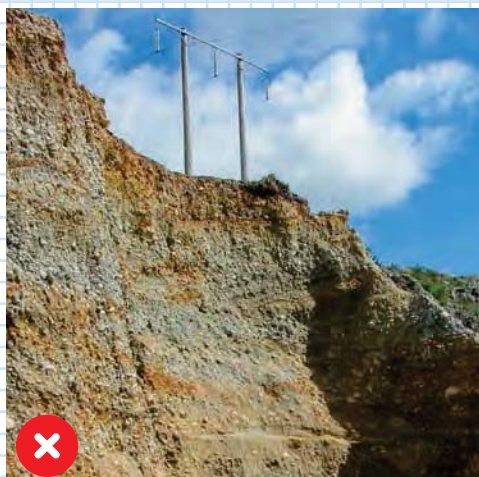
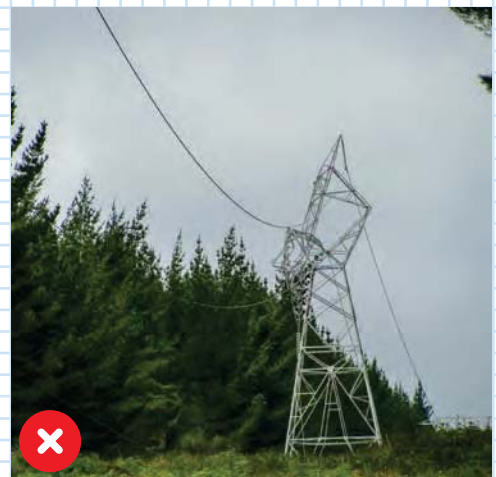
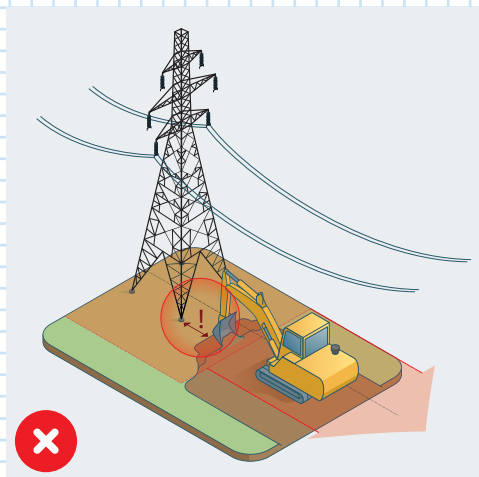
Although open space and recreation activities are often preferred and recommended as the best use of land under the lines, some activities, such as kite flying, use of model aeroplanes and drones, boating and fishing, must be avoided around the lines due to the electrical hazards. Structures such as children's playgrounds also need to be located safe distances from the lines and conductors.



Risks to National Grid support structures

Development and activities too close to National Grid support structures can also affect the structural integrity of the support structures. Earthworks (any kind of soil disturbance, including drilling) too close to towers or poles, or the diversion of water, can physically undermine the stability of towers or poles.

Direct contact with National Grid conductors and structures can also cause structure failure. There have been examples where towers have been driven into, or trees have fallen on the line, weakening the support structure and risking collapse.



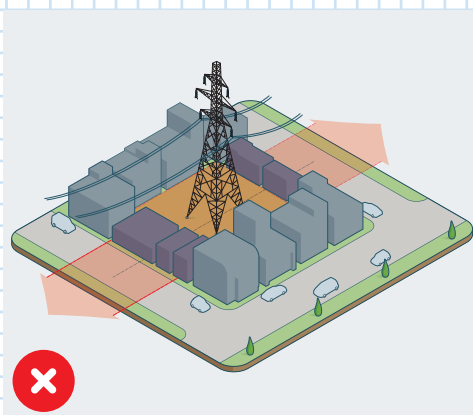
Examples of development too close to transmission lines and the consequences of not keeping clear of the structure.

Constraints on access

Property boundaries through subdivision and new buildings and structures can constrain or block vehicle access to the lines. Access is required for inspection and maintenance activities. Constrained access can result in increased time, effort and cost of line inspections and patrols, and routine maintenance work. This can also result in inconveniences to landowners as well as to Transpower.



For more information on the location of building platforms refer to Sections 4-5 on subdivision and redevelopment.



In these images, development around National Grid structures has constrained access to them.

We are here to help.

Contact Transpower to discuss your proposal:
transmission.corridor@transpower.co.nz

Noise and visual effects

National Grid lines can emit noise, especially in damp weather, so people in buildings too close to the lines may be affected by this. Similarly, National Grid lines, and especially their support structures, can be visually unattractive.

Conductors swinging in the wind can worry those living below, and rainwater collects on and drips from them. Setbacks can help manage or reduce these effects.

The visual impact of the structures is often less of a concern in areas of commercial or industrial development due to the scale and character of such areas.



What's a National Grid

YARD?

Transpower can provide you with an aerial image showing your site and the National Grid Yard.

Don't forget, we are here to help. Contact Transpower to discuss your proposal.



As discussed in the previous section of this guide, development near National Grid lines can have unwanted and unintended effects on the lines, and conversely, the National Grid lines can also affect how development takes place. To address these issues, the National Policy Statement on Electricity Transmission 2008 directs a corridor approach. This section of this guide sets out Transpower's corridor approach to existing and new development.

Buffer corridors, transmission corridors, setbacks, red zone/green zone, National Grid corridors and yards – these are the terms that refer to areas where inappropriate development is restricted.

What are National Grid Subdivision Corridors?

The National Grid Subdivision Corridor is the area where Transpower needs to be involved in the design and layout of subdivision (and its subsequent land use). The Subdivision Corridor is an area up to 37 metres either side of the centreline. This is the general extent of the area where the conductors (wires) are physically present as the lines can swing out this far in high wind conditions. It is also the area where access to the National Grid is often determined. The size of the corridor differs depending on the voltage and structure type.



We are here to help

You are encouraged to discuss proposals with Transpower as early as possible to ensure the best outcomes.

Email us:
transmission.corridor@transpower.co.nz



Even moderate winds show just how much the conductors (wires) can swing from the centreline of a transmission line.

What can I do in the National Grid Subdivision Corridor?

Subdivision is an opportunity to design new development in a manner that takes the lines into account – including ensuring allotments are of a size that can be safely developed. Many activities, including residential buildings, can occur within the National Grid Subdivision Corridor, provided they are set back from the National Grid Yard.

The following sections, particularly on subdivision and redevelopment (Sections 3–5), provide additional information on what needs to be considered and examples of how to achieve best-practice development.

If you wish to establish a new building or structure, subdivide or substantially change land uses within the National Grid Subdivision Corridor or Yard, please get in contact with Transpower to discuss your proposal as soon as possible.

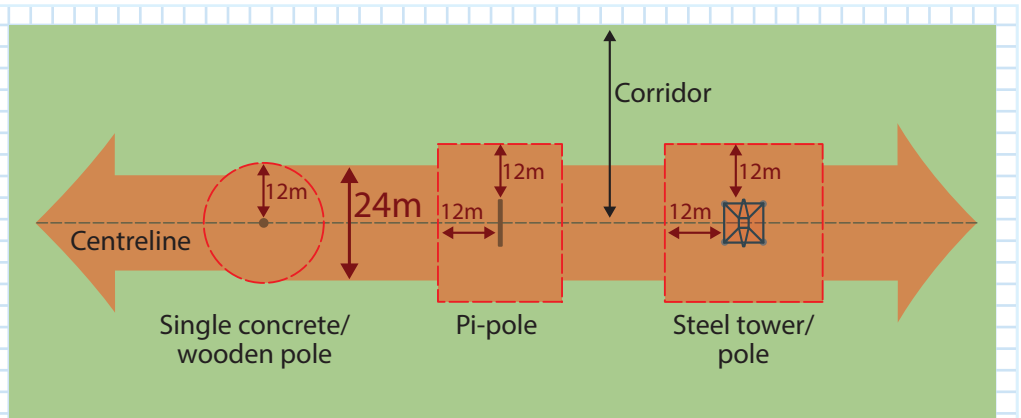
*Setbacks will also apply to substations. Landowners developing adjacent to a substation should contact Transpower to discuss their proposals.

What are National Grid Yards?

Within the National Grid Subdivision Corridor is a National Grid Yard. The National Grid Yard is the area beneath and immediately next to National Grid lines (including their support structures). Incompatible activities and land uses need to be set back from National Grid lines as they can compromise the ongoing operation, maintenance, upgrading and development of the National Grid or the safety of those living or working around it.

For these reasons, Transpower seeks a 12 metre setback either side of the centreline of a National Grid line and 12 metres in any direction from the outer edge of a National Grid line structure. This is reduced to a 10 metre setback where the line is a single concrete/wooden pole line, although the distances from the structures remain the same.

Transpower's approach is consistent with international best practice and the Government's National Policy Statement on Electricity Transmission 2008 (NPSET).



What can I do in the National Grid Yard?

Transpower seeks to keep the National Grid Yard free of buildings and structures and to manage land use and activities that could pose a risk to your safety or to the safe and efficient operation of the National Grid.

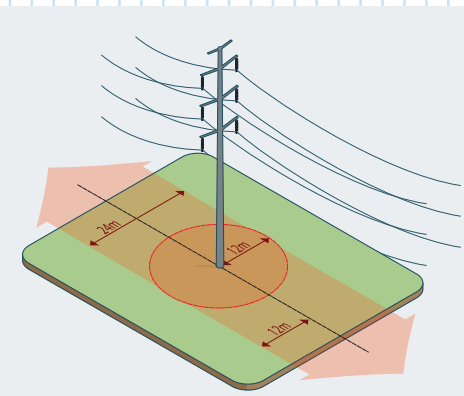
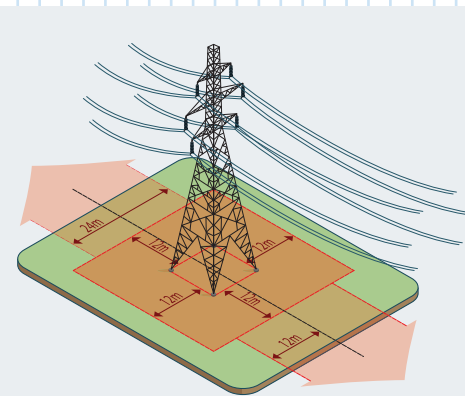
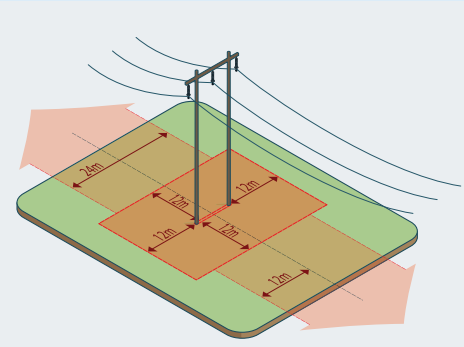
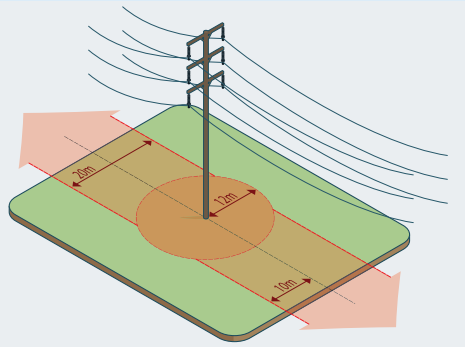
What can (and can't) be established within the National Grid Yard depends on where your site is located. Existing activities within the National Grid Yard can continue as is.

In any location (urban or rural), Transpower will not support any new or extended sensitive activities within the National Grid Yard. In many situations it is possible to design around National Grid lines, and land within the National Grid Yard can be utilised for other activities.

The following images show the National Grid Yard around a single pole (concrete/wood), pi-pole, lattice tower and steel monopole.

Sensitive activities

These activities include any residential dwelling, school (including childcare facility) or hospital. Local planning rules may include other activities.



The purpose of NZECP 34 is to protect people, property and mobile plant by providing a physical separation. NZECP 34 does not consider the operational, maintenance (access) and upgrading requirements of the National Grid. Depending on the circumstances, NZECP requirements may extend beyond the National Grid Yard.

What else do I need to know about?

For any activity or development near National Grid lines, there are also a number of important regulations that contain mandatory requirements relating to development near existing National Grid lines. Please consider these:

New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34)

The New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34), referred to as NZECP 34, is a regulation under the Electricity Act 1992. Compliance with its provisions is mandatory. NZECP 34 specifies minimum safe separation distances for people, buildings/structures, mobile plant and earthworks from National Grid lines (including their support structures). You can find a copy of NZECP 34 here: transpower.co.nz/resources/NZECP_34

Electricity (Hazards from Trees) Regulations 2003

The Electricity (Hazards from Trees) Regulations 2003, referred to as the Tree Regulations, came into effect on 1 July 2005 and are mandatory. The Tree Regulations define a safe separation distance for trees growing under overhead lines. They also specify who is responsible for ensuring separation distances are maintained, place potential liability on tree owners if the Tree Regulations are breached and provide an arbitration system to resolve disputes relating to tree trimming. You can find a copy of the regulations here: legislation.govt.nz/regulation/public/2003/0375/latest/DLM233405.html

Electricity Act 1992

You can find this here: legislation.govt.nz/act/public/1992/0122/latest/DLM281858.html

Resource Management Act (RMA) 1991

You can find the RMA here: legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html

National Policy Statement on Electricity Transmission (NPSET)

The NPSET is intended to provide national direction to councils on reflecting the importance of the National Grid within their plans.

District and regional plan requirements

Your local council may also have rules to manage buildings, subdivision and other activities. Please contact your local council for further information.

Any registered easements over the land

Transpower may have a registered easement for the relevant transmission lines, and the easement agreement will set out restrictions on certain activity within the easement area.

Building Act 2004

The Building Act regulates building work. You can find the Building Act here: legislation.govt.nz/act/public/2004/0072/latest/DLM306036.html

SMALL-SCALE RESIDENTIAL DEVELOPMENT

Small parcels of land near National Grid lines can be developed for residential use, provided the necessary safety and operational considerations are taken into account and the required safe separation distances are met. In many cases, this can be achieved if development is set back beyond the outer edge of the National Grid Yard.

If proposals are well considered from the outset, the impacts of the lines can be reduced and the effects of the development on the lines can be well managed.

What are the issues?

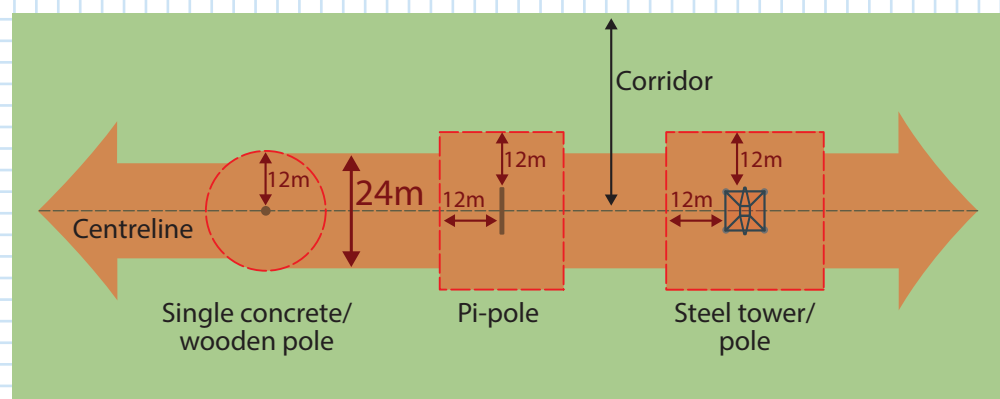
Residential development (in particular, dwellings) located too close to National Grid lines can result in a number of issues for both the lines and the development. These issues were discussed in detail in Section 2 of this guide. To recap, matters of relevance to small-scale residential development include:

- increased risks of electrical hazards to people and dwellings
- risks to the National Grid network – faults and power outages as a result of electrical hazards
- the need to keep sensitive activities and almost all other buildings outside the National Grid Yard
- the need to maintain access to the lines (including their support structures)
- noise, visual and other effects of the lines and inconvenience of landowners/occupiers.

What are National Grid Yards?

The National Grid Yard is the area beneath and immediately next to National Grid lines (including their support structures). Incompatible activities and land uses need to be set back from National Grid lines as they can compromise the ongoing operation, maintenance, upgrading and development of the National Grid or the safety of those living or working around it.

For these reasons, Transpower seeks a 12 metre setback either side of the centreline of a National Grid line and 12 metres in any direction from the outer edge of a National Grid line structure. This is reduced to a 10 metre setback where the line is a single concrete/wooden pole line, although the distances from the structures remain the same.



How can these issues be managed?

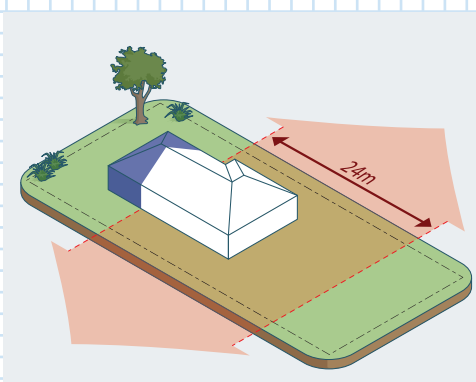
Ensure a clear National Grid Yard

When planning new residential dwellings or extensions to existing dwellings, ensure that they are located outside of the National Grid Yard – 12 metres either side of the centreline (or 10 metres for a single concrete/wooden pole line) and 12 metres in any direction from the outer edge of the support structure. The National Grid Yard is explained in Section 3 of this guide.

In built-up urban areas, accessory buildings such as sheds or garages can be located in the National Grid Yard if necessary. However, access to the lines and towers/poles must still be preserved and the setbacks in NZECP 34 complied with:

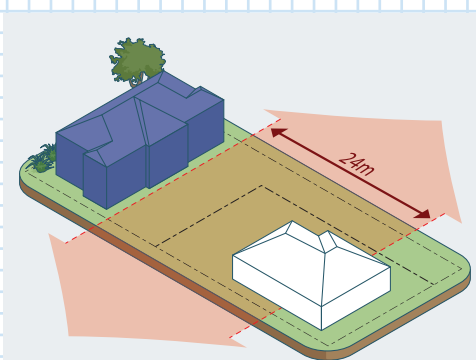
- Houses that are entirely within the National Grid Yard may be retained but they cannot be extended within it.
- Houses that are partly within the National Grid Yard may be able to be extended outside the National Grid Yard.

Consider whether additional land outside the National Grid Yard is available that may increase opportunities for redevelopment.



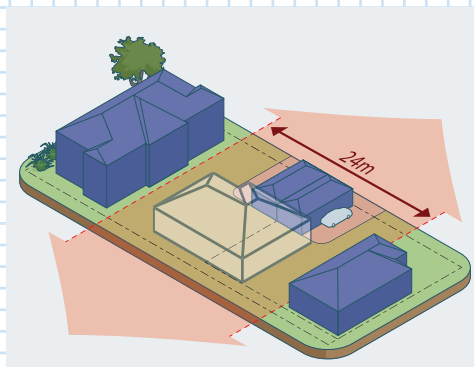
Extend existing house (white) beyond the National Grid yard, as shown by the blue addition.

- Old dwellings within the National Grid Yard can be replaced, providing they retain the same footprint and scale. Where possible, they should be relocated outside the National Grid Yard as much as possible.
- New dwellings can be added outside the National Grid Yard, where the existing site layout allows.

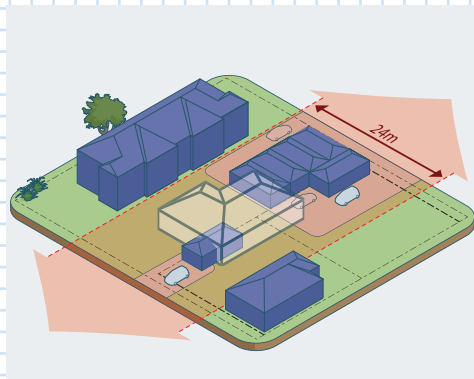


Retain existing building (white) and build outside National Grid Yard (blue).

- Larger sites usually give more scope, but even standard sites can be redeveloped effectively.
- Sites can be redeveloped, replacing an existing dwelling or intensifying by adding more dwellings (with or without subdivision). All dwellings must be located outside the National Grid Yard.



Within the National Grid Yard, dwellings (in opaque white) can be replaced with non-dwelling structures, while building new structures outside the yard (blue).



Larger sites provide greater opportunities.

To help with your planning, we have illustrated various different scenarios and colour coded them:



Comply with NZECP 34

In addition to the National Grid Yard, buildings and structures must also comply with the minimum safe clearance requirements in NZECP 34. Sometimes, NZECP 34 requirements require setbacks or clearances that may overlap or be greater than the National Grid Yard.

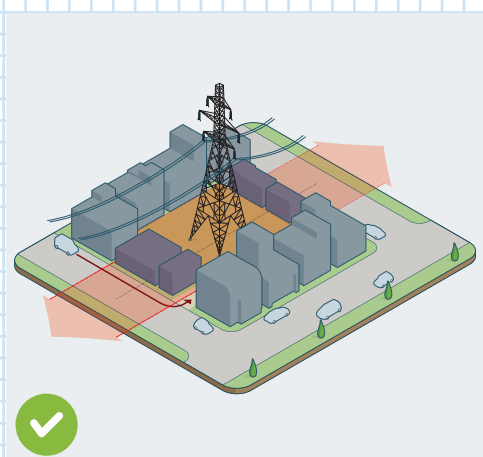
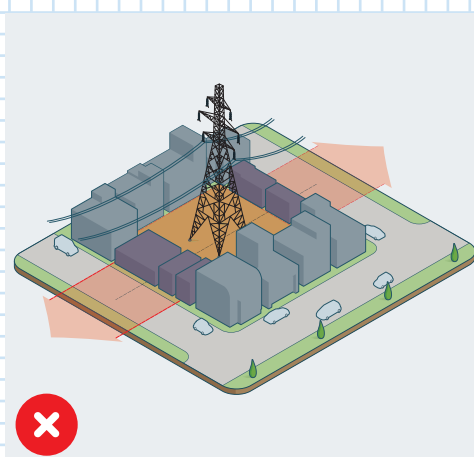
NZECP 34 specifies minimum safe separation distances for people, buildings/structures, mobile plant and earthworks from National Grid lines (including their support structures). The construction methodology also needs to be considered (ie how things are built and erected) – construction activities must also comply with NZECP 34, not just the finished product.

The safe distances specified in NZECP 34 differ depending on the voltage of the line, the position of the support structures, the length of the span crossing your site and the topography.



Preserve access to the lines and towers/poles

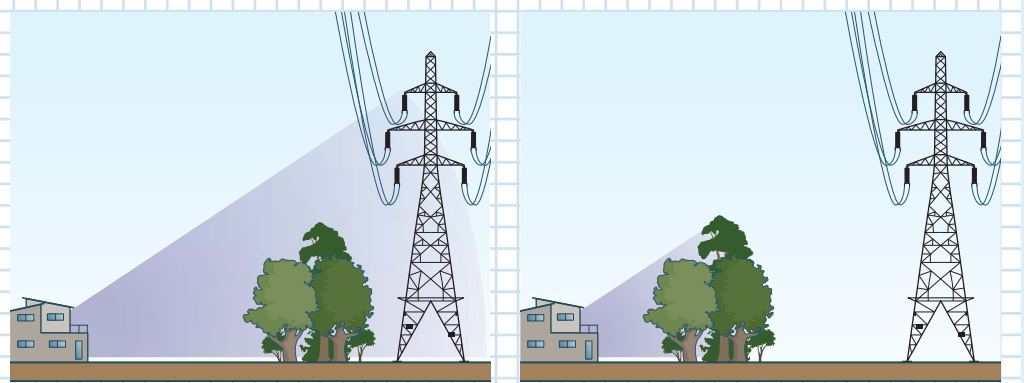
Ensure that you carefully plan the location of dwellings and any other structures (such as garages or fences) so that they do not restrict vehicle access to the lines (and any of their support structures that are on site). This access is important and is required for inspections and maintenance of lines (and their support structures).



Screen dwellings from the lines

In some circumstances, planting close to your house can help screen views of nearby lines. For screening purposes, it is usually more effective to plant closer to houses than to a support structure. Planting closer to houses also avoids potential problems with trees not meeting the requirements of the Electricity (Hazards from Trees) Regulations 2003.

Section 10 of this guide provides additional advice on planting near National Grid lines.



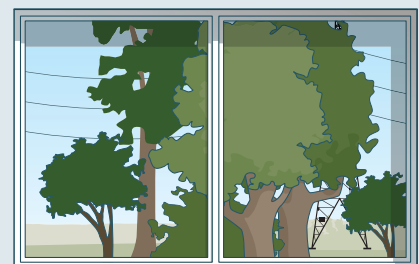
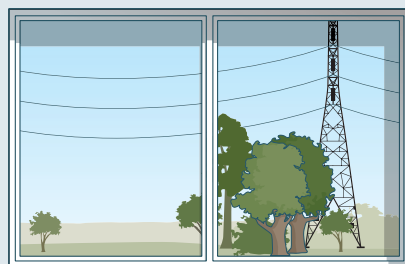
Site layout

Any potential visual impacts of the lines can be reduced by early planning taking into account the presence of the lines (and their support structures).

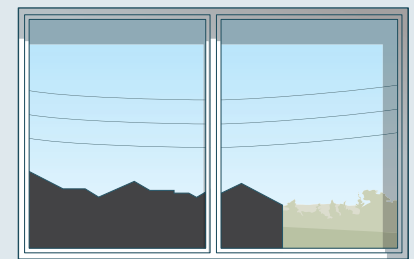
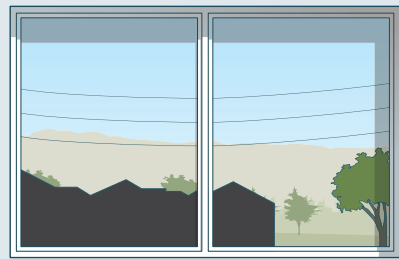
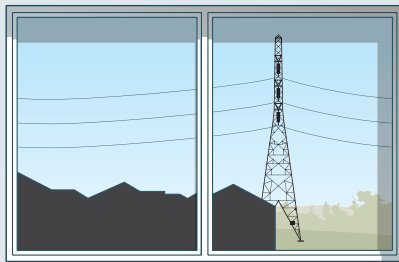
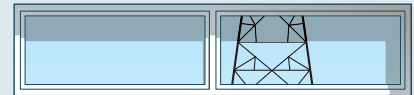
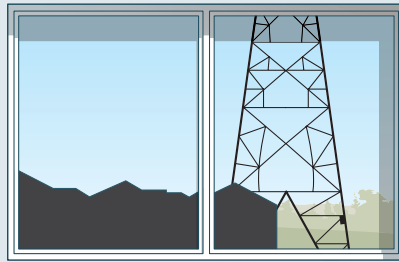
Development can be oriented away from the lines (or their support structures) or to look under lines at views beyond. Gardens within the National Grid Yard can become the focus of close views from main windows.

Building design and orientation

When deciding where entranceways and windows should be placed in a new house, consider where views of the line are and noise from the line. Consider smaller windows, double glazing or acoustic glass where bedroom windows are close to and/or facing the line. If an outlook is not important, consider the use of opaque glass.



Views of towers tend to be more dominant than views of conductors only.



You can still use the land under the lines

The land under the lines and within the National Grid Yard can be used effectively and well if the development is carefully designed. The space can be utilised for outdoor living including gardens, lawns, paved areas or car parking or driveways. Garages and structures such as utility sheds can be considered within the National Grid Subdivision Corridor on a case-by-case basis and subject to NZECP 34 compliance.

LARGE-SCALE RESIDENTIAL DEVELOPMENT

Large-scale new residential development will provide greater opportunities for the National Grid Yard to be appropriately accommodated than in smaller-scale developments, without impacting on property yield.

What are the issues?

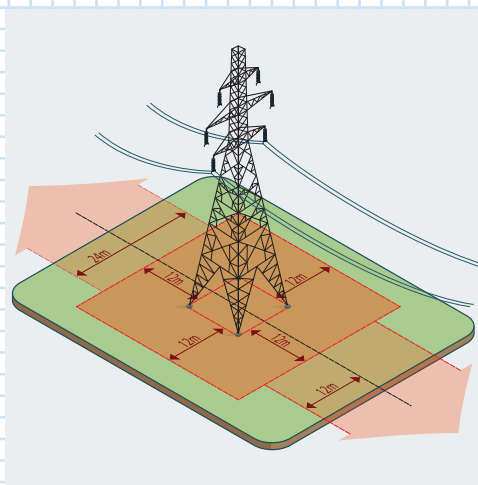
Most development issues were discussed in Section 2 of this guide. To recap, matters of relevance to large-scale residential development include:

- increased risks of electrical hazards to people and buildings
- risks to the National Grid network – faults and power outages as a result of electric hazards
- the need to maintain access to the lines and their support structures
- the need to keep sensitive activities outside the National Grid Yard
- the need to keep almost all buildings outside the National Grid Yard in new development areas
- noise and visual effects.

What are National Grid Yards?

The National Grid Yard is the area beneath and immediately next to National Grid lines (including their support structures). Incompatible activities and land uses need to be set back from National Grid lines as they can compromise the ongoing operation, maintenance, upgrading and development of the National Grid or the safety of those living or working around it.

For these reasons, Transpower seeks a 12 metre setback either side of the centreline of a National Grid line and 12 metres in any direction from the outer edge of a National Grid line structure. This is reduced to a 10 metre setback where the line is a single concrete/wooden pole line, although the distances from the structures remain the same.

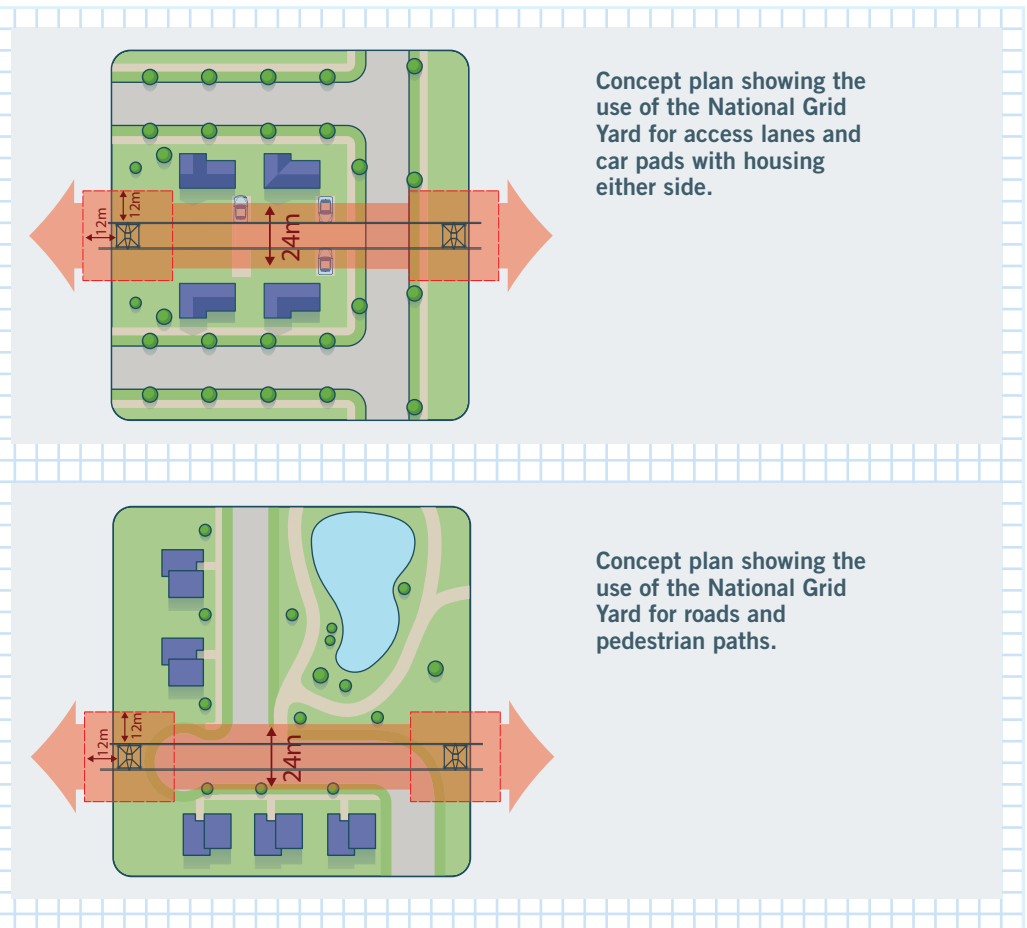


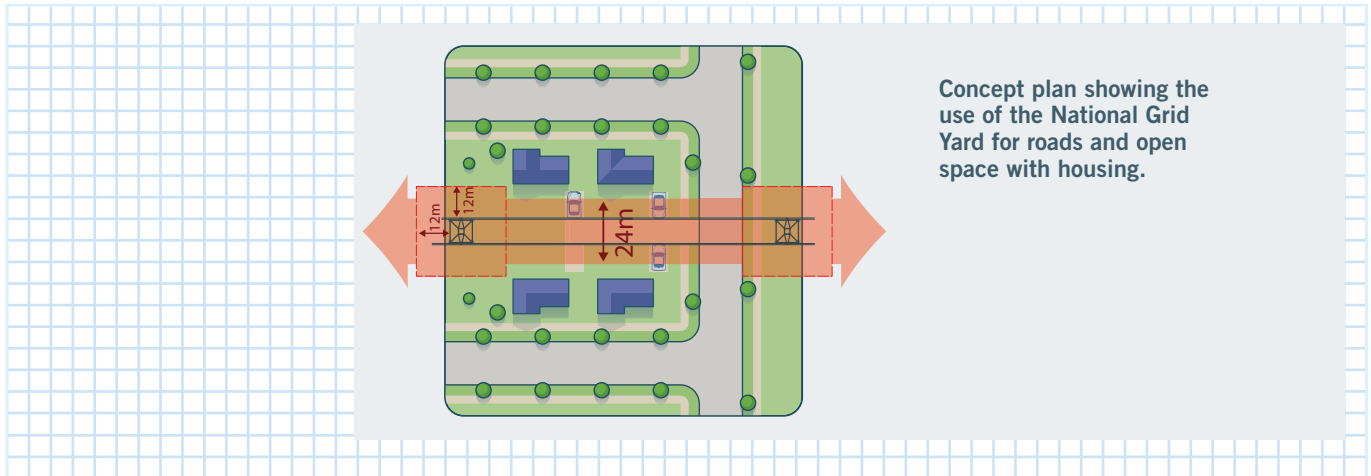
How can these issues be managed?

Ensure a clear National Grid Yard

New areas of development provide maximum opportunities for design and layout that is compatible with the National Grid. Layouts and how a National Grid line can best be integrated into future development should be considered at master plan, structure plan or concept plan stage.

- Use the National Grid Yard for open-space corridors, footpaths, cycleways and roads, drainage systems or open space in larger lots.
- Design subdivisions to avoid future pressure for buildings within the yard.
- Ensure access to National Grid line support structures is maintained and remains convenient where they are not part of an open space or road system.





Site layout

Any potential visual impacts of the lines can be reduced by early planning taking into account the presence of the lines (and their support structures).

Development can be oriented away from the lines (or their support structures) or to look under lines at views beyond. Gardens within the National Grid Yard can become the focus of close views from main windows.



Don't forget

Construction must also comply with NZECP 34.

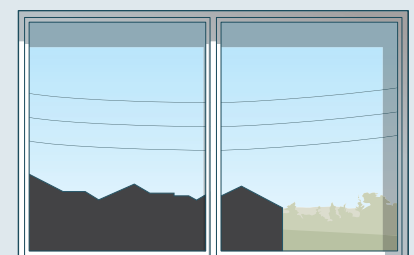
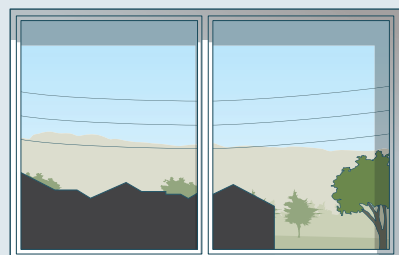
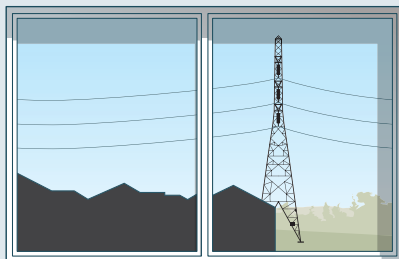
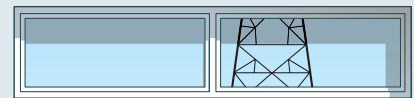
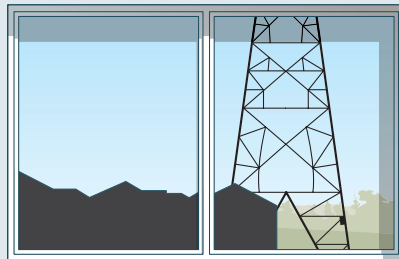
Building design

For all new residential buildings close to lines, outlook and orientation should be considered at the design stage.

- If possible, orient main living areas away from close views of National Grid lines and especially support structures.
- Design living area windows to look under conductors to views beyond or to open spaces and gardens within the National Grid Yard.
- Where bedrooms are close to National Grid lines or substations, consider reducing the size of windows facing in that direction, using opaque glass and/or double glazing windows to reduce noise.

When deciding where entranceways and windows should be placed in a new house, consider where views of the line are and noise from the line. Consider smaller windows, double glazing or acoustic glass where bedroom windows are close to and/or facing the line. If an outlook is not important, consider the use of opaque glass.

Views of towers tend to be more dominant than views of conductors only.



Please contact us for assistance with the correct NZECP 34 safe distances for your site:

transmission.corridor@transpower.co.nz

Comply with NZECP 34

In addition to the National Grid Yard, buildings and structures must always comply with the minimum safe clearance requirements within NZECP 34. Sometimes, NZECP 34 requirements require setbacks or clearances that may overlap or be greater than the National Grid Yard. If you're in doubt or need further assistance, contact us directly.

NZECP 34 specifies minimum safe separation distances for people, buildings/structures, mobile plant and earthworks from National Grid lines and their support structures. Also consider construction methodology (ie how things are built and erected), as this must also comply with NZECP 34, not just the finished product. The safe distances in NZECP 34 that apply will depend on the voltage of the line, the position of the support structures, the length of the span crossing your site and the topography.

Beyond our minimum requirements in the National Grid Yard to prevent underbuild and protect the network, we believe developers can more positively integrate National Grid lines within their developments without compromising property yield.

 Quick tip...
Look to

INTEGRATE

positive spaces into the corridors

LARGE-SCALE REDEVELOPMENT (BROWNFIELD)

There are both opportunities and constraints in large-scale redevelopments near to National Grid lines. Transpower is interested in how the wider corridor is subdivided so that access to the lines is maintained and subdivision design makes the best of the opportunities of the National Grid Yard.

What are the issues?

Most development issues were discussed in Section 2 of this guide. To recap, matters of relevance to subdivision and redevelopment include:

- increased risks of electrical hazards to people and buildings
- risks to the National Grid network – faults and power outages as a result of electric hazards
- the need to maintain access to the lines and their support structures
- the need to keep sensitive activities outside the National Grid Yard
- the need to keep almost all buildings outside the National Grid Yard in new development areas
- noise and visual effects.

What are National Grid Yards?

The National Grid Yard is the area beneath and immediately next to National Grid lines (including their support structures). Incompatible activities and land uses need to be set back from National Grid lines as they can compromise the ongoing operation, maintenance, upgrading and development of the National Grid or the safety of those living or working around it.

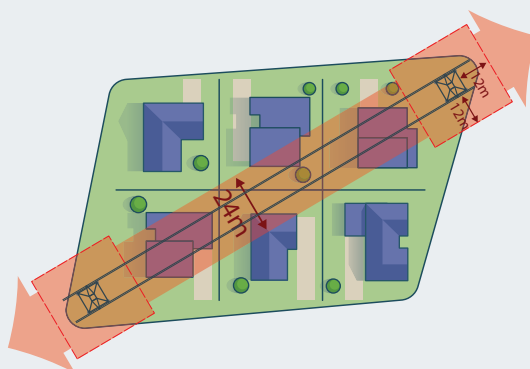
For these reasons, Transpower seeks a 12 metre setback either side of the centreline of a National Grid line and 12 metres in any direction from the outer edge of a National Grid line structure. This is reduced to a 10 metre setback where the line is a single concrete/wooden pole line, although the distances from the structures remain the same.

How can these issues be managed?

Ensure a clear National Grid Yard

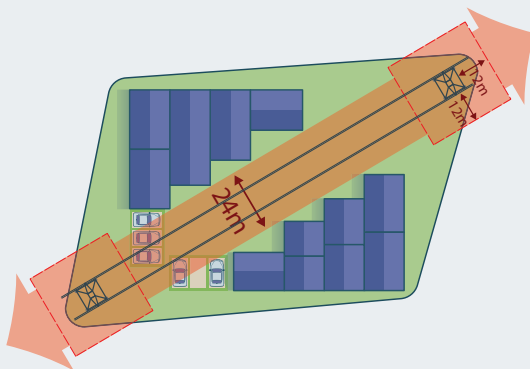
Redevelopment around National Grid lines in existing urban areas is quite common, and there are many ways to do it. Redevelopment usually involves some degree of intensification. Only in limited circumstances, where lots are already small or where most of the land is within the National Grid Yard, is intensification impossible. In almost all circumstances, it is possible to intensify and redevelop while maintaining a clear National Grid Yard. Transpower can assist with ideas for lot layout and/or redevelopment to ensure dwellings are located outside of the National Grid Yard.

In most circumstances, Transpower will require that the National Grid Yard is kept free of all buildings. In existing commercial and industrial areas, although some leeway may be acceptable.



BEFORE

Consider acquisition of additional land to enhance redevelopment opportunities.



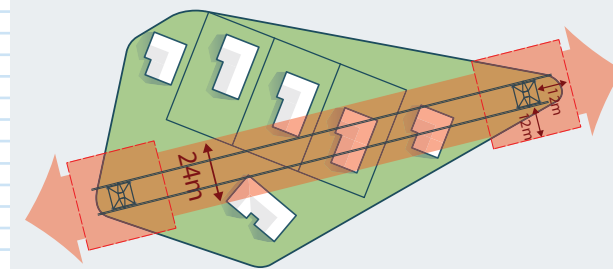
AFTER

Six dwellings replaced by 12. Car parking, circulation space and gardens within National Grid yard.

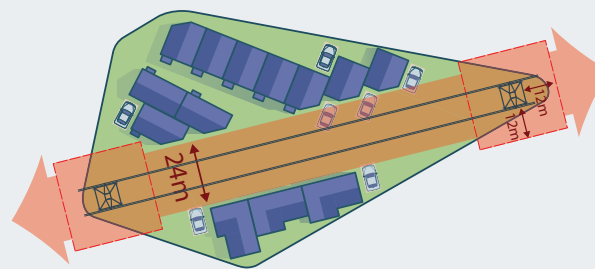
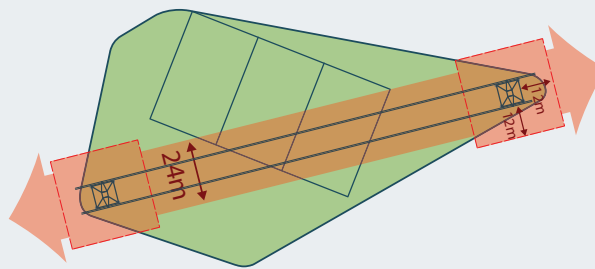
We are here to help

Contact Transpower to discuss your proposal:

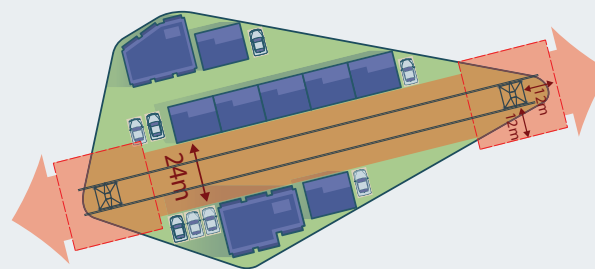
transmission.corridor@transpower.co.nz



BEFORE
Site amalgamation enhances redevelopment options.



AFTER
Land redevelopment from six dwellings to 13 – mix of terraced and semi-detached.



Land redevelopment from six dwellings to a terrace plus two apartment blocks – 12+ dwellings.

COMMERCIAL AND INDUSTRIAL DEVELOPMENT

Early planning is essential when determining industrial and commercial site design and layout so that operational and maintenance needs, required separation distances, and safety and access issues can all be taken into account.

We are here to help

It is worthwhile discussing your proposals with Transpower in the early stages of planning a development.



What are the issues?

Commercial and industrial development can result in a number of issues for both the National Grid lines and the development. These issues were discussed in Section 2 of this guide. To recap, matters of relevance to commercial and industrial development include:

- increased risks of electrical hazards – buildings, construction, outdoor storage (such as containers), use of mobile plant and people working too close to lines and structures
- risks to the National Grid network – faults and power outages as a result of electrical hazards
- the need to maintain access to the lines and support structures
- in greenfield areas, the need to keep almost all buildings outside the National Grid Yard.

What are National Grid Yards?

The National Grid Yard is the area beneath and immediately next to National Grid lines (including their support structures). Incompatible activities and land uses need to be set back from National Grid lines as they can compromise the ongoing operation, maintenance, upgrading and development of the National Grid or the safety of those living or working around it.

For these reasons, Transpower seeks a 12 metre setback either side of the centreline of a National Grid line and 12 metres in any direction from the outer edge of a National Grid line structure. This is reduced to a 10 metre setback where the line is a single concrete/wooden pole line, although the distances from the structures remain the same.

To help with your planning, we have illustrated various different scenarios and colour coded them:



Refer to Sections 4-5 for some design tips.

How can these issues be managed?

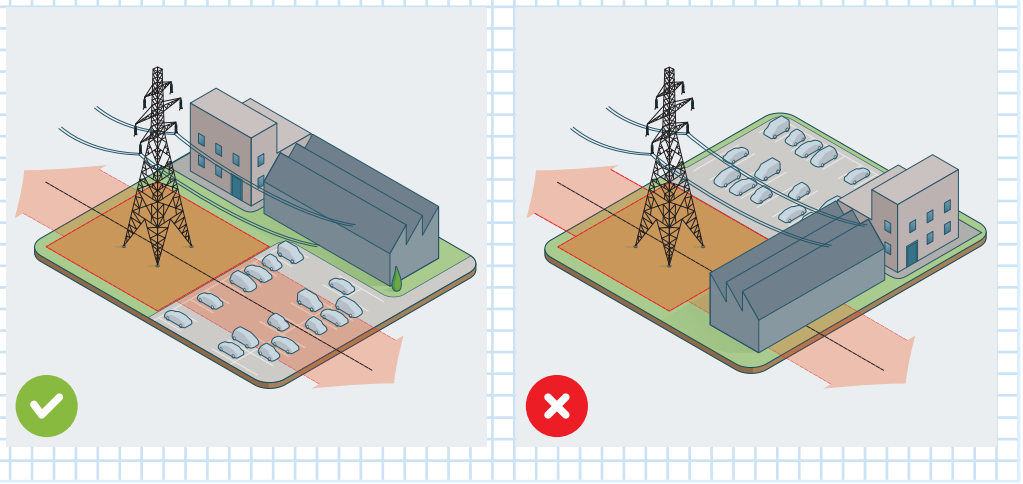
Ensure a clear National Grid Yard

Plan your site layout to ensure that buildings and structures are not located directly under the lines or within the National Grid Yard. Use lower building heights nearer to the lines, and increase building height as distance away from the lines increases.

Develop land under and around National Grid lines with activities that are compatible with the operation of the lines and location of support structures. Make sure the risks associated with building and working in close proximity to the National Grid lines are known and understood and that measures are taken to ensure safety.

The area under the lines can be used, for example, for car parking or internal roads providing that the necessary separation distances are maintained and NZECP 34 is complied with. For commercial developments, this may be a suitable place for car parking, for internal roads or for outdoor amenity areas. For industrial development, the area could be used for low-level display and storage of (non-flammable and non-explosive) goods and wares, but particular care must be taken with the use of mobile plant (such as, cranes or forklifts). If a support structure is near a proposed road or car park, adequate setbacks and protection for the structure will be needed to ensure that it is not damaged and remains accessible. When designing roads or car parks around support structures, ensure vehicle movements are directed away from the structure.

Please contact us for assistance with the correct NZECP 34 safe distances for your site:
transmission.corridor@transpower.co.nz



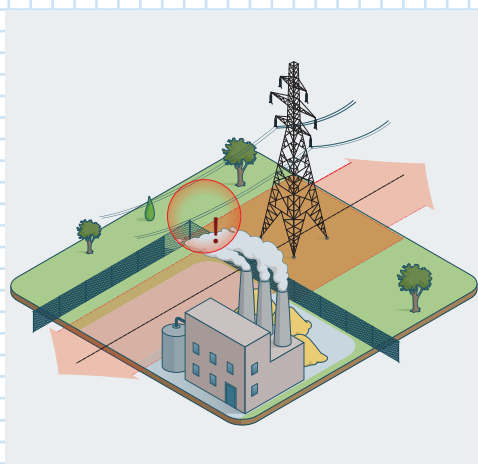
Comply with NZECP 34

Always ensure that any activities, buildings and structures comply with the safe separation setbacks required by NZECP 34. The safe distances in NZECP 34 that apply to your site will depend on the voltage of the line and the length of the span crossing your site.

Where you have a tower or steel monopole on site, you must set back any buildings or structures a minimum of 12 metres from the outer edge of the structure. For wooden/concrete poles, the required setback is 8 metres.

Do not attach anything to a tower or pole, and make sure access for maintenance is preserved. If fences or bollards around towers or poles are proposed, these must be set back in accordance with NZECP 34 and must be removable for when Transpower needs to access the structure for maintenance.

If stockpiling soil or similar materials make sure that any change to the ground level beneath the National Grid line does not encroach into the separation distances required by NZECP 34. Similarly, avoid excavating adjacent to towers or poles as this may undermine the stability of the towers or poles.



Building has been built too close to lines in violation of NZECP 34 requirements.

Don't forget to consider construction and not just the finished product. Construction must also comply with NZECP 34.

Preserve access to lines

Locating activities such as car parking or access roads under the lines to keep the National Grid Yard clear will assist in meeting the separation distances required by NZECP 34 and maintaining vehicle access to support structures. Remember to ensure adequate setbacks and protection is provided for National Grid support structures to ensure that they are not damaged and remain accessible.

Consider your building materials

Long sections of metal roofing or walls parallel to the National Grid lines can act as a circuit – these should be broken up by inserting sections made of non-conductive materials (such as, timber). Ensure metal buildings and structures, including building cladding, are earthed or bonded. A specialist engineer can advise on safe and compliant development.

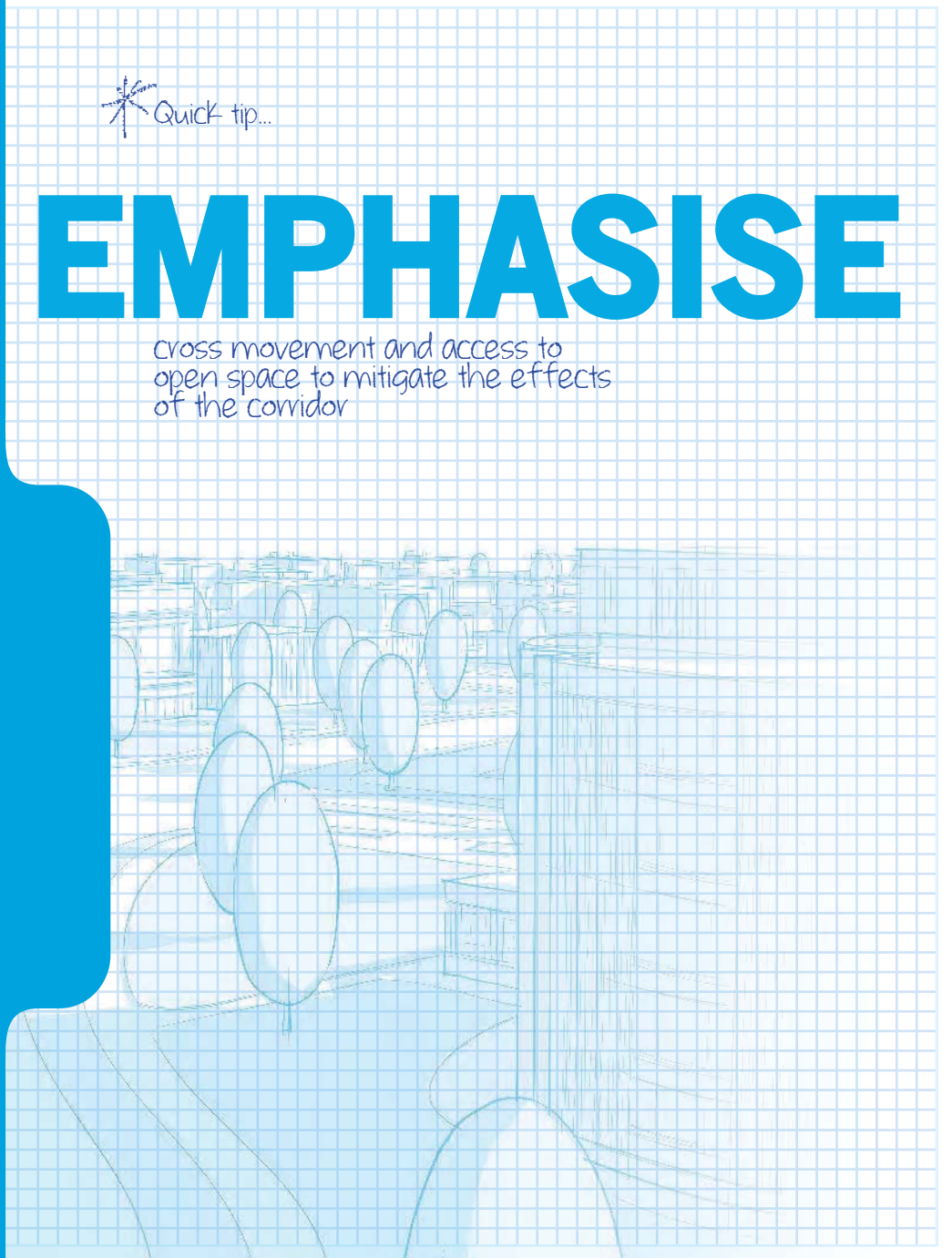
Also consider construction methodology, in particular, the use of cranes. Large sections of concrete wall or roofing may not be able to be safely put in place while maintaining safe clearance distances from the lines and towers/poles. Always consider whether construction will comply with NZECP 34.



* Quick tip...

EMPHASISE

cross movement and access to open space to mitigate the effects of the corridor



OPEN SPACE AND RECREATION

We are here
to help

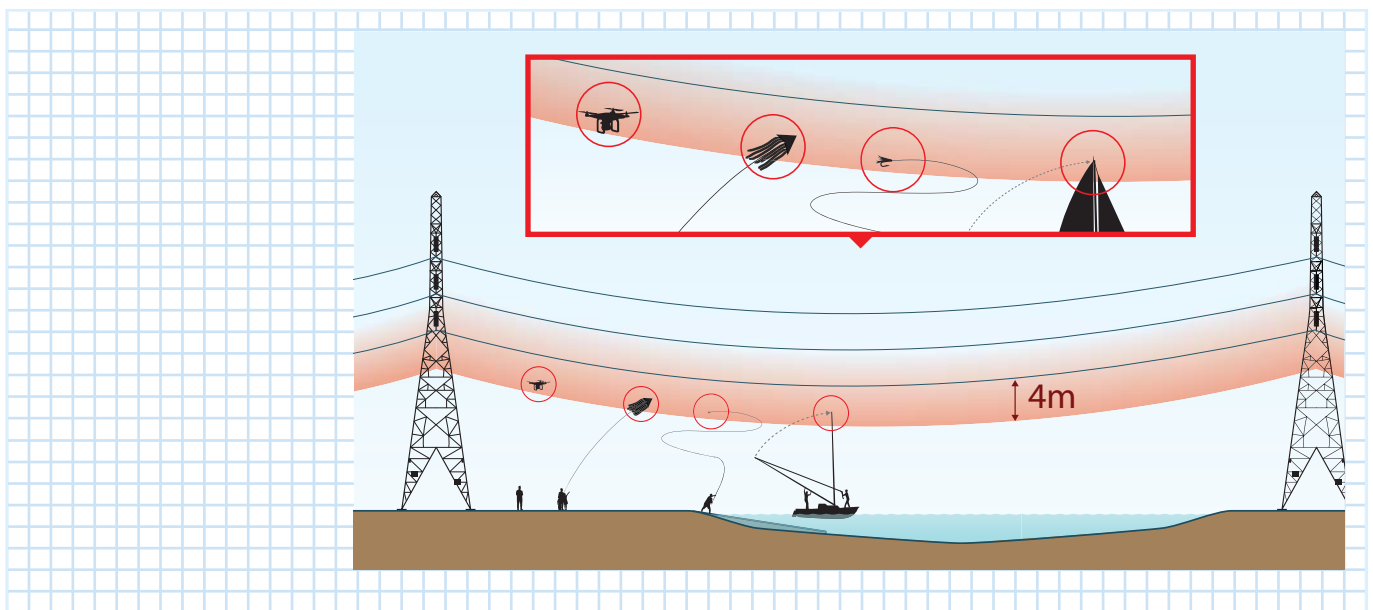
Contact Transpower
to discuss
your proposal:
transmission.corridor@transpower.co.nz

Land under and around National Grid lines can be used as open space and for recreation. Many activities are compatible with the presence of the lines, provided that safe separation distances are maintained, tree planting complies with the Tree Regulations and general safety measures are observed.

What are the issues?

Although open space and recreation activities are often preferred and recommended as the best use under the lines, some activities can still result in issues for both the National Grid lines and the activity or development. These issues were each discussed in Section 2 of this guide. To recap, matters of relevance to open space and recreation include:

- increased risks of electrical hazards – structures (such as goal posts), vegetation or activities (such as fishing) too close to lines and structures
- the need to keep almost all buildings outside the National Grid Yard.



How can these issues be managed?

Ensure the activity is compatible with the lines

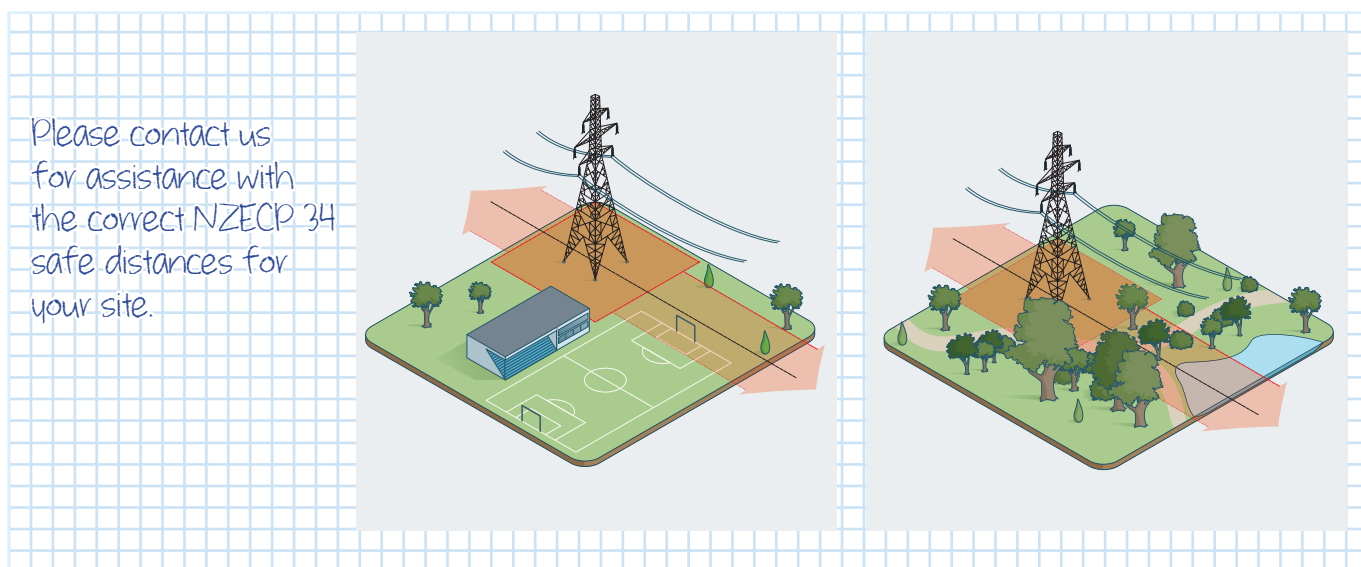
There are some open-space activities that must be avoided (or take place with caution) near National Grid lines:

- **Kite flying:** The kite string can create a dangerous electrical hazard risk if any part of the kite touches the conductors.
- **Model aircraft and drones:** These can become caught in National Grid lines, creating faults on the lines, and require outages to be removed.
- **Boating:** Be aware of the height of masts when passing underneath National Grid lines.
- **Fishing:** Casting can result in the fishing line coming into contact with the conductors and becoming a conductor itself.



When recreational uses that require larger open areas, such as sports fields, golf courses or courts, are located under or near the lines, ensure that any structural elements, such as rugby goal posts, stands or lighting, are located away from the lines and comply with NZECP 34 separation distances.

Facilities for light aircraft, helicopters, hang gliding and ballooning need to be well away from National Grid lines. Ensure flight paths avoid National Grid lines.



Design of open space and recreation

When planning parks and open spaces, ensure you take the National Grid lines (including their support structures) into account. For example, the location of the National Grid lines will influence the location of tall structures, such as floodlights or goal posts.

Careful planning of paths and tracks can assist with mitigating landscape and visual effects of the lines and towers/poles. For example, a path could weave under the lines rather than following it in a straight line. Careful planting of shrubs and low trees can also screen longer views. Always avoid locating paths or areas of congregation directly next to towers or poles.

The National Grid Yard can also provide a good opportunity to create wetland areas or wildlife corridors through built-up areas, provided that vehicle access to the towers or poles is maintained. Wetlands can be successfully developed, provided tower foundations are not affected.

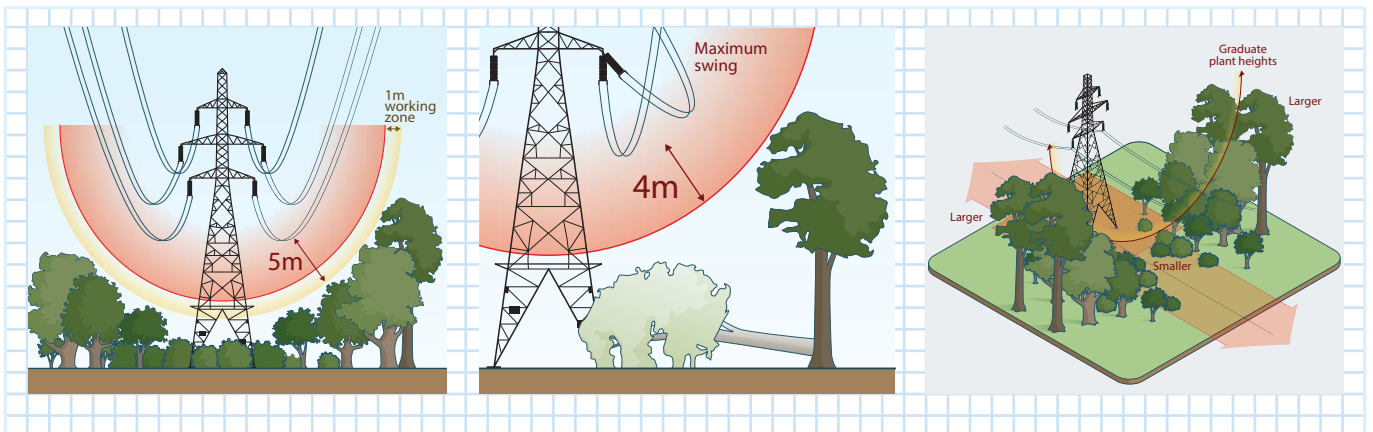
Comply with NZECP 34

Always ensure that any activities, buildings and structures comply with the safe separation distances required by NZECP 34. These distances will depend on the voltage of the line and the length of the span crossing your site.



Comply with the Tree Regulations

Trees near and around National Grid lines can become a problem if the trees grow tall enough to interfere with the lines or fall on them. It is important that the safe clearances within the Tree Regulations are met as well as setbacks to cover tree fall hazard. Trees must remain a sufficient distance from the lines so that, if a tree falls in a storm, it will not make contact with the lines.



RURAL AND FORESTRY LAND USE

We are here to help

Contact Transpower to discuss your proposal:
transmission.corridor.transpower.co.nz
[@transpower.co.nz](https://twitter.com/transpower.co.nz)

Rural land uses can generally coexist well with National Grid lines, provided that minimum safe separation distances are met. However, some activities, such as irrigating, burning off or spreading fertiliser, will need to be managed to ensure the existing lines aren't adversely affected. Likewise, it is important that the lines do not adversely affect landowners/users. Some rural buildings and structures can be compatible with National Grid lines – a hay shed or horticultural structure can generally be worked around. Buildings involving intensive activities such as factory farming barns, commercial greenhouses and dairy sheds should not be located in the National Grid Yard. Similarly, large-scale buildings such as packing sheds should not occur in the National Grid Yard.

Forestry and tree-based horticulture will often need greater setbacks than other rural land uses to ensure adequate electrical separation as the trees grow.

The Tree Regulations and NZECP 34 apply to farming and forestry.



What are the issues?

Most rural and forestry land use issues were discussed in Section 2 of this guide. To recap, matters of relevance to rural and forestry land use include:

- increased risks of electrical hazards – buildings or vegetation too close to lines and structures
- risks to the National Grid network – faults and power outages as a result of electric hazards
- the need to maintain access to the lines and support structures
- the need to keep most types of buildings and some activities such as irrigation and fertiliser drops outside the National Grid Yard.

To help with your planning, we have illustrated various different scenarios and colour coded them:

 Not quite right

 Working well

Section 10 has information on planting near National Grid lines.

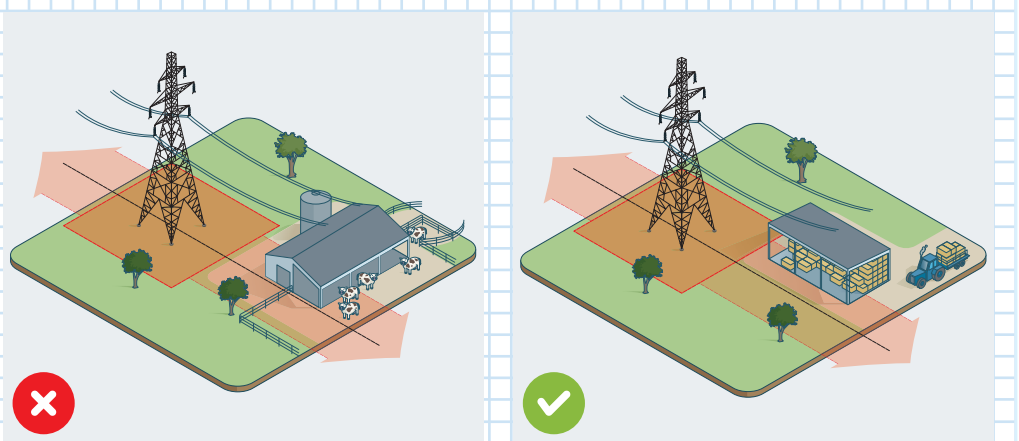
How can these issues be managed?

Ensure a clear corridor

Locate farm sheds, hay barns and other buildings and structures away from National Grid lines support structures. This will also help ensure vehicle access to the towers or poles is maintained. Within the National Grid Yard, intensive activities like milking sheds, indoor poultry/pig farms or similar buildings should be avoided. Utility buildings like hay sheds or equipment sheds are acceptable provided NZECP 34 requirements are met.

Ensure that any forestry plantings, shelterbelts and horticultural tree crops maintain the separation distances required by the Tree Regulations and provide for vehicle access to lines for inspection and maintenance. However, be aware that tall-growing trees (although they may comply with the Tree Regulations) could still cause a hazard if they fall on a line or tower. Ensure that trees cannot fall within 4 metres of a National Grid line.

Check with Transpower about the buildings that can be built within the National Grid Yard.



Avoid potential electrical hazards

Long runs of metal and wire fencing parallel to the National Grid lines will need to be broken up with either non-conductive sections or by inserting insulators. Without this, hazardous voltages can be transferred along the fence or other structure. NZECP 34 sets out separation distances for fencing from towers or poles. For example, all fencing must also be kept more than 5 metres from a pole or tower, and where possible, the fencing should run perpendicular to the direction of the conductors.

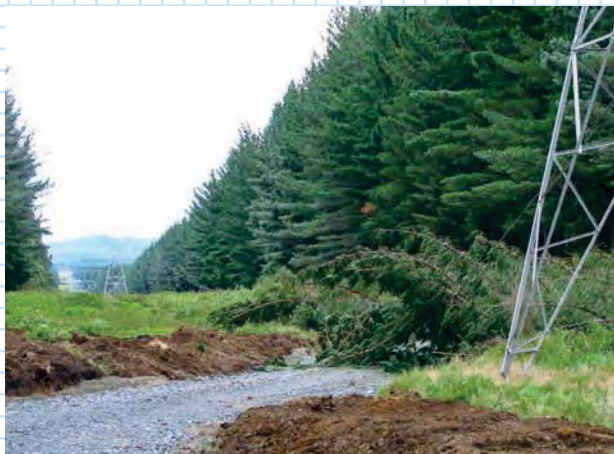


Ensure NZECP 34 safe separation distances for all activities and buildings. In particular, note safe distances for buildings, earthworks and mobile plant such as irrigators. Keep irrigators and other spray units well away from the lines, towers and poles. Adjust nozzles to make sure they are not spraying onto the conductors, jets are turned off when the boom passes by the towers and the boom stays well clear of the conductors. There are different minimum approach distances for mobile plant depending on the voltage of the line. If you are unsure, it is recommended you keep all mobile plant at least 6 metres clear of National Grid lines at all times. Contact Transpower for further guidance on your specific situation.

The lines may also pose a hazard to helicopters and planes that are topdressing or spraying. Make sure the exact location of the lines is marked on the flight map, and if possible, avoid spraying or topdressing in patterns that require the flight path to cross the line. Fly parallel to the line whenever possible. It is safest to cross a line at a tower rather than mid-span.

Contact us

Transpower can help you identify what safe separation distances will apply to your site.



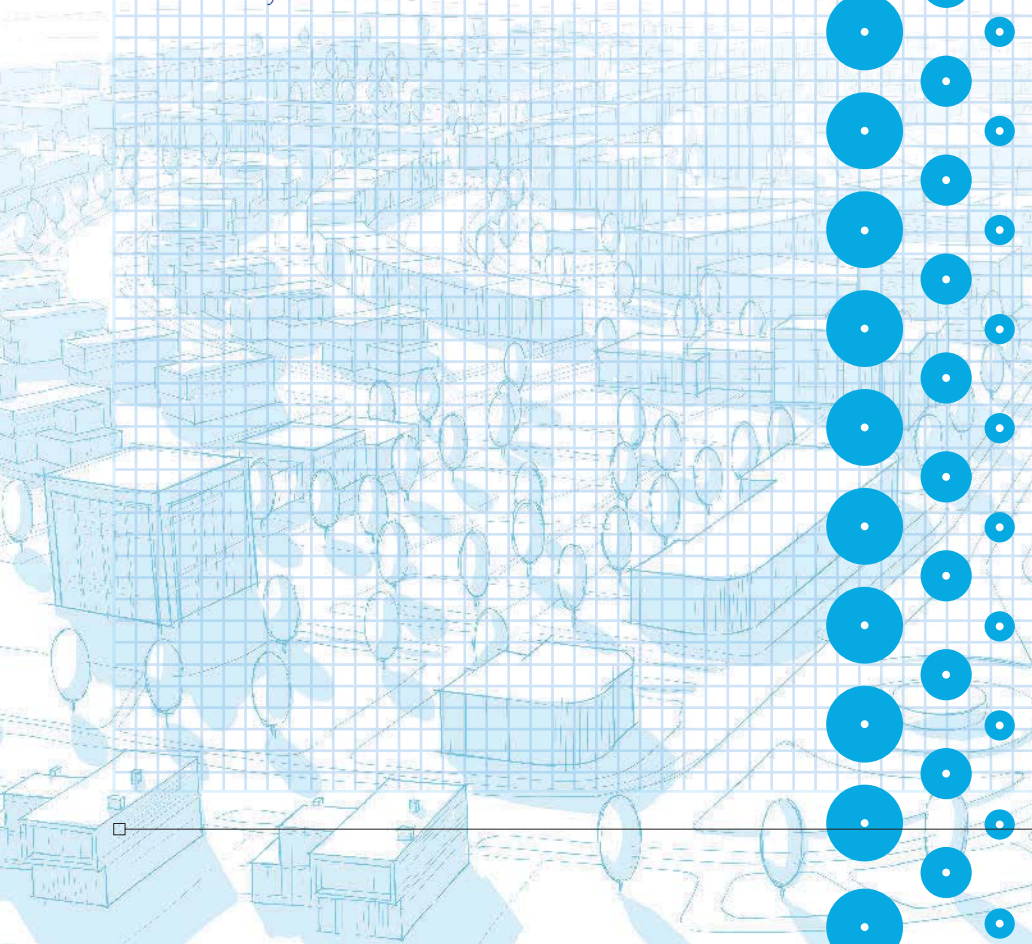


Quick tip...essentials

Plan your

PLANTING

remembering that vegetation grows and falls over. In either case make sure you keep vegetation from growing into or falling onto National Grid lines.



PLANTING NEAR THE NATIONAL GRID

Tree planting under National Grid lines can become a problem if the trees grow tall enough to interfere with the lines or fall on them. It is important that the safe clearances within the Tree Regulations are met, as well as setbacks to cover tree fall hazard. Trees must remain a sufficient distance from the lines so that, if a tree falls in a storm, it will not make contact with the lines.

What are the issues?

Most issues relating to trees and vegetation were discussed in Section 2 of this guide. To recap, trees growing too close to power lines may cause:

- a fault that will affect the operation of the line
- injury or death to someone near the tree
- damage to land and property.

How can these issues be managed?

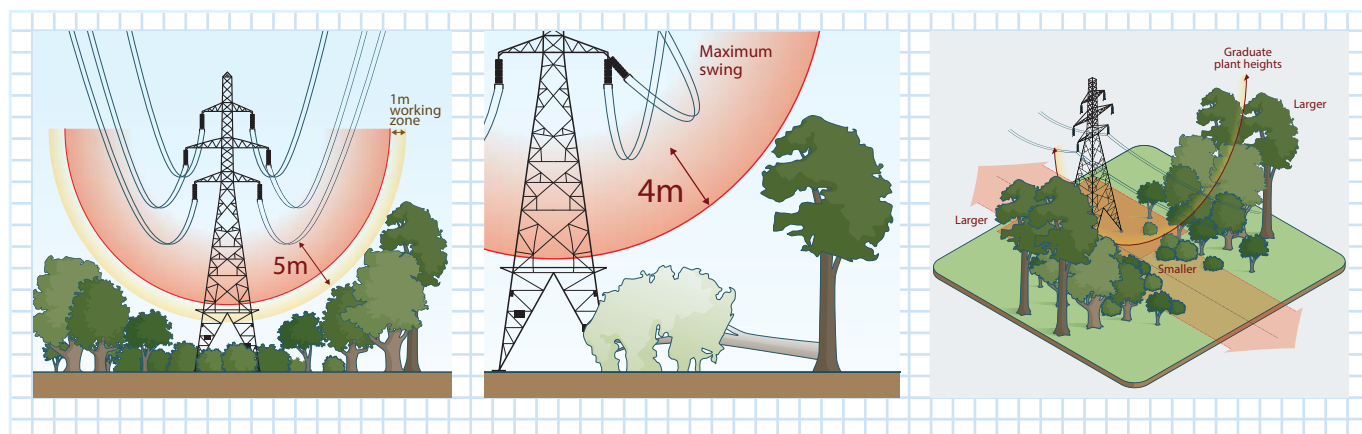
Ensure safe separation distances

First, check the Electricity (Hazards from Trees) Regulations 2003 for safe clearance distances for trees and overhead lines. It is important to note that the Tree Regulations do not cover setbacks to address tree fall hazard. Trees must remain a sufficient distance from the lines so that, if a tree falls in a storm, it will not make contact with the lines. Tree fall hazard can pose a serious risk to National Grid lines, security of supply and public safety. To address this, Transpower has its own Tree Fall Risk Management Policy.

Contact us to
get a copy of
Transpower's
tree or
horticulture
information
sheets



Any proposed planting must be located to ensure that, at full maturity, the tree cannot fall within 4 metres of a National Grid line.



In practical terms, a good way to avoid any problems with tree planting is to develop a graduated zone of planting for areas under and around National Grid lines. Immediately under the lines, any planting must be kept low by using species that do not grow any higher than 2 metres at full maturity. This is also a cheaper and easier solution than relying on trimming and maintenance. In some cases, the topography of the land being traversed by a line span (like a valley) might allow higher species to be planted – check with Transpower on what is possible.

As the distance from the lines increases, the height of the planting can be gradually increased until tall trees can be safely planted. A useful rule of thumb is that a tree should be planted no closer to the National Grid lines than 1.5 times the mature height of the tree.

If establishing commercial forestry near lines, Transpower can help calculate practical planting distances from the line. Early planning will avoid trees having to be trimmed or removed prior to maturity later on. Where trees have been removed, you can stop regrowth or sprouting by applying environmentally friendly herbicides to the stumps.

In all cases, it is very important to check the mature growth height of trees and shrubs before planting and discuss your plans with Transpower.

Choose the right species

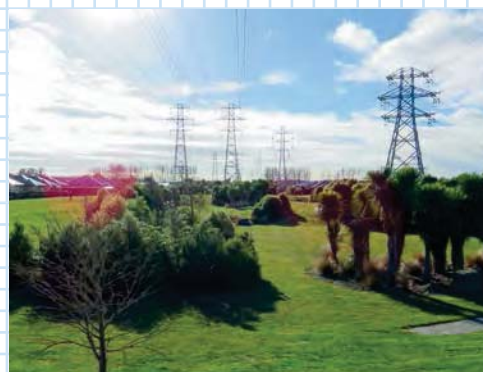
Instead of planting large tree species such as oak, elm, pine, poplar or eucalyptus, consider planting smaller, more compact species. Suitable species could include Japanese maple, acacia, *Robinia*, birch, kōwhai, *Pittosporum*, *Dodonaea*, *Prunus* or *Malus* (flowering cherry and apple).

Small orchard species can generally be grown without risk under National Grid lines. Hedges and shrub planting pose few problems, and ground covers are obviously suitable. However, you should discuss with Transpower the potential impact on the lines of spraying.

Contact us to discuss your proposal.



Screening using plants is an effective way to minimise the prominence of transmission towers.



Low trees and vegetation add foreground detail, drawing the eye away from transmission towers and lines.

GLOSSARY

ARCING Electrical discharging, usually along the outside surfaces of an insulator, which occurs as the electricity leaks to earth. Minor arcing is heard as buzzing or frying sounds and may be visible at night as small intermittent flashes. A major arc is a flashover.

CONDUCTORS The conductors are the wires that carry electricity along the transmission line and are made of copper or steel-reinforced aluminium.

FLASHOVER A momentary, but major, electric arc, usually across an insulator string.

Each flashover is accompanied by a brilliant flash and a loud bang and results in a short circuit, which may damage equipment at a substation and occasionally on private properties. Flashovers can also occur between two conductors or between a conductor and an object underneath the line, such as a tree or a crane jib.

A fire under the line may cause a flashover from a conductor direct to ground. With transmission lines, objects do not need to actually touch the conductors to cause a flashover, as the arc can 'jump' (over a metre in some circumstances). In general, flashovers are rare and may indicate a problem with the line. Always report flashovers.

INSULATOR Insulators (or an insulator string) are used to connect the conductor to the pole, tower or monopole, while preventing electricity 'leaking' from the conductors into the structure and from there to the ground. Older insulators are made of glass or porcelain. New insulators are made of fibreglass or rubber.

MOBILE PLANT This includes cranes, elevating platforms, tip trucks or similar plant, irrigator booms, any equipment fitted with a jib or boom (such as a drilling rig), any device capable of being raised or lowered (such as a post rammer), loaders, excavators, drilling or pile-driving equipment or other similar devices.

NATIONAL GRID The assets used or owned by Transpower New Zealand Limited. It includes overhead high voltage transmission lines, underground cables, substations and ancillary buildings.

NATIONAL GRID SUBDIVISION CORRIDOR The area up to 37 metres either side of the centreline within which subdivision, development and changes in the use of land may affect the operation and development of existing National Grid high voltage transmission lines. If developing within this corridor, you should get in touch with Transpower.

NATIONAL GRID LINES The conductors (wires), the insulators that the conductors are suspended from, the support structures (towers, steel monopoles and poles) and their foundations. These are assets used, owned or operated and maintained by Transpower.

NATIONAL GRID YARD The area within the National Grid Subdivision Corridor, and defined as 12 metres from the centreline of a transmission line (or 10 metres for a single pole line) and 12 metres from the outer edge of the foundation of a support structure. Transpower seeks that this area remains free of most buildings and some types of land use activities.

NATIONAL POLICY STATEMENT ON ELECTRICITY TRANSMISSION (NPSET) The NPSET is a National Policy Statement providing direction for local authorities on how to recognise the national significance of the National Grid in Resource Management Act 1991 planning documents and local decision making. These documents include regional policy statements, regional plans and district plans.

NEW ZEALAND ELECTRICAL CODE OF PRACTICE FOR ELECTRICAL SAFE DISTANCES 2001 (NZECP 34). NZECP 34 sets out the minimum safe distances for excavation and construction of structures or buildings and the operation of mobile plant near conductors and support structures. The primary purpose of these distances is to protect people and property from harm caused by electrical hazards, such as flashovers. (Available from ess.govt.nz/rules/pdf/NZECP_34_2001.pdf)

POLES, TOWERS (PYLONS) AND STEEL MONOPOLES Support structures that have cross arms to hold the conductors clear of the ground. These structures and their foundations are designed to be strong enough to safely carry the weight of the conductors and withstand storm forces or wind.

SAFE SEPARATION DISTANCE OR SETBACK The mandatory distance a structure, earthworks or mobile plant (such as a crane or forklift) is permitted from existing National Grid transmission lines (conductors and towers or poles). Refer NZECP 34.

SENSITIVE ACTIVITY This is defined by the NPSET and includes schools, childcare facilities, residential buildings and hospitals.

TREE REGULATIONS The purpose of the Electricity (Hazards from Trees) Regulations 2003 is to protect the security of supply of electricity and the safety of the public, from hazards from trees. The schedule to the Tree Regulations identifies the growth limit zones in relation to trees growing near transmission lines. Any trees planted in the vicinity of National Grid lines must be located and managed to comply with these regulations. (Available from legislation.govt.nz/regulation/public/2003/0375/latest/DLM233405.html)

ADDITIONAL INFORMATION

PHONE

0800 843 474 (0800 THE GRID)	A 24-hour emergency number.
0508 526 369 (0508 LANDOWNER)	Call during office hours for general enquiries or information more specific to your property.
0800 248 344 (0800 B4UDIG)	Find out what underground cables are on your property.

EMAIL

landowner@transpower.co.nz	Our dedicated email address for landowners.
transmission.corridor@transpower.co.nz	For queries regarding development near transmission lines.

WEB RESOURCES

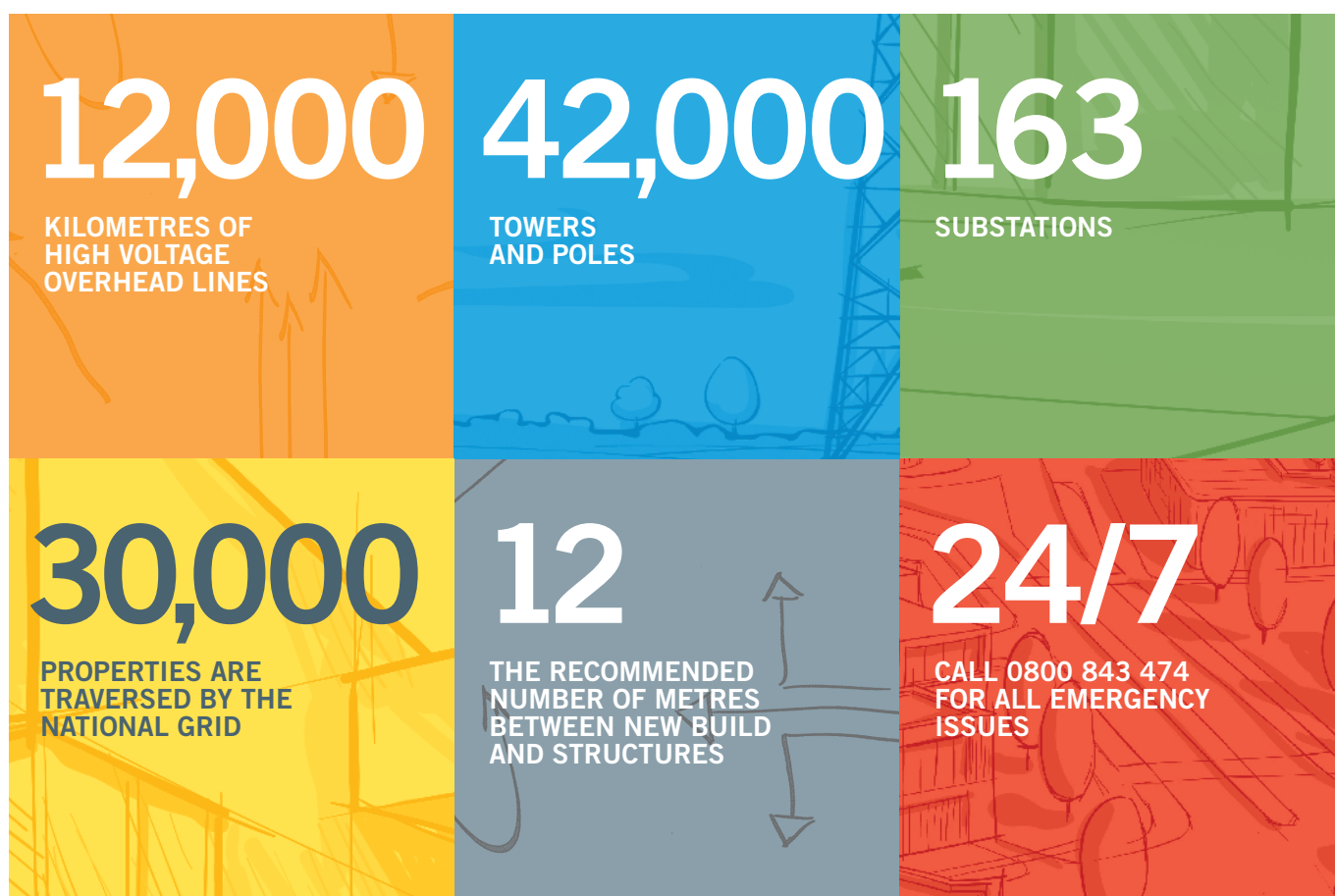
transpower.co.nz	Transpower website.
legislation.govt.nz	For copies of: <ul style="list-style-type: none">■ Electricity Act 1992■ Electrical (Hazards from Trees) Regulations 2003■ Resource Management Act 1991.
ess.govt.nz/rules/pdf/NZECP_34_2001.pdf	New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34).
who.int/peh-emf/en/	World Health Organization information on electromagnetic fields.
health.govt.nz/system/files/documents/publications/electric-magnetic-fields-your-health-V2_0.pdf	<i>Electric and magnetic fields and your health</i> (2013). Ministry of Health.
mfe.govt.nz/publications/rma/nps-electricity-transmission-mar08	National Policy Statement on Electricity Transmission 2008 and background information. Ministry for the Environment.

BACKGROUND – WHO WE ARE

Transpower New Zealand Limited (Transpower) is the State-owned enterprise that plans, builds, maintains and operates the National Grid – the high voltage National Grid network.

Transpower's network of National Grid lines transports electricity at high voltages from electricity generators to lines companies (for distribution to consumers via local networks) and directly to major industrial users.

The National Grid consists of around 12,000 km of high voltage overhead lines, 163 substations and some 42,000 towers and poles, traversing approximately 30,000 properties. The National Grid does not include local distribution lines (such as those owned by distribution companies like Vector, Powerco and Orion). The core network comprises mostly 220 kV and 110 kV alternating current (AC) lines, as well as a 350 kV direct current (DC) line from Benmore in the South Island to Haywards in the North Island, crossing under Cook Strait via the Cook Strait cables.



The configuration of the various lines enables them to operate as a network, where electricity can be sent in different directions depending on where the demand is. Because the network is a dynamic system, it is continually requiring maintenance and upgrading and sometimes extension in order to meet New Zealand's demand for electricity.

Transpower's lines were generally established under statutory provisions, including the Public Works Act 1908 and the Electricity Act 1968 and subsequent amendments. Transpower has statutory rights to the continued ownership and operation of National Grid lines built before 1 January 1988, which includes rights to carry out works necessary to inspect, operate and maintain lines. However, as these rights were provided for in statutes, they do not generally appear on certificates of title for affected land.

It is Transpower's preference, international best practice and required by the National Policy Statement on Electricity Transmission 2008 (under the Resource Management Act) to keep the area under lines free of buildings and structures. While Transpower generally doesn't own the land on which lines are situated, it does have some easements over part of the network. Where Transpower has easements over the lines, it is usually a condition that no buildings, structures or planting of vegetation occur within the easement area. Earthworks may also be restricted in easement areas.

In the absence of an easement, Transpower still recommends keeping the area clear and ensuring any nearby buildings or structures are adequately earthed or bonded. By setting back development from the lines, Transpower's rights to access the lines are provided for and safety risks are minimised.

Since 1988 (when new provisions of the relevant legislation came into effect), Transpower has negotiated easements for any new lines – the easement is registered on the certificate of title for the land, and the terms of the easement bind any subsequent owners. Transpower has produced a booklet for landowners – *Working on your land* – that contains important information for landowners and occupiers who have Transpower's assets on or crossing their properties. It details the rights and obligations of landowners and occupiers, safety and health issues and provides contact information for general enquiries and in case of an emergency.



THANKS.

