

Before an Independent Hearings Panel
appointed by Christchurch City Council

under: the Resource Management Act 1991

in the matter of: the hearing of submissions on Plan Change 14 (Housing
and Business Choice) to the Christchurch District Plan

and: **Orion New Zealand Limited**
Submitter 854

Statement of Evidence of Anthony John O'Donnell

Dated: 20 September 2023

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STATEMENT OF EVIDENCE OF ANTHONY O'DONNELL

INTRODUCTION

- 1 My full name is Anthony John O'Donnell.
 - 2 I am the Head of Network Delivery at Orion New Zealand Limited (*Orion*).
- Qualifications and experience**
- 3 I started my electrical career in 1997 as an industrial electrician. I have been registered as an electrical engineer since 2010 and am also a member of the Electricity Engineers Association.
 - 4 My professional qualifications are as follows:
 - 4.1 National Certificate – Electrical Engineering Levels 4 and 5 (Electrical Registration and Advanced Trade);
 - 4.2 Diplomas in Electrotechnology and Electrical Engineering – Level 6; and
 - 4.3 University of Canterbury Project Management PEPM83.
 - 5 In my role at Orion, I lead a team providing a wide range of services overseeing the management, installation, maintenance and replacement of the Orion electricity distribution network. My employment history is as follows:
 - 5.1 In 2003 I started as a Power Quality Officer;
 - 5.2 In 2007 I became the Technical Engineer for Distribution, a technical role responsible for Orion's underground design standards including the management of Orion's 66 kV distribution cable network;
 - 5.3 In 2011 I took over the Property Manager role and was responsible for all of Orion's property assets. In 2014, I then progressed to the Property and Projects Manager; and
 - 5.4 In 2018 I became the Works Delivery Manager. As of October 2021 I became the Head of Network Delivery responsible for all elements of delivery in accordance with our Asset Management Plan, and customer connection requests.
 - 6 I have been authorised by Orion (submitter number 854) to provide evidence on its behalf.

SCOPE OF EVIDENCE

- 7 My evidence will address:
- 7.1 Orion's role as the electricity distribution network provider for Christchurch;
 - 7.2 Orion's operations and the importance of enabling the efficient maintenance, use, development and upgrade of electricity infrastructure;
 - 7.3 the reasons why Orion seeks protection for its electricity distribution lines in the proposed Housing and Business Choice plan change (*PC14*); and
 - 7.4 the reasons why Orion seeks provision for electricity infrastructure that is required for servicing capacity under PC14.

SUMMARY AND CONCLUSIONS

- 8 A secure, well protected, reliable and efficient electricity distribution network is more critical than ever for the people, businesses and communities of Christchurch City.
- 9 Orion seeks recognition of the importance of its network and activities in PC14. As part of that recognition, Orion seeks the ability to maintain high standards of safety through the inclusion in the district plan of setbacks from both high and low voltage lines.
- 10 Additional infrastructure will be required in those areas where intensification occurs. This is a natural consequence of the number of households and electricity users increasing. Orion seeks that provision for such infrastructure be considered through the district plan provisions to enable developers to provide for the necessary space, or an agreed alternative, at an early stage in developments.

ORION'S NETWORK AND OUR ROLE IN THE ELECTRICITY INDUSTRY

- 11 Orion owns and operates the electricity distribution network that provides power to central Canterbury. Our aim is to consistently deliver a safe, secure and cost-effective supply of electricity to our customers.
- 12 The Orion network is both rural and urban and covers around 8,000 square kilometres across central Canterbury from the Waimakariri in the north, to the Rakaia river in the south; from the Canterbury coast to Arthurs Pass. The network (see **Figure 1** below) includes 11,500 kilometres of overhead lines and underground cables,

51 zone substations, 396 steel sub transmission towers, 90,000 power poles and 11,900 distribution substations.

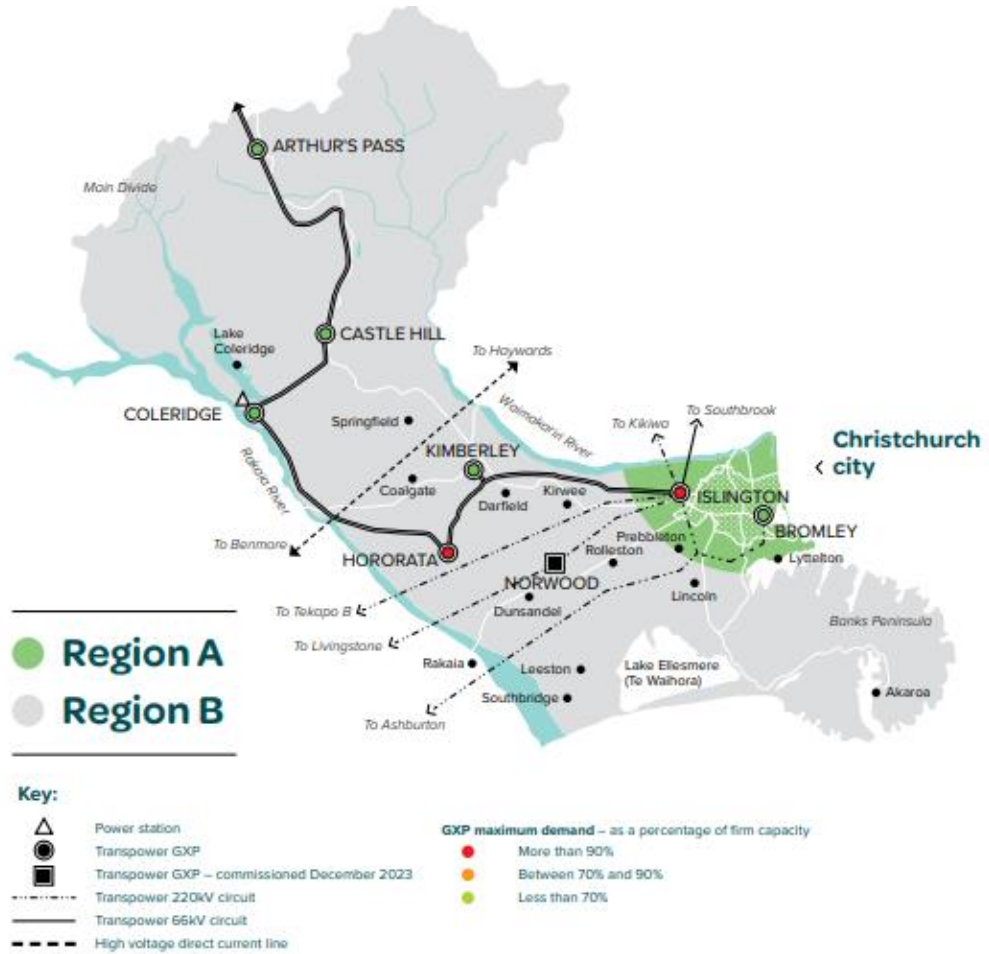


Figure 1: Orion’s electricity distribution network.

- 13 Through this network, Orion delivers electricity to more than 220,000 homes and businesses throughout Christchurch City and the Selwyn District. We are New Zealand’s third largest electricity distribution business.
- 14 It is important to recognise that electricity is distributed by an interconnected network that must be protected in totality. To explain:
 - 14.1 In New Zealand, electricity produced by generation companies (like Trustpower, Meridian, and Contact) is transmitted from the point of generation around the country via the National Grid (which is owned and operated Transpower). Electricity distribution network operators like Orion take delivery of electricity from Transpower at various

locations in the National Grid known as Grid Exit Points (*GXPs*).

- 14.2 The purpose of such facilities is to connect and transform the very high voltages of electricity transmitted by Transpower's network (typically 220,000 Volts in Central Canterbury) down to sub-transmission voltages that are managed by Orion (typically at 66,000V or 33,000V). Currently there are two GXPs within the Christchurch District, located at Islington and Bromley.
- 14.3 Orion then distributes these sub-transmission voltages to a number of zone-substations via a series of critical sub-transmission lines. At zone-substations, electricity is transformed to lower voltages before it is distributed to customers (400V or 230V).
- 15 Orion does not sell electricity direct to customers. Rather, the sale of electricity is undertaken by electricity retailers who purchase the electricity from generators on the wholesale market and sell it to their customers. Orion provides the physical region-wide network that enables this to occur.
- 16 Orion is continually investing in the operation and development of its network to cater for growth and to enhance the resilience of the network. Over the next ten years we are forecasting total capital expenditure of \$3b and operational expenditure of \$1.2b. Compared to our previous Asset Management Plan (*AMP*), our network spending is forecast to increase by 260% in capital expenditure and 140% in operating expenditure over the next ten years. This expenditure is necessary to meet increased demand for electricity from major industrial customers and continued growth in residential locations, as well as maintenance of safety levels and asset condition.
- 17 While conventional demand for electricity continues to increase, Orion is also subject to (and is adapting to meet) rapidly evolving customer expectations of what an electricity distribution business is and should or could be. These expectations are fuelled by new technology that is quickly changing customer behaviour. For example, as the update in electric vehicles (*EV*) gathers momentum, the electrification of process heat shifts gears and the greening of infrastructure becomes more widespread.
- 18 One of the key challenges driving Orion's increased investment in the network is housing intensification and population growth. The incidence of housing intensification is growing in Orion's region, as it is nationally. Christchurch City Council (*CCC*) says multi-unit dwellings made up around 44% of residential consents in 2016. This figure has steadily increased to around 75% in 2022. We expect this

figure to continue to increase throughout the area Orion services given the increase in densities that will result from PC14.

ORION'S NETWORK AND ACTIVITIES IN CHRISTCHURCH DISTRICT

- 19 Orion's network in Christchurch City includes:
 - 19.1 32 Zone substations, where electricity is managed and transformed from sub-transmission voltages down to lower voltages;
 - 19.2 81.6km of 33kV sub-transmission lines and 128.6km of 66kV sub-transmission lines and associated support structures, which provide the critical link between zone substations;
 - 19.3 698.3km of 11kV lines and approximately 1,323.1km of 400kV overhead lines delivering power from the street to customers' premises;
 - 19.4 High and low voltage lines are supported by approximately 41,647 associated poles (as well as various pole mounted equipment) which connect zone substations with hundreds of distribution or building substations and kiosks, and ultimately to electricity customers; and
 - 19.5 49,209 Orion owned distribution boxes, 5,739 Orion owned multi-link boxes and 3,821 Orion owned ground mounted transformers or transformers within a kiosk that manage the supply of power to individual locations.
- 20 Individual customers or connection points range from single dwellings requiring approximately 5KW at peak demand through to major industrial users who require in excess of 15MW at their peak.
- 21 The majority of Orion's overhead low voltage network in Christchurch consists of lines or conductors supported by either single wooden or concrete poles. The higher voltage network consists of a mix of overhead conductors supported by towers (or poles in some instances) and underground cables.
- 22 The vast majority of Orion's sub-transmission and distribution network in Christchurch (whether overhead or underground), as well as its ground mounted distribution substations, kiosks and cabinets, are located within the road corridor. This is standard practice throughout the country as the location of utilities within the road corridor is enabled, authorised and protected by various legislation.
- 23 Networks located over boundary and established prior to 1993 are enabled, authorised and protected by the Electricity Act 1992. Over

boundary networks established after this date are generally authorised by private property rights – particularly easements.

- 24 Zone substations are located on Orion owned sites.
- 25 In my experience, the general public give little (if any) thought to the nature of electricity network in their neighbourhood beyond whether it is overhead or underground.

Network reinforcement in Christchurch

- 26 Orion’s activities and operations in Christchurch (and across our wider network) are guided by a rolling ten-year AMP. This sets out our asset management policy, strategy, practices, work plan and expenditure forecasts for the next decade.
- 27 As part of our AMP, we are constantly monitoring, modelling and forecasting low, mid and high electricity peak load demand and growth scenarios across the network.
- 28 For Region A of our network (the urban network) we are currently forecasting strong electricity network peak load growth over the next ten years.
- 29 Major network projects planned in the Christchurch district include:
- 29.1 Increasing the resilience of our 66kV sub-transmission network against the impact of a major seismic event by replacing 40km of 66kV oil filled underground cables. Although resilience and obsolescence are the dominant drivers, this replacement programme also incorporates forecast network growth and other asset lifecycle replacement projects across our Region A 66kV network. It is likely this project will continue beyond 2035.
- 29.2 The southwest area of Christchurch and fringe townships are experiencing steady load growth due to the green-fields expansion of residential subdivisions in and around Halswell and Prebbleton, and the popularity of the Hornby industrial belt on the fringe of Christchurch City. To address this growth, upgrades are planned within Christchurch City and the Selwyn district to strengthen the network and build resilience.
- 29.3 Presently Orion’s Belfast, Dallington, Rawhiti and Waimakariri zone substations do not meet our Security of Supply criteria as they are vulnerable to complete outages for single cable faults. Upgrades are planned that will provide network security, power quality and resilience.

29.4 Our largest GXP, Islington 66kV, is forecast to meet or exceed its firm capacity at the end of the ten year AMP period. We anticipate that as more fossil-fuelled process heating is converted to electric, the capacity of Islington 66kV GXP will be reached sooner. Rather than putting more dependency on Islington 66kV GXP by introducing more capacity at this site, we will look at opportunities to increase our 66kV sub-transmission resilience by strengthening ties to enable offload capability to adjacent GXPs. Planned projects will enable Larcomb and Weedons zone substations to be offloaded and fed from the new Norwood GXP by reinforcing the capacity of existing lines.

30 These projects are outlined in **Figure 2** below.

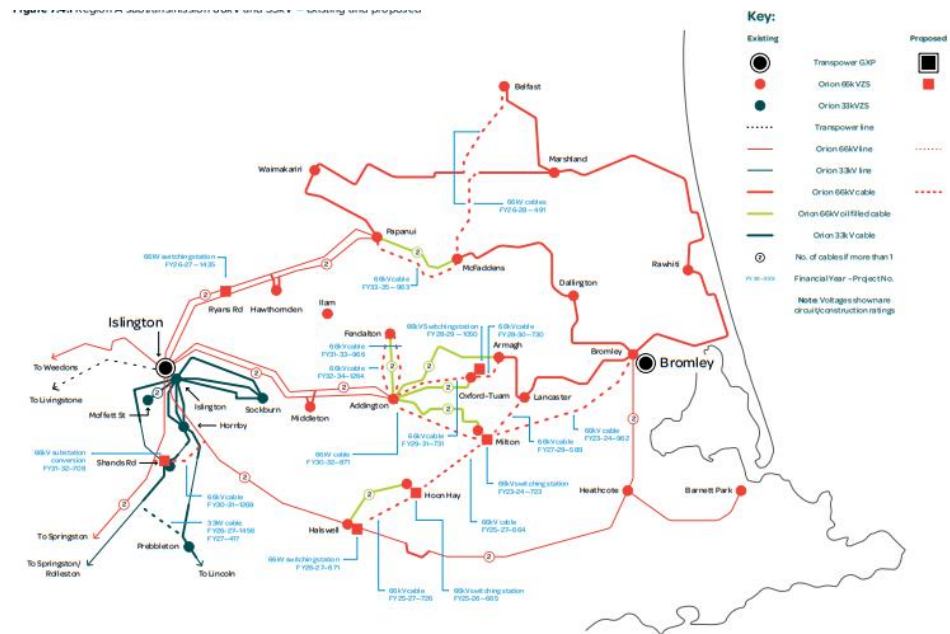


Figure 2: Major Planned Network Projects in Region A

IMPACT OF THE HOUSING INTENSIFICATION PROVISIONS ON SIGNIFICANT ELECTRICITY DISTRIBUTION LINES

- 31 I understand that PC14 protects Significant Electricity Distribution Lines (*SEDLS*) as a 'qualifying matter' by way of setbacks and clearances. Orion supports this protection, but also seeks the addition of setback requirements for lower voltage lines and provision for electricity servicing.
- 32 PC14 must ensure there are appropriate corridor protection rules to ensure existing sub transmission lines are protected. These lines are called *SEDLS* in the planning context.

- 33 SEDLs comprise the higher voltage sub-transmission (mainly 30,000V or 66,000V but also specific 11,000V) lines connecting our existing zone substations in the district so that electricity can be transformed down to lower voltages and delivered to customers.
- 34 The SEDL network is predominantly co-located on poles with other existing high and / or low voltage lines. While there are spans where this network is built over a boundary (on private property), the vast majority of it is within the road reserve. That said, much of the SEDL network within the road reserve is built close to the boundary with private property, given the width of the road corridor in rural areas.
- 35 The importance of SEDL's to the district justifies protection in the planning framework through suitable corridor protection rules. Without such, there is an unacceptable risk of inappropriate development and / or activities immediately adjacent to these lines (if not directly beneath them). This can pose both a serious health and safety risk to people, stock and property. It can also significantly impact and constrain (if not prevent entirely) Orion's ability to operate, maintain and upgrade these critical network assets and thereby provide electricity to our region.
- 36 Corridor protection provisions are already included in the Christchurch District Plan and Orion seeks the continued protection of these important assets through the notified qualifying matter. In my experience, the existing corridor protection provisions have improved safety around our network and have ensured a number of new dwellings, warehouses and commercial buildings (although noting PC14 is residentially focused) have been constructed in accordance with safety requirements. Ultimately this benefits all involved – particularly developers, landowners and council staff (by providing them with more clarity and certainty about setbacks and clearances) as well as Orion (in that we can continue to operate, maintain and upgrade these critical network assets).
- Legislative protection of electricity lines**
- 37 Protection of existing lines by way of property rights is either by land ownership, easement, or rights established by the Electricity Act 1992 (*Electricity Act*). However, the Electricity Act does not include detailed obligations for land owners regarding the use of land under lines, or immediately adjacent to them.
- 38 The New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP 34: 2001) (the *Code*) is issued by WorkSafe under section 36 of the Electricity Act and is particularly relevant to the protection of electricity lines and the regulation of actions in relation to them.

- 39 The Code sets minimum safe electrical clearance requirements for structures and certain activities in relation to overhead electric line installations and support structures. These have been set primarily to protect persons, property, vehicles and mobile plant from harm or damage from electrical hazards.
- 40 While the Code goes further than the Electricity Act by specifying distances that apply to lines and particular activities, it does not always prevent underbuild or encroachment in practice.
- 41 Consistent with the Operative District Plan provisions and the provisions notified as part of PC14, Orion supports the following specific setback distances being included in PC14:
- 41.1 Sensitive activities and buildings are not to be located within 10 metres of the centre line of a 66kV electricity distribution line or within 10 metres of a foundation of an associated support structure;
 - 41.2 Sensitive activities and buildings are not to be located within 5 metres of the centre line of a 33kV electricity distribution line or within 5 metres of a foundation of an associated support structure;
 - 41.3 Sensitive activities and buildings are not to be located within 5 metres of the centre line of the 11kV Heathcote to Lyttelton electricity distribution line or within 5 metres of a foundation of an associated support structure;
 - 41.4 Fences within 5 metres of a 66kV or 33kV electricity distribution line support structure foundation; and
 - 41.5 Fences within 5 metres of an 11kV Heathcote to Lyttelton electricity distribution line support structure foundation.
- 42 The setbacks Orion supports in this regard are generally consistent with those in the Code. However, in some cases, the setbacks sought are amended for consistency and usability, and to reflect the realities of Orion's network and operating environment.
- 43 By highlighting and specifically incorporating the requirements of the Code in the planning rules, we are able to improve safety to the public, remove cost and promote good electricity network outcomes. In particular, time and effort are associated with remedial works to address structures or other activities that have established beneath Orion's electricity lines or encroach electricity clearances distances. These costs can be in the order of \$20,000 to \$100,000 and are normally borne by the landowner.

Reasons that SEDLs need protection

44 Having structures (whether fences or buildings) under, or very near to, one of Orion's SEDLs, and carrying out earthworks in close proximity to them:

44.1 Increases risk to people (particularly via electric shock or electrocution) and property (through increased risk of outages);

44.2 Complicates operation, maintenance, and upgrading activities by adding significantly to costs and duration of works;

44.3 Can annoy occupiers;

44.4 Potentially impacts on the reliability of electrical supply as repair, maintenance and upgrading can be delayed and / or take longer; and

44.5 Can, if an electrical fault occurs, have the potential to cause significant harm or death as the structure may incur hazardous voltages.

45 Some examples of where underbuild or encroachment has occurred on our high voltage network are shown in the following photographs (all taken in parts of Orion's network).



Tower lines – built up area – 66,000V



Tower lines – built up area – 66,000V



Shed under lines – underbuild– 11,000V



Shed close to lines – 11,000V

- 46 Having a structure under, or in close proximity to, a line can cause various issues, including some which a property owner may not be aware of before taking ownership of the property or building. Similarly, where a power line or pole is located within the road corridor but adjacent to the boundary, landowners often fail to consider the line when planning and carrying out development or activities on their land.
- 47 Issues associated with reduced clearances include:
- 47.1 Maintenance, replacement and upgrading: Periodically, conductors and support structures need to be replaced or upgraded. As explained earlier in my evidence, Orion will be upgrading parts of the SEDL network over the next 10 years to ensure we can continue to meet the electricity needs of the

district. Underbuild and encroachment on clearances makes maintenance, replacement and upgrading far more complex. In some cases, it can prevent these activities entirely. Similarly, where SEDL support structures are being upgraded, encroachment can make this significantly more difficult. All of the above adds time, cost and safety risks to the network activity.

- 47.2 Communication and logistics: Having structures near SEDLs and associated support structures complicates communication and coordination with owners as to our maintenance, upgrade and replacement plans. This in turn means that we need to work in with any requests of the property owner for timing of works and nature of reinstatement.
- 47.3 Ancillary structures and extensions: With any underbuild or encroachment, there is the risk that landowners will over time install additional extensions or structures and aerials and other ancillaries too close to live conductors. This puts both the landowner and the security of electrical supply at risk. It is simply not possible for Orion to regularly check the SEDL network for this incremental encroachment.
- 47.4 Maintenance of third-party structures: Maintenance of the buildings and structures under or adjacent to a line also becomes problematic and can be fatal if electrical clearances are not maintained at all times. Replacing roofing and guttering can be particularly hazardous. Orion's experience is that these issues are best managed by ensuring clearances are maintained at the outset.
- 47.5 Reverse sensitivity: Two types of noise occur with high voltage overhead lines. The first is caused by wind blowing across the conductors, insulators and structures. The second is caused by electrical discharges (corona) along insulators and conductors which produce a crackling sound. While this noise is not particularly loud, it can be unpleasant and lead to complaints.

IMPACT OF THE HOUSING INTENSIFICATION PROVISIONS ON PUBLIC SAFETY

- 48 The same issues that arise for SEDLs can also occur for Orion's lower voltage lines.
- 49 While existing development presents challenges to the location of electricity infrastructure and protection of lines clearances, the scale and density of intensification associated with PC14 will see these challenges increase significantly in prevalence and severity.

- 50 As noted above, the Code is an industry standard, overseen by WorkSafe, that sets minimum safe electrical clearance requirements for structures and certain activities in relation to overhead electric line installations and support structures. The Code prescribes that certain clearances must be met in relation to 230V, 400V and 11kV lines (and that other larger clearances must be met in relation to 33kV and 66kV lines, among others).
- 51 In addition to the Code, Orion has obligations under the Health and Safety at Work Act 2015 that it must comply with.
- 52 11kV, 400V and 230V lines are generally mounted on poles that are located in the berm or road reserve. 400V and 230V lines often also frequently run down right of ways to service dwellings and development on rear sites, setback from the road corridor. Clearances in the Code apply irrespective of where the electricity line (and any compromising building or structure) is located.
- 53 I understand the medium density residential standards (the *MDRS*) implemented by PC14 would enable residential development up to six stories high with setbacks of as little as 1.5m from the front boundary (and closer to internal or side boundaries in certain circumstances). This has the potential to be highly problematic in terms of overhead lines. Specifically:
- 53.1 Some overhead lines traverse residential properties. If higher buildings are permitted this may compromise safe clearance distances as new or larger residential buildings encroach on existing overhead lines;
- 53.2 Where overhead lines run along road frontages (generally somewhere in the berm or road corridor), higher buildings on private land built close to the boundary may also compromise clearance distances. For example, where an existing 11kV line is located in the berm 1.5m from the boundary with private property, the 1.5m front boundary setback specified by the *MDRS* would allow a clearance of just 3m between lines and the façade of a new residential building. These clearances would fall well short of the generic clearance distances set out in the Code;
- 53.3 Where overhead lines run down a right of way, intensification may bring new buildings closer to these lines, compromising clearances. Suitable setbacks in internal boundaries are essential to ensure safe clearance is maintained between existing lines and new buildings. In this regard, it is important to note that electricity clearances down rights of way are often already heavily constrained. Already there is often very little room to relocate lines away from new structures (given the width of the right of ways). Reducing internal boundary

setbacks down to just 1m is likely to significantly exacerbate these issues.

- 54 The notified provisions were released with generated images showing what intensified development might look like in the Christchurch context. None of the generated images included power lines but the reality is that they will be present in most areas being rezoned. The images below show where those lines might be located (recognising that the exact location of lines is likely to differ in each street).





- 55 The result of buildings and certain activities locating under, or very near to, overhead electricity lines is:
- 55.1 Increased risk to people (particularly via electric shock or electrocution) and property (through increased risk of electricity outages);
 - 55.2 Complicating operation, maintenance, and upgrading activities on the electricity distribution network - which adds significantly to costs and duration of works;
 - 55.3 Affecting the amenity of occupiers of residential units;
 - 55.4 Potentially impacting the reliability of electrical supply as repair, maintenance and upgrading can be delayed and / or take longer; and
 - 55.5 If an electrical fault occurs, potential to cause significant harm or death as the structure may incur hazardous voltages.
- 56 Conflicts between development and overhead electricity line clearances are not new. Orion has been working to minimise these issues on its network for a number of years, with dedicated staff working to protect the electricity network, to ensure standards are complied with, and to keep the public safe. As townhouses and infill development have become more popular in recent years, Orion has seen an increase in potential clearance violations on its network.
- 57 Where developments fail to take into account electricity clearances, either the lines themselves or the development / structure which creates the clearance violation must be modified to reinstate

compliance. Safety is non-negotiable for Orion. Where clearances are compromised, they must be remediated one way or another.

- 58 Modification to lines in this regard may involve raising the lines. This can be through:
- 58.1 the installation of taller poles or attachments on existing poles to raise line heights (and thereby achieve clearances); or
 - 58.2 the lateral / horizontal relocation of lines and poles.
- 59 In some cases, where neither of these is an option, it may be necessary to underground the line. Costs for amending lines to reinstate clearances can be in the order of \$20,000.00 - \$100,000.00 depending on the nature and extent of the breach.
- 60 Moreover, the options for raising line heights, relocation and undergrounding are often heavily constrained. In particular, berms often support an array of infrastructure (much of which cannot be seen from the surface), meaning there are few options for new pole locations or additional underground electrical infrastructure. Similarly, Orion's ability to relocate above ground infrastructure and raise line heights is controlled by provisions of the District Plan and may require resource consent.
- 61 Recognition of clearances for 11kV, 400V and 250V lines in PC14 would significantly reduce the likelihood of clearances being overlooked and ultimately compromised by intensified residential development. These clearances are first and foremost about keeping people and property safe around electrical hazards.
- 62 The alternative consenting pathway sought by Orion would allow Orion to work with consent applicants to ensure an engineered solution can be found where one is available. Orion does not wish to restrict development, but to ensure that the safety and reliability of electricity supply are not compromised, and that these matters are considered at the outset of projects.
- 63 Orion's experience in the Christchurch context has shown that intensified development in existing areas has the potential to interact adversely with Orion's infrastructure.
- 64 Examples of development located within setback distances from existing low voltage lines are shown in the images below (again, all taken at locations in the Orion network).



New development located in close proximity to the existing 400kV lines.



Fence, decking area and pergola located very close to the overhead service main.



Garage built under the overhead service main.



Deck built in close proximity to overhead service mains. From the finished deck the lines could likely be reached by those standing on it.



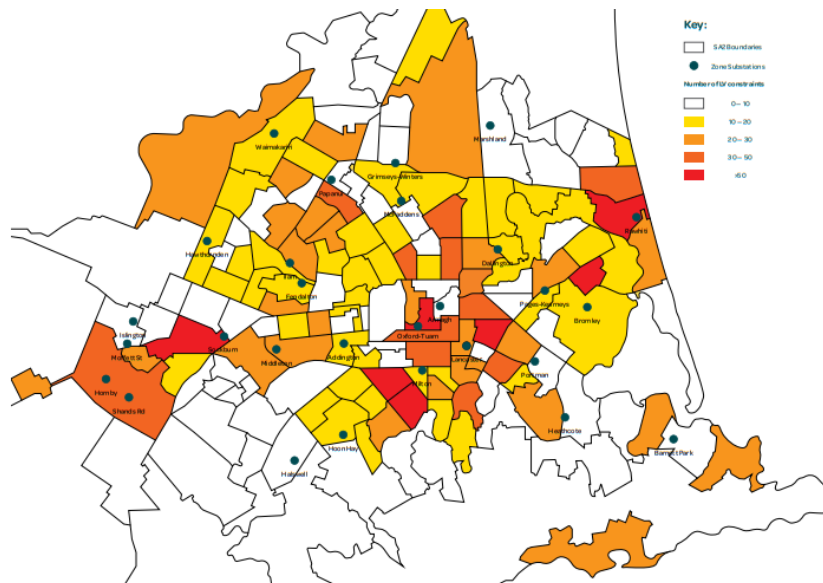


Scaffolding within the ECP:34 setback distances from low and high voltage lines (11kV)

IMPACT OF THE HOUSING INTENSIFICATION PROVISIONS ON SERVICING CAPACITY

- 65 As housing intensifies and EV uptake increases, the spare capacity in Orion's low voltage network will diminish. We plan to use up as much spare capacity as we can before we trigger other methods to meet the increase in demand, but we will eventually reach a tipping point where Orion needs to either utilise flexible solutions or invest in lower voltage and potentially medium voltage network reinforcement in areas that have reached capacity.
- 66 An increase in intensification will significantly affect our network as, instead of a low voltage feeder supplying 20 standalone homes, a number of these could be replaced by multiple apartment units, increasing electrical load and triggering network reinforcement. The cost to upgrade infrastructure to service infill housing in older established areas is typically greater on a per-house basis than the cost to connect a new standalone house in a new subdivision.

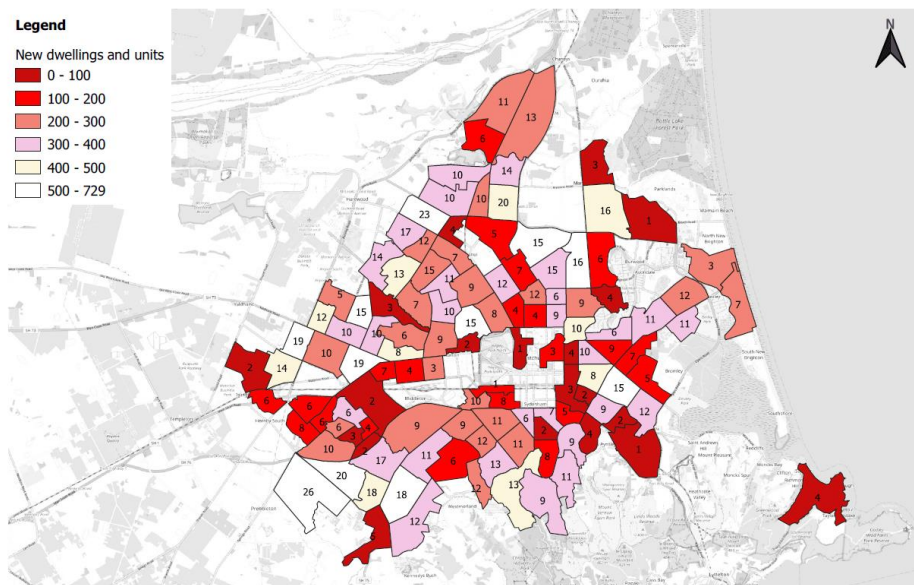
- 67 As business and communities increasingly rely on technology, and as New Zealand steps up its decarbonisation in order to respond to climate change and reduce carbon emissions, the need for a reliable, secure, and efficient electricity network is becoming ever more critical. This is both a significantly challenging time for Orion, and an incredibly exciting one.
- 68 The map below shows the areas of constraint within Christchurch as predicted for 2030.



- 69 Where there is intensification it is critical that the electricity network is considered and sufficient land is reserved for electricity distribution infrastructure. Developers (both smaller scale landowners redeveloping small lots, and larger commercial developers) generally do not approach Orion to discuss servicing matters until after plans for a development are fixed, and often after resource consent has been granted. Developers often fail to include (or set aside) sufficient space on site for the necessary infrastructure.
- 70 Development enabled by medium density zoning and the MDRS is likely to exacerbate existing issues and challenges in this regard, unless this development is appropriately managed through the incorporation of related provisions. In particular, intensification will allow a larger number of residential units in smaller areas – dramatically increasing electricity demand. At the same time, with smaller setbacks and intensification enabled, the medium density framework is likely to see greater site coverage and buildings built closer to road frontages / boundaries. This will see buildings and development squeezing and increasingly occupying front yards that

have historically accommodated electricity distribution equipment and infrastructure. Ultimately, this intensification is enabling more development, while making it more difficult for infrastructure providers to supply that development with critical infrastructure.

- 71 The figure below highlights the number of new dwellings that could be fed from the existing residential distribution transformers in each SA2 where PC14 has proposed medium-density residential zones. The number does not consider the increasing uptake of zero-emission vehicles or the capability of overhead and underground reticulation, which would reduce the limit of dwellings that can be supported by existing electrical infrastructure. The number shown on each SA2 is the total number of residential transformers installed.



- 72 The type of infrastructure that might be required as a result of an increase in demand will vary but the following equipment is commonly required:

72.1 Full Kiosk



72.2 Half Kiosk



72.3 High Kiosk



72.4 Quarter Kiosk



72.5 Standalone Switchgear



72.6 Distribution Cabinet



72.7 Distribution Box



73 When sites are developed (or redeveloped) as part of intensification, it is critical that the electricity network is considered and sufficient land is reserved for electricity distribution infrastructure from the outset of the development. This is because:

- 73.1 There is a functional need for electricity distribution infrastructure to be located on or immediately adjacent to sites the infrastructure services. Lines and cables must connect to the site in order to provide electricity. Kiosks, cabinets and distribution substations must be located around the electricity network in accordance with the demand for electricity. This equipment cannot perform its function if it is situated away from the location of electricity demand.
- 73.2 The size and footprint requirements of this infrastructure are often fixed and inflexible (and are directly related to the electricity demand in the immediate area). For example, the physical footprint of a full low electricity distribution kiosk is generally 2.2m x 2.5m. An additional 1.5 metre clear operational area is required in front of the kiosk. Depending on the location of adjacent buildings, and fire safety mitigation installed, it can be necessary for setbacks of up to 6 metres between transformers and buildings. In order to operate and maintain this equipment, Orion must be able to access kiosks 24 hours a day, 7 days a week. Because of these requirements, it is usually necessary for this equipment to be located just over the front boundary on private land.
- 73.3 Various safety and electrical standards set clearances around ground mounted equipment. Neither the equipment nor the standards can be amended or resized to “fit” the equipment within the space available. There is often very little opportunity to compromise on the land area required for electricity distribution infrastructure.
- 73.4 Putting aside functional and operational constraints, sourcing alternative locations for electrical infrastructure (i.e. other

than on or immediately adjacent to the site which the infrastructure services) is problematic as:

- (a) Locating infrastructure in berms or road corridors exposes equipment to vehicular traffic (which has safety and network security consequences); clashes with existing underground infrastructure (particularly three waters, telecommunications and transportation network assets); can have adverse visual impacts on the streetscape; and is generally resisted by corridor managers (e.g. Council or Waka Kotahi);
- (b) Locating above ground infrastructure equipment in reserves and parks is generally opposed by Council and / or Local Boards although this does provide a viable alternative where onsite infrastructure cannot be accommodated; and
- (c) Owners of adjacent sites that have sufficient land to accommodate infrastructure should not be required to accommodate it simply because development on an adjacent site requires it (and in the vast majority of cases they will not accept it on their land).

74 The electricity distribution network can be upgraded to service new dwellings and greater intensification, provided that intensification and development takes into account the need for upgraded infrastructure. Intensification (and the resulting increased demand for electricity) generally results in a need for upgraded / reinforced overhead electricity lines and / or underground cables, and larger or an increased number of ground mounted equipment such as electricity distribution kiosks, cabinets and distribution boxes. As with the setback provisions above, Orion does not wish to hinder intensification or development but wishes to ensure that solutions can be found that work for all parties. The earlier Orion is involved the easier this will be.

75 Based on the above, Orion is seeking the inclusion of a new servicing standard, as outlined in the evidence of **Ms Foote**. This is a critical aspect of Orion's submission and an area we are taking very seriously in the face of increasing intensification in Christchurch City.

Anthony O'Donnell

20 September 2023