



Electricity Engineers'  
Association

TRANSPower



PROFESSIONAL  
DEVELOPMENT

## Annual Power Engineering Exchange (APEX)

Water beats towers.  
Are poles our future?

Rangitata Flood Response – Rebuild of 220kV Single Circuit Line

EEA.CO.NZ



*Thank you to our sponsors  
for their support.*





Edward  
Popham

Employee



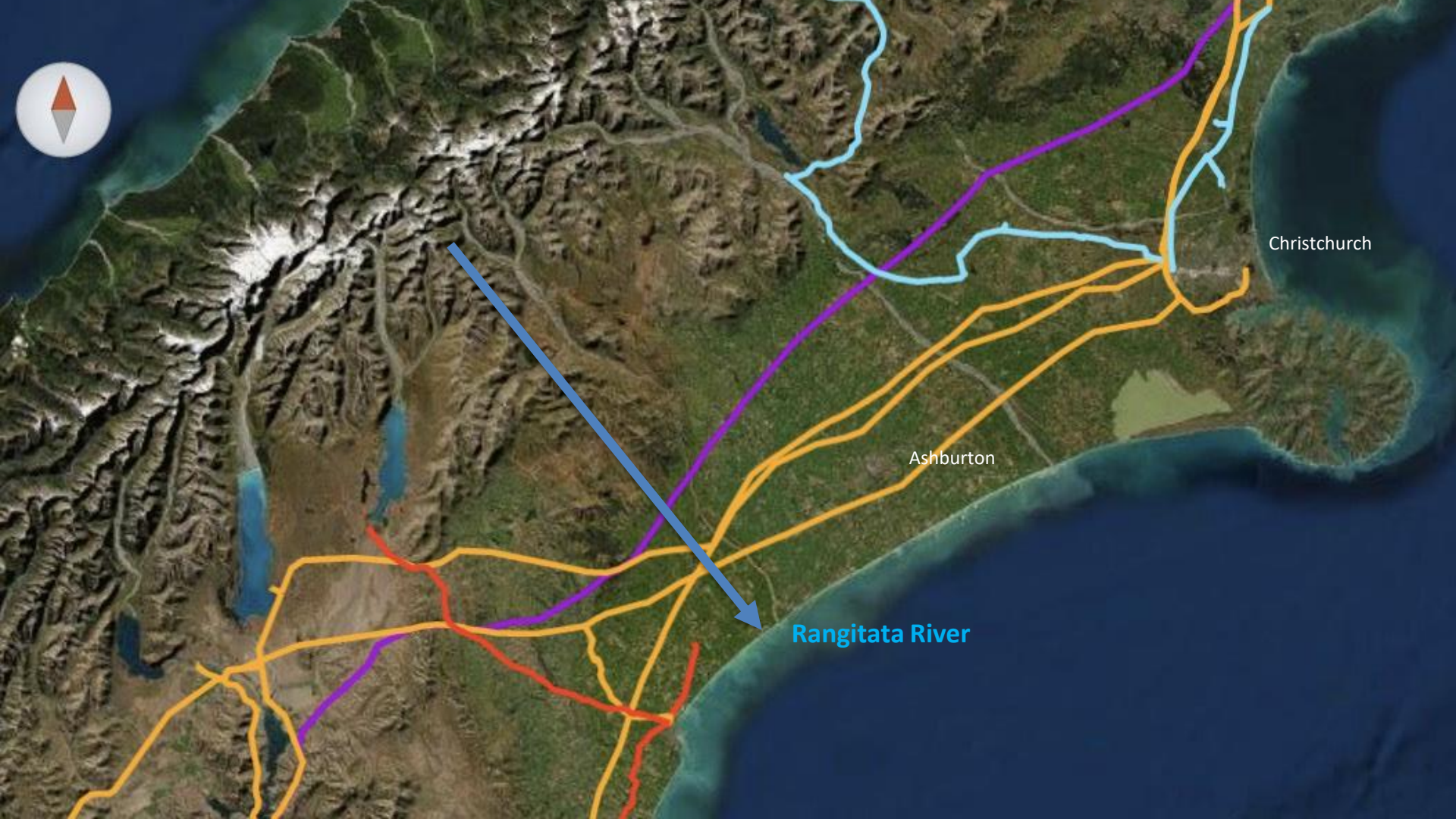


## TRANSPower



- Own, operate, maintain and develop the national grid
- Over 12,000km of high voltage lines
- AC: 66kV, 110kV, 220kV, 400kV
- DC link: 350kV
- More than 170 substations





Christchurch

Ashburton

Rangitata River

# Timaru District floods: Rangitata residents told to



ended its evacuation area around the Rangitata river a  
: People urged  
ata River levels

news

## Rangitata River flood risk set to remain for months

MATTHEW LITTLEWOOD, DOUG SAIL AND AL WILLIAMS · 18:06, Dec 10 2019



rise again

NEW ZEALAND

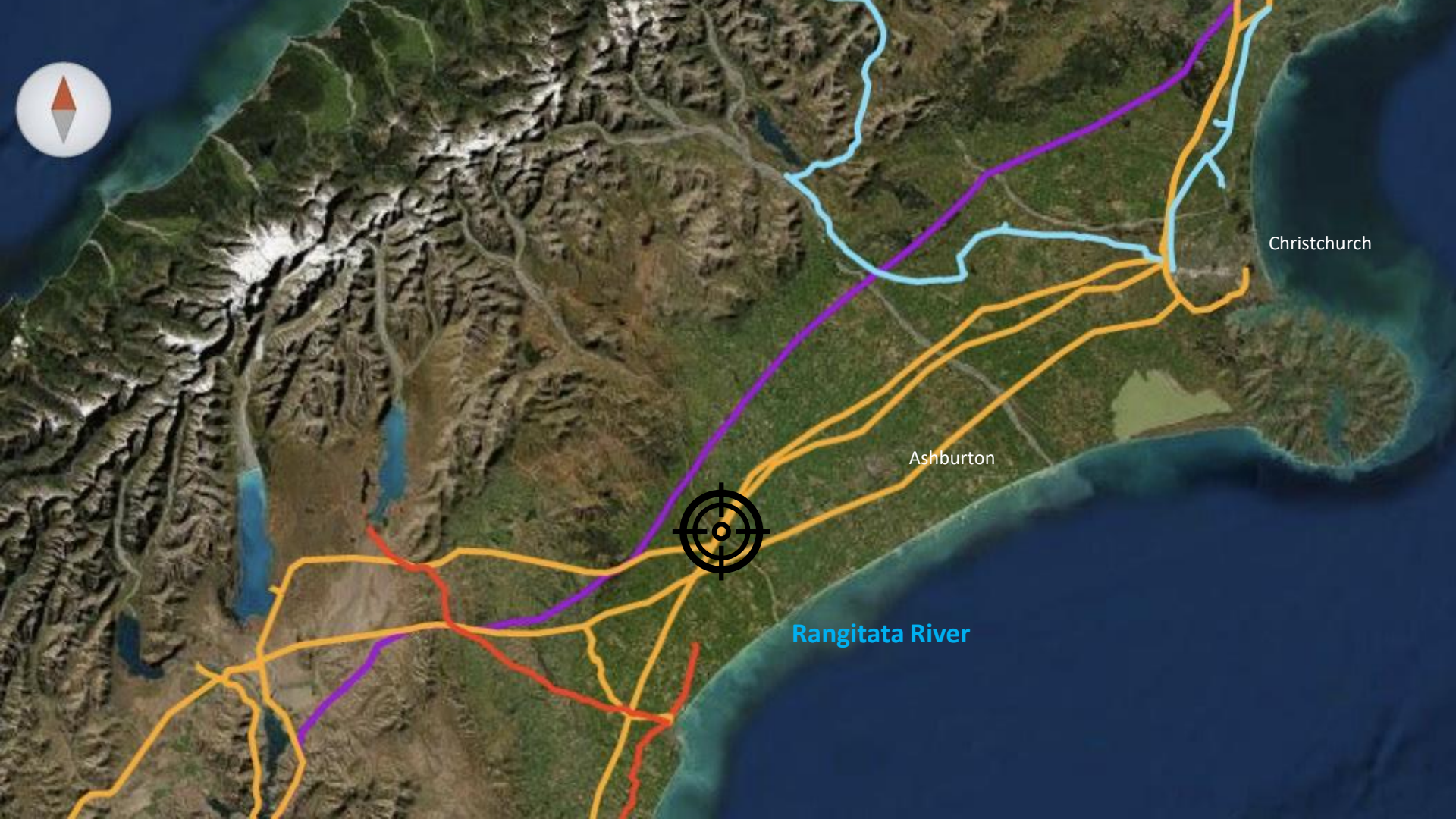
## Wild weather: Ti

10/12/2019 Mark Quinlivan Ella Prendergas



News > Rangitata  
stuff  
ver Flood Warning





Christchurch

Ashburton

Rangitata River





ROX-ISL-A

6 October 2019



8 December 2019

44.02646°S 171.35264°E

1:25 879

500 m



Image: LAND VIEWER



8 December 2019

44.02646°S 171.35264°E

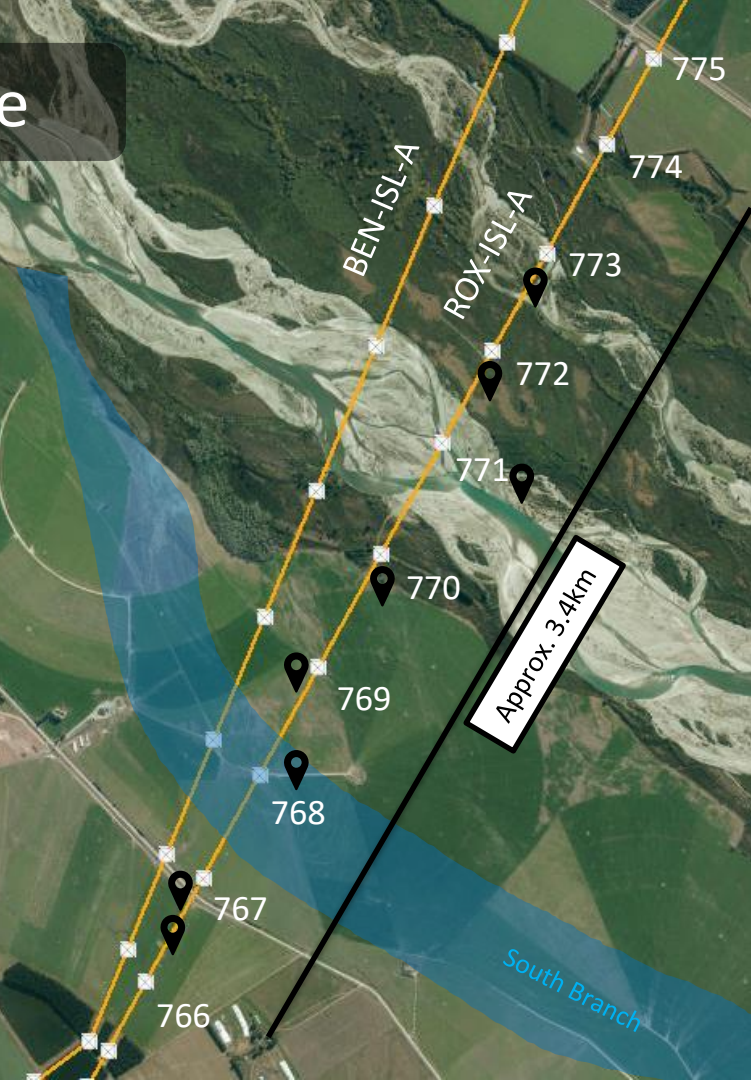
1:25 879

500 m



Image: LAND VIEWER

# Damage Done



BEN-ISL-A

ROX-ISL-A

Approx. 3.4km

South Branch

T773



T772



T771



T771





T770



T769



T768



BEN-ISL-A0397



T767



T766



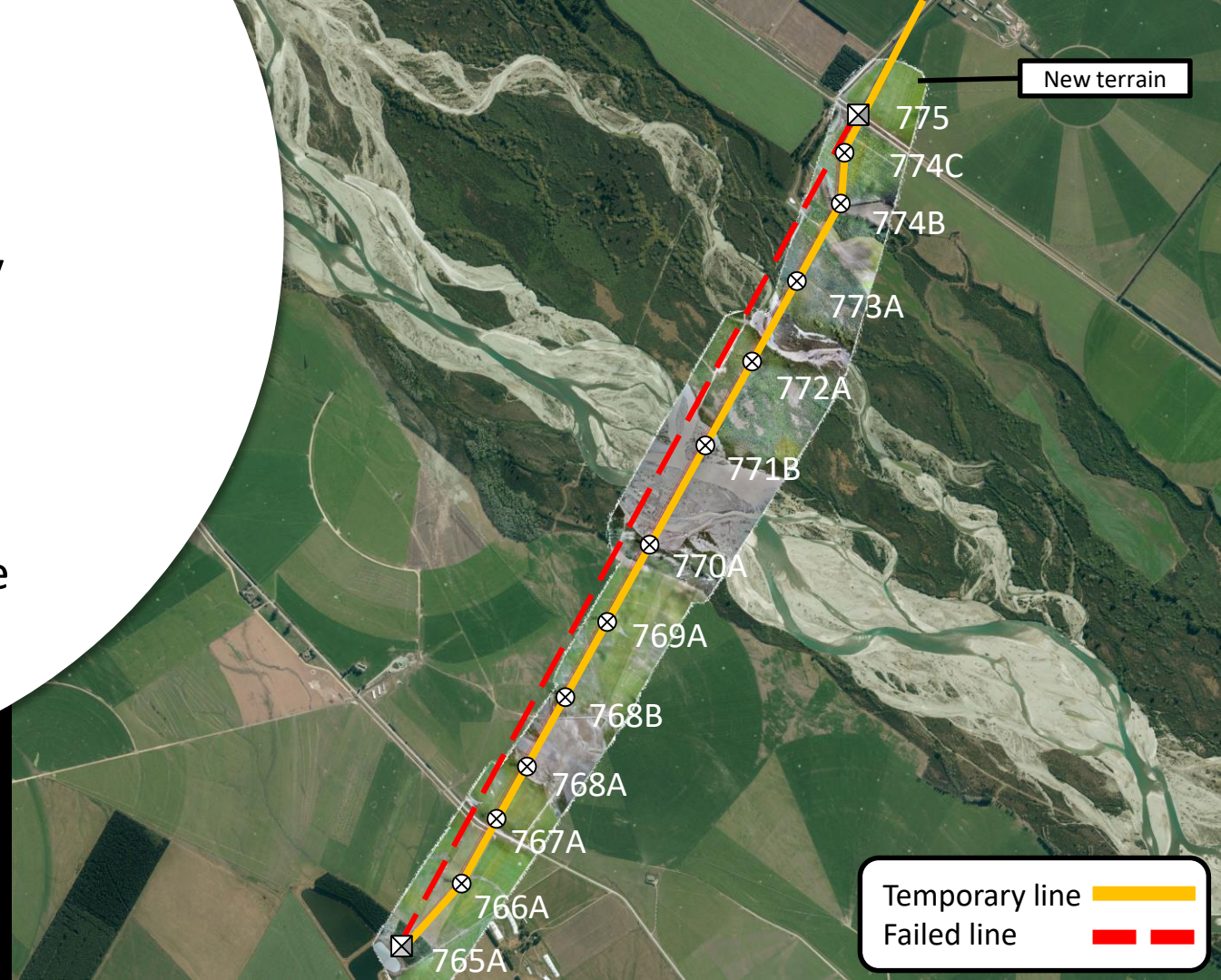
BEN-ISL-A0394

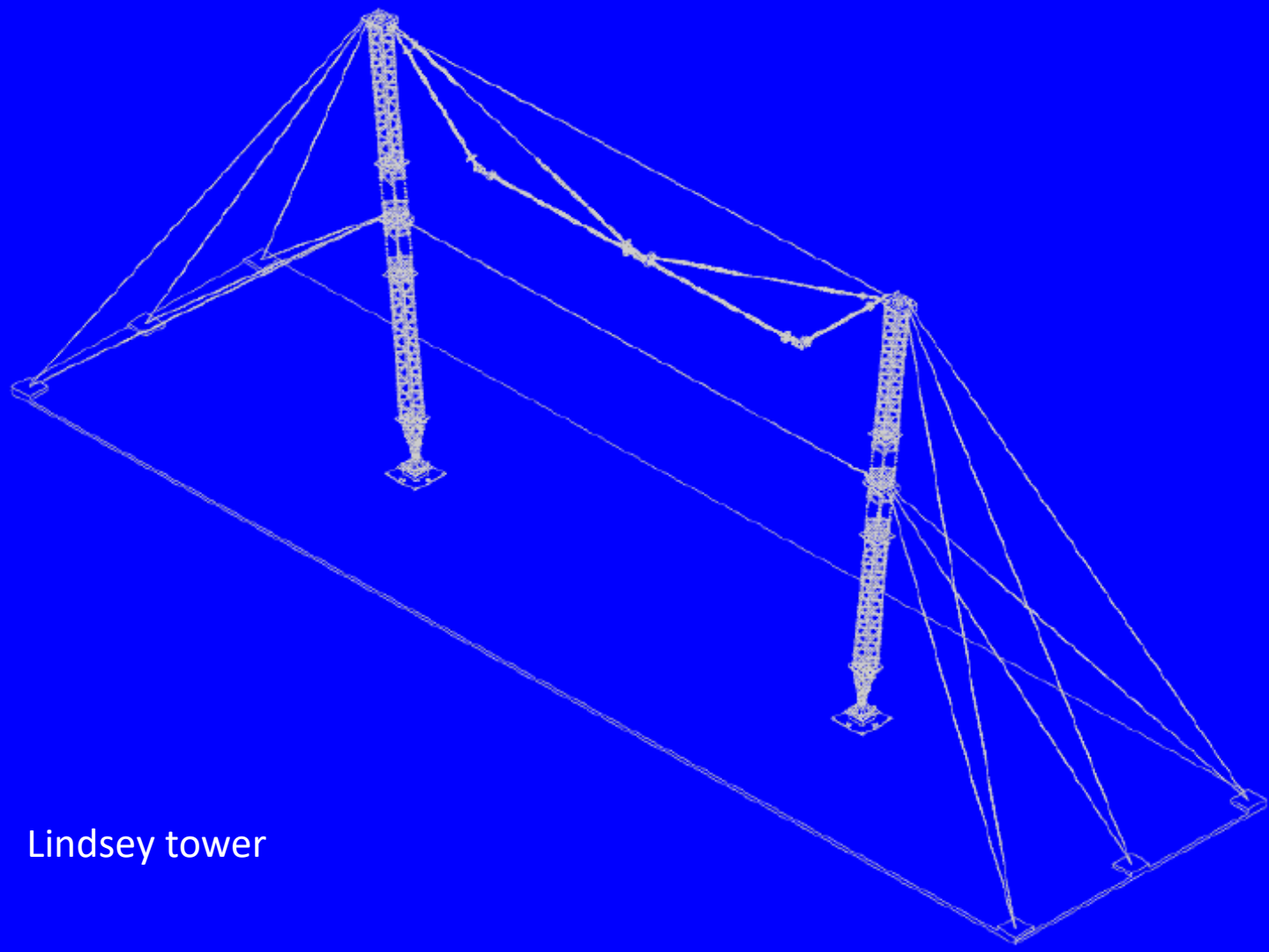
T765A



# Temporary Line

- Quick fix to secure a winter power supply
- 11 locations
  - 5 triple poles
  - 6 pi-poles
- 7 of the 11 locations required specific pile foundations



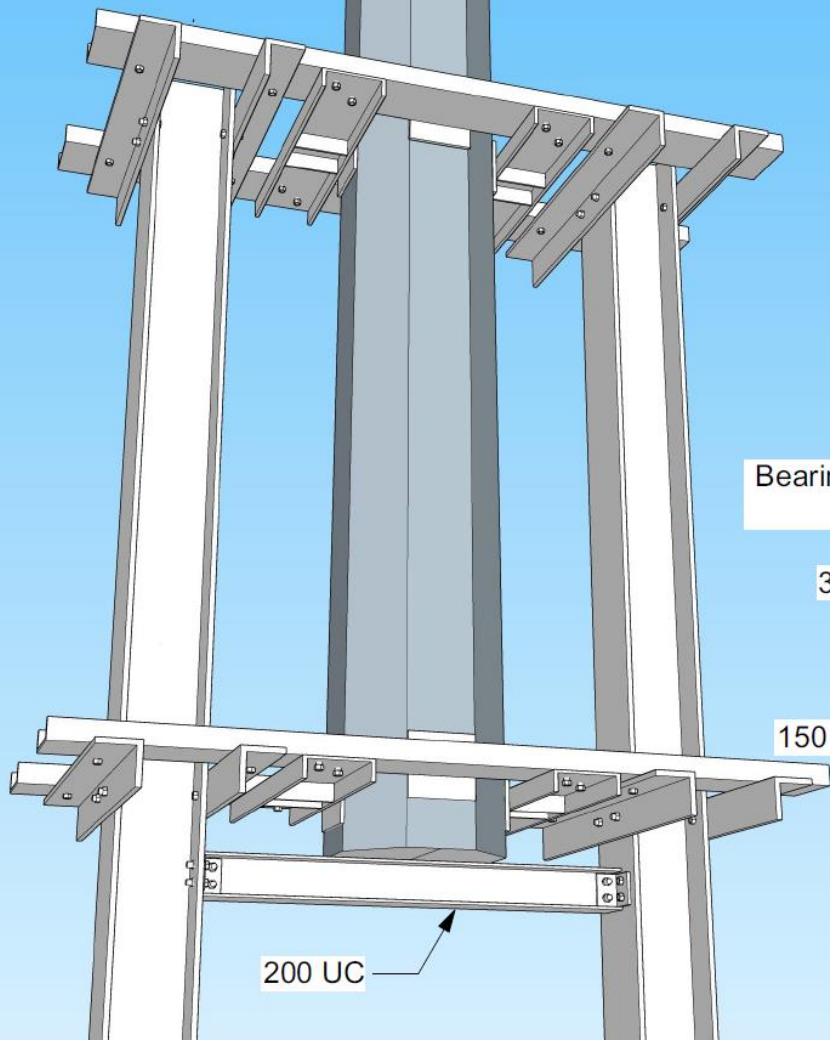


Lindsey tower

BICC tower







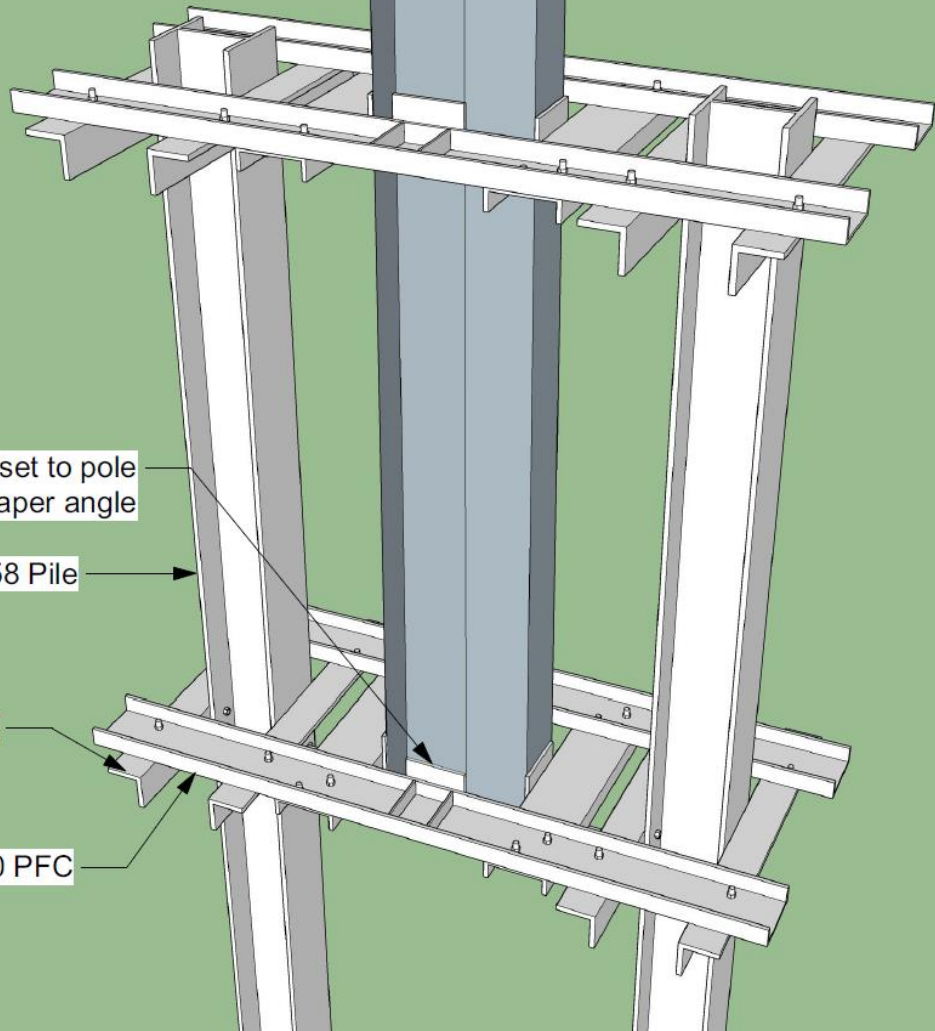
Bearings pad set to pole taper angle

310UC158 Pile

150 x 16 EA

250 PFC

200 UC





# River Diversions



Main flow diversion

771 location

ROX-ISL-A

BEN-ISL-A0400

BEN-ISL-A0399

Main river flow

Diversion









Stringing across the river from 771B to 770A (x2 speed)



\*press enter for next slide\*

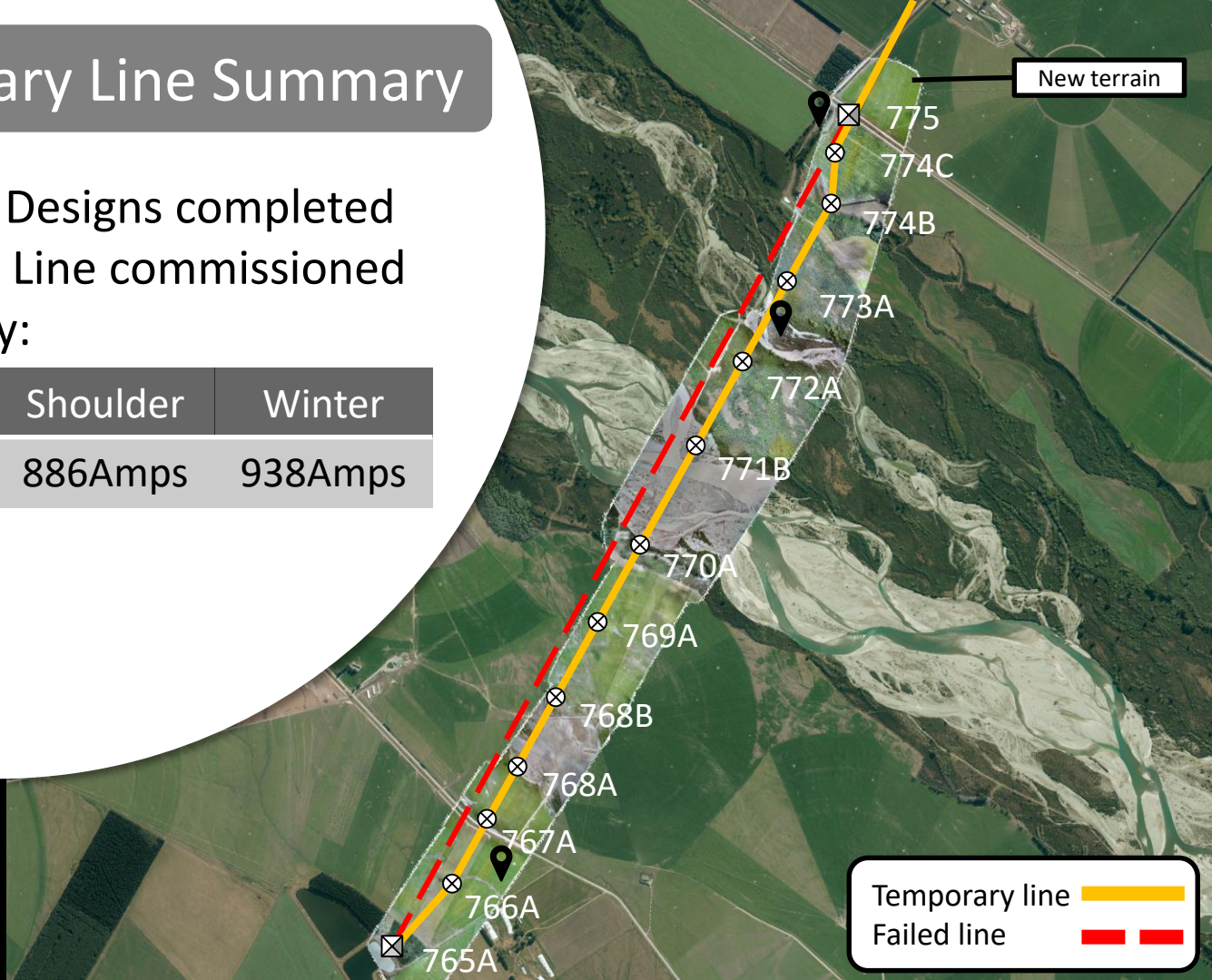




# Temporary Line Summary

- 14 Feb: Designs completed
- 27 Mar: Line commissioned
- Capacity:

Summer	Shoulder	Winter
830Amps	886Amps	938Amps



767A



766A

T765A



772A



771B

770A

769A

770A-771B  
River crossing



774C-774B



# Permanent Line New Structures

New tower on  
existing foundations



BEN-ISL-A

ROX-ISL-A

775

772

770

769

768

767

766



# Permanent Line New Structures



773 crossarm replaced  
with old one from 774

BEN-ISL-A

ROX-ISL-A

775

773

772

770

769

768

767

766

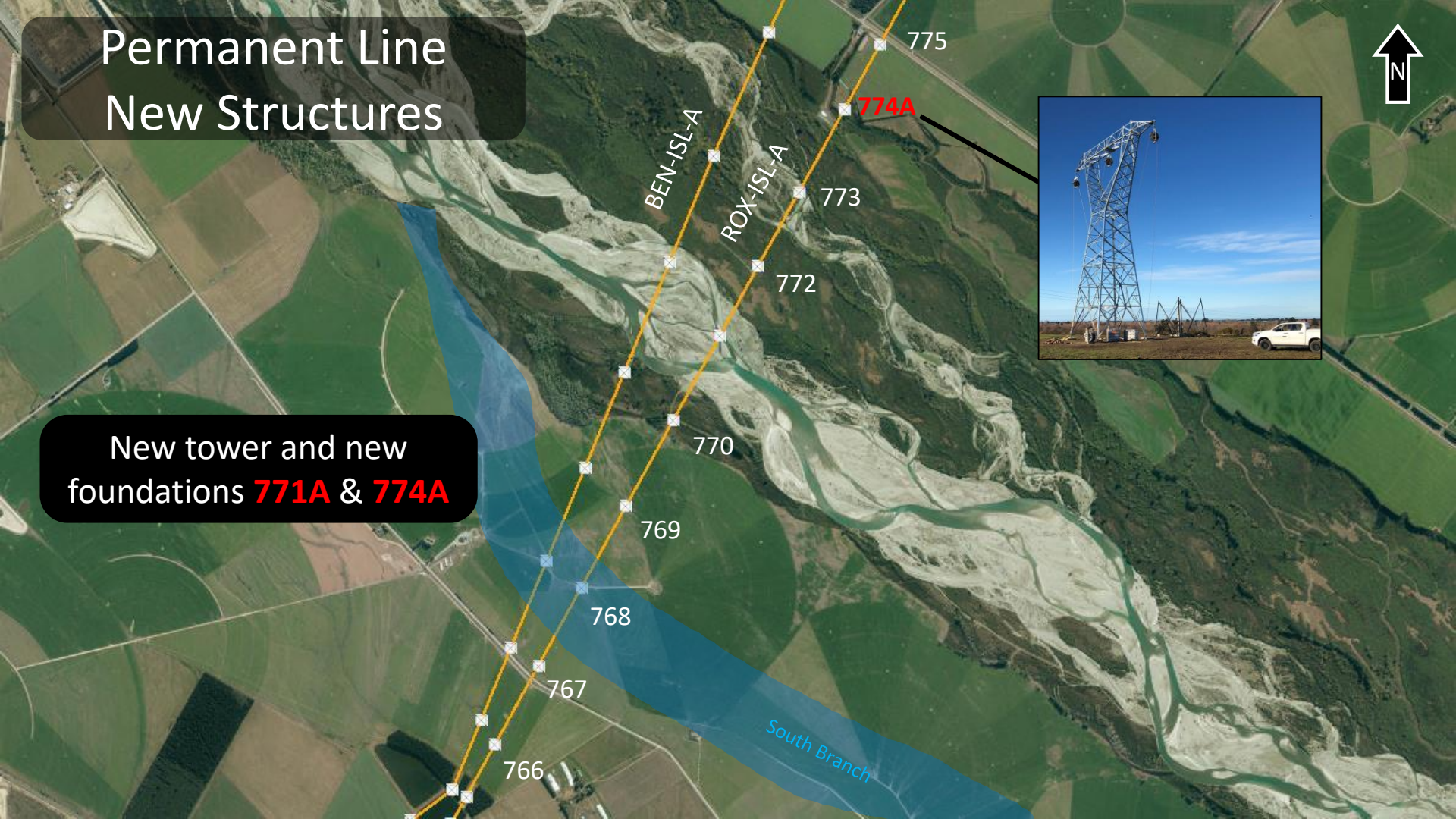
South Branch



# Permanent Line New Structures



New tower and new foundations **771A** & **774A**







# Permanent Line New Structures

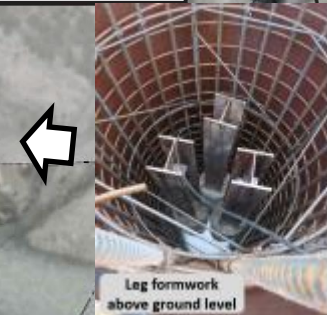


New tower and new foundations **771A** & **774A**



# 771A progress

ROX-ISL-A0771A  
Liners in place  
21/5/20



CONST ALLOW  
CONST 70m St  
VER 77



A photograph of a construction site at dusk or dawn. In the center, a yellow lattice boom crane is positioned on a concrete pad. To its left and right are several large, dark brown, cylindrical metal liners. The ground is uneven and covered with dirt and rocks. The sky is filled with soft, colorful clouds in shades of orange, yellow, and blue. A semi-transparent white box with rounded corners is overlaid on the right side of the image, containing text.

**ROX-ISL-  
A0771A  
Liners in  
place  
21/5/20**



**3 sleeves per  
liner driven**







**Gravel removed  
H-beams driven**



**Sleeves  
poured**





**Leg formwork  
above ground level**





**Four legs  
poured**



**Construction  
area built up**



**New tower on new river  
foundation**



**New tower on existing  
river foundation**

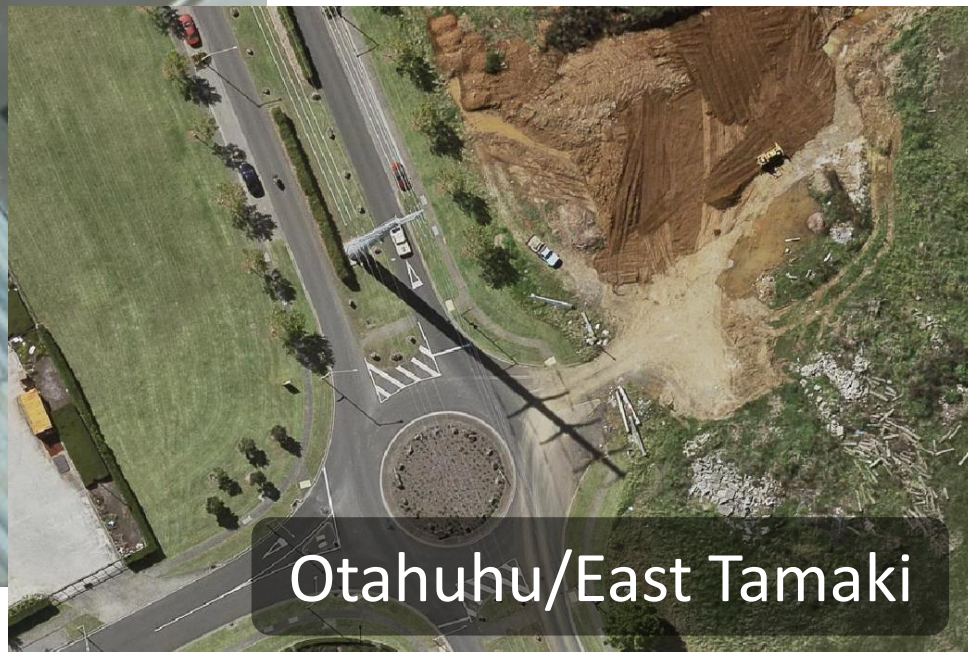
# Carbon Zero Innovation



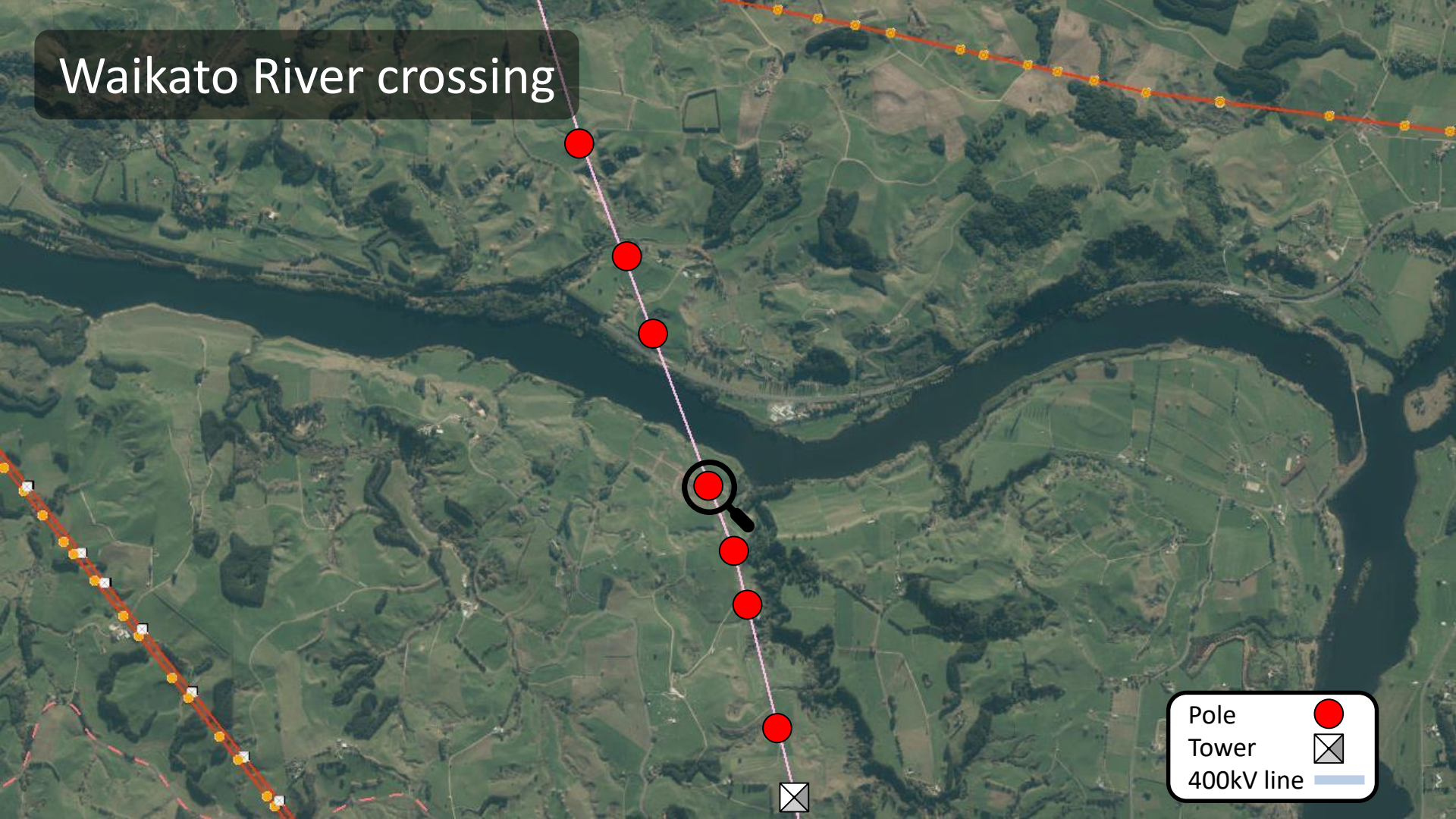
South Dunedin






Otahuhu/East Tamaki



# Waikato River crossing



Pole   
Tower   
400kV line 





# Carbon Zero Innovation

~~Poles vs Towers~~



# Carbon Zero Innovation

- Manufacturing - steel vs concrete
- Materials - steel vs concrete

Emission source		Unit	kg CO <sub>2</sub> -e/unit
Concrete	Default	kg	0.148
	17.5 megapascals (MPa)	kg	0.109
	20 MPa	kg	0.113
	25 MPa	kg	0.123
	30 MPa	kg	0.133
	35 MPa	kg	0.149
	40 MPa	kg	0.172
	45 MPa	kg	0.181
	50 MPa	kg	0.203
Average steel	Steel – structural, columns and beams	kg	2.85
Average aluminium	Default	kg	11.8

- Transport - of steel from China to NZ
  - Concrete poles made in NZ
- VS
- Steel made in China
- More land use with smaller footprint



A landscape photograph showing a series of power lines and towers stretching across a green field under a bright sun. The sun is in the upper right corner, creating a lens flare. The power lines are supported by tall metal towers in the distance and smaller poles in the foreground. The foreground is filled with tall grass and some utility equipment. The sky is clear blue with a few wispy clouds.

Water beats towers.  
Are poles our future?