BULLETIN
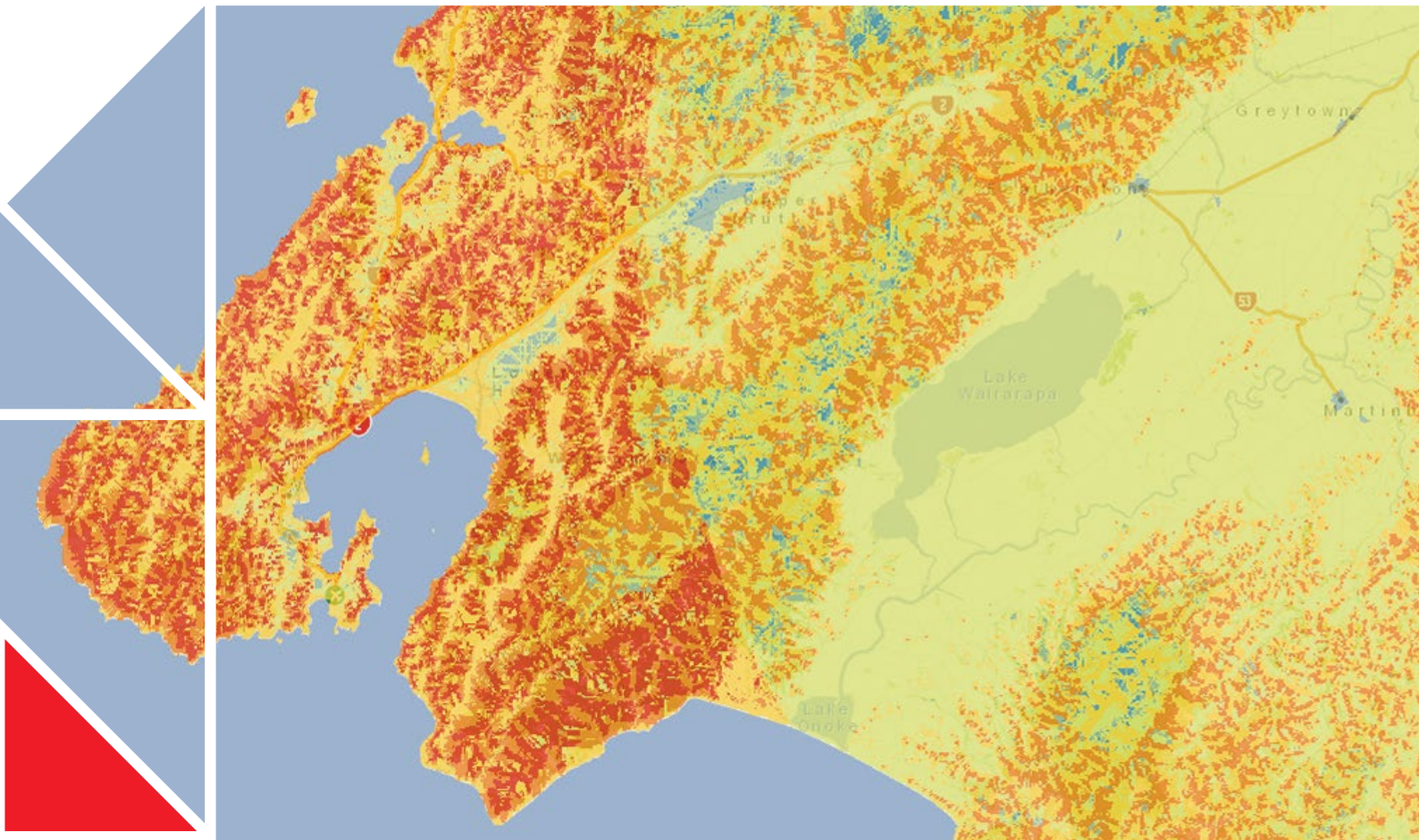
BRANZ MAPS AND WIND ZONE CALCULATIONS

■ BRANZ Maps is an online tool that identifies a range of features for a specific location, including earthquake zone, exposure (corrosion risk) zone and climate zone.

■ The tool also provides an approximate wind zone for a given location.

■ This bulletin explains the BRANZ Maps tool, how the wind zones were calculated and what other wind zone data is available.

1 INTRODUCTION

1.0.1 BRANZ Maps is an online tool in the Calculators and tools section of the BRANZ website.

1.0.2 When a specific location is entered into the tool, it shows a range of information that applies to that location, including:
- parcel IDs
- legal description
- full address
- earthquake zone
- exposure (corrosion risk) zone
- climate zone
- 10-minute rainfall intensity
- wind region
- wind zone (experimental)
- lee zone.

1.0.3 BRANZ Maps shows information for the whole of New Zealand. Outside of this tool, the information that is available around the country varies enormously, depending on the resources, web and geographic information system (GIS) services provided by individual councils.

1.0.4 At its launch in 2012, BRANZ Maps focused on exposure (corrosion risk) and earthquake zones. Climate zones and rainfall intensities were subsequently added, and experimental wind zone data was added in early 2015. The climate zones have since been updated to comply with New Zealand Building Code documents H1/AS1 5th edition, H1/VM1 5th edition, H1/AS2 1st edition and H1/VM2 1st edition.

1.0.5 The wind zone given for a specific location may differ slightly from the wind zone calculated in other ways.

1.0.6 This bulletin gives an overview of the BRANZ Maps tool and also explains how the wind zones were calculated, what other wind zone data is available and how that is determined.

2 BRANZ MAPS

2.0.1 The tool is an ArcGIS web application and is accessible by a range of digital devices including smartphones, tablets and laptops. The tool is accessed after agreeing to the terms and conditions.

2.0.2 There are three ways to find a particular location:
- Enter a street address in the search box and click the search button.
- Zoom and pan to a location and click on a land parcel.
- Use a 'find me' function that uses GPS or Wi-Fi.

2.0.3 When clicking on the land parcel has identified a location, a popup box appears with summary data for that location.

2.0.4 The basemap can be selected from several options, including:
- A generic New Zealand basemap.
- A Land Information New Zealand (LINZ) topographical map.
- An aerial/satellite photograph.

2.0.5 The tool also includes a number of other features such as measuring tools.

2.1 EARTHQUAKE ZONES

2.1.1 The earthquake zones shown in BRANZ Maps are modified versions of earthquakes zones 1–4 in Figure 5.4 of NZS 3604:2011 *Timber-framed buildings*.

2.1.2 The zones are modified so that they better align with NZS 1170.5:2004 *Structural design actions – Part 5: Earthquake actions – New Zealand*.

2.1.3 BRANZ Maps also includes the changes to the zone boundaries in the Canterbury region introduced by the Acceptable Solutions and Verification Methods for Building Code clause B1 *Structure* published in August 2011.

2.1.4 BRANZ Maps does not include any potential changes resulting from the implementation of the National Seismic Hazard Model.

2.2 EXPOSURE/CORROSION ZONES

2.2.1 The exposure (corrosion risk) zones in BRANZ Maps are a BRANZ interpretation of the three exposure zones, B, C and D, shown in Figure 4.2 of NZS 3604:2011.

2.2.2 The zones relate to the severity of exposure to wind-driven salt, with B being low risk, C medium risk and D high risk. Zone D includes:
- all offshore islands
- the area within 500 m of the coastline of New Zealand, including harbours
- the area within 100 m of tidal estuaries and sheltered inlets.

2.2.3 BRANZ has not attempted to define precisely what is or isn't a tidal estuary or sheltered inlet, so BRANZ Maps is technically conservative in those areas.

2.2.4 The Acceptable Solution for Building Code clause E2 *External moisture* E2/AS1 (3rd edition amendment 10) includes (in Table 20) an exposure zone E: beachfront regions subject to rough seas and surf beaches. NZS 3604:2011 contains the comment (C4.2): "For the purposes of NZS 3604, the corrosion protection requirements for structural fixings in exposure zones D and E are identical…"

2.3 CLIMATE ZONES

2.3.1 The six climate zones in BRANZ Maps are from Appendix C in H1/AS1 and H1/VM1 5th edition amendment 1 and H1/AS2 and H1/VM2 1st edition amendment 1.

2.4 WIND REGION/LEE ZONE

2.4.1 Wind region/lee zone data is derived from Figure 5.1 and paragraph 5.2.2 of NZS 3604:2011.

2.4.2 NZS 3604:2011 is currently (2023) under revision, and there are likely to be changes to the wind regions and lee zones.

2.5 RAINFALL INTENSITY

2.5.1 Rainfall intensity values are sourced from NIWA's High Intensity Rainfall Design System (HIRDS) calculator and correspond to a 10-minute rainfall intensity with an annual probability of being exceeded of 10%. These values can be used in conjunction with Building Code clause E1 *Surface water*. For other storm durations, consult the HIRDS calculator.

2.5.2 These figures will be useful to architects, designers or engineers – for example, when doing surface run-off calculations.

3 WIND ZONES

3.0.1 Wind calculations are contained in two key standards: AS/NZS 1170.2 *Structural design actions – Part 2: Wind actions* and NZS 3604.

3.0.2 AS/NZS 1170.2 prescribes the process for determining wind speeds and the wind actions to be considered in structural design.

3.0.3 BRANZ Maps is based on NZS 3604:2011 section 5.2, which uses and modifies some of the data and calculations in AS/NZS 1170.2 (for more information see *Build* 128, pages 24–27). NZS 3604:2011 gives a series of steps to follow to determine the wind zone for any specific location [Table 1].

3.0.4 At the end of the calculation, the maximum ultimate limit state wind speed can be compared with the following wind zones:
- Low – 32 m/s
- Medium – 37 m/s
- High – 44 m/s
- Very high – 50 m/s
- Extra high – 55 m/s.

3.0.5 Specific engineering design is required for wind speeds above 55 m/s.

3.0.6 Knowledge of wind zones is required for tasks such as calculating bracing demand, window design and cladding details in new building work. The wind zone must be included in consent applications for new buildings.

3.1 BRANZ MAPS WIND ZONE CALCULATIONS

3.1.1 The wind zones in BRANZ Maps are an output from a 2014 research project at BRANZ. The project aimed to see if the calculation of wind zones in accordance with NZS 3604:2011 could be automated using GIS software.

3.1.2 A number of approximations were made while creating the map, which are explained below.

3.1.3 Steps 1 and 2 from Table 1 – determining the wind region and if in a lee zone – were completed by digitising the map in Figure 5.1 of NZS 3604:2011.

3.1.4 Steps 3 and 4 were more challenging, as the NZS 3604:2011 calculation requires counting obstructions (buildings and trees 3 m or higher) around a site. This data doesn't exist on a nationwide level. As a rough proxy, land use data from Landcare Research was used:

Table 1. Steps to determine wind zones. Adapted from NZS 3604:2011 Table 5.1 provided by Standards New Zealand under licence 001165.

Steps	Action	Values available
1	Determine wind region	A, W
2	Determine if in a lee zone	In, out
3	Determine ground roughness	Urban terrain, open terrain
4	Determine site exposure	Sheltered, exposed
5	Determine topographic class	Gentle to steep
6	Determine wind zone	L, M, H, VH, EH

- For step 3 (ground roughness), urban areas were assumed to be the built-up areas, and forests and these areas were then trimmed by 500 m, as per clause 5.2.3 of NZS 3604:2011. Open areas were deemed to be everything else.
- For step 4 (site exposure), sheltered areas were assessed using the same built-up areas and forest areas but trimmed by 100 m (representing two rows of obstructions) and with steep areas removed (see step 5). Exposed areas were everything else.

3.1.5 Step 5 in NZS 3604:2011 requires calculation of the ground slope, which in turn requires identification of ridges and valleys. Once again, BRANZ looked for a proxy and used a LINZ digital elevation model (DEM) of New Zealand. This splits the country into 80 x 80 m pixels, each pixel representing a particular height. This data was processed to create the ridges and valleys, a task that required some assumptions to be made. Finally, a wind zone was calculated for each 80 x 80 m pixel.

3.1.6 The wind zone feature in BRANZ Maps allows wind zones to be plotted on a site. For example, the BRANZ site at Judgeford, Porirua, includes areas of different wind zones in the one block [Figure 1]. The wind zone given in the summary popup box is the highest value for the site.

3.2 ASSESSING AND USING THE WIND ZONE INFORMATION

3.2.1 The wind zone data given for locations in BRANZ Maps carries the label 'experimental'.

3.2.2 Up-to-date calculations are available for some areas such as Wellington city, and the zones as shown on BRANZ Maps can be compared with these [Figure 2]. Comparisons such as this need to be done with caution – it is sometimes assumed that vector data with its smooth curves (the Wellington city data) is more accurate than raster data (the BRANZ data), but this is only true if the vector data comes from more accurate source information. Nevertheless, there appears to be relatively close agreement, especially considering assumptions were made as part of the calculation.

3.2.3 Initial user testing has found escarpments and cliffs expose the limits of accuracy in the BRANZ wind zone source data, which was 80 x 80 m elevation data. Landscape can change significantly within a 6,400 m² area, and the source data limits the accuracy of the final results.
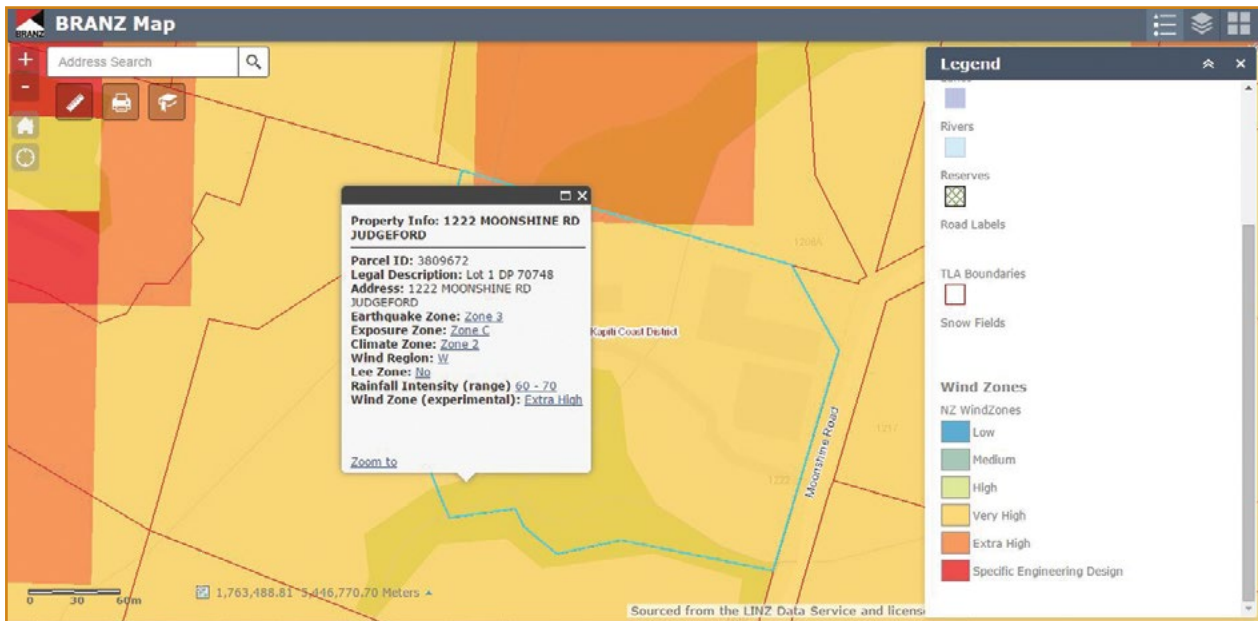
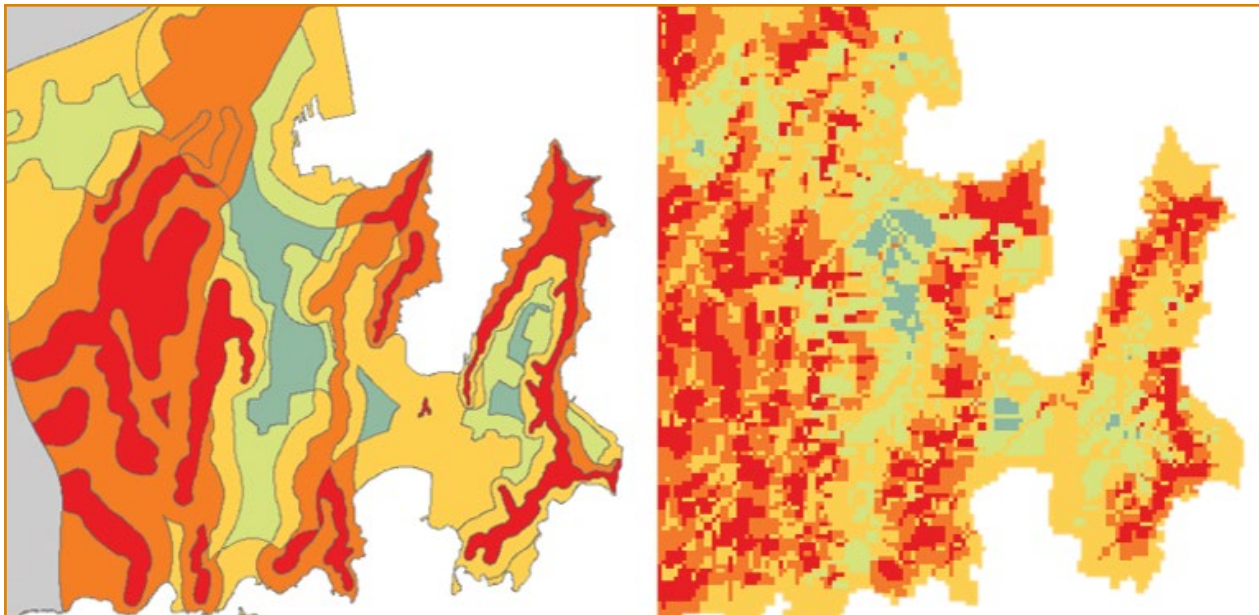Figure 1. The BRANZ Judgeford site with wind zones plotted.

Figure 2. Wellington city map (left) beside BRANZ Map (right) for the same area.

3.2.4 The order of resolution of wind zone calculations at the current time, with the most precise at the top, is:
- calculations made specifically for a site following AS/NZS 1170.2:2011
- calculations made specifically for a site following NZS 3604:2011
- council wind maps (if up to date)
- BRANZ Maps.

3.2.5 Some council wind maps based on NZS 3604:1999, are out of date and do not include the extra high wind zone from NZS 3604:2011. Some are even based on the old loading standard NZS 4203:1992 *General structural design and design loadings for buildings*.

3.2.6 At this stage of the development of the wind zone calculation tool, the wind zone data derived from BRANZ Maps could be used to cross-check information from other sources. It could be used by local authorities as one tool to assist in development of their own maps and databases.

3.2.7 BRANZ does not recommend using the current version of BRANZ Maps as the primary source of wind zone data for purposes such as making bracing calculations or preparing building consent application documents if other more reliable data (such as an up-to-date council map) is available.

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