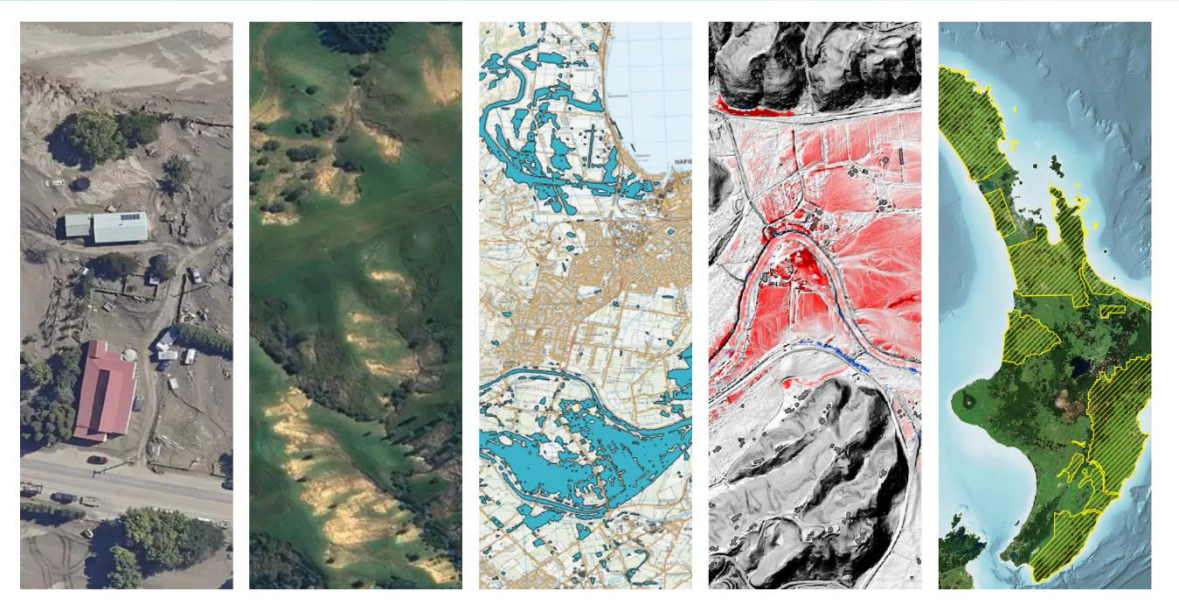
Key Data for Resilience and Climate Change

Data Improvement Plan 2023/24



Toitū Te Whenua Land Information New Zealand

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

WAKA KOTAHI NZ TRANSPORT AGENCY

Stats NZ Tatauranga Aotearoa

NIWA Taihoro Nukurangi

KiwiRail

Objective ID: A5879500

18 October 2023

Acceptance

Role	Name	Signed	Date
Head of Location Information	Aaron Jordan	Approved	18 October 2023

Reference documents

Location	Description
Strategic intentions 2023–2027 | Toitū Te Whenua - Land Information New Zealand (linz.govt.nz)	Toitū Te Whenua Strategic Intentions 2023-2027
https://storymaps.arcgis.com/stories/fd06c8aa37e74b6b910cf53e98414a58	Key data improvement programme achievements 2019 - 2023
Key datasets for resilience and climate change | Toitū Te Whenua - Land Information New Zealand (linz.govt.nz)	Key Data Improvement Plans 2019 - 2022

Revision history

Date	Version	Author	Description
02/10/2023	0.1	Susan Shaw	Draft priority improvements for 2024/25
06/10/2023	0.2	Tracey Lowndes	Reviewed by Toitū Te Whenua Communications Team
09/10/2023	0.3	Lead agency representatives	Priorities approved by all data lead agencies

Contents

Executive Summary

2023 will be remembered for the devastating impact on local communities during the Auckland floods and Cyclone Gabrielle, and the national state of emergency declared to coordinate the cyclone response.

Both events highlighted the critical importance of data about people, property, transport, rivers, places, land and coasts to inform the immediate response and the long-term recovery.

In 2023/24 Toitū Te Whenua will continue to work with Waka Kotahi, Stats NZ, National Institute of Water and Atmospheric Research (NIWA), and KiwiRail to ensure the key datasets remain the authoritative, national source of truth which emergency management decision makers can rely on. Ministry of Business, Innovation and Employment (MBIE) joins the key data improvement programme with a focus on Rapid Building Assessment data, and Toitū Te Whenua added place names as a key dataset.

The publication of the 2023/24 key data report was delayed due to Cyclone Gabrielle.

The emergency management geospatial community, in collaboration with the six key data lead agencies, have agreed the following data improvement plan for 2023/24:

Key data improvement plan 2023/24

Waka Kotahi to

- publish **road** status using consistent symbology recommended by GEMA, for both Journey Planner and TREIS by June 2024.
- investigate publishing a national view of road status for state highways and local roads recorded in RAMM by June 2024.
- publish the state highway network model by January 2024 and the national network model by June 2025.

Toitū Te Whenua to publish a pilot dataset which links **property** IDs to address, building and District Valuation Roll data by June 2024.

MBIE to work with Toitū Te Whenua to investigate pre-populating **Rapid Building Assessment** forms with property information by June 2024.

Toitū Te Whenua to publish the **Building** Outline Specification by December 2023. Also to update hospitals and schools based on automated change detection by December 2024 and identify rest homes by June 2025.

Toitū Te Whenua to publish information for councils about the positioning of **address** points by June 2024.

Toitū Te Whenua to publish guidance for requesting satellite **imagery** during an emergency by June 2024.

Toitū Te Whenua to publish a national hill shade layer, using the best available data, by June 2024. Investigate how to create and maintain a national digital **elevation** model (DEM), using the best available data, by June 2024.

Toitū Te Whenua to promote the NZ **Suburbs** and Localities change request process with councils by June 2024.

NIWA to work with Ministry for the Environment and Toitū Te Whenua to confirm the requirements for an easy to use GIS layer based on the latest River Environment Classification for named national **rivers** and **catchments** by June 2024.

Stats NZ to publish the 2023 census **population** data at Statistical Area 1 level.

Toitū Te Whenua to publish 'NZ **Coastline** – Mean High Water Springs' by June 2024.

Toitū Te Whenua to publish Ngā Pou Taunaha o Aotearoa's New Zealand Gazetteer **place names** as an ArcGIS REST service by June 2024.

KiwiRail to publish freight **rail** line and ferry maintenance status and document process for using this data in an emergency by March 2024.

No improvements planned for LINZ **Topographic** Basemap in 2023/24 while elevation data is prioritised by Toitū Te Whenua.

Background

The key data improvement programme began in 2017 when Toitū Te Whenua Land Information New Zealand (LINZ) recognised the importance of collaborating with other organisations on resilience and climate change issues to make a real difference for New Zealand.

Applying this resilience and climate change lens to our work enabled us to engage directly with our customers in the emergency management geospatial community, which helped us to understand where data improvements could add the most value.

Toitū Te Whenua's Strategic Intentions for 2023-2027 continues to recognise the importance of geospatial and property information, which is trustworthy and reliable, freely available, and well used. It also confirms Toitū Te Whenua's ongoing support for emergency management.

Strategic intentions 2023–2027 | Toitū Te Whenua - Land Information New Zealand

Purpose

The purpose of this document is to confirm the key datasets for resilience and climate change, establish the priority data improvements for the coming year and provide an update of data improvements since July 2022.

Key Datasets for Resilience and Climate Change

Why are national key datasets important?

Our customers, particularly in local government, have done great work to capture data for their local area. For example, many councils have developed detailed river network and water catchment boundaries. These councils will likely continue to invest in their data for emergency management risk reduction, readiness, response, and recovery.

Significant emergency events such as the 2023 Cyclone Gabrielle or the 2016 Kaikōura earthquake, which affected multiple councils across the country, demonstrate the need for a national overview. Accessing and combining data from numerous local sources under these circumstances is difficult and time consuming. Creating and maintaining national datasets from a single, authoritative source adds real value to support reliable emergency planning and risk reduction, informed emergency response and efficient recovery.

Collaboration between councils and the national data lead agencies is vital to ensure the key datasets are accurate, reliable, and fit for purpose for emergency management.

What are the key datasets?

The 14 key datasets focus on people, property, transport, rivers, place, land and coasts. Two new datasets included this year are Rapid Building Assessments and Place Names.

Theme	Key Dataset	Lead Agency
Population	Population Statistical Grid Prototype Statistical Area 1 Boundaries	Stats NZ
Building	NZ Building Outlines	Toitū Te Whenua
Address	NZ Addresses	Toitū Te Whenua
Suburbs	NZ Suburbs and Localities	Toitū Te Whenua
Property	NZ Property Hybrid (Pilot) NZ Property Titles including Owners NZ Primary Parcels	Toitū Te Whenua
Rapid Building Assessments	Not currently available	MBIE
Road	National Road Centreline	Waka Kotahi
Rail	NZ Railway Network Railway Resilience	KiwiRail
Rivers & Catchments	River lines and catchments with names River Environment Classification 3	NIWA
Imagery	NZ Imagery Basemap and Index	Toitū Te Whenua
Elevation	Elevation Aotearoa LiDAR and LiDAR Index	Toitū Te Whenua
Topo Maps	NZ Topographic Basemap Topo50 and Topo250	Toitū Te Whenua
Coastline	NZ Coastline – Mean High Water	Toitū Te Whenua
Place Names	Ngā Pou Taunaha o Aotearoa New Zealand Geographic Board's New Zealand Gazetteer	Toitū Te Whenua

Who is responsible for the national key datasets?

Toitū Te Whenua is collaborating with five lead agencies to improve the key datasets - Waka Kotahi, KiwiRail, NIWA and Stats NZ. In 2023 Ministry of Business Innovation and Employment (MBIE) joined the key data improvement programme with a focus on Rapid Building Assessments.

Partner organisations

This year the resilience and climate change key data improvement programme has introduced partner organisations, to work alongside the lead agencies to support the key data improvements.

The National Emergency Management Agency (NEMA) is partnering with MBIE's Space Agency and Toitū Te Whenua to look at options for coordinating imagery acquisition during a response. The Ministry for the Environment is working with NIWA and Toitū Te Whenua on named rivers and catchments. Ngā Pou Taunaha o Aotearoa New Zealand Geographic Board, custodian of the NZ Gazetteer, are supporting the work to improve access to place name data. NZ Post is a key stakeholder in the work to improve addressing and suburbs and Toka Tū Ake EQC is considering the requirements for improving building data for insurance purposes.

Who are our customers?

The key data improvement work programme engages directly with the geospatial emergency management community, and we are in regular contact with individual customers.

As it has been five years since our initial consultation which shaped this work programme, in 2023 we have focused on engaging with the wider geospatial emergency management community. We have hosted seven workshops, 25 interviews and reviewed 89 survey responses to hear our customer's stories and learn from their experiences. More information about who has represented the geospatial emergency management community is listed in Appendix A. This has helped identify where the lead agencies can add real value by improving the national key datasets.

In addition the programme maintains formal engagement with three customer representative organisations – Geospatial Emergency Management Aotearoa (GEMA), Geospatial Special Interest Group (Geospatial SIG) and Fire and Emergency New Zealand.

GEMA represents geospatial practitioners in local and central government, the National Emergency Management Agency, Civil Defence Emergency Management groups, private companies, and academic researchers. GEMA helped prioritise the 2023/24 key data improvement priorities in September 2023.

The Geospatial SIG, formerly the Local Government Geospatial Alliance (LGGA), brings together geospatial experts from Regional Councils to enable geospatial collaboration, capability, and communication. In 2020 the Geospatial SIG reviewed the key data criteria assessment (Appendix B) and provides an annual review of the key data improvement priorities, most recently in September 2023.

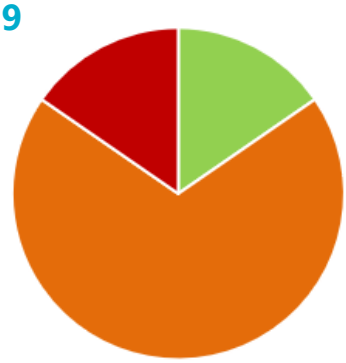
Fire and Emergency NZ was previously a key data lead agency for NZ Localities. Now this data has been transferred to Toitū Te Whenua, Fire and Emergency NZ remains part of the key data improvement programme as a representative of a national response agency, and helped agree the key data improvement priorities in September 2023.

Review of Key Data Improvements 2022/23

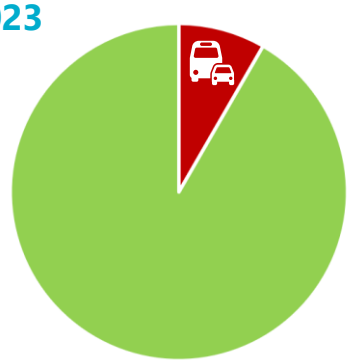
The first national key data improvement plan was published in June 2019. At this time only **2 of the 12** key datasets were considered reasonably fit for emergency management purposes - Topo50 Maps and NZ Primary Parcels.

By June 2023, **11 of the 12** key datasets are assessed as fit for purpose for emergency management. This is a real achievement which represents the importance of collaboration between agencies and with our customers to achieve valuable outcomes.

2019



2023



> *"It's hard to say which data improvement is more important as all data improvements, when taken together, represent a massive improvement for us, and will make a real difference to our emergency management planning and preparedness"*
>
> *Recent feedback from emergency management geospatial community*

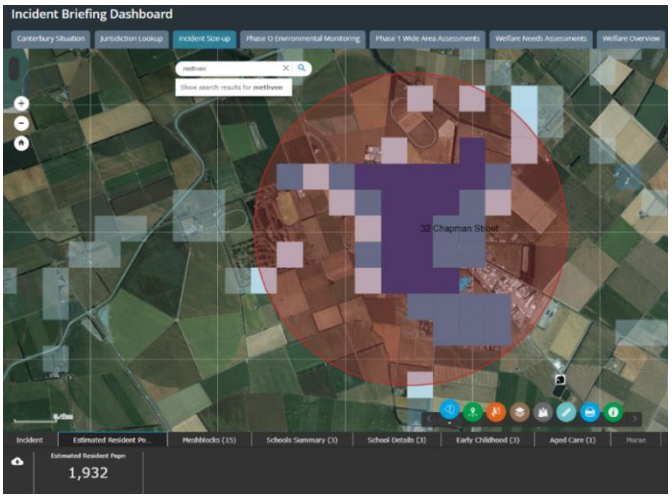
Since the previous key data improvement report in July 2022 there have been a number of significant key data improvements.

Fire and Emergency transferred the responsibility for maintaining NZ Localities to Toitū Te Whenua LINZ. The data structure was updated and published as NZ Suburbs and Localities. This resulted in suburbs being the most improved key dataset. In addition, as part of their response to Cyclone Gabrielle, Fire and Emergency NZ developed a Common Operating Platform to improve the sharing of operational data.

NZ Addresses became the authoritative national dataset for physical addresses and 14 building outline updates were published.

All 67 territorial authorities now share their District Valuation Roll (DVR) data into the national dataset. The national coordination of DVR data by Toitū Te Whenua has helped create a pilot property boundary dataset for government agencies.

The Stats NZ Population Grid prototype has been very well received by the emergency management community, and the national address, property and building data were used by Stats NZ to support the 2023 census.



The Stats NZ 250 metre residential population grid layer is integrated within the Canterbury Civil Defence Emergency Management Incident Briefing Dashboard.

Toitū Te Whenua published 43 imagery datasets via the LINZ Imagery Basemap and LINZ Data Service, and more recently via the Registry of Open Data on Amazon Web Services, with imagery being recognised as one of the key datasets most fit for purpose for emergency management. Toitū Te Whenua hosted aerial photography and satellite imagery for Top of the South Floods and Cyclone Gabrielle and are now coordinating $2.2 million from MBIE's Strategic Science Investment Fund for imagery and LiDAR acquisition to support Cyclone Gabrielle recovery.

The collaboration of Regional Councils and Toitū Te Whenua has resulted in LiDAR data capture for over 55% of the country. NIWA has used this data to revise the River Environment Classification hydrological models, and Toitū Te Whenua is using the data, along with improved tidal models, to create a new mean high water springs coastline.

Waka Kotahi are working with WSP to build a national multi modal network by June 2025, to be published under Creative Commons licensing and enabling network analysis. As with many of our key data lead agencies, KiwiRail and Waka Kotahi are focused on Cyclone Gabrielle response and recovery.

After all these impressive data improvements, it is important to note that when disaster struck in February 2023 the response agencies once again reported the absolute importance of hard copy Topo50 and Topo250 maps to quickly and easily provide context for a region wide assessment.

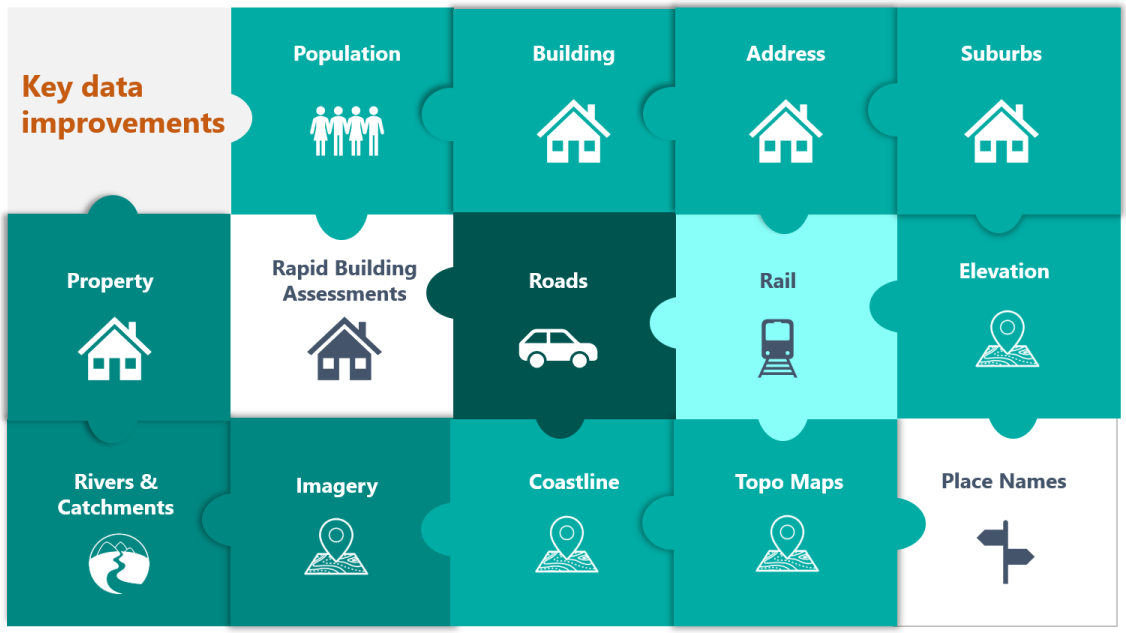
» More information about the data improvements implemented since 2019 is available from the Key Datasets for Resilience and Climate Change Update Storymap.

Key Data Assessment 2023/24

The wider geospatial emergency management community consultation outlined on page 9 resulted in the following assessment of the 14 key datasets.

The feedback was unanimous that roads data has the most opportunity for improvement, and there are a high number of requests for changes to property, rivers and imagery.

Rail has only two requests, and buildings, address, suburbs, elevation, population, coastline and topo maps each have at least three data improvement requests. Rapid Building Assessments and place names have not yet been assessed. Each data improvement request relates to one of the key data assessment criteria (Appendix B).



Summary of key data assessment at October 2023.

The key assessment represents the number of data improvements requested:

	Very Good	One or two data improvements requested
	Good	Three to five data improvements requested
	Average	Six to nine data improvements requested
	Poor	Ten or more data improvements requested
	New key dataset has not yet been assessed by customer representatives.	

Population

Agreed data improvement for 2023/24

Stats NZ to publish the 2023 census population data at Statistical Area 1 level.

User story

Eagle Technology prepared a view of population data specifically for emergency management based on Statistical Area 1 2018 Census data and the Index of Multiple Deprivation by Ministry of Health and University of Otago. This layer is well used because it is easy to understand, but as it is not published by Stats NZ as an authoritative source this introduces doubt and hesitation at a critical time.

Generating the 250 metre statistical grid is a significant achievement, enabling the number of people to be evacuated to be calculated much more accurately using this data. This informs the transport required to evacuate an area or how many essential supplies need to be prepared for an isolated community. This census information is only helpful during the night. Adding a daytime population estimate to the grid is critical. For example the residential population estimate for central Christchurch is approximate 3,000, whereas the number of people in central Christchurch during business hours will be closer to 30,000. In addition, information about the number of dwellings would enable resourcing estimates, for example how many responders are required to door knock individual homes during an urgent evacuation.

Other data improvements requests

1. Publish easy to use GIS layer of population information and deprivation index.
2. Add estimated daytime population and dwelling count to Statistical Grids.
3. Attribution - Remove decimals from population estimate and use full names e.g. Estimated Residential Population rather than ERP in the 250 metre Statistical Grid. Ensure the data is authoritative and easy to understand in a stressful situation.
4. Discoverable – Create a single, high profile page on Stats NZ website linking to all spatial population data. There is good data available, but it is hard to find.
5. Topology – use hexagons rather than square grids to minimise sampling bias.

Recent data improvements

New Zealand Statistical Grid 250 metres (prototype) 2022 published in October 2022.

Current status of national population data is **Good**

Buildings

Agreed data improvement for 2023/24

Toitū Te Whenua to publish the Building Outline Specification by December 2023, update hospitals and schools based on automated change detection by December 2024 and identify rest homes by June 2025.

User story

More time and resource is required to evacuate a rest home in an emergency. Rest homes are usually evacuated early and need extra resource to support the residents. Temporary accommodation needs to be carefully considered as an overnight stay in a welfare centre would not be appropriate. Being able to identify and prioritise rest homes is therefore critical.

Identifying which buildings are dwellings would save significant time when time is most critical during an emergency evacuation. This would help prioritise deploying Urban Search and Rescue teams for evacuations, assigning building inspectors to carry out Rapid Building Assessments and for Red Cross to collect welfare needs assessments.

Individual datasets about building types are available, but dispersed across multiple agencies in different formats, making it difficult to assess the complete picture and harder to analyse. An example is the Earthquake Prone Register of buildings is maintained by MBIE.

Customer data improvement requests

1. Attribution – add building use.
   Identify dwellings and rest homes and update schools, hospitals and supermarkets to assist with readiness planning and response.

2. Attribution – add an address.
   Enable first responders and building inspectors to confirm the correct property.

3. Attribution - add building height.
   Fire and Emergency NZ send different appliances to buildings over nine metres tall.

4. Attribution – identify earthquake prone building from MBIE's register.
   Knowing earthquake prone status before entering a property would improve safety.

5. Update – publish update programme.
   Update programme is unknown, and some areas appear out of date.

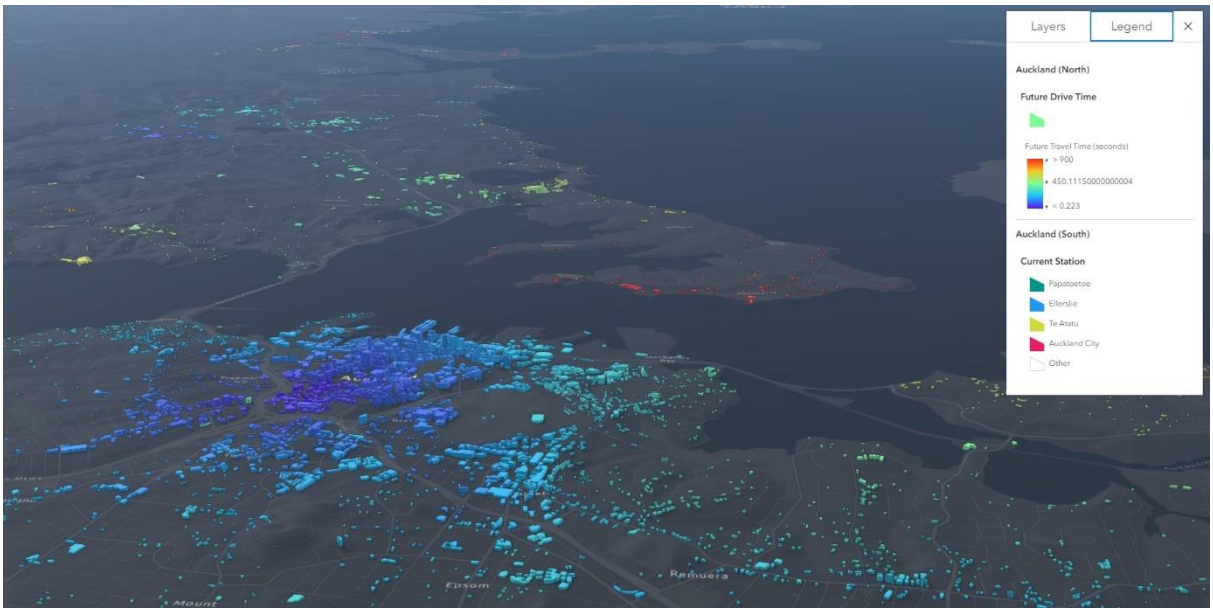
6. Update – enable councils to submit updates to building outlines to ensure data is current.

7. Extent – Capture buildings for all of New Zealand including populated islands.

Recent data improvements

The process for maintaining building outlines has been improved, which has enabled 14 building datasets to be verified and published since June 2022.

Current status of national buildings data is **Good.**



Fire and Emergency New Zealand have conducted a pilot study to combine LiDAR and building outlines data to identify buildings with an area over 1000m^2 or nine metres in height. These buildings typically require a specialised aerial appliance to battle fires. Road network analysis then identified the estimated response times to these buildings.

Address

Agreed data improvement for 2023/24

Toitū Te Whenua to publish information for councils about positioning of address points by June 2024.

User story

Councils have requested clear information to help position a new address point to improve data consistency. Most information collected about a property during a response relates to a building. Geocoding information against NZ Addresses means this information has to be manually edited and placed over the correct building to be meaningful, as happened during Cyclone Gabrielle. Having address points consistently placed on buildings would resolve this issue, saving time, and improving data accuracy. Conversely not all long driveways or entranceways are represented by an address point. These should be generated, tagged, and published as a second type of address.

Customer data improvement requests

1. Accuracy – locate address points over buildings.
   Standardise address point locations over buildings and provide an additional address for entrances or driveways to improve geocoding.

2. Attributes – add postcode
   A courier delivery uses a physical address plus the postcode. It is important to provide this accurate information when delivering essential services.

3. National source of truth – work with NZ Post to align addresses
   Having two distinct addresses to represent a physical and postal address for the same property creates unnecessary overheads when processing welfare needs during evacuations. This also generates significant geocoding issues with many hours spent attempting to clean address data during a response.

4. Update – enable councils to supply data as a service and automate update process
   Quicker address processing would increase the data reliability and confidence of users during a response that new developments are included.

Recent data improvements

NZ Addresses was published is the national, authoritative dataset for physical addresses in January 2023, including over 130,000 previously missing addresses.

Current status of national address data is **Good.**

Suburbs

Agreed data improvement for 2023/24

Toitū Te Whenua to promote the NZ Suburbs and Localities change request process with councils by June 2024.

User story

NZ Suburbs and Localities was published in June 2023, and further work is required to ensure organisations including councils and NZ Post are aware of the online change request process to help improve this dataset.

Customers have requested improved suburb boundary alignment with property boundaries, for example in Marlborough where suburb boundaries have not been corrected after earthquakes impacted the region. This introduces doubt about data accuracy and provides incorrect results when using suburbs are used to filter data for example in an emergency response dashboard, as identified during Cyclone Gabrielle.

Customer data improvements requests

1. Accuracy – Align NZ Suburb and Localities boundaries with property boundaries.

2. Attributes – The estimated residential population by suburb has been well received by the emergency management community, to help support an immediate assessment of likely impact of an event. Adding an estimate of day time population and dwelling counts would provide additional information to help better understand the resourcing required during an emergency.

3. Ready to respond – A significant amount of data collected during a response is address based. This requires data cleaning and geocoding to enable the information to be mapped and understood in relation to other information. Publishing and regularly updating a national geolocator, which can easily be used in ArcGIS Online, would reduce the amount of work and time required for geocoding at present, and ensure a national approach across the country. The Esri World Geocoder is currently the main tool used, but the perception is this is not updated regularly in New Zealand, resulting in missing new subdivisions, as happened during the Auckland floods and suburb name changes.

Recent data improvements

NZ Suburbs and Localities published in June 2023, with online change request process.

Current status of national suburbs data is **Good.**

Property

Agreed data improvement for 2023/24

Toitū Te Whenua to publish a pilot dataset which links property IDs to address, building and District Valuation Roll data by June 2024.

User story

Rapid Building Assessments (RBAs) are carried out on all buildings impacted by a flood or earthquake. The RBA confirms whether the building is safe to enter and whether an owner can return to their home. Approximately 10,000 RBAs were carried out in the last 12 months, including 310 in Tairāwhiti. Building Inspectors, often brought in from other regions, are required to manually enter information including address, area, number of storeys, construction age, structure type and cladding type while onsite. This information is already collected by councils in their District Valuation Roll (DVR) and held by Toitū Te Whenua as a national dataset. Publishing DVR data and pre-populating the RBA forms will save time and improve data accuracy.

Customer data improvements requests

1. Ready to respond - Publish a dataset which links property IDs to address, building and District Valuation Roll to improve accuracy and linking of operational data collected during a response.

2. Licence - Publish NZ Properties Hybrid (pilot) with a Creative Commons CC-BY licence, creating a national source of truth for property boundaries for all agencies.

3. Attribution – Improve NZ Properties Hybrid attributes by including leading zeros in valuation reference and adding territorial authority name.
   A complete Valuation Reference would enable linking to other data, and territorial authority name would improve data filtering.

4. Webservices - Publish NZ Properties Hybrid (pilot) as an ArcGIS REST service.
   ArcGIS Online is the preferred option for data sharing between response agencies.

5. Accuracy – Resolve missing parcels in NZ Properties Hybrid (pilot) layer.
   Create a reliable national source of truth for property boundaries

Recent data improvements

All 67 territorial authorities are now sharing District Valuation Roll data with Toitū Te Whenua and the national dataset is available for all organisations with a .govt.nz email.

Current status of national property data is **Average**.

Rapid Building Assessments

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Agreed data improvement for 2023/24

MBIE to work with Toitū Te Whenua to investigate pre-populating Rapid Building Assessment forms with property information by June 2024.

User story

Rapid Building Assessments (RBAs) are carried out on all buildings impacted by a flood or earthquake. The RBA confirms whether the building is safe to enter. Approximately 10,000 RBAs were carried out in the last 12 months, with 310 in Tairāwhiti following Cyclone Gabrielle. Often building inspectors are brought in from other regions to carry out the RBAs. While onsite they are required to manually enter information including address, building ID, building area, number of storeys, construction age, structure type and cladding type. This information is already collected by councils in the District Valuation Roll (DVR) and held by Toitū Te Whenua as a national dataset. Publishing DVR data and pre-populating the RBA forms will save time and improve data accuracy.

Customer data improvements requests

MBIE's Rapid Building Assessments is a new dataset added to the key data improvement programme in October 2023. Feedback from the emergency management geospatial community identified the critical need to enable linking between RBAs, property IDs and the District Valuation Roll as providing significant savings.

Recent data improvements

The Rapid Building Assessment data has not yet been assessed against the key data criteria (Appendix B) by the geospatial emergency management community. This assessment will be reported in the next data improvement plan.

Roads

Agreed data improvement for 2023/24

Waka Kotahi to

- publish road status using consistent symbology recommended by GEMA, for both Journey Planner and TREIS by June 2024.
- investigate publishing a national view of road status for state highways and local roads recorded in RAMM by June 2024.
- publish the state highway network model by January 2024 and the national network model by June 2025.

User story

Creating a national overview of unplanned road closures during an emergency is the biggest key data improvement opportunity. A national overview, including both state highways and local roads, is vital to identifying isolated communities, understanding potential evacuation routes and planning detours for essential services and fast moving consumer goods. Multiple datasets with no consistent approach across the 68 Road Controlling Authorities results in poor information to support first responders.

During Cyclone Gabrielle Road Controlling Authorities, road contractors and CDEM Intelligence Teams spent an unprecedented amount of time and effort attempting to piece together information about road status from texts, emails and marked up screenshots of Google Maps without knowing how current, accurate or reliable the information was. It took the NZ Herald to provide the first overview of the whole road network, combining state highways and local roads. This information was published on 23rd February, nine days after the national state of emergency had been declared.

The consequences of road closures to public safety and delivery of essential services across the country should not be underestimated. In one example where the Ashburton Bridge was closed during the Canterbury floods, lorries were detoured off the state highway and along local roads which were already closed, with the lorries stuck for hours without the ability to turn around.

Public officials refer to Waka Kotahi's Journey Planner website as providing the latest information on road closures in an emergency. The problem is the public are likley to interpret Journey Planner as identifying all local roads as open. The emergency management community report the status of state highways as being timely and accurately, but the data becomes inaccurate because it does not include local roads.

Waka Kotahi's Journey Planner is also setting a standard of reporting closed roads as a black line. This is contrary to all other international emergency management standards where red is the recommended colour for identifying serious issues. Local CDEM groups adopt the black colour to try to maintain consistency for their ratepayers, despite black not being visible when viewed over an aerial imagery.

There is a longer term requirement to provide standards on how unplanned road closure information is managed, to align with the process for planned road closures.

Customer data improvement requests

1. Ready to respond - Combine state highway and local road unplanned road closures and publish with GEMA's recommended symbology.

2. Source of truth – provide guidance on how to capture unplanned road closures in an emergency to improve data accuracy and reduce the resourcing required for maintaining the data.

3. National coverage – requires both road centrelines and attributes for state highways and local roads in order to identify alternative and safe road detours.

4. Attribution – heavy vehicle status confirms if detours are appropriate for all vehicles.

5. Accuracy – rural roads are often not accurate which reduces the value of the data.

6. Update – update programme is not known which reduces confidence in the data.

7. Topology – routable network would enable analysis to identify safe evacuation routes

8. Licence – adopt CC-BY licence to enable data sharing with all response agencies.

9. Services – ArcGIS REST and OGC WFS webservices road data would be easier to share.

10. Metadata – publish with agreed metadata for emergency management (Appendix C).

Recent data improvements

Waka Kotahi approved a tender in July 2023 to create a multi modal transport network that is likely to provide many of the national data criteria for emergency management.

GEMA recently drafted guidance for displaying road status and capturing information about road closures during an emergency which has been shared with Waka Kotahi.

Current status of national roads data is **Poor.**

Rail

Agreed data improvement for 2023/24

KiwiRail to publish freight line and ferry maintenance status and document process for using this data in an emergency by March 2024.

User story

The rail network datasets published by KiwiRail remains the key dataset consider most fit for purpose by the emergency management community. This is in large part due to the GIS team at KiwiRail being very responsive to customer requirements.

The remaining improvements focus on providing additional information specific to emergency events. An indication of track status is important for logistics planning to moved essential goods between main ports in the North and South Islands to ensure continuity of the supply chain to all regions of New Zealand.

Customer data improvement requests

1. Ready to respond – provide rail track status and passenger numbers as useful information to inform emergency responders considering evacuation of passengers.

2. Accuracy – provide additional information about the location of rail buildings

Recent data improvements

No recent data improvements, noting the rail network data is already considered very good and KiwiRail's priority is reinstating the rail network following Cyclone Gabrielle.

Current status of national rail data is **Very Good.**

Rivers & Catchments

Agreed data improvement for 2023/24

NIWA to work with the Ministry for the Environment and Toitū Te Whenua to confirm the requirements for an easy to use GIS layer based on the latest River Environment Classification for named national rivers and catchments by June 2024.

User story

Rivers and catchments provide important points of reference during most emergency events as they define physical access and help describe where people are and how they are connected. It is one of the first datasets used by Search and Rescue to help identify a missing person.

One of the worst hit areas during Cyclone Gabrielle was flooded by the Esk River. Without river names it is impossible for someone outside the area to search for and locate this priority area.

The May 2021 Canterbury floods impacted the smaller catchments in lowland areas, including Ashburton and Selwyn, where there was heavy, localised rain. The larger catchments including the Rakaia, with headwaters in the Southern Alps were less affected, and so it was important to know catchment names and their extents.

NIWA's latest river data – River Environment Classification REC3 - does not have a name, and the pilot river name layer provided by Toitū Te Whenua is a cartographic product with many gaps in the linework. Without named rivers and catchments there is a missing link in key information used to inform a common operating picture.

Regional councils often hold detailed river and catchment data but the wide range of data sources, formats and access means it is difficult and time consuming to build and maintain a national picture.

An easy to use GIS layer for both rivers and catchments, based on the hydrological modelling of NIWA's River Environment Classification, which including names is one of the most significant opportunities for improvement for the key datasets.

Customer data improvement requests

1. Ready to respond - Create easy to use GIS layers based on REC3 with names for national rivers and catchments

2. Attribution – add territorial authority name to enable filtering of river and catchment data.

3. Accuracy – Update named river network and catchments based on REC3 and LiDAR to provide the most accurate and current river network.

4. Update – Update programme is not known.

5. Download – Named river network and catchments are not available for download.

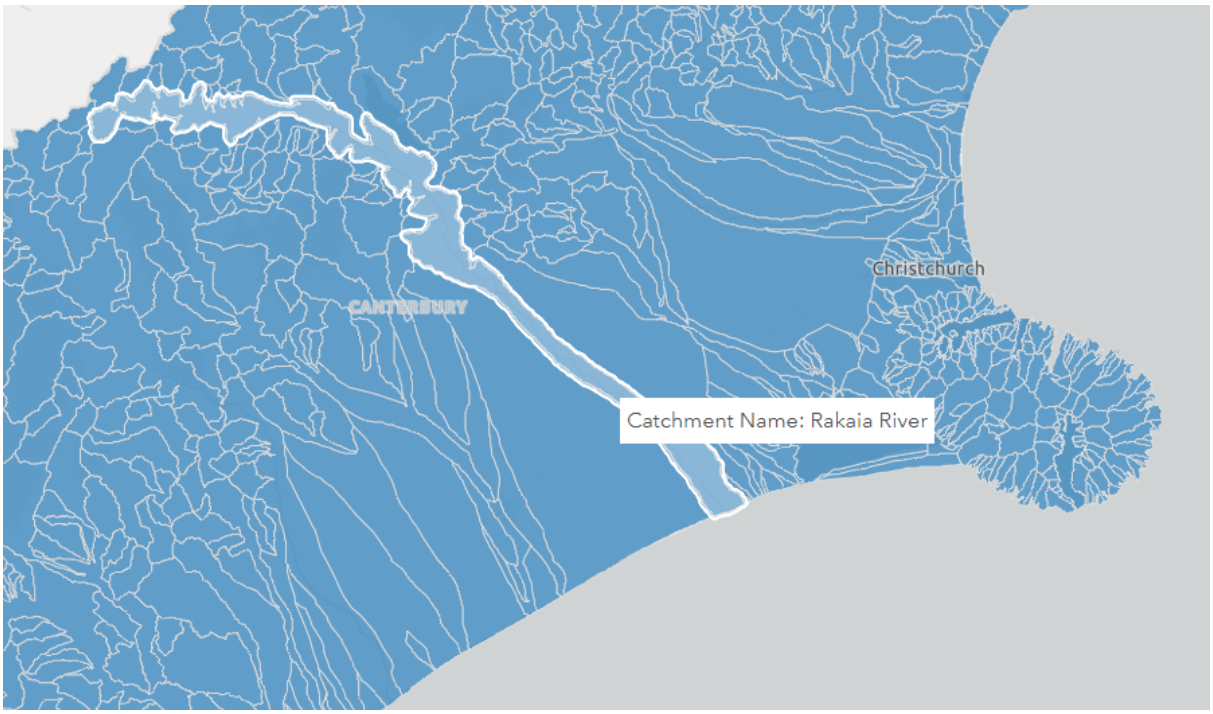
6. National coverage – include all rivers and catchments, including offshore islands

7. Source of truth – Council river and catchments data are used more frequently than NIWA data.

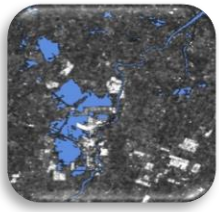
Recent data improvements

NIWA have created and published an improved hydrological model (REC3) based on the latest LiDAR, however river and catchment names have not been transferred.

Current status of national river and catchment data is **Average**.



The Rakaia River catchment was less impacted during the Canterbury Floods in May 2021 because the catchment stretched back into the Southern Alps and only had a small area in the lowlands, compared to the neighbouring Selwyn Plains. Named catchments are critical to understanding this picture. Catchment data supplied by Environment Canterbury.



Imagery

Agreed data improvement for 2023/24

Toitū Te Whenua to publish guidance for acquiring and hosting satellite imagery during an emergency event by February 2024.

User story

Satellite imagery can provide an important source of information in the early stages of a response, particularly when it is used to extract information such as flood extents. There are many considerations a first responder needs to be aware of including cost, resolution, frequency, extents, optical or radar, processing and hosting options. A guidance document which provides an overview of potential suppliers and the different options depending on the type of emergency event would help improve the capability and confidence to use and fund satellite imagery capture during an emergency.

Customer data improvements requests

1. Ready to respond - publish guidance for acquiring and hosting satellite imagery during an emergency event.

2. Funding – centralised, coordinated funding for imagery in an emergency would save a significant amount of time during a response, ensuring data is captured during critical weather windows to support response and recovery.

3. Webservices – provide instructions for adding LINZ Imagery Basemap to ArcGIS Online to ensure it is easy to use imagery captured during a response.

4. Accuracy – align the LINZ and Eagle imagery basemaps ordering by date and resolution to ensure consistency and to avoid introducing doubt during decision making.

5. Attributes – Add place name, road name and river name labels to LINZ Imagery Basemaps to provide important context.

6. Update – a known aerial imagery update programme would improve confidence in decision making if there is certainty that the latest information is being used.

7. Metadata – publishing the LINZ Imagery Basemap index as an ArcGIS REST service would improve confidence in decision making to better understand the likelihood of change since the imagery was captured.

8. Discoverable – add historical imagery from Retrolens to LINZ Imagery Basemap to enable assessments of land change over time to help inform response and planning.

9. National source of truth – many agencies refer to the Eagle Technology imagery basemap as the source of truth. It may help agencies to know the Eagle Technology imagery is sourced from Regional Councils and Toitū Te Whenua.

Recent data improvements

43 imagery datasets and four satellite datasets have been published on the LINZ Data Service and LINZ Imagery Basemap since June 2022. Almost 20TB of cloud-optimized aerial imagery is now available on the Amazon Web Services (AWS) Registry of Open Data, with support from the AWS Open Data Sponsorship Programme.

A range of satellite imagery, including radar, aerial imagery, flood extents and silt extents was purchased, analysed, or hosted on behalf of other organisations on the LINZ Imagery Basemaps during Cyclone Gabrielle.

Current status of national imagery data is **Average.**

Customer screenshots highlight the different LINZ and Eagle Technology imagery basemaps.

Elevation

Agreed data improvement for 2023/24

Toitū Te Whenua to publish a national hillshade layer, using the best available data, by June 2024, and investigate how to create and maintain a national digital elevation model (DEM), using the best available data, by June 2024.

User story

The emergency management community need easier access to the latest LiDAR data available. Preparing a national Digital Elevation Model (DEM), Digital Surface Model (DSM), contours and hillshades of the best available information, including combining the latest LiDAR with the lower resolution elevation data to build a national view, would give emergency responders the confidence they were making decisions based on the latest information when understanding the slope of land within an area of interest. As an example Fire and Emergency NZ have compared the DEM and DSM to determine building heights to help deploy appropriate appliances for buildings over nine metres.

Customer data improvements requests

1. Webservices - Publish a national Digital Elevation Model, Digital Surface Model, contours and hillshade derived from the latest data, that can be used in ArcGIS Online.

2. National coverage – Good progress with capturing national coverage of LiDAR in New Zealand, but funding must be identified to complete the gaps in Manawatū-Whanganui and Otago.

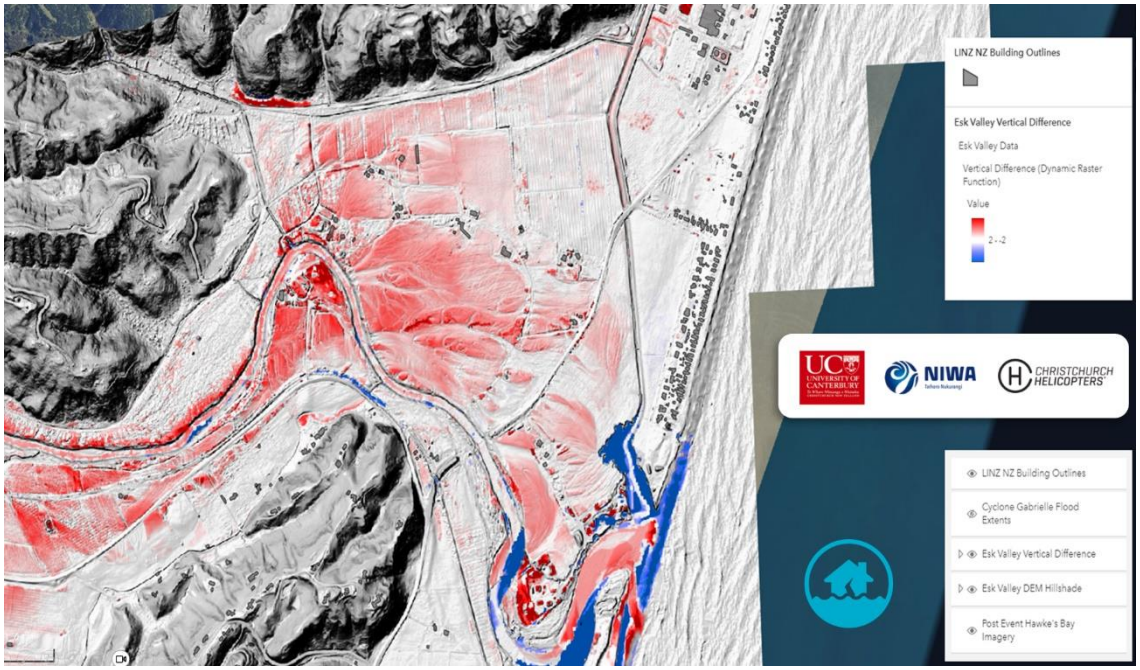
3. Update – maintenance programme is not known or resourced beyond additional areas impacted by Cyclone Gabrielle with funding provided as part of the recovery.

4. Ready to respond – Provide guidance for LiDAR capture during an emergency, including setting the expectations of the time taken to access LiDAR post capture.

Recent data improvements

21 elevation datasets have been published since June 2022, taking national coverage from 20% to 55% over this time. The latest information on LiDAR availability, case studies, user guides and visualisations are available via Elevation Aotearoa, which is recognised as a valued resource by the emergency management community.

Current status of national elevation data is **Good.**



Prepared by NIWA and the University of Canterbury this image was created by comparing LiDAR before and after Cyclone Gabrielle and indicates silt deposition in the Esk Valley.

Topo Maps

Agreed data improvement for 2023/24

No improvements planned for LINZ Topographic Basemap while elevation data is prioritised in 2023/24 by Toitū Te Whenua.

Toitū Te Whenua
Land Information
New Zealand

User story

Topo50 and Topo250 maps remain highly trusted by the NZ Defence Force as a dataset which is authoritative and consistent across New Zealand, which form the base standard for planning, operations and exercises.

Topo50 maps were widely used at the start of Cyclone Gabrielle to provide an overview of the scale of the event, and to quickly provide important context at a regional level from a single data source. In Tairāwhiti and Hawkes Bay where power and communications were an issue in the first days of the response, paper topo maps were marked up to build a picture of the impact.

The current Topographic Basemap tile service cannot currently be used in ArcGIS Online, and does not have sufficient detail and labels at a regional scale to be as effective as the Topo50 maps. The Esri Topo Basemap is widely used by the emergency management geospatial community to help inform their decision makers.

Customer data improvements requests

1. Create a Topographic Basemap that is easy to use in ArcGIS Online
2. Create a Topographic Basemap that replicates the features and symbology used in the Topo paper maps which is very familiar to users, including staff deployed to support a response from other regions or overseas.
3. Publish greyscale version of the Topographic Basemap to make it easy to display and interpret operational data during an emergency.

Recent data improvements

LINZ Topographic Basemap was published as a vector tile basemap in October 2021.

Current status of national topo data is **Good.**

Coastline

Agreed data improvement for 2023/24

Toitū Te Whenua to publish NZ Coastline – Mean High Water Springs by June 2024.

Toitū Te Whenua
Land Information
New Zealand

User story

An accurate and reliable national coastline which is maintained using the latest available information is critical to improving our understanding of the impacts of climate change and inundation across the country, and to improve modelling and forecasting, for example to inform managed retreat.

Mean High Water Springs is the preferred coastline definition as it is referenced in resource management planning and cadastral surveying and most likely to be used by Councils and CDEM groups, for example when creating tsunami evacuation zones.

Customer data improvements requests

1. Accuracy – Publish Mean High Water Springs as this is the coastline used most frequently to model climate change, sea level rise and inundation.

2. Ready to respond – Publish nautical charts as an ArcGIS REST service. A number of agencies, including Maritime NZ, NIWA, multiple Regional Councils, universities, and the Australian Hydrographic Office, publish versions of the New Zealand navigation charts in ArcGIS Online. This results in multiple copies of the charts listed in ArcGIS Online, with no clear authoritative source of truth and the possibility of using out of date information during an emergency.

3. Attribution – improve attribution of coastal environment. NZ Coastline Mean High Water has some attribution to describe the type of coastline e.g. rocky or sandy shoreline. This should be extended around the whole coastline to inform marine search and rescue deployment options and oil spill responses.

4. Update – NZ Coastline – Mean High Water does not currently have a data maintenance programme. Frequent updates are critical for areas with high rates of change in order to better understand the consequences of climate change.

Recent data improvements

The current NZ Coastline – Mean High Water is recognised as the national source of truth by emergency management community.

Current status of national coastline data is **Good.**

Place Names

Agreed data improvement for 2023/24

Toitū Te Whenua to publish Ngā Pou Taunaha o Aotearoa's New Zealand Gazetteer place names as an ArcGIS REST service by June 2024.

User story

Defining an area of interest provides important intelligence during an emergency response, when it is vital to be able to share the location of impacted areas, damaged infrastructure and isolated communities with multiple agencies. Place names help to quickly and accurately identify a location, and to communicate directions to support deployed from out of town with no local knowledge.

The Place Names Gazetteer contains official and unofficial place names under the jurisdiction of the New Zealand Geographic Board Ngā Pou Taunaha o Aotearoa (the Board). Official place names are those that have been assigned, altered, adopted, approved, and validated under the Board's Act 2008 or through other statutes that assign official names, for example, Treaty settlement legislation. Unofficial place names are those that have not been processed under the Board's Act 2008 or through other relevant statutes. Data is extracted from 'New Zealand Gazetteer of Official Geographic Names', which is maintained by the Board's Secretariat.

The emergency management geospatial community have requested access to the NZ Gazetteer as an ArcGIS REST service. Toitū Te Whenua publishes other place name datasets on the LINZ Data Service, and the emergency management geospatial community have also requested support with how and when to use the different place name datasets.

Customer data improvements requests

Place names is a new dataset added to the key data improvement programme in October 2023 by Toitū Te Whenua. Feedback from the emergency management geospatial community identified the critical need for authoritative and especially official place names.

Recent data improvements

Place name data has not yet been assessed against the key data criteria (Appendix B) by the geospatial emergency management community. This assessment will be reported in the next data improvement plan.

Next Steps

Regular updates on the key data improvement priorities outlined in the Executive Summary will be prepared in collaboration with the lead agencies and shared with the Toitū Te Whenua Location Information Leadership Team, Toitū Te Whenua Kaihautū Leadership Team, Minister for Land Information, key data lead agencies, partner organisations and customer representatives.

An annual report collating the data improvements over the previous 12 months will be prepared in July 2024 and will be available from the Toitū Te Whenua website.

Please share any feedback on the key data improvement programme with the team at resilience@linz.govt.nz

Appendix A: Geospatial Emergency Management Community Engagement

Workshops

- Top of the South flood debrief (Aug 2022) and key data workshop - 10/05/23
- Geospatial Special Interest Group key data update - 12/05/23
- Hawke's Bay Cyclone Gabrielle debrief (Feb 2023) and key data workshop - 08/06/23
- Tairāwhiti Cyclone Gabrielle debrief (Feb 2023) and key data workshop – 01/08/23
- Geospatial Special Interest Group data improvement plan review - 18/09/23
- GEMA data improvement plan review - 21/09/23
- Key data lead agency data improvement plan review - 21/09/23

Interviews and Conversations

Regional

- Northland Regional Council – Anya Duxfield – 21/08/23
- Auckland CDEM - Camilo Roja Sorrego - 12/07/23
- Waikato Regional Council and CDEM – Derek Phyn and Jeff Graham - 05/09/23
- Bay of Plenty Regional Council - Glen Clarkin and Kate Waterhouse - 27/07/23
- Hawke's Bay Regional Council – Tim Farrier – 02/08/23
- Hawke's Bay CDEM – Teira Cowan – 07/08/23
- Gisborne District Council – Orlo Dennison – 23/08/23
- Taranaki CDEM - Val de Feo - 13/07/23
- New Plymouth District Council - Jake Hechter - 13/07/23
- Horizons Regional Council – Nathan Batchelor – 24/08/23
- Marlborough District Council - Malcolm Jacobson and Matt Henderson - 17/07/23
- Tasman District Council – Sam Flewitt – 14/08/23
- Environment Canterbury – Maurice Wills – 14/08/23
- Canterbury CDEM – Steve Ferris – 24/08/23
- Otago Regional Council – Ingrid Darragh and Gareth Andrews – 10/08/23

National

- NEMA – Charlie Blanch and Kate Burns – 04/09/23
- Fire and Emergency NZ – Hamish McEwen and Phil Woods – 08/08/23
- NZ Police – Sarah Hodgson – 08/09/23
- Defence – John Donaldson – 16/05/23
- Ministry of Primary Industries – Phillip Lubeck – 07/08/23
- Toka Tū Ake EQC – Richard Woods – 21/08/23
- Kainga Ora – Sam Keast – 01/08/23

Stakeholders

- Eagle Technology - Ed Cook - 06/07/23
- Tonkin + Taylor – John Carter – 16/08/23
- Transpower – Blaine Morch and Leo Lui – 21/08/23

Appendix B: Key dataset assessment criteria

Criteria	Definition
complete national coverage	Complete national coverage includes North Island, South Island, Stewart/Rakiura Island, Chatham Islands and populated coastal islands of New Zealand.
relevant data attributes	Information associated with a spatial feature, which is necessary to inform decision making related to emergency management and climate change
adequate level of accuracy	The scale of data capture is known and recorded, which is appropriate to inform decision making related to emergency management and climate change
acceptable update programme	A known and planned update frequency, which is appropriate for emergency management and climate change given the expected frequency of change.
suitable topology	The data is available as point, line or polygon. Lines are contiguous and can form a network, polygons are discrete and do not overlap.
relevant metadata	All metadata fields are recorded to meet the agreed Metadata Content Guidance (Appendix C)
free to access	Cost is not a barrier to accessing the data.
Creative Commons License - CC BY	Licensing is not a barrier to accessing, and reusing the data, including for commercial purposes.
suitable formats for download	Data is available to download in a minimum of two formats. Preferred formats are Esri and an open format.
webservice	Vector data as both OGC WFS and ArcGIS REST service
	Raster data as both OGC WMTS and ArcGIS Imagery Tile Service
discoverable	Data is easily identified and described after a keyword search on data.govt.nz or Esri's Living Atlas
performance	Speed of download or speed of webservice is acceptable.
national source of truth	The authoritative, reference dataset at a national scale. Local versions may be more uptodate, but the best available data for the whole of New Zealand.
ready to respond to an event	Data has been prepared specifically to enable an efficient and effective response to an emergency event

Appendix C: Metadata

Minimum requirements for metadata for resilience and climate change key datasets

Metadata element required	Definition	Example
Dataset name	Name by which the data is known.	NZ Property Titles
Unique identifier	Unique reference ID specific to the metadata record, often automatically assigned.	2d28e0af-c177-628b-d667-22b15b648d55
Source	Name of organisation responsible for the metadata.	LINZ - Land Information New Zealand
Source contact information	Contact details for enquiries relating to the data. Include name, phone number or email.	customersupport@linz.govt.nz
Date created - dataset	Date data was first created.	2018-11-20
Date created – metadata	Date metadata record was created / last updated.	
Last updated - dataset	Date the data was last updated.	
Description	An abstract of additional information about the content of the data used to assess usefulness of the resource.	This dataset provides title information (excluding ownership) where there is a relationship to one or more primary parcels. Refer to full description of this data. https://data.linz.govt.nz/layer/50804-nz-property-titles/
Extent	The geographic location the data applies to, often defined by the coordinates of the 4 corners of the	166.688755883 -175.833301833 -47.2899925167 -34.12963565

	bounding box that covers the extent of the dataset.	
Coordinate (reference) system	Name or identification code for the coordinate reference system to which the data is associated. New Zealand Geodetic Datum (NZGD) 2000 is: 4167	4167
Spatial representation type	The method used to spatially represent the data e.g. point, line, polygon, polyline, raster, vector, TIN (Triangulated Irregular Network).	polygon
Method of collection	Description of the sources and processes used to produce the data.	The function of the Registrar-General of Land is to provide a system, whereby the ownership of land can be legally evidenced, under which dealings with it can be effected and recorded Refer to method of collection example https://data.linz.govt.nz/layer/50804-nz-property-titles
Purpose	Summary of the intended use of the data, including why it was created and the uses it has been designed for.	This layer provides title information (excluding ownership) where there is a data link to one or more primary parcels.
Dataset attribution	Description of each attribute.	This information is provided in the accompanying document: property-and-ownership-simplified-tables-data-dictionary.pdf
License	Access and use constraints applied to the data	Creative Commons Attribution 4.0 International