TOP 10
Geospatial Things
AUTUMN EDITION

Land Information New Zealand
Toitū te whenua

INTERESTING GEOSPATIAL DATA LAYERS
Useful datasets and sites of interest for GIS users

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The last decade of open GIS data has been fantastic for geospatial practitioners who now have access to an ever-growing range of datasets and imagery for use in GIS projects.

The catalogue of open data at *data.govt.nz* now has several thousand datasets available in an array of data formats, including types that we can live stream without downloading. Data.govt.nz is also a great way to browse and discover interesting datasets like footpath renewals, airport air noise contours, and national grid transmission corridors.

At Land Information New Zealand (LINZ) we thought it would be useful to share a few of our geospatial data highlights to kick off the first edition of S+S in 2020.

LiDAR[1] Elevation Data
go: *gis.ai/lidar*
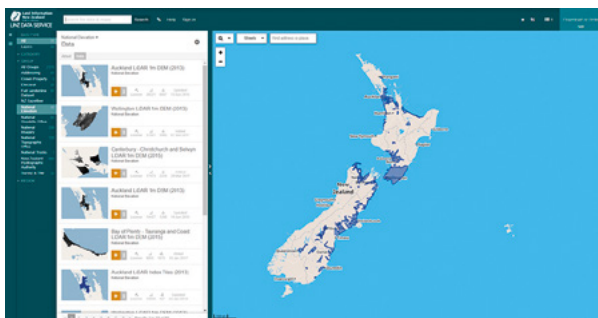
Lidar coverage available from *data.linz.govt.nz*

Large areas of data now available from *data.linz.govt.nz* including DSMs,[2] DEMs,[3] and Point Cloud Data can be accessed online and downloaded in its native format from *opentopography.org*.

Large scale LiDAR capture is underway for much of New Zealand, and significant areas of derived 1m resolution elevation data are already available at *data.linz.govt.nz*

including these areas: Auckland, Tauranga, parts of the Waikato and Hauraki, Manawatū, Wellington, Nelson, Tasman, Marlborough, Kaikōura, Rangiora, Canterbury, Timaru and quite a few other areas. View full coverage at *gis.ai/coverage*.

Most datasets are available as clear DEMs, as well as DSMs that retain trees, buildings, cars and other features.

You can access elevation data from *data.linz.govt.nz* by searching for DEM or DSM or browse to the National Elevation group. Once you've found the data you are looking for, add it to your downloads and crop to your area of interest.

Once you have downloaded the data, you'll want to merge the tiles to a new mosaic dataset before re-projecting, and then build a cache or pyramid layers for faster access and viewing. Don't forget to set the coordinate system and vertical datum (more information about NZVD2016 below).

If you're creating a hill shade, try out a multi-aspect option if available. If you're working with WGS84 or Web Mercator projections, you might want to be aware of setting the Z- factor correctly based on the latitude of your map extent. Most of the time you'll be using this data in NZTM[4] and will not be affected, but you'll know it when your hill shades are too dark when using non-linear projections.

If you're intending to do further hydrological modelling you'll need to research filling sinks, smoothing spikes, and gain an understanding which method has been used to interpolate the raster from its point cloud origin. Before you download and process a large area, start with a sample area first.

For more information about creating DEMs from LiDAR, check out this post from the Topographic team at LINZ *gis.ai/dems*.

You can also access and preview on *opentopography. org*. The first thing to do is to create a login, and then log in. This increases your workspace from 50 million to 250million points and you can also request access for up to a cool half a billion points. You can preview the data in 3D online or download for local use.

X, Y and Z Datums
go: *gis.ai/nzvd2016*

Vertical Datum information on the *linz.govt.nz* website.

Now that you have some detailed LiDAR, Z values for other datasets like pipes, drains, streams and shorelines will feature in data management discussions. GNSS[5] GPS[6] receivers can measure height more accurately so its timely to look at the implications for GIS data and projects such as ensuring pipes remain under the ground.

There is nothing worse than finding out your flood model won't work because water refuses to flow upwards into a 35m high polygon representing the sea as can be the case.

Long story short: Set the New Zealand Vertical Datum 2016 (NZVD2016) as a vertical datum when working with elevation data and water modelling.

Most GIS users will not have come across a vertical datum before, and it's worth spending some time carefully reading through the LINZ Vertical Datum pages at *gis.ai/nzvd2016*. Most of the time you'll be able to set NZVD2016 and forget about it. You'll find the Z spatial reference settings near the XY coordinate system dialogue boxes in most desktop GIS apps.
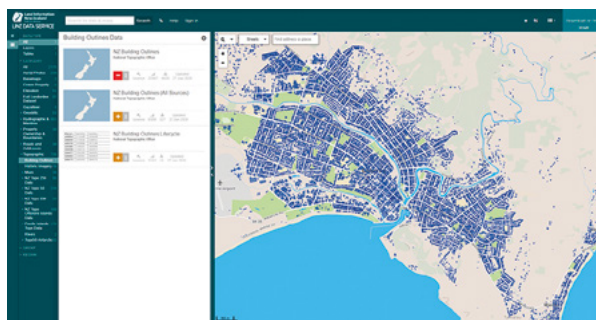
NZ Building Outlines
go: *gis.ai/buildings*

NZ Building Outlines is a recently released new dataset of 3.11 million features captured using the latest in machine learning technology and represents the outline or roofline of a building ("footprints" are difficult to capture using 2D aerial imagery due to eaves and other roof related structures).

Coverage is available for most of New Zealand, and the few remaining areas should be completed by June 2020, and a building use type attribute is in the works.

The outlines data are a great reference addition to any

Building outlines for Gisborne from *data.linz.govt.nz*

neighbourhood scale maps, and a variety of other indicative analysis like solar potential and water runoff modelling. If you're using them in 3D visualisations you can add a generic height field which makes them useful as background context for a study area where you may already have 3D building models.

Other uses for the data could include developing evacuation plans during an emergency, monitoring building inspections, and exploratory analysis of building size for real estate and subdivision or urban development potential using council zoning or residential area selections.

The Building ID field is extremely important during an emergency response to record Damage Assessments. This field can become a proxy ID to tie together information about a person, building, address, property - records, images, registration forms, and insurance claims for example.

Because this is a countrywide layer it's useful to think of it as a "national single source of the truth" as multiple agencies and organisations will use it.

Avoid Downloading 20TB of Urban and Rural Aerial Photography
go: *gis.ai/aerials*
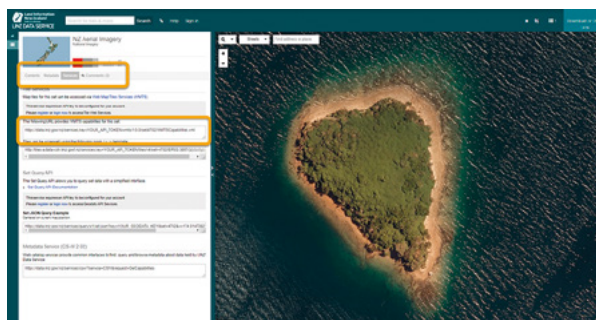
Can you guess the name of this heart shaped island near Picton?

There are more than 20 terabytes (20,000GB) of aerial photography hosted and available to everyone from *data.linz. govt.nz*. Best of all you can livestream *all* of these as services directly in your web maps and desktop applications in a variety of projections without downloading the data.

If you're printing a high quality and high-resolution map it may still be better to download the data as this

reduces any compression artefacts, and gives you more control over colour matching and other settings including scale as webservices are cached for use at 15 or so set scales in web maps.

The webservices are provided as a WMTS[7] service (not WMS)[8] and supports NZTM, Web Mercator and others. To use the webservices you'll need to login and under your profile, specify an API[9] key. Avoid making these public in the event they are over-used which may create issues.

Within the imagery category of *data.linz.govt.nz* under each layer you'll find a "Services" tab, and you're after the WMTS Capabilities section. One you've logged in, copy the URL[10] for the imagery you need, and then within your mapping software, add "webservice from URL" or add WMTS server.

If you do download the imagery, you'll want to create an index or mosaic the imagery into a single layer for ease of use, build the cache/pyramids for speed and adjust colour matching.

In the future new imagery will be added all the time as soon as it's processed, and there is an increasing availability of imagery for more than one time period for much of the country. Coming soon is new Waikato Region 0.3m imagery. Great imagery for Otago and Chatham Island has been recently released.

Sentinel satellite imagery is another useful national base map layer, there are two periods of cloud free cover at 10m resolution, visual spectrum only.

Access the Sentinel images at *gis.ai/esa*

Getting Lost with NZ Topo50 and Topo250!
go: *gis.ai/topo*
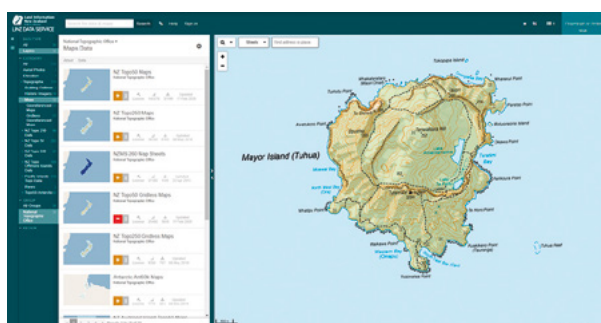
An example of the NZTopo50 Gridless map for Mayor Island (Tuhua)

We're all well familiar with the NZ Topo maps, and the team at LINZ is updating them often, and the maps published to *data.linz.govt.nz* are always the most recent version.

You can also access these maps as streaming webservices, once you've logged into the LDS and generated an API key, go to the Topo layer you're interested in and copy the WMTS capabilities URL, add it into your web map as a WMTS service and it should appear within a moment or two.

If you are printing, exporting or using the Topo maps in 3D you may want to download them all as image tiles. For the NZ Topo50, you'll need to download them in zipped chunks of 3.5GB (it's limited to help manage cloud processing costs and share resources fairly across all users) and then build a mosaic after downloading.

If you can wait a week, a better option is to ask your manager to have the LINZ Data Service team put this data and (several other large datasets at the same time) on a USB or portable hard drive and courier it to you overnight for a fee. You'll get to keep the drive or pass it on to a client, upgrade your media server, or create a backup image of your workstation or routine data backup for emergency purposes, easily justified as it mitigates data loss and backup risks as well.

If you're looking for the individual NZTopo50 vector datasets they're all there as well, and you can access them as "sets" which avoids the need to find them one by one, which is a real time saver. Check them out at *gis.ai/sets*. For advanced technical users there are changesets for most datasets that can be scripted to run automatically, try *gis.ai/changesets*.

## Water Wonderful World
go: *gis.ai/hydro*
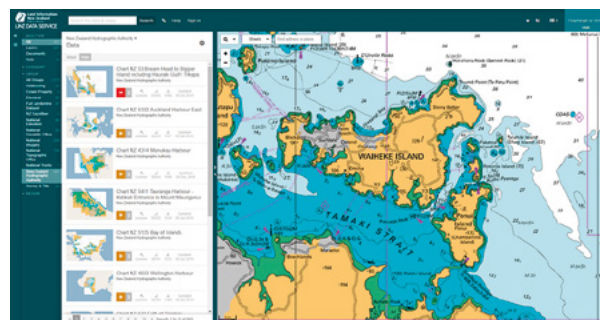
An example of a marine chart found on *data.linz.govt.nz*

While for many of us our work is focused on the land, marine geospatial information can be useful for many projects. This information includes bathymetric surfaces (the topography of the seafloor), vector data and raster images of the marine navigational charts. All are available on *data.linz.govt.nz* and can be downloaded in a variety of formats or streamed using WMTS web services for including in web maps and online applications. Just search for "depth contours" or "bathymetric" to discover the wonders of the undersea world.

If you are looking for a good image of New Zealand's bathymetry, the data from NIWA could also be useful as well: *gis.ai/niwa*

Official NZ Place Names
go: *gis.ai/places*
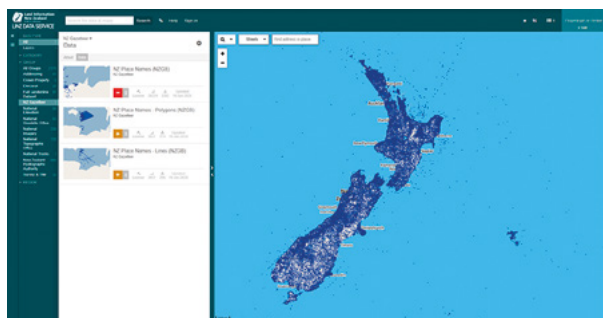
NZ Place Names data available on *data.linz.govt.nz*

Ever wondered if there was an official or given name for a place? This data has every official and many unofficial place names for all areas managed by the NZ Geographic Board. Over the past few months, about 700 place names were made official and 550+ Antarctic places have improved positions, so it's worth downloading an updated copy for your reference data. The data has a reasonably comprehensive attribute table, including NZTM and Lat Long coordinates.

If you're wanting to filter or adjust the symbology hierarchy for this layer, it's possible to use the **feat_type** field as a way to categorise both icons and labelling styles at different scales, so that you can avoid a large number of labels drawing.

You can also use this data to select or filter for different types of map themes, for example all of the named Glaciers (1149), Waterfalls (300), Rock (500), or place names referencing other keywords of specific interest.

If you know of a place spelled incorrectly or a naming error, you can also make a proposal for a place name change on the NZGB page *gis.ai/propose* and there is the recently updated online Gazetteer at *gazetteer.linz.govt. nz* and at the bottom of that page, you can download a csv file of Māori place names which include macrons. Unfortunately, most mapping tools do not support macrons, or they can become lost in the data editing, encoding, data translation, publishing or printing process.

A named river dataset at last!
go: *gis.ai/rivers*

The Topographic team has been carefully adding river names to the river lines used to create the NZ Topo50 maps. They need to be used in conjunction with the coastlines, islands, lagoons, lakes, ponds and swamp polygon areas, but they do make a very nice cartographic representation – with labels and this works very well with other NZ Topo50 vector layers.

If you're wanting to display river orders and catchments, you could try using the "River Environment Classification
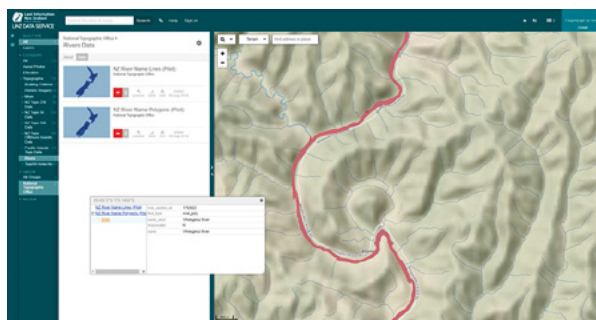
A closeup of the named river datasets available on *data.linz.govt.nz*

(2010)" from *data.mfe.govt.nz*, and the "Sea Draining Catchments" which are based on a coarse nationwide raster grid, which will become readily apparent at local scales. You can run a smoothing algorithm to improve their appearance. Note that the catchments and some rivers may flow up and over some ridgelines visible in any underlying hill shades.

A Realtime Group Selfie from Space!

Here's a fun site for geospatial enthusiasts. Last summer, the Japanese Himawari satellite made the headlines by providing real time imagery of smoke from the Australian bushfires, and recently a rare cloud free image of New Zealand again made the headlines.

Remember the Smokey skies in January?

gis.ai/himawari8

Or try this rare cloud free day back in February:

gis.ai/cloudfree

Or for a real time, whole of Pacific selfie from space taken in real time while you were reading this! *himawari.asia*

Geospatial Webinars

Keep an eye out for the LINZ Webinar series coming up that will include sessions focused on taking a more detailed look at some of these and other open datasets, their creation, maintenance, and demonstrations of how to access, and apply some of the processes described above including downloading, processing and using web services in live web maps and applications. If you have ideas for webinar themes and topics, please do get in touch.

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Open data and reuse queries: jball@linz.govt.nz

NOTES
1   Light detection and ranging
2   Digital Surface Model
3   Digital Elevation Model
4   New Zealand Transverse Mercator
5   Global Navigation Satellite System
6   Global Positioning System
7   Web Map Tile Service
8   Web Map Serve
9   Application Programming Interface
10   Uniform Resource Locator