National mapping of integrated transport and land use

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Abbreviations

GIS	geographic information system
NZTA	New Zealand Transport Agency
RoNS	roads of national significance
SPGISC	NZTA Spatial Planning GIS Capability

Contents

Abstract

The NZ Transport Agency (NZTA) is charged with taking an integrated approach to land transport planning. Our Integrated Planning Strategy sets out how we can invest in land transport activities that support appropriate land-use patterns and connect major cities and ports. We aim to achieve the lowest possible long-term transport costs for firms and households through effective planning and design.

This research collated geospatial information to enable the NZTA to gain a better understanding of how transport networks, land-use information, demographic and key environmental constraints interact. The collated data was loaded into the Spatial Viewer system and will now be analysed and checked for 'hot spots' that require prioritisation of effort. These hot spots may be areas where there are significant change pressures such as population growth.

In particular this work will help ensure that when undertaking long-term integrated planning work (ie feasibility work), land-use planning, transport planning and investment decisions are addressed together and not separately.

1 Introduction

1.1 Research purpose

The 'national mapping of integrated transport and land-use research project' (mapping project) collated geospatial information to use for informing integrated planning at a national level.

1.2 Background

The NZ Transport Agency (NZTA) is charged with taking an integrated approach to land transport planning. Our Integrated Planning Strategy sets out how we can invest in land transport activities that support appropriate land-use patterns and connect major cities and ports. We aim to achieve the lowest possible long-term transport costs for firms and households through effective planning and design.

Currently the NZTA has a limited number of geospatial layers available to apply to this integrated planning process. A comprehensive visual representation, at a national level, of how land uses and transport and other key transport infrastructure interact is not currently possible; however, this type of information is held by a number of different organisations, in particular at the regional and local levels. The NZTA sought to source and gather, where appropriate, relevant geographic datasets to improve our ability to visualise these interactions.

1.3 About the project

This research project collated information to enable the NZTA to begin to gain a better understanding of how transport networks, land-use information, demographic and key environmental constraints interact.

After the data had been collected and collated the NZTA entered the information into its Spatial Viewer system. This approach was undertaken to enable the data to be visualised by NZTA staff; ensuring ownership and accuracy of the datasets while exposing the data to the largest audience.

The NZTA will be able to analyse this information and see where there are 'hot spots' that require prioritisation of effort. These hot spots may be areas where there are significant change pressures such as population growth.

In particular this work will help ensure that when undertaking long-term integrated planning work (i.e. feasibility work), land-use planning, transport planning and investment decisions are addressed together and not separately.

1.4 Beca Infrastructure Limited (Beca)

The research was carried out by the Beca Geospatial Team between July and December 2010 as part of the NZTA Research Programme. In essence it was a data needs review, and data discovery, collection and management exercise.

After Beca had collated the datasets, the data was processed and uploaded into the NZTA Spatial Viewer by NZTA staff. This was completed by June 2011.

1.5 The NZTA Spatial Planning GIS Capability project

The NZTA Spatial Planning GIS Capability (SPGISC) project's purpose was to investigate and recommend how the NZTA could improve its geospatial capability and capacity to ensure the organisation is supported in fulfilling its role to build a better transport system for New Zealanders.

The SPGISC project has implemented an enterprise geographic information system (GIS) platform, which will result in improved:

- geospatial governance and capacity
- internal capability
- geospatial-related decision making
- stakeholder engagement
- customer service.

The National Mapping research project was a parallel project; however, its outputs were considered an early contributor to improving the organisation's geospatial capability. Adding these datasets to the Spatial Viewer will increase the geospatial information available to NZTA staff by 30%.

1.6 Research deliverables

This research consisted of five key phases:

1.6.1 Phase 1: Data needs review

Phase 1 of this project identified a wide range of geospatial datasets that would be of value to decisions made by the NZTA in relation to integrated transport and land use.

1.6.2 Phase 2: Data discovery

Phase 2 of this project reported on the potential availability of all the datasets identified in phase 1, including ease of access, access restrictions, data formats and structures, costs of access and any other pertinent information available in respect to individual datasets.

1.6.3 Phase 3: Data structure definition and rationalisation

Phase 3 of this project defined the data structures (file types, spatial projection, naming conventions) and the metadata documentation standards that would be implemented for any data collated in phase 4 of the project. Phase 3 of this project also identified those datasets listed in phase 1 and researched in phase 2 that would be collected in phase 4. In total 29 datasets were identified to collect and collate.

1.6.4 Phase 4: Data collation

Phase 4 of this project comprised the data collection and collation. Those datasets identified in phase 3 were collated from a wide variety of sources, including the wider NZTA, the Ministry of Transport, Civil Aviation Authority, Transpower, Vector, NZ Refining Company, KiwiRail, the Ministry of Economic Development, commercial parking building providers, the Department of Statistics and all territorial, unitary and regional authorities.

1.6.5 Phase 5: Data packaging and management

Phase 5 of this project comprised the data processing. All datasets collated in phase 4 were formatted to meet the spatial data requirements of the NZTA, including the implementation of standard naming conventions, GIS formats and spatial data projections. All datasets processed and provided as part of phase 5 have had metadata documented within the NZTA standard metadata database.

1.6.6 Reporting

Beca prepared reports to document the outputs of the above project phases. At the completion of the research the NZTA was supplied with all geospatial datasets as a collection of geospatial files in ESRI shapefile format.

1.7 Sourcing and collation process

The data sourcing and collation process for each spatial layer followed these basic steps:

1 Identification of the owner of the spatial dataset (in some instances the NZTA already held some of these spatial datasets).

2 Where a clear data owner was identified, contact was made with data owner and request for copy of data made.

3 Where data owners were ambiguous, data was sourced from alternate sources including holders of copies of datasets and other sources of public information, for example internet sites.

4 All data sources and data requests (date, names and type of request – email, phone call) were recorded. All follow-up requests and responses (or lack of) from data owners were recorded.

1.8 The collection and collation process

Twenty-nine discrete datasets were collected and collated from 89 separate data providers, ranging across central government departments and ministries, government agencies, private organisations and local government, including 78 territorial, unitary and regional government authorities.

1.9 Findings from the data collection and collation process

Findings from the data collection and collation process were varied:

- Most local government organisations and the majority of non-local government organisations (private companies, state owned enterprises, ministries, departments and other Crown agencies and organisations) responded to requests for data.
- All non-local government organisations made their datasets available to the NZTA free of charge and with low-impact data use conditions or agreements. Most local government authorities provided their datasets free of charge with low-impact data use conditions or agreements. However, some local authorities required the NZTA to sign a restrictive data licence and some required payment of a fee before providing the data. This fee was however small in most cases.
- National and local datasets were more freely available than regional datasets. Regional councils were contacted for a number of datasets but on the whole were unable to provide them as they either did

not hold the datasets, or those they held were not exactly what was required for this project, or they were unable to meet the project's deadlines.

- The quality of the data collected and collated varied from dataset to dataset, and provider to provider.
- Following the data collection and collation all datasets were processed so they were provided to the NZTA in adherence to the NZTA spatial data standards. In all, 154 discrete datasets were provided and processed.

1.10 Uploading into the NZTA Spatial Viewer

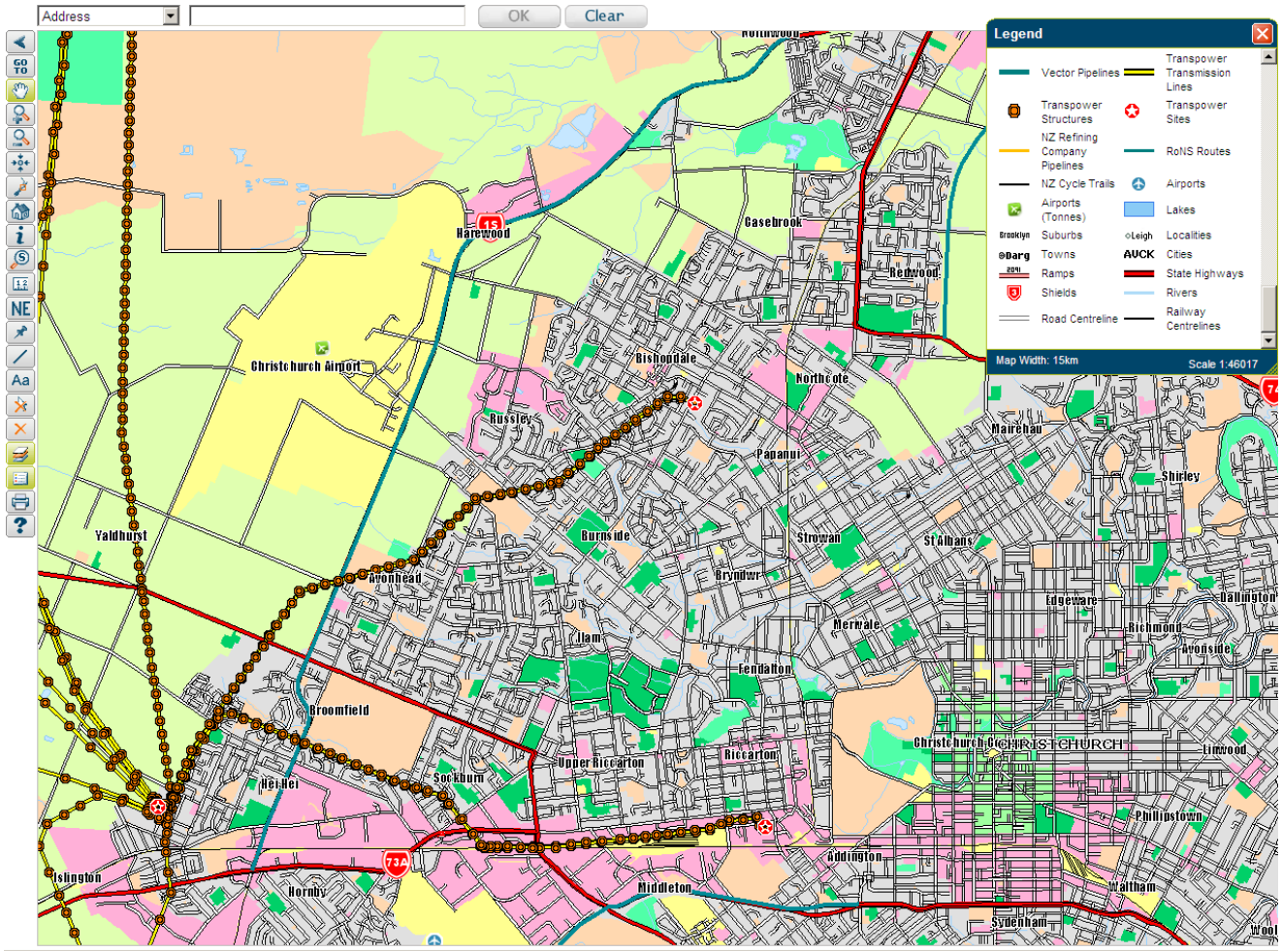
There was little conformity to the data with each data provider following their own standards and naming conventions. Similar datasets were combined, such as the district plan zones, to enable the Spatial Viewer to show a national representation of the data, while data for some individual locations, such as parking facilities, needed a little manipulation before being loaded in the Spatial Viewer.

A thorough audit was carried out to ensure the cartographic representation of the new data layers conformed with Spatial Viewer's existing data.

1.11 Data use

Please contact the Geospatial team at the NZTA email address spatial@nzta.govt.nz if you would like more information about the data layers held.

Figure 1.1 Excerpt of Spatial Viewer showing land use, utility and airport data



2 Summary of collected and collated spatial information

Category	Layer	Sub-layer	Summary of dataset	Summary of collection/collation
Networks/transport corridors	Road networks	State highways	The state highway network including all state highway classifications	Data layer held by NZTA.
		Roads of national significance	This dataset represents the location of roads of national significance (RoNS). The detailed location of individual RoNS is somewhat determined by the status of the RoNS project (investigation and reporting, detailed design or under construction) and the information available.	Collected and collated by Beca.
	Freight routes	National	Key major freight routes on the state highway network.	Data layer held by NZTA.
	Tourism routes	National	Key major tourism routes on the state highway network.	Data layer held by NZTA.
	Airports	National	This dataset illustrates the location of all airports and heliports in New Zealand.	Collected and collated by Beca.
	Ports		This dataset illustrates all commercial ports in New Zealand.	Collected and collated by Beca.
	Coastal shipping routes		This dataset illustrates generalised commercial freight shipping routes between New Zealand ports.	Collected and collated by Beca.

Category	Layer	Sub-layer	Summary of dataset	Summary of collection/collation
	High-level public transport (PT)	Quality transit networks (QTN)	This dataset illustrates quality transit network routes in major cities in New Zealand.	Collected and collated by Beca. Limited data available.
		Rapid transit networks (RTN)	This dataset illustrates rapid transit network routes in major cities in New Zealand.	Collected and collated by Beca. Limited data available.
	Cycle networks	National	This database illustrates the generalised location of Quick Start tracks that form the New Zealand Cycle Trail Project.	Collected and collated by Beca.
	Rail networks		This dataset illustrates the location of rail networks in New Zealand.	Collected and collated by Beca.
	Designations	Rail	This dataset illustrates the location of rail designations in New Zealand. It includes the proposed Marsden Point Rail Link designation.	Collected and collated by Beca.
	Limited access roads (LAR)		This dataset illustrates spatially the location of limited access roads (LAR) in New Zealand	NZTA dataset.
Locations	Parking facilities	Parking buildings	This dataset illustrates the location of parking building facilities in the major cities and towns in New Zealand.	Collected and collated by Beca.
		Park and ride	The dataset illustrates the location of park and ride facilities in Auckland and Wellington.	Collected and collated by Beca.
Land use and demographics	Land use	Zones	These datasets illustrate land-use zoning in territorial authorities and unitary authorities	Collected and collated by Beca.

Category	Layer	Sub-layer	Summary of dataset	Summary of collection/collation
			(council) as defined in district plans. A large number of files comprise this dataset, reflecting the large number of councils in New Zealand. Each council may store zoning data as one geospatial dataset, or as multiple datasets. Each council can have different ways of describing land-use zones. Some common zone types include residential, rural, commercial and industry, but across the whole of local government many variations and zone types exist. In some councils zone types such as commercial may vary from one council to another.	
		Metropolitan urban limit (MUL)	This dataset illustrates metropolitan or urban extents as defined by councils. Each council can have different definitions for a metropolitan urban limit or urban extent.	Collected and collated by Beca.
	Growth/ intensification	Centres	These datasets illustrate growth/intensification centres as defined by regional, territorial or unitary authorities.	Collected and collated by Beca.
		Corridors	This dataset illustrates growth/intensification centres and corridors as defined by regional, territorial or unitary authorities.	Collected and collated by Beca.
	Major utilities	Transpower	This dataset illustrates the location of Transpower assets across New Zealand (the assets include	Collected and collated by Beca.

Category	Layer	Sub-layer	Summary of dataset	Summary of collection/collation
			electricity transmission lines, substations/ switchyards, towers and fibre-optic cables).	
		Vector (national high-pressure gas lines)	This dataset illustrates the location of the Vector high-pressure gas transmission pipeline network in New Zealand.	Collected and collated by Beca.
		New Zealand Refining Company (oil pipelines)	This dataset illustrates the location of the New Zealand Refining Company petroleum transmission pipeline.	Collected and collated by Beca.
	Populations	Population density	This dataset illustrates population density in New Zealand based on the 2006 Census dataset. Density is represented as a calculation of usually resident population per hectare.	Collected and collated by Beca.
		Population age	This dataset illustrates population age by range in New Zealand based on the 2006 Census dataset.	Collected and collated by Beca.
Environmental risks	Climate/weather		This dataset illustrates sections of the rail network and state highway network in New Zealand less than 5m above sea level. This dataset was generated as part of *NZTA research report 378* 'Climate change effects on the land transport network' (2009).	Collected and collated by Beca.
		Flooding	This dataset illustrates recorded floods on the rail and state highway network during 2006 and 2007. This dataset was generated as part of the *NZTA*	Collected and collated by Beca.

Category	Layer	Sub-layer	Summary of dataset	Summary of collection/collation
			research report 378 'Climate change effects on the land transport network' (2009)	
		Ice	No suitable national dataset illustrating areas of rail or state highway network at risk from ice were identified.	No suitable dataset – therefore not collected.
	Hazards	Earthquakes	During the layer collection process it was decided the required data for this group would simply be the fault lines as illustrated on the GNS QMAP series maps.	Fault lines as illustrated on the GNS QMAP series maps already held by NZTA.
		Coastal erosion	No suitable national dataset illustrating areas of rail or state highway network at risk of coastal erosion were identified.	No suitable dataset – therefore not collected.
Other	Supported strategies and endorsed packages		This dataset illustrated areas where there were supported strategies and endorsed packages.	Collected and collated by Beca.