GHD
Glenn Coppard

CLIENT: SKM/NZTA

SCOPE:

40km extension of the Auckland Motorway network in New Zealand.

12d DIMENSIONS:
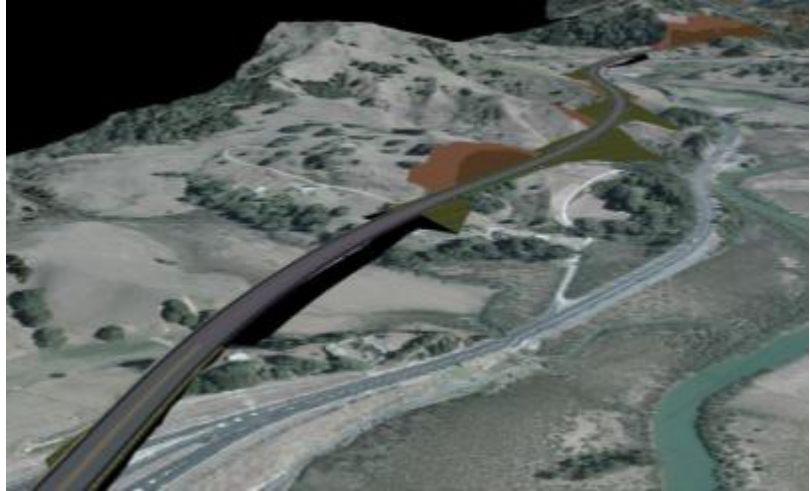- Roads and Highways

SCOPE:

The purpose of this project is to improve State Highway 1 between Pūhoi and Wellsford in the northern Auckland region.

Project Summary

Route Selection to Scheme Assessment for the ~40km extension of the Auckland Motorway network, from the north of the Johnston Hill Tunnels at Pūhoi, to Wellsford.

The study area covered over 550km² of rugged hill forest and farm land, with over 1,000km of route design produced and documented using 12d Model software. The 'Preferred Route' for the section from Pūhoi to Warkworth was later announced following public consultation.

For more information

To find out more about how you can create better designs faster with the 12d Model solution for civil engineering design, visit www.12d.com.

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Ara Tūhono - Pūhoi to Wellsford
Road of National Significance

The Challenge

GIS was required to identify potential routes, based on weighted constraints *e.g.* Social, Economic, Environmental, and topography.

Some 30+ long listed routes were to have alignments created and earthworks produced for comparative and multi-criteria analysis to be carried out.

Within the study area, 14 geological terrain systems were identified, with highly varied characteristics and irregular boundaries. The design of any earthworks in 12d Model needed to take into account the high variability of the geology along the route, as well as with depth of cut/fill.

The process needed to be robust, flexible and consistent across all routes identified, and fast, given the length of each route and quantity to be assessed over a short project time frame.

The Solution

Decisional Templates were the obvious/traditional tool to use to cater for the varied batter profiles given the depth of the alignment from the existing ground.

These were then taken one step further and given a form of spatial awareness so batter profiles could be suited to the varied geological terrain systems encountered along the alignment, taking away the need for designer intervention at terrain system boundaries.

This drastically sped up the initial creation of alignments, and resultant fine tuning to meet desired cut/fill ratios.

The process of adding spatial awareness to the decisional template was largely straightforward, albeit slightly abstract; the various terrain systems were assigned elevations and triangulated to create a tin with various plateaus. This was the basis of the spatial decision making, with all batter scenarios contained within the one template and covering the entire route (excluding overrides for structures where required).

The completed routes (including *e.g.* interchanges, tunnels, viaducts and MSE embankments) were documented straight out of 12d Model to DWG format for compliance with company QA, and to PDF for detailed engineering assessment where required. Volumes were sent to Excel and into GIS using shape files for back analysis of social/environmental effects and potential land requirement.

Result

Benefits of the project include reducing congestion during peak periods, as well as improving economic development and tourism opportunities in Northland.

12d Model

Roads and Highways

12d Model's design option is the smarter solution for the design, modification and maintenance of Road and Highway projects.

Enjoy advanced 3D tools to design local and major roads, intersections, roundabouts, highways, interchanges and much more.

Ports and Dredging

12d Model is the solution for port infrastructure and dredging, easily managing the very large datasets and complex volume calculations often required by these projects.

A complete range of flexible and customisable volume calculation tools allow teams to extract and present the information quickly and easily.

Land Development

12d Model is the most versatile solution for the creation of sustainable land development projects, including residential, commercial and industrial developments, recreational areas, landfills, and agriculture projects.

Easily manage all aspects of your land development project from earthwork quantities, road design utilities and drainage design.

Airport Infrastructure

12d Model provides a solution for the design, construction and analysis of new airports, as well as the upgrade and maintenance of existing runways and airport infrastructure.

Easily manage large airport infrastructure projects and share data across multi-disciplinary teams.

Rail

12d Track has been specifically designed for the survey, design and construction of light, heavy and high speed rail projects.

Extensive railway tools in 12d Track allow the rail designer to quickly and easily design their projects. These options are built on the existing 3D modelling and design tools available in 12d Model.

Mining Infrastructure

12d Model's powerful set of exploration, site investigation, survey and analysis tools are crucial for the initial design, construction and ongoing operation of mining projects.

Comprehensive tools for the survey, design and construction of access roads, railways, earthworks and services allow for the coordinated design and management of mining infrastructure from within 12d Model.

Drainage, Sewer and Utilities

12d Model provides comprehensive tools for the design, analysis and optimisation of stormwater and sewer projects using rational, dynamic (hydrograph) and 2d drainage methods.

Powerful clash detection management allows for efficient 3D modelling of service networks such as gas, electricity, telecommunications and water prior to construction.

Surveying

12d Model is a complete surveying package providing the tools to manage all facets of surveyed data including LIDAR, topographical, as-built, conformance, traversing, geodetics, data mapping, labelling and much more.

The 12d Field option runs on a ruggedized tablet and gives the user access to full 12d Model functionality, allowing you to take the entire project into the field with the most comprehensive pick-up and set-out tools.

Oil and Gas

12d Model assists with the design, construction and mapping of oil and gas pipelines, original site exploration and the wide range of infrastructure required for oil and gas projects.

Accurate 3D modelling and the ability to share data between users allow teams to quickly and easily coordinate designs.

Construction

12d Model is the ultimate software for construction with powerful set-out options, direct interfaces to machine control and detailed conformance reporting and auditing.

Manage 3D data and control volumes, quantities and progress claims with 12d Model. Set-out your project and undertake conformance and as-built surveys live on-site using 12d Field.
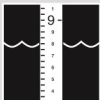
Rivers, Dams and Hydrology

12d Model handles very large datasets and interfaces with a wide range of analysis packages, making it perfect for flood studies and the management of rivers and dams.

12d has partnered with industry leading analysis software, allowing users to apply 2D drainage analysis from within 12d Model.

Environmental

12d Model's ability to handle very large datasets combined with flexible and comprehensive 3D analysis and modeling tools make it perfect for a wide variety of environmental projects.

Existing workflows can adopt 12d Model easily as it allows users to directly interface with GIS systems and most software packages and file formats.

Why Choose 12d?

- **Powerful data processing & intelligent functionality.**
- **Modular, easy to update & completely customisable.**
- **Seamless integration with major industry software and hardware.**
- **Used in over 55 countries worldwide.**
- **Friendly support & training from industry experts.**

12d® Model