

**MWH NZ Ltd**  
Stephen Bennett

CLIENT: Tasman District Council

SCOPE:

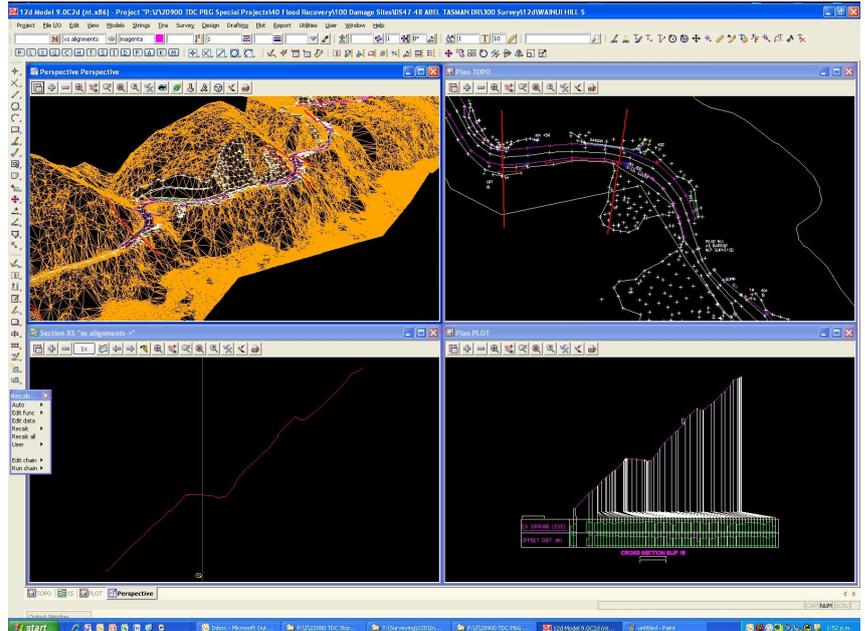
Flood slip recovery

12d DIMENSIONS:

- Surveying

# Flood Slip Recovery

## Wainui Hill



*Sections can subsequently be cut quickly for design coordination and construction planning*

## Project Summary

December 2011 brought unexpected record rainfall and slips to the Nelson/Tasman region of New Zealand. Wainui Hill in Golden Bay was just one example of the downpour's aftermath, with 25 slips over a 2km stretch resulting in hill closure & house evacuations.

Geotech Engineers required a quick set of survey data to enable visual extents of slips and their catchments, enable profiling along testpits, to produce geotech reports/costs on options.

Roading Engineers required a DTM model showing existing carriageway and structures to enable concept road design to accompany remedial work options.

## 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](http://www.12d.com).



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## The Challenge

With the short time frame provided, and the steep, bush-clad environment, it was decided to use the Council's existing LiDAR data. This, of course, did not include the new slips, and LiDAR point data files are huge and cumbersome (Excel would not open them for edit in one go); many software products cannot handle them, and the data is not as accurate in level.

Some existing road/recent slip asbuilt data was available in older formats, but this information differed in coordinate and level datums.

Field surveys were undertaken over four days to gain GPS control where reception was available, and robotic total station topographic surveys undertaken of each slip site as well as road edges, culverts, and structures.

LiDAR level datum was validated as good enough for purpose (prelim road design alignments) on road surfaces and good enough though less accurate for geotechnical purposes in vegetated areas above and below the actual slip sites.

## The Solution

The job was divided into two parts (each side of hill) for ease of use and because one side was reported on first (though 12d Model software could easily have handled it as one project).

The robotic topographic survey traverses were easily adjusted to the GPS control using Survey Adjustments Helmert 2d (advanced). Old data was imported using the File I/O data input DXF import, then adjusted to match GPS control and converted using NZ Conversions. This created a combined actual surveyed data set of slip surfaces and road edges or CLs, culverts, etc. 12d Model's ability to display different views with different datums all in one project, and the ease of conversion (and not having to worry about overlapping point numbers!), made this task a relative 'breeze'.

The LiDAR data was imported using x,y,z pt id input. The ease of the format options was helpful as it enabled the team to bypass the problem of editing huge files in a third-party product, by simply ticking what columns were to be imported, and indicating in what



*Wainui Hill Tataranui Road. Flood 2011. Photo by Tasman District Council.*

order. These four tiles were huge, so the team employed the FENCE routine, by only bringing in the points required inside a drawn polygon (fence).

A polygon was also drawn around the extents of the merged topographical surveys. Using FENCE, this time from the Utilities menu, the LiDAR data inside the topographic polygon was easily fenced out and deleted. By turning on the remaining LiDAR data and the more accurate topographical models, the team gained a complete set of data which was used to create the TIN model. This method led to an excellent TIN and contour model without the rough edges that can occur (because of the huge number of LiDAR points) when creating super tins between data of differing qualities.

The visual representation for the geotechnical engineers was achieved by simply creating a perspective view and toggling on SHADE, then turning on the appropriate models (roads, slips, culvert strings, *etc.*) that show in surveyed positions on the TIN. By using TIN DRAPE tool, the legal boundaries could even be represented over the TIN. All in all, a successful presentation of data was achieved.

Profiling of slip sites was then undertaken by creating a simple line string through test pit sites and extending above and below the slip sites, then draping over the TIN (visually seen live on screen). PPFs were then edited to show appropriate string cuts, *etc.* Outputs to other programs were also performed, to be included in reports, and the overall model used by the road designers for design alignments.

## Results

As a relatively basic survey team still learning to use 12d Model software, and with no Visualisation module yet installed, 12d Model proved to be the ideal answer to everyone's needs - the simple learning curve and time saving opportunities made what would have been a near-impossible task much easier.



*Rocks Road slip, December 2011. Photo by The Nelson Mail.*



## 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.

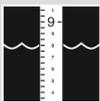
Accurate 3D modelling and the ability to share data between users allow teams to quickly and easily coordinate designs.



## 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.**

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