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David Greaves

TMR 12d Model Customisation

WINNER: SURVEY & CONSTRUCTION

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2016

Name:	David Greaves on behalf of the Department of Transpo	**Category:**
Position:	Surveyor	☒ **Design & Visualisation**
Company:	Department of Transport and Main Roads	☒ **Survey & Construction**
		☐ **Drainage, Sewer, Utilities & Rivers**
Name Project:	TMR 12d Model Customisation	☒ **Customisation**
Client:	n/a	☐ **12d Synergy**
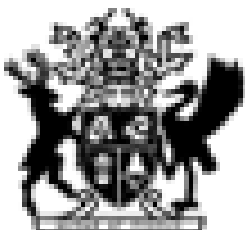
Queensland Government
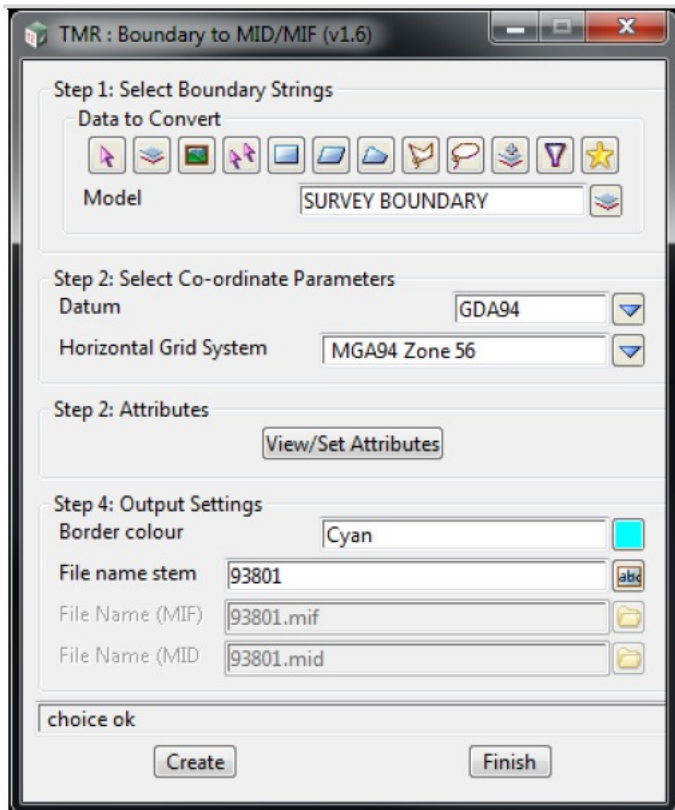
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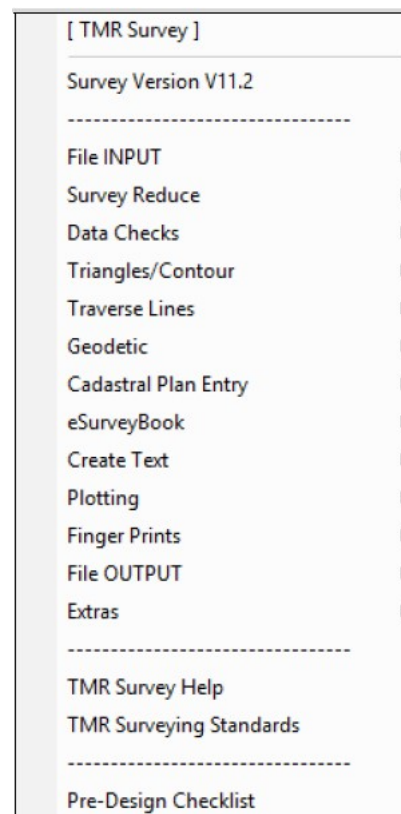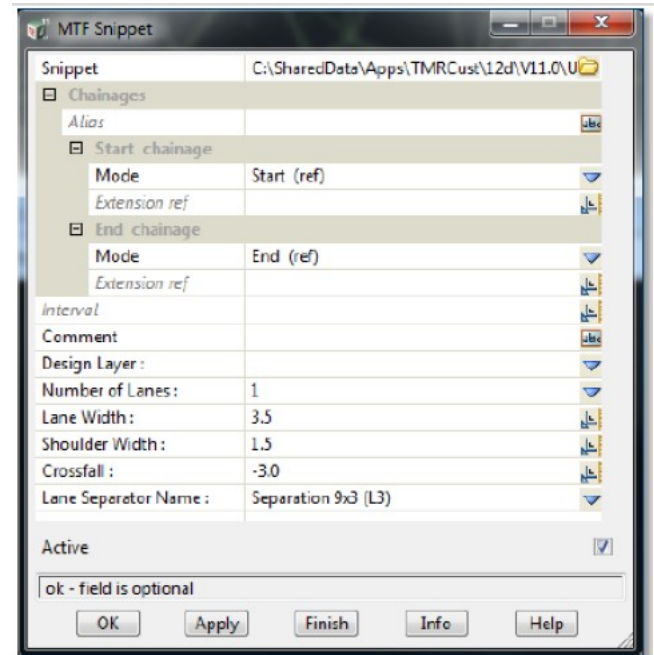Figure 9: TMR Boundary to Mid/Mif Macro

Figure 2: TMR Survey Menu

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Description of Project:

The Transport and Main Roads 12d Model Customisation is a product of the *Transport and Main Roads Surveying Standards*, *TMR Standard Drawings* and *Drafting and Presentation Manual* determined by the Engineering and Technology Branch.

The customisation is based around the Department's string naming convention and has been designed to expand upon the techniques and methodologies developed by the Department to make the process of producing drawings more efficient and productive. This customisation is in a continual process of development as new ideas are introduced with each new version released.

Description of problem faced / task undertaken:

The problem faced by the Department of Transport and Main Roads was one of how to ensure that a consistent product was produced within the Department of Transport and Main Roads as well as from external consultants performing work for the Department.

The Road Infrastructure Design Process project (2009) identified as a main goal "*The refinement of the end to end Business Process to exploit 'strong-point' functionality of 12d Model by delivering richer information collected by Survey and integrated into Planning, Design, Tendering and Construction, through the consistent use of 3D electronic models in a highly visual environment*"

The TMR 12d Model Customisation continues to support this vision through the development of tools that support and encourage the 'complete' modelling of the elements that comprise a road infrastructure project.

How the problem was solved:

To ensure a consistent product was delivered and to make workflows more efficient the TMR 12d Customisation was first introduced for v3 of 4d Model. This involved the creation of custom files incorporating the string labelling convention, colours, linestyles, mapping files and macros.
Further to this a series of User Menus were developed to assist users efficiently process their data.
These menus are based on the Discipline and also the data being processed. (*Refer to Figure 1: TMR User Menu*)

Within the Survey Discipline the User Menu has been formatted such that it follows the workflow that a surveyor will be required to follow when processing information. (*Refer to Figure 2: TMR Survey Menu*) Embed within this menu are inbuilt 12d Model commands and macros that have been developed to check the quality of the survey information and generate reports to ensure that survey information meets the *Transport and Main Roads Surveying Standards*.

Inputs include:
- Permanent Mark macro that performs a search of the Survey Control information contained on the Queensland Spatial Catalogue (http://qldspatial.information.qld.gov.au/catalogue/custom/index.page)
- DCDB Import macro that downloads the most current DCDB information from our internal Oracle Server. (*Refer to Figure 3: DCDB Import Macro*)
- TMR Calculate Uncertainty macro that will calculate the Survey & Positional Uncertainty for marks that have been adjusted in TBC and import them into 12d Model. (*Refer to Figure 4: Calculate Uncertainty Macro*)

Checks include:
- Quality string report used to compare independently located quality strings to the TIN (*Refer to Figure 5: TMR QQ Report Macro*)
- Single Point String Check used to check for any single point line strings.
- Missing comment macro used to check for codes that have not been commented in the field.

Reports include:
- Height log report used to compare the differences between levelled mark heights and their corresponding trigonometric height value and update the height in 12d to the levelled height.
- Geodetic report extractor that customises the default 12d geodetic report into a structure suited to TMR as well as generating a table on screen. (*Refer to Figure 6: TMR Geodetic Report Macro*)
- Feature points report file that generates a report of all those points that have a comment.

Once the data has been processed and checked a series of macros have been developed to generate custom outputs to assist with data transmittal and archival.
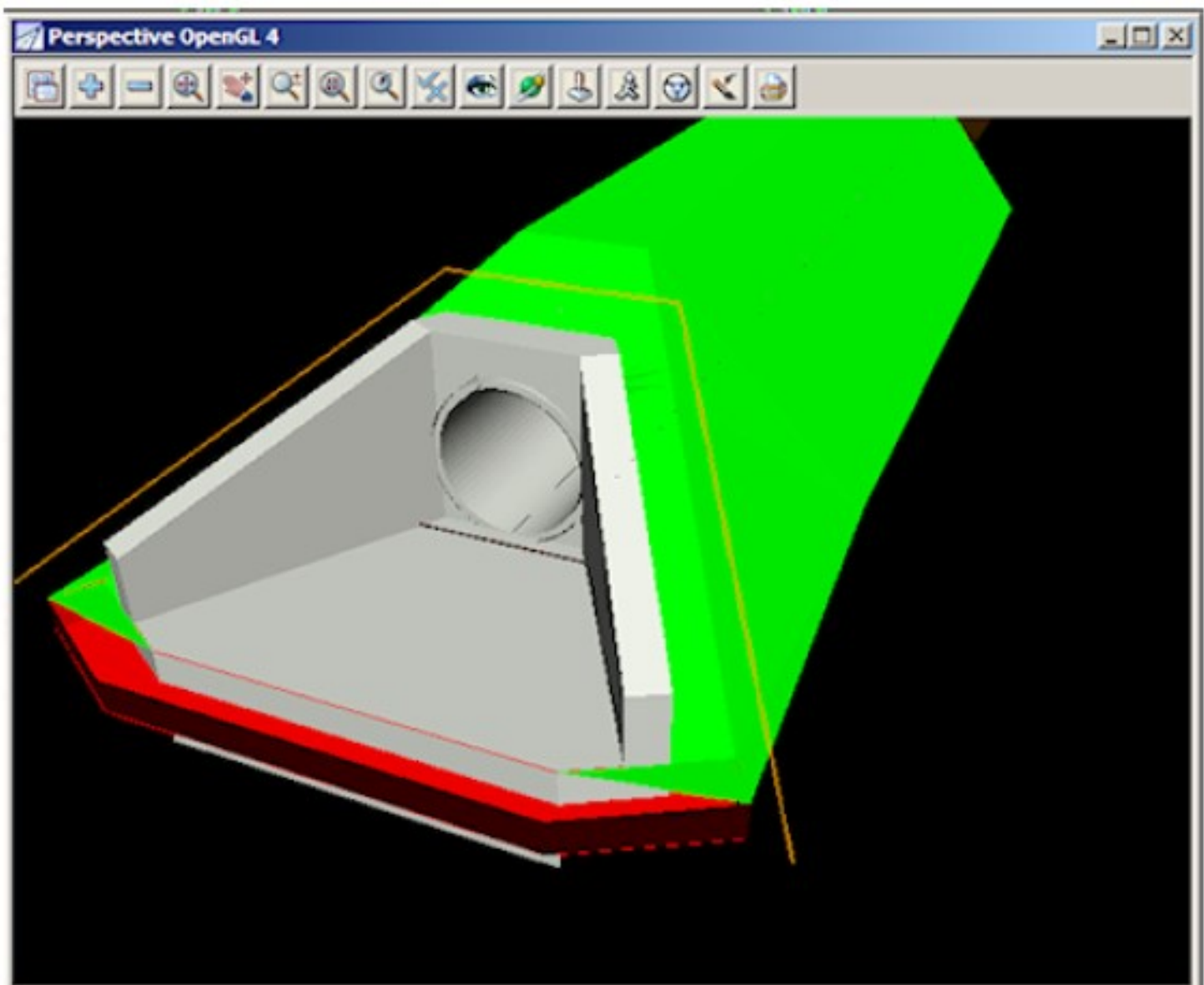
These include:

- The Metadata macro creates an attributed Model that contains a text block with all the information relevant to the project. (*Figure 7: TMR Metadata Macro*)
- File Output macro that applies a fingerprints to each of the Models to ensure the information provided by the Surveyor has not been altered. These Models are then packaged up as a series of 12d Archive files inside the MR Archive file. (*Figure 8: TMR Output Macro*)
- The Boundary to Mid/MIf macro extracts the attributes from Metadata Model and generates mid/mif files that include the survey extents from the Boundary Model along with the attributes from the Metadata. These files can then uploaded to the Survey Location Interactive Map (SLIM) which is a record of all the Departments surveys. (*Figure 9: TMR Boundary to Mid/Mif Macro*)

Recently the TMR Survey Customisation has been expanded to include a menu to assist with the checking of Pointcloud data and also that information that has been extracted from it. Like with the Survey Menu it has been structured to follow a workflow to assist the user. (*Refer to Figure 10: TMR LiDAR Menu*)

As part of this expanded menu a number of macros have been developed to assist in the checking process.

These include:
- The Relative Accuracy macro that is used to compare quality strings against a TIN derived from a Pointcloud to check that the TIN correctly represents grade of the road surface in both the longitudinal and cross sectional directions. (*Refer to Figure 11: TMR Relative Accuracy Macro*)
- The Long Section macro that is used to compare a string derived from the Project Pointcloud to the same string draped to each of the individual Pointclouds to check for any significant deviation in a raw run. (*Refer to Figure 12: TMR Long Section Macro*)

Within the Design Discipline a number of tools have been developed to support and encourage the 'complete' modelling of elements that comprise a road infrastructure project.

For Example:
- Culverts
- Noise Barriers
- Guardrails
- Gully Pits
- Road lighting
- Sign meshes
- Design Snippet Library

3D Model Culvert
The Culvert program and associated 12d Macro is used to design and model culverts under roadways in accordance with the Transport and Main Roads (TMR) Standard Drawings for culverts.

TMR Guardrail
This 12d macro creates a guardrail model with visualisation content and plan presentation that is locationally correct based on the requirements of the various standard drawings for steel beam guardrail, including Std Drgs 1474 to 1485, 1488 to 1491 and 1493 and 1494.
The model can then be used to make better assessments of potential clashes with other infrastructure such as services, drainage and structures.
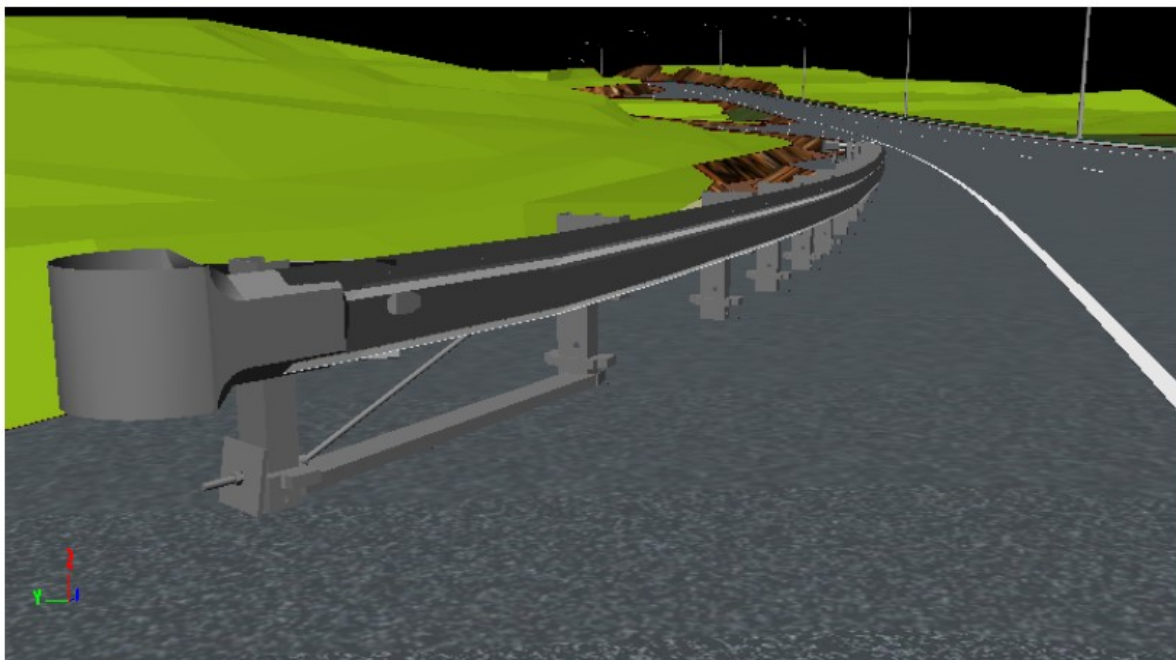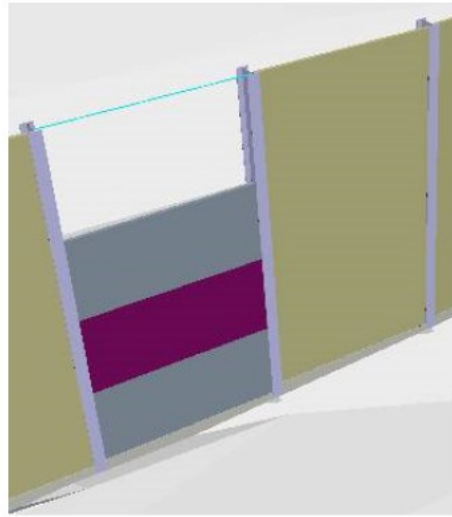
TMR Noise Barrier

The Noise Barrier solution consists of two 12d Model macros that enable you to:
- Define and add a noise barrier model to a road design project.
- Edit or delete an existing noise barrier model.

The models created by this solution represent noise barriers based TMR Standard Drawing 1608.

TMR Gully Pit

The TMR Gully Pit 12d macros enable the modelling of 'cast in situ' concrete gully pits based on TMR Standard Drawings.

TMR Sign Meshes

This 12d macro allows the user to select an MUTCD (Manual of Uniform Traffic Control Devices) sign from a library and specify the following parameters:
- Chainage
- Offset
- Rotation
- Shared post
- Number of posts
- Mounting height
- Post diameter
- Footing depth
- Footing width

The output includes a model of strings with plan view symbols and 3D meshes of the signs. This model can then be used to make better assessments of potential clashes with other road infrastructure, along with better assessments of sign placement impact on visibility and sight distance.

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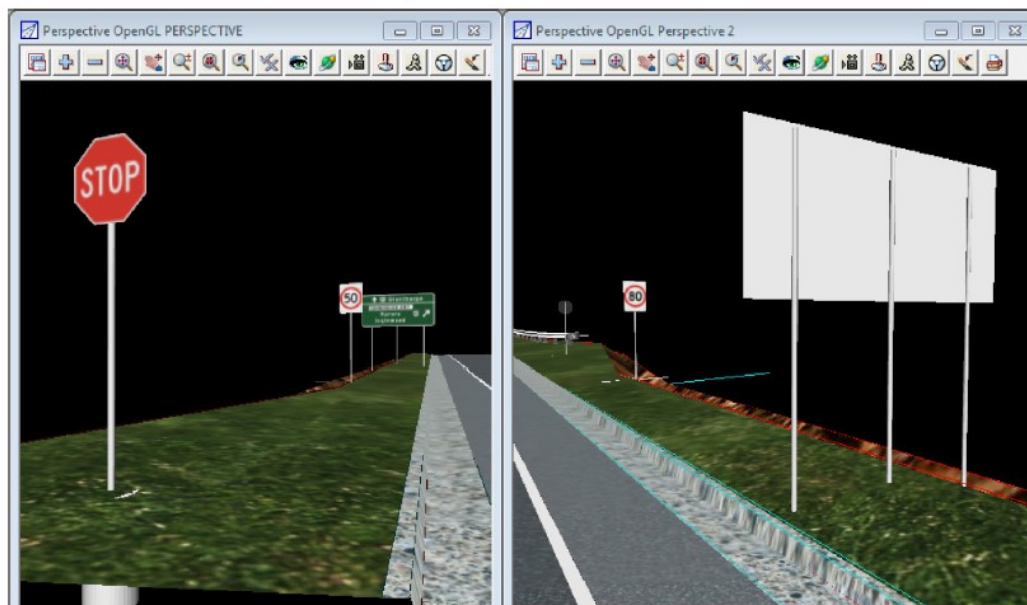
<u>TMR Snippet Library</u>
The TMR 12d customisation for V11 includes a library of Snippets that can be used to perform typical road design modelling functions in 12d Model.
Snippets save time, aid consistency and help in the application of standards.
Highly complicated design processes can be reduced to the application of a single MTF 'snippet' command, with the user supplying the required information, such as lane widths, number or lanes, pavement depths, kerb types etc.

Library contents:
- Carriageway - 0 to 4 Lanes plus Shoulder.mtfsnippet
- Intersection Infill.mtfsnippet
- Kerb And Channel (Std Dwg 1033).mtfsnippet
- Kerb w Channel-Tray - Below Ground - Transition.mtfsnippet
- Kerb - On Surface - Transition.mtfsnippet
- Channels - Transition.mtfsnippet
- Driveway - Centre point.mtfsnippet
- Driveway - Footpath Crossfall - Centre Point.mtfsnippet
- Driveway - 2 points.mtfsnippet
- Driveway - Footpath Crossfall - 2 Point.mtfsnippet
- Verge.mtfsnippet
- Footpath.mtfsnippet
- TopsoilTurfing.mtfsnippet
- Earthworks - Example.mtfsnippet
- Pavement - 3 Layers to batter slope.mtfsnippet
- Pavement - 3 Layers with K and C.mtfsnippet
- Pavement - 3 Layers Between Strings.mtfsnippet
- Pavement - Back Intersection.mtfsnippet
- Pavement - Back Of Driveway - Centre Point.mtfsnippet
- Pavement - Back Of Driveway - 2 points.mtfsnippet
- Subsoil Drain - Type B.mtfsnippet
- Subsoil Drain - Type D - Pavt Edge.mtfsnippet
- Subsoil Drain - Type D - Cutting.mtfsnippet
- Guardrail.mtfsnippet
- Set String Properties.mtfsnippet
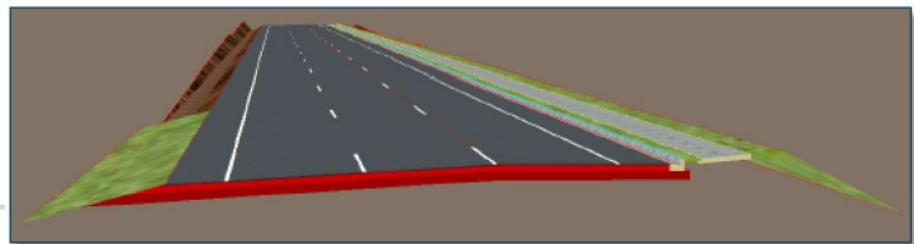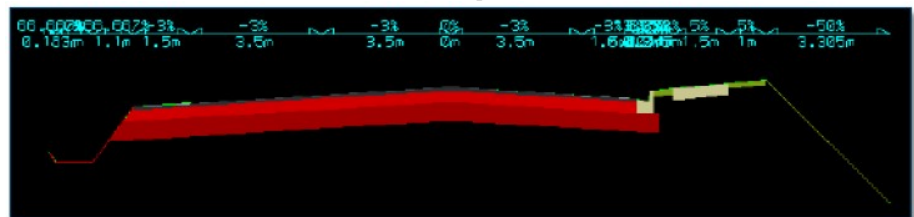
Relevant 12d screenshots and/or data attached:

The current Transport and Main Roads Customisation can be found at http://www.tmr.qld.gov.au/business-industry/Road-systems-and-engineering/Software/Transport-and-Main-Roads-12D-model-customisation.aspx
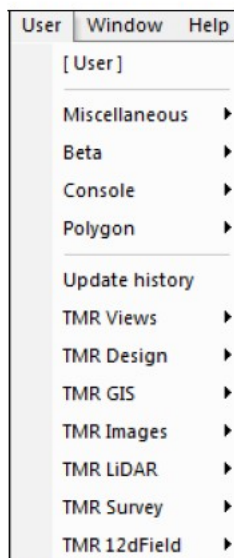
User	Window	Help
[User]		
Miscellaneous ▶		
Beta ▶		
Console ▶		
Polygon ▶		
Update history		
TMR Views ▶		
TMR Design ▶		
TMR GIS ▶		
TMR Images ▶		
TMR LiDAR ▶		
TMR Survey ▶		
TMR 12dField ▶		

Figure 1: TMR User Menu
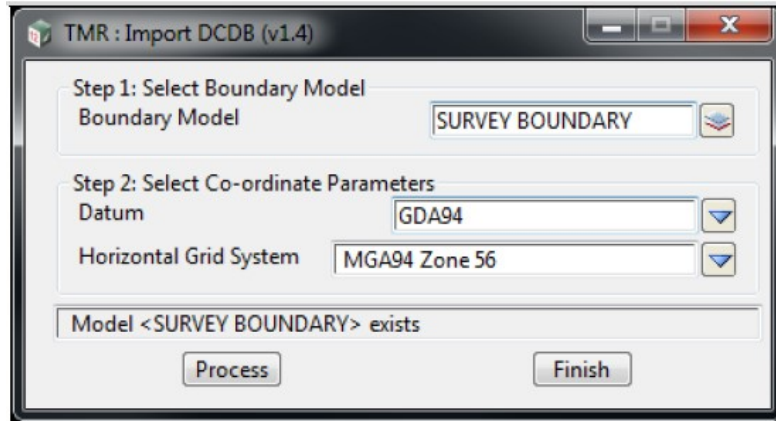
Figure 3: TMR Import DCDB Macro
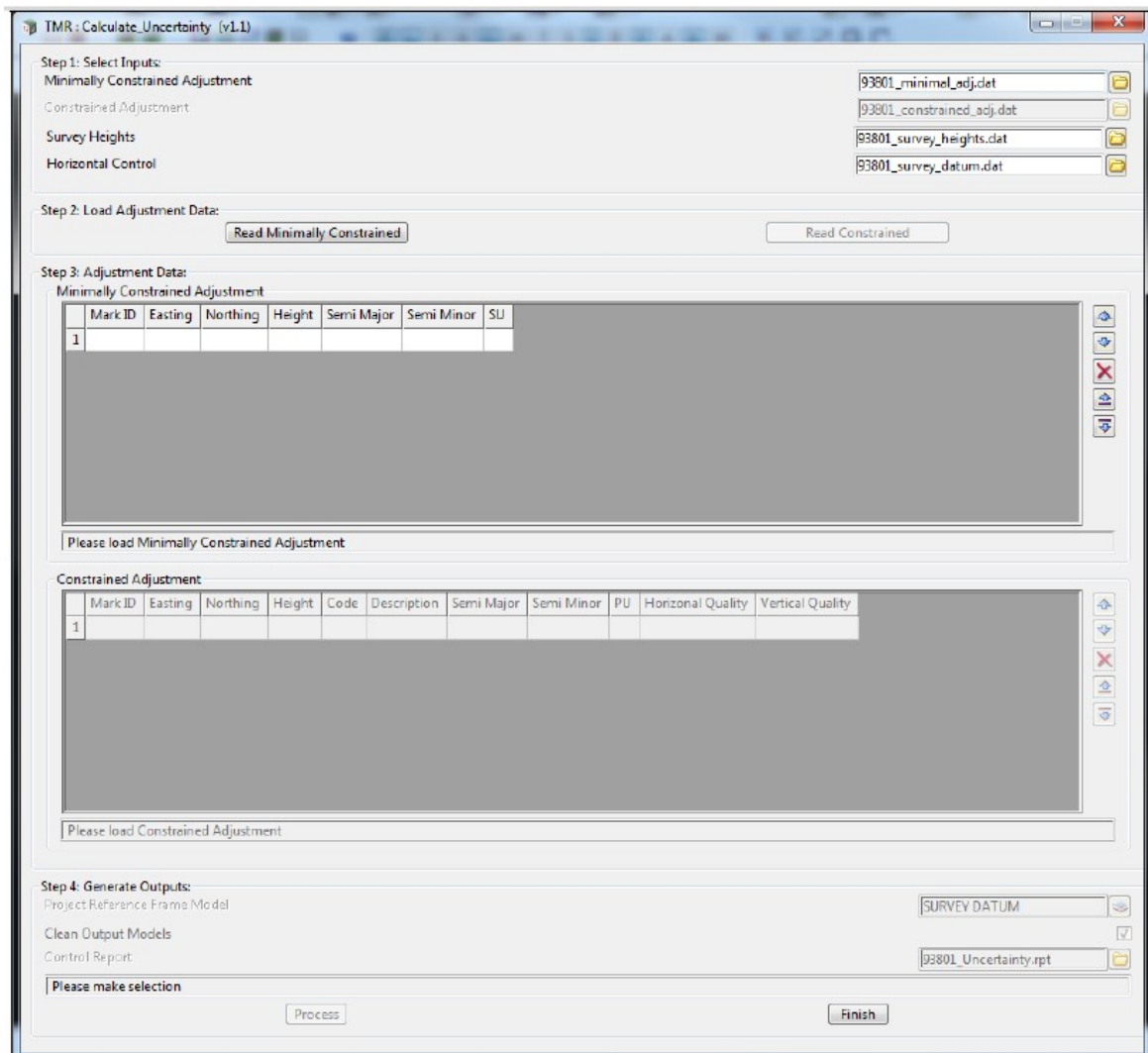
Figure 4: TMR Calculate Uncertainty Macro

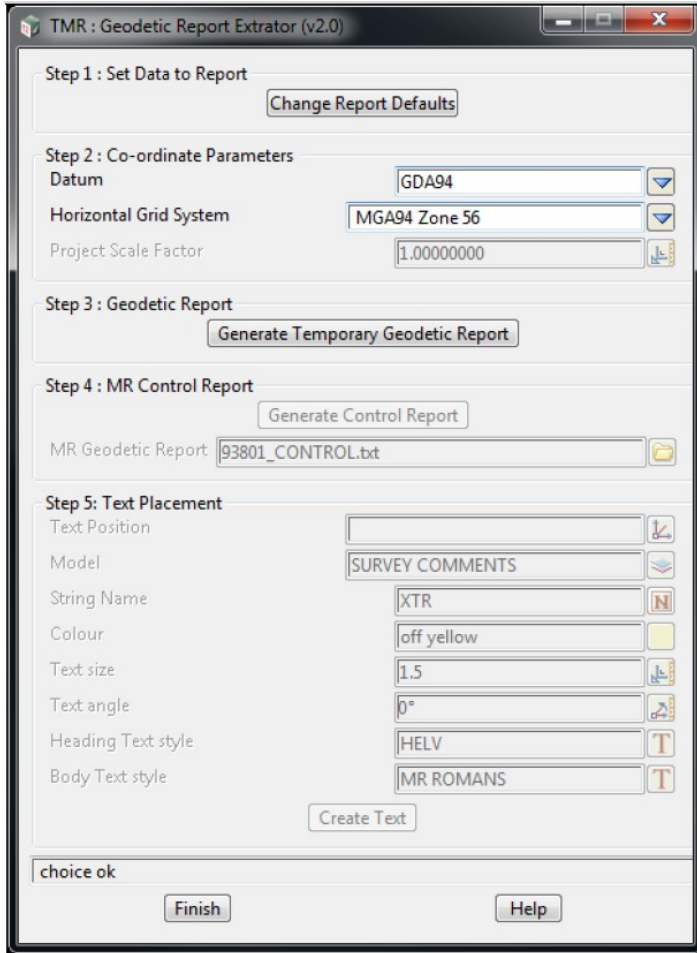**Figure 5: TMR QQ Report Macro**

Figure 7: TMR Metadata Macro

Figure 6: TMR Geodetic Report Macro

Figure 8: TMR Output Macro

Figure 11: TMR Relative Accuracy Macro
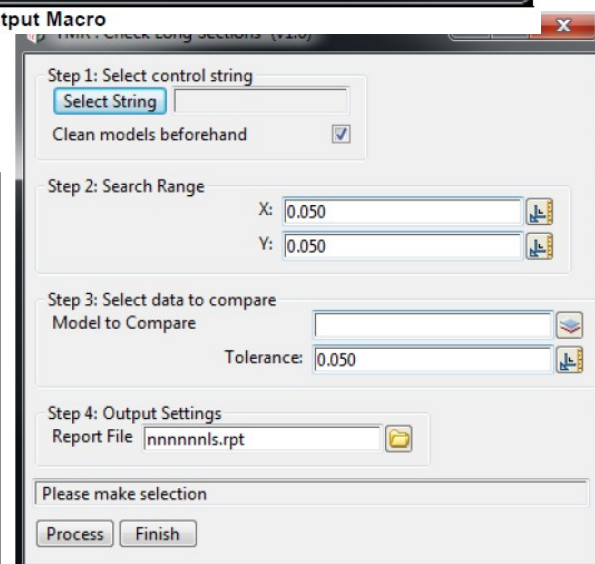
Figure 12: TMR Long Section Macro

Figure 10: TMR LiDAR Menu