

M1 Belfast – Road Surface Deformation

"...this survey technique is unparalleled in speed, data collection and safety"

Stephen Donovan, Construction Services, Belfast

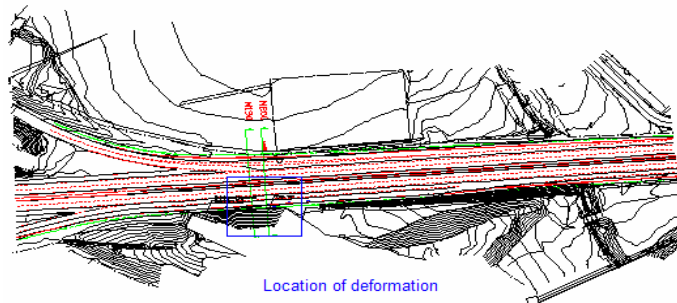
Scope: registered 3d point cloud of deformed carriageway surface, rendered model, 2d CAD plan, dimension and section drawings

Client: Construction Service (Roads), DOE N.Ireland.

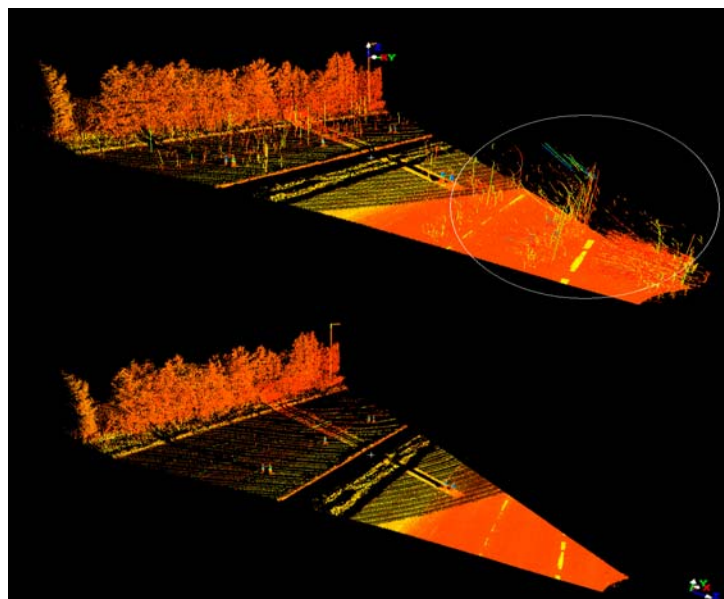
Date: December 2003

Background: After the appearance of a crack on the Belfast M1 exit carriageway surface, the Roads Service instigated a monitoring program using traditional survey techniques (8 survey nails & total station). This involved the closure of both exit lanes out of Belfast with surveying taking place at unsociable hours to minimize disruption to traffic flow and risk to the survey crew.

Construction Service (Roads) DOE, contacted gridpoint solutions Ltd to investigate if a 3d laser scanning High Definition Survey (HDS) of the deformed road surface could replace and improve upon their traditional monitoring program.

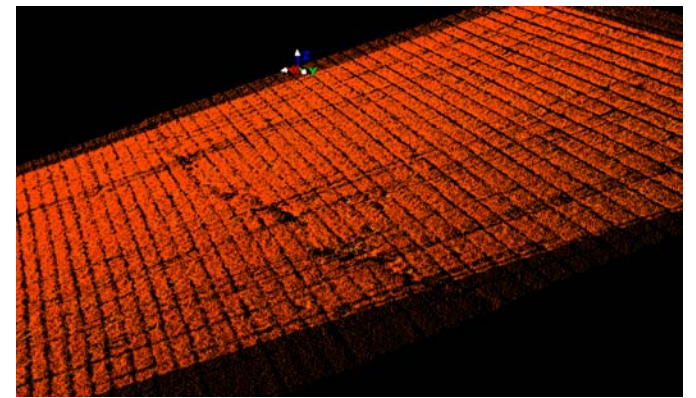


Workflow: Gridpoint Solutions Ltd used the Leica Geosystems 2500 scanner to capture over one million pts on the carriageway surface (1,000 pts/second). The survey, conducted from the roadside, behind the protection of an Armco barrier, took place at peak rush hour traffic without the need for road closure. Due to the rate and number of points (known as a 'point-cloud') a HDS collects, any vehicle passing through the survey area during scanning causes negligible data loss.



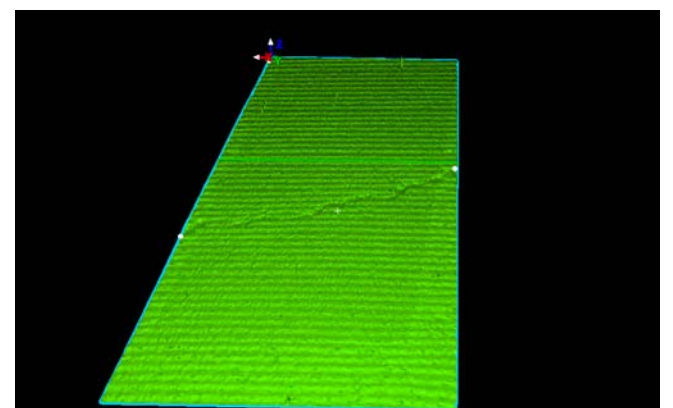
Before and after removal of traffic interference

Back in the office, any interference caused by passing traffic was removed (shown bottom left) using Cyclone™, Leica Geosystems dedicated HDS software. This 'cleaned' point cloud was then rendered to aid visualisation and exported in CAD format. CloudWorx™ plug-in tools were used to "slice" the carriageway surface intelligently, anywhere along the X, Y or Z axes and provide detailed 2d views of each slice directly within AutoCAD™.



M1 3d deformation scan

AutoCAD's™ standard tools (e.g. polygon tool, arch tool, spline tool, etc.) were used to trace, create sections, and dimension the point cloud slices and surface model. Once finished the drawings/models were emailed to the project engineer for analysis.



M1 3d deformation model

Construction Service are extremely impressed with the speed, efficiency and accuracy of High Definition Surveying, especially the benefits of increased safety, reduced staffing levels and zero disruption to traffic flow exiting the city during monitoring and plan to resurvey deformation locations as part of their ongoing monitoring strategy.

Project Facts

Field: 2 person scanner crew, 1 hour.

Office: 1 surveyor, 1 day using Cyclone & Cloudworx.

Deliverable: registered 3d point cloud, rendered model of road surface, 2d CAD section and plan drawings.

Benefits

- Removed need to close busiest exit route from Belfast to conduct survey.
- HDS can be carried out at any time regardless of traffic flow levels.
- Minimal risk to survey crew.
- Increased number of measurements by 10^5
- Very Quick turnaround
- Vastly reduced staff numbers.
- Survey quality and accuracy



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