



The most dangerous phrase in the English language is;

“We’ve always done it this way”

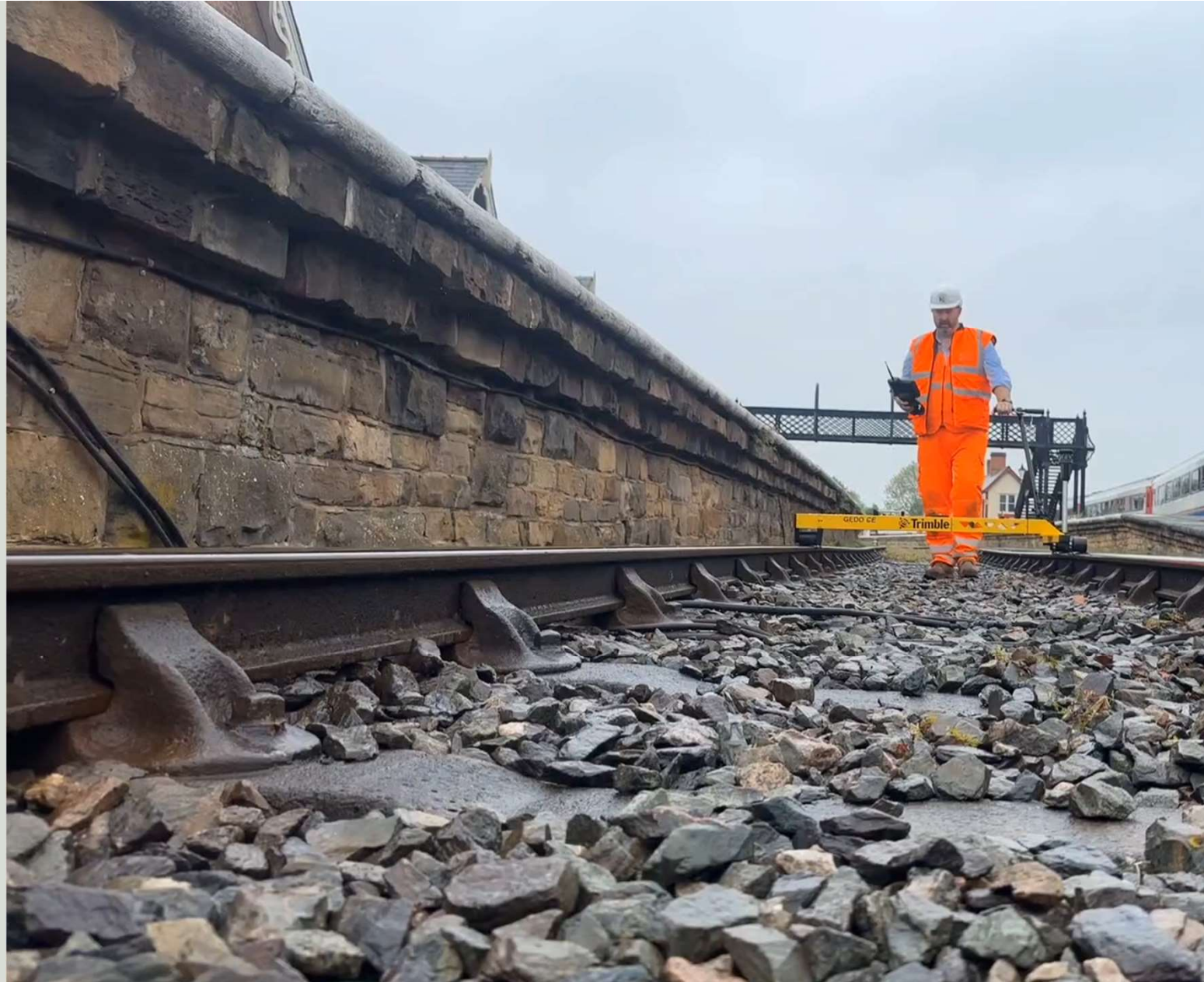
KOREC Rail

Trimble GEDO:
**Survey Innovations for
the future of the railway**

Presenters:

Ric Kirman – National Rail Manager

Matt Barwell – Senior Rail Engineer



KOREC Group

Who are KOREC Group?

- KOREC specialises in providing measurement solutions, surveying equipment & mapping systems for the geospatial, engineering & construction sectors in the UK and Ireland.
- We are proud to be one of the largest and most successful Trimble distributors in the world.
- Additionally, we provide solutions from some of the world's leading manufacturers in the fields of unmanned aerial vehicles, wireless monitoring systems, and 3D point cloud sharing



Trimble & KOREC Rail

Objectives:

- Who are you listening to?
- What is a “GEDO” and why should I care?
- Overview and real-world examples.
- Live demonstration.
- Questions.



Why does it matter?

Why do we care about Track Survey?

It's all about quality and it really matters.

Good Track Geometry = Safer Higher Line Speeds

Here's a great example of poor track geometry.



Why is it important?

Why do we care about Track Survey?

It's all about quality and it really matters.

What happens if it goes wrong?

This is an image of a derailment (Stonehaven August 2020)



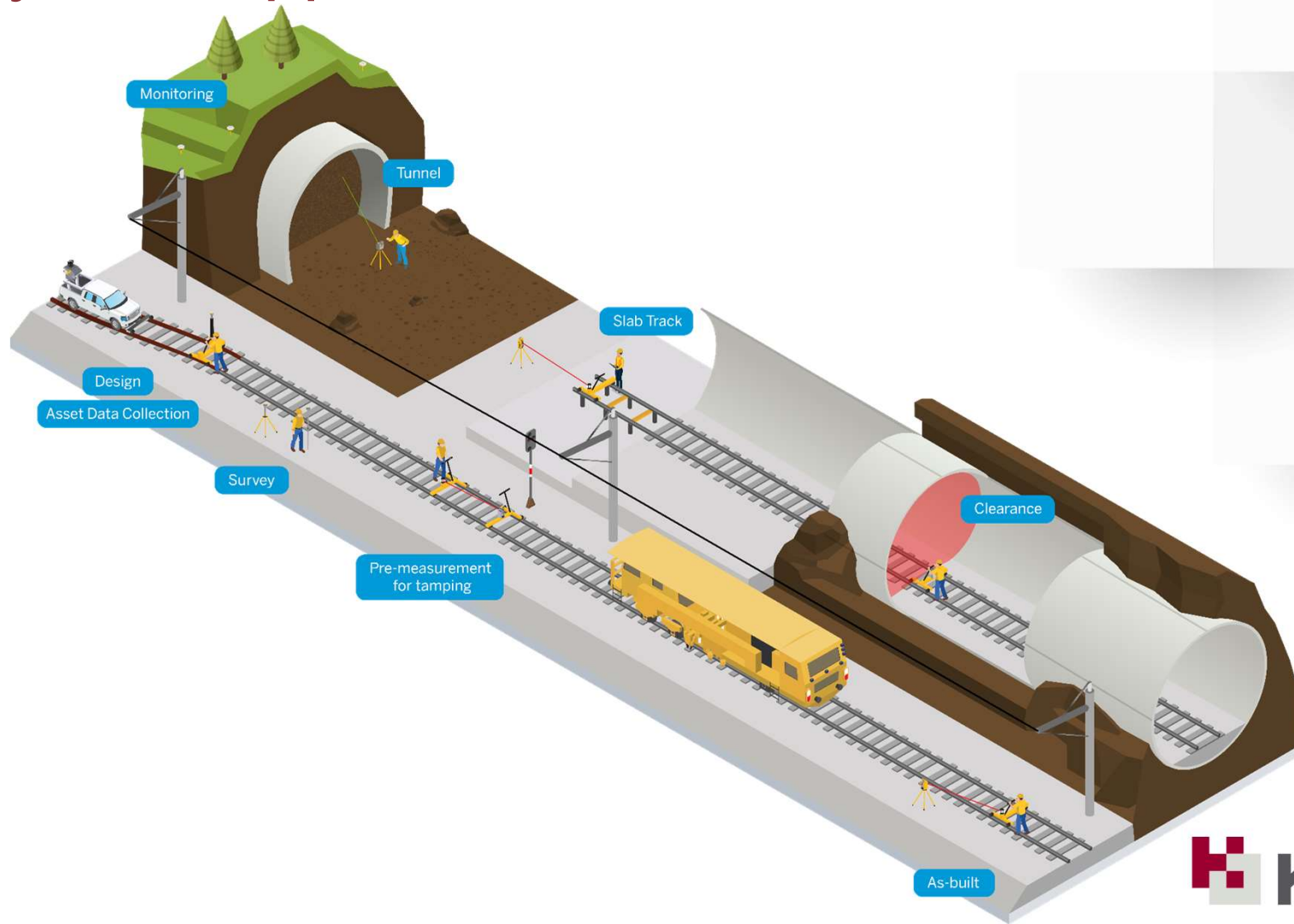
In a nutshell

The Trimble system makes **rail survey** data more **accessible** and **actionable** to the rail industry to allow for collaborative working.

Reducing the time spent on-site and exposure to dangerous working environments whilst increasing accuracy, health & safety and reliability.



GEDO System Applications



GEDO Systems

Track Measuring Device (NOT a Trolley)



GEDO – Doc



GEDO – Rec



GEDO – IMS



GEDO – Scan

There are 4x GEDO Systems we will look at today:

GEDO

Flexible and Modular

Each system features a base TMD

- **GEDO CE 2.0 base unit**
 - *Precise cant and gauge sensor*
 - *Odometer*
 - *Communication*
 - *Illumination*
- **Gauge adapter**
 - *Utilise for differing networks, Country, Metro etc*
 - *Minimum 1000mm gauge*



GEDO – Doc

- Continuous, recording of track gauge, cant and twist
- Live display of the current measured values
- Direct output of results on site
- Recording and coding of relevant features and positions
- Can be easily upgraded

GEDO

Flexible and Modular

Each system features a base TMD

- **GEDO CE 2.0 base unit**

- *Precise cant and gauge sensor*
- *Odometer*
- *Communication*
- *Illumination*

- **Gauge adapter**

- *Utilise for differing networks, Country, Metro etc*
- *Minimum 1000mm gauge*



GEDO – Rec

- TMD captures track position, gauge and cant in a single operation
- Use Total Station or GNSS for positioning
- Fast operation and information capture:
up to 3,000 meters of track per hour using GNSS,
And more than 1,000 meters per hour with total stations
- Merge data from multiple surveys
- Export results to rail design software, and compare existing conditions to design alignments
- Can be easily upgraded

GEDO

Flexible and Modular

Each system features a base TMD

- **GEDO CE 2.0 base unit**

- *Precise cant and gauge sensor*
- *Odometer*
- *Communication*
- *Illumination*

- **Gauge adapter**

- *Utilise for differing networks, Country, Metro etc*
- *Minimum 1000mm gauge*



GEDO – IMS

- TMD captures track position, gauge and cant in a single operation
- Use FOG Inertial Measurement Unit and EDM for positioning
- Very fast operation and information capture:
up to 3,000 meters of track per hour with coordinated,
And up to 5,000 meters per hour relative mode.
- 5 minute setup and initialisation, ideal for rapid deployment.
- Export results to rail design software, and compare existing conditions to design alignments
- Can be easily upgraded

GEDO Office

GEDO Office

- All track survey processing & design Data prep
- Local to Global co-ordinate transformation
- Absolute and Relative reporting
- Track specific handback documents
- Versines, Twist and Gauge as-builts
- Track Monitoring
- Back Edge dimensions
- Track design offsets



GEDO Office

Modules

GEDO Office Base:

Alignment data can be checked to verify the use of the data in the field.

GEDO Office Module Rec:

Station setups can be re-calculated. Coordinate export for the left rail, centre line and right rail together with the cant and gauge values. Based on alignment data the differences between design and as-built are calculated.

GEDO Office Module IMS:

Measured data segments can be analysed and re-processed based on new reference point coordinates as well as merged to a line. The differences between design and as-built are calculated.

GEDO Office Module Tamp:

Measured and processed data from GEDO Rec, GEDO Track, and GEDO IMS measurements can be used. A graphical interface allows an easy ramp definition by occurring on minimum lift values, maximum lift and shift values and other constraints. Data for all common tamping machines can be output.

GEDO Office Module Quality:

Generates reports on the quality of the track. In addition to flexible travel chord evaluations, special calculations can be carried out, Speed Raiser (Network Rail) or TUCRail (Belgium) can be created.

GEDO Office Module Monitoring:

Module for comparison of measurements from different epochs for monitoring tasks and control of tamping work.

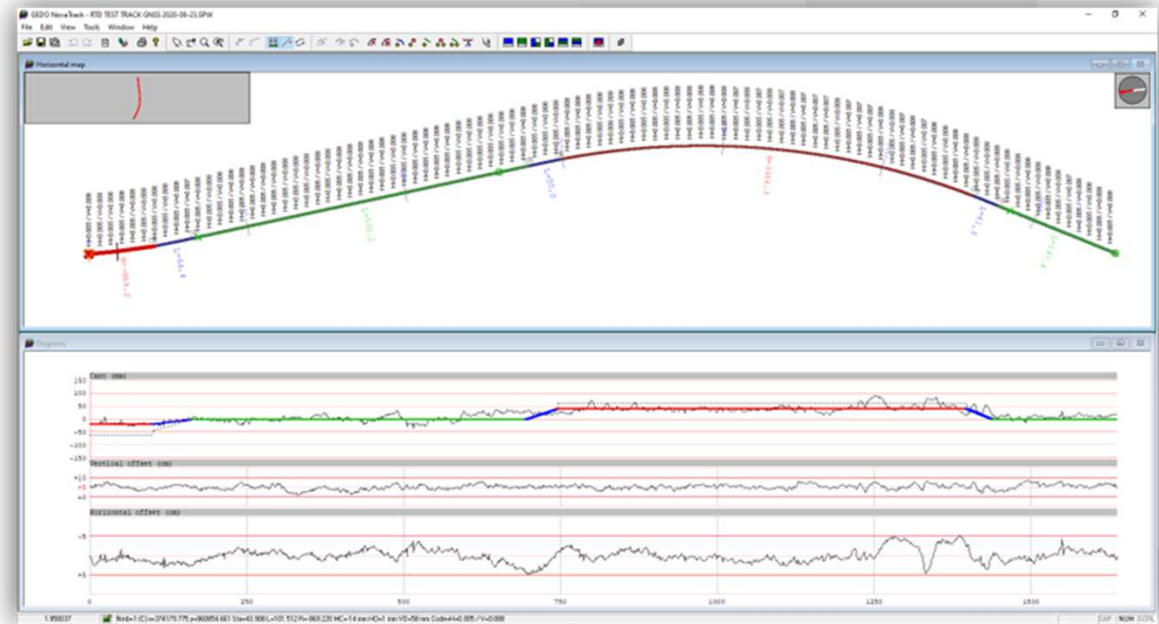
GEDO Office Module NovaTrack:

Module for Design smoothing. More info coming up.

GEDO Office

NovaTrack – Alignment calculation for Track Optimisation

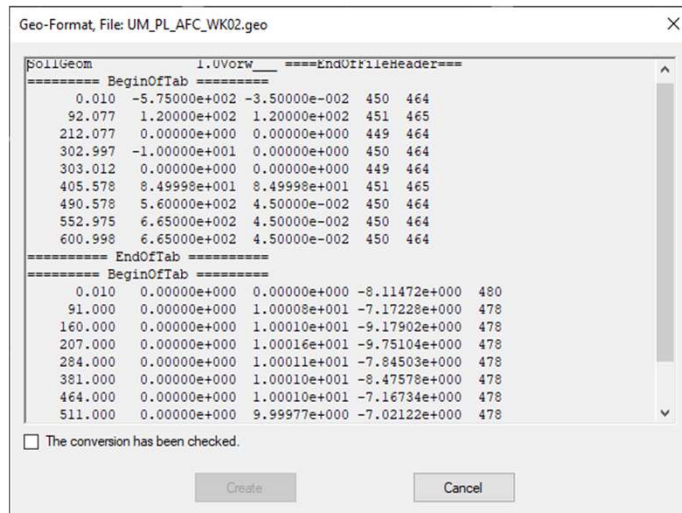
- Alignment data does not exist
- Existing track far from initial design due to smooth/ALC tamping
- Initial geometry information missing
- Automatic or semi-automatic reverse calculation of alignments
- Advanced measurement analysis using regression methods
- Alignment element calculation with Best-fit limitations as an option
- Support of user defined rules for geometry, speed and cant parameters



GEDO Tamping

GEDO Office & GEDO IMS

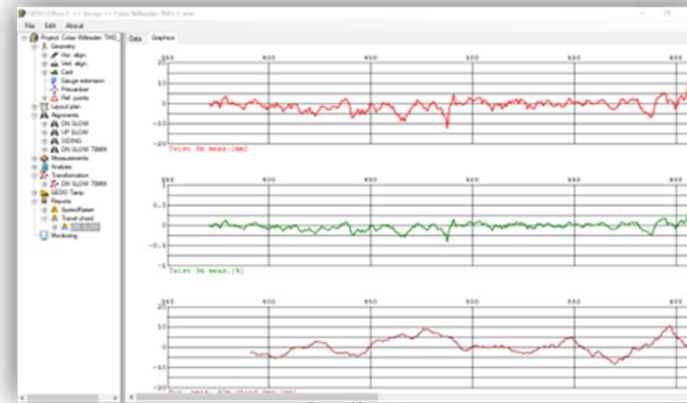
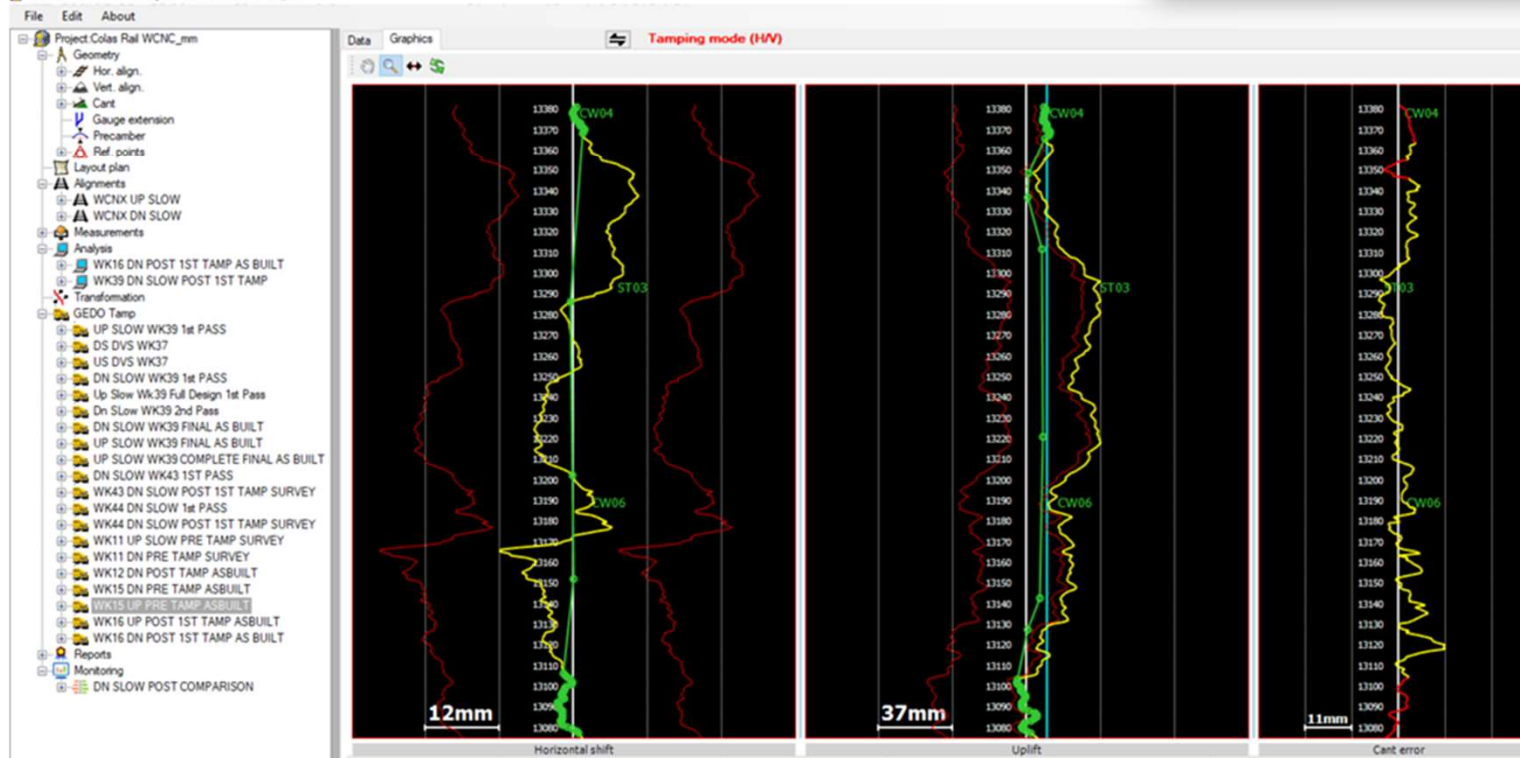
- Provide lift and slue values to WinALC or Matisa/GECO tamping machines for Design Tamping
- Provide .GEO file direct from GEDO Office using alignment/design



GEDO Tamping

Tamping Schemes & Quality Reports

GEDO Office 2 ++ Vorsys ++ Colas Rail WCNC_mm



WK16 DN POST 1ST TAMP AS BUILT - Notepad

Pole no.	P	H	Position	Slue	Uplift	(Target)	dCant	Gauge
	<	>	13.0+75.00	<- 0	0	(0/2)	-1	1431.2
			13.0+80.00	<- 0	0	(-2/-4)	-1	1433.1
			13.0+85.00	<- 0	0	(-2/1)	1	1431.6
			13.0+90.00	<- 0	0	(-2/1)	2	1432.0
			13.0+95.00	<- 0	0	(-1/3)	0	1428.6
			13.1+00.00	<- 0	3	(-1/4)	2	1432.5
			13.1+05.00	<- 0	9	(-2/3)	0	1433.9
			13.1+10.00	<- 2	13	(-1/2)	2	1433.2
			13.1+15.00	<- 3	7	(-1/1)	11	1434.9
			13.1+20.00	<- 4	7	(-1/0)	6	1435.9
NiloA			13.1+25.00	<- 2	10	(-1/-1)	0	1435.1
			13.1+30.00	<- 4	16	(-1/-3)	6	1435.4
			13.1+35.00	<- 3	12	(-1/-5)	6	1435.6
			13.1+40.00	<- 5	11	(0/-7)	3	1435.2
BN			13.1+44.88					
			13.1+45.00	<- 5	17	(0/-7)	1	1435.3
			13.1+50.00	<- 8	14	(0/-7)	3	1432.1
			13.1+55.00	<- 7	16	(0/-7)	3	1435.6
			13.1+60.00	<- 11	12	(0/-7)	5	1432.5
			13.1+65.00	<- 2	16	(0/-7)	-1	1433.8
			13.1+70.00	<- 2	10	(0/-7)	-1	1433.3
			13.1+75.00	<- 5	11	(0/-7)	-2	1434.1
			13.1+80.00	<- 1	10	(0/-7)	4	1433.7
CW06	<	>	13.1+85.00	<- 4	4	(0/-7)	2	1434.8
			13.1+88.51	<- 2	6	(0/-7)	1	1434.4
			13.1+90.00	<- 3	4	(0/-7)	1	1434.4
			13.1+95.00	<- 1	11	(0/-8)	1	1435.0
			13.2+00.00	<- 1	16	(0/-8)	3	1435.7

GEDO Speed Raiser

Tamping Schemes & Quality Reports

GEDO Office 2 - Vorrays - Colas Rail WCNC_mm

File

Edit

About

Project Colas Rail WCNC_mm

Geometry

Hor. align.

Vert. align.

Cant

Gauge extension

Precamber

Ref. points

Layout plan

Alignments

WCNX UP SLOW

WCNX DN SLOW

Measurements

Analysis

WK16 DN POST 1ST TAMP AS BUILT

WK39 DN SLOW POST 1ST TAMP

Transformation

GEDO TAMP

Reports

SpeedRaiser

US DVS WK37

WK39 DN SLOW FINAL AS BUILT

WK39 UP SLOW FINAL AS BUILT

WK39 UP SLOW SQUEEZE ONLY

WK39 UP SLOW COMPLETE AS BUILT

WK39 DN SLOW FINAL AS BUILT TRK001

WK43 DN SLOW POST 1ST TAMP SURVE

WK43 DN SLOW POST 1ST TAMP SURVE

WK39 UP SLOW COMPLETE AS BUILT 001

WK39 UP SLOW POST TAMP 001

WK44 DN SLOW POST 1ST TAMP SURVE

WK44 DN SLOW POST 1ST TAMP SURVE

WK12 DN POST TAMP ASBUILT

WK16 DN POST 1ST TAMP AS BUILT

WK16 UP POST 1ST TAMP ASBUILT

Travel chord

Monitoring

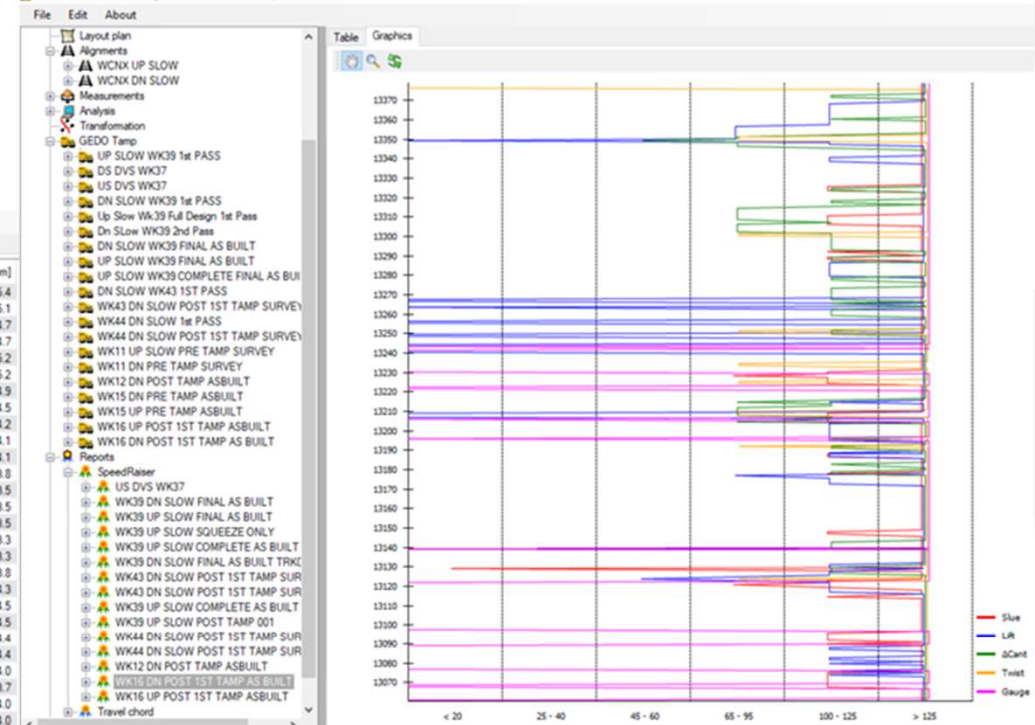
DN SLOW POST COMPARISON

Table

Graphics

Change [m]	Speed [mph]	Track type	Slue [abs.] [mm]	Slue [change] [mm]	Lift [abs.] [mm]	Lift [change] [mm]	ΔCent [mm]	Twist [mm]	Gauge [mm]
13142.955	100 - 125		1.8	-2.1	12.9	-0.1	2.5	-1.0	1435.4
13143.921	100 - 125		1.7	-2.0	12.9	0.0	1.9	-1.0	1435.1
13144.926	100 - 125		1.2	-1.8	12.7	-0.3	1.7	-1.9	1434.7
13145.916	100 - 125		1.1	-2.2	12.9	0.1	1.6	-2.2	1434.7
13146.978	100 - 125		1.7	-3.1	12.1	0.4	0.8	-0.6	1435.2
13148.016	100 - 125		1.5	-3.0	11.3	0.7	-0.3	1.0	1435.2
13149.015	100 - 125		0.5	-1.6	12.3	0.0	-0.7	1.6	1434.9
13149.959	100 - 125		0.3	-1.0	12.4	0.2	0.1	0.9	1434.5
13150.957	100 - 125		0.1	-0.1	12.5	0.3	0.6	0.8	1434.2
13151.967	100 - 125		-0.4	-0.1	12.8	-0.1	1.0	0.3	1434.1
13152.931	100 - 125		-0.4	-0.5	12.8	-0.3	1.1	-0.1	1434.1
13154.020	100 - 125		-0.4	-0.6	12.9	-0.6	1.5	-1.1	1433.8
13154.954	100 - 125		-0.6	-0.3	12.3	-0.1	1.2	-1.0	1433.5
13155.964	100 - 125		-1.1	0.0	13.0	-1.7	0.9	-0.3	1433.5
13156.917	100 - 125		-1.4	0.8	12.6	-2.3	0.3	0.7	1433.5
13157.941	100 - 125		-1.5	1.3	12.0	-1.6	0.2	1.1	1433.3
13158.945	100 - 125		-1.1	1.4	12.2	-0.6	0.6	0.2	1433.3
13159.951	100 - 125		-0.7	0.9	12.7	-1.5	1.1	0.4	1433.8
13160.922	100 - 125		0.0	0.1	12.8	-2.1	1.3	0.0	1434.3
13161.941	100 - 125		-0.5	0.0	12.6	-2.4	0.9	0.3	1434.5
13162.915	100 - 125		-0.9	-0.8	12.5	-2.4	1.5	-0.6	1434.5
13163.924	100 - 125		-1.0	-1.1	12.2	-2.4	1.4	-0.7	1434.4
13164.971	100 - 125		-0.9	-1.4	12.2	-1.2	1.2	-0.7	1434.4
13166.024	100 - 125		-1.2	-1.2	11.3	-0.7	0.9	0.2	1434.0
13167.025	100 - 125		-0.5	-2.7	10.1	0.6	0.6	0.0	1433.7
13167.928	100 - 125		-0.2	-2.4	10.4	2.1	0.5	-0.4	1434.0
13169.025	100 - 125		0.3	-1.6	11.8	0.7	1.1	-2.1	1434.0
13169.906	100 - 125		0.1	-0.8	11.2	-0.1	0.8	-2.2	1433.7
13170.918	100 - 125		0.1	-2.1	10.7	0.2	0.1	-1.2	1433.7
13171.944	100 - 125		-0.5	-2.1	10.2	2.3	-1.0	1.1	1432.9
13172.922	100 - 125		-1.7	-1.4	10.1	3.8	-1.5	2.2	1432.4
13173.945	100 - 125		-2.1	-1.5	9.8	3.6	-1.0	1.5	1432.3
13175.003	100 - 125		-2.3	-0.7	11.0	3.2	0.2	2.3	1433.4
13175.906	100 - 125		-2.2	0.4	10.6	3.5	0.7	1.5	1433.6
13176.946	65 - 95		-3.2	2.5	10.6	9.0	0.5	-0.2	1432.9
13178.025	100 - 125		-2.6	3.9	12.7	1.0	2.5	-2.6	1432.3
13178.938	100 - 125		-1.4	0.2	12.6	-0.6	2.2	-1.1	1433.4
13179.931	100 - 125		-0.6	0.1	11.0	1.6	0.3	1.9	1434.5
13180.948	100 - 125		-2.0	2.1	10.9	2.7	-0.3	1.4	1434.0
13182.812	100 - 125		-3.0	2.4	14.0	-0.8	2.4	-2.3	1433.1
13183.926	100 - 125		-3.6	2.7	13.5	0.1	1.1	-1.9	1432.8

GEDO Office 2 - Vorrays - Colas Rail WCNC_mm



Wembley Blockade and follow-up tamps using NR2102 Construction Standard



Product Approval

PA05/04029 – Issue 6 - 28/11/2023

NetworkRail

Certificate of Acceptance

PA05/04029

Manufacturer:
Trimble

Issue : 6
Valid From : 28/11/2023

GEDO Track Measuring Device

Product Description

Trimble GEDO CE 1.0/2.0 - A suite of tools for measurement, recording, analysis and applications for railway track location, construction and maintenance (now obsolete).

GEDO CE 2.0 - The updated TMD is a lighter model than v1.0, can be used on a variety of gauges, has an improved braking system and can run smoothly on S&C. It has also been future proofed for the fitment of additional sensors.

GEDO CE IMU - The Trimble GEDO IMS system, consisting of a track survey trolley Trimble GEDO CE 2.0 and a high precise IMU (inertial measurement unit), is the basis for running an efficient track survey and asset data collection. Additional components and sensors can be added to the system to enable the usage of further applications and to guarantee the best performance.

Product Image



Scope of Acceptance

Full Acceptance

Accepted for the survey of track position and infrastructure; and gauging of adjacent structures.

Additional spares may be permitted as authorised by the both the Network Technical Heads, or delegates, in writing.

Network Rail Acceptance Panel (NRAP) hereby authorises the product above for use and trial use on railway infrastructure for which Network Rail is the Infrastructure Manager under the ROGS regulations.

Reviewed by:

Authorised by:

Authorised by:

Amir Malik
Product Acceptance Coordinator

Jordan Skey
Network Technic Head of Plant

David Webb
Network Technical Head of Track

Certificate of Acceptance

PA05/04029

Manufacturer:
Trimble

Issue : 6
Valid From : 28/11/2023

Certificate History

Issue	Date	Issue History
1	17/07/2009	First accepted for use.
2	20/07/2012	Re-issued to add the Vorsys component.
3	19/09/2013	Re-issued to include details of the GEDO CE 2.
4	11/11/2013	Re-issued to include the part number for the product as a whole unit.
5	10/12/2018	Re-issued to include Total Station S9 and the following modifications to the GEDO CE 2.0 chassis: • The dead-man braking system • The battery location • The pushing handle • The GEDO IMU location
6	28/11/2023	Inclusion of GX50 dual head scanner.

Contact Details

Manufacturer

Ric Kirman
Trimble

ric.kirman@korecgroup.com

Applicant

Graham Hutchinson
Network Rail

graham.hutchinson@networkrail.co.uk

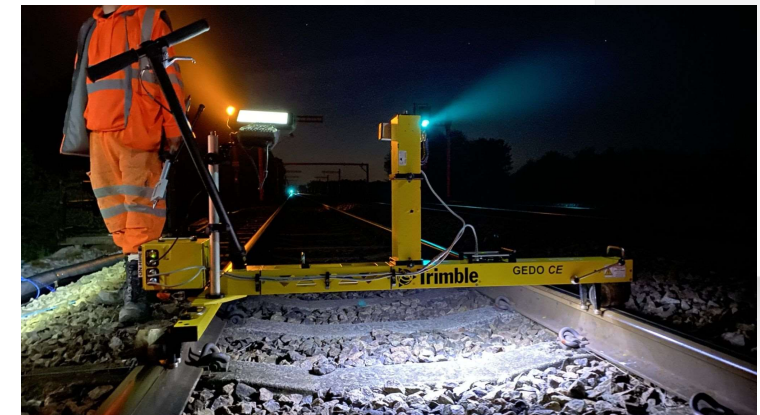
Lead Reviewing Engineers

Timothy Sherratt
Network Rail – Plant TA

Timothy.Sherratt@networkrail.co.uk

Colin Mcateer
Network Rail – Track TA

Colin.Mcateer@networkrail.co.uk



 **KOREC**™



GEDO Survey / Tamp Case Study

Case Study

S&C South Alliance achieved 100% Track Quality with Trimble GEDO

S&C Alliance South achieved 100% track quality score at Willesden, North London, on both the Up and Down Slow Lines.

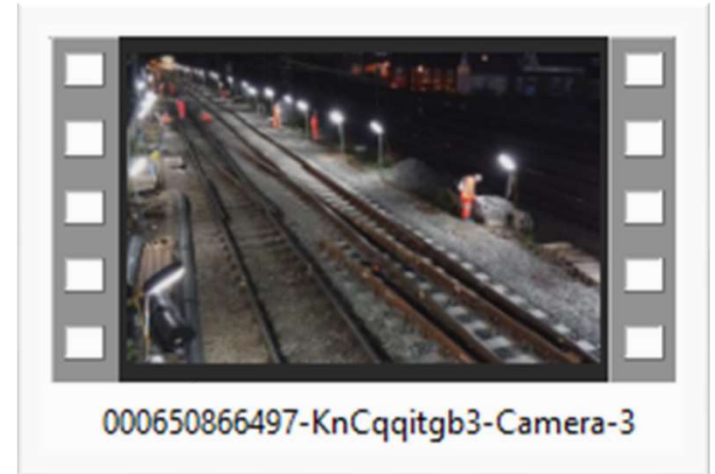
The S&C South Alliance is responsible for all major rail works involving switch and crossing installations in the south of the UK.

*“The track engineers were able to guarantee all aspects of track survey, WinALC tamping and Speed Raiser reporting.
We look forward to further successful track installations by the S&C South Alliance.”*

**Steve Naybour Head Of Transformation,
Network Rail S&C Alliance South**

‘It’s a great development- new innovations support us in our Focus on Safety and our drive for quality- the team are really happy at 100%!’

**Karl Redfern (Alliance
Engineer)**





Willesden North Junction | Easter 2019
Putting the Passenger First

Trimble GEDO

Survey / Tamp Live Demonstration





GEDO Scan

GEDO

Flexible and Modular

Each system features a base TMD

- **GEDO CE 2.0 base unit**
 - *Precise cant and gauge sensor*
 - *Odometer*
 - *Communication*
 - *Illumination*
- **Gauge adapter**
 - *Utilise for differing networks, Country, Metro etc*
 - *Minimum 1000mm gauge*



GEDO – IMS Scan

- TMD captures track position, gauge and cant in a single operation
- Use FOG Inertial Measurement Unit and EDM for positioning
- Very fast operation and information capture:
 - up to 3,000 meters of track per hour with coordinated,
 - And up to 4,500 meters per hour relative mode @ 1.2mps.
- 5 minute setup and initialisation, ideal for rapid deployment.
- Export results to rail design software, and compare existing conditions to design alignments
- Can be easily upgraded

Trimble GEDO GX50 Configuration Options

Single Head

Entry level configuration
with one scanner



Dual Head 90° Orientation

Highest accuracy for
clearance analysis



Dual Head 80° Orientation

Good object visibility
and high accuracy



Dual Head Butterfly Orientation

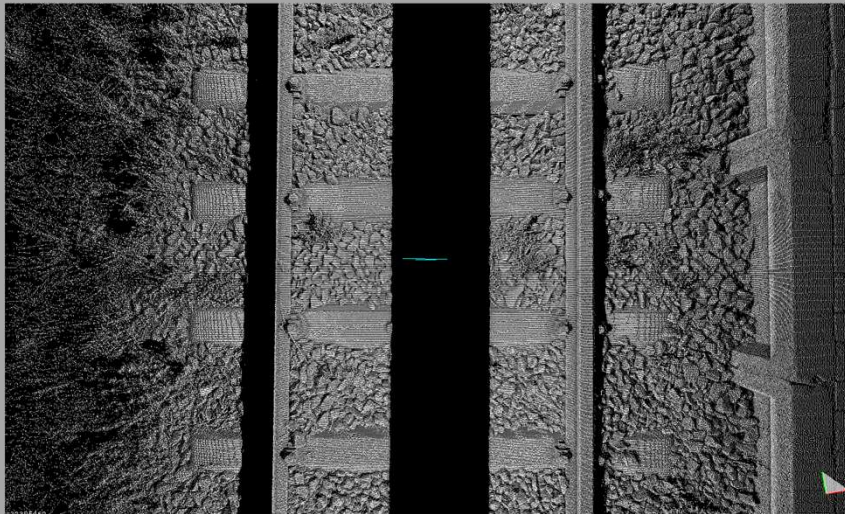
Best object visibility



Trimble GEDO GX50 Head Orientation & Coverage

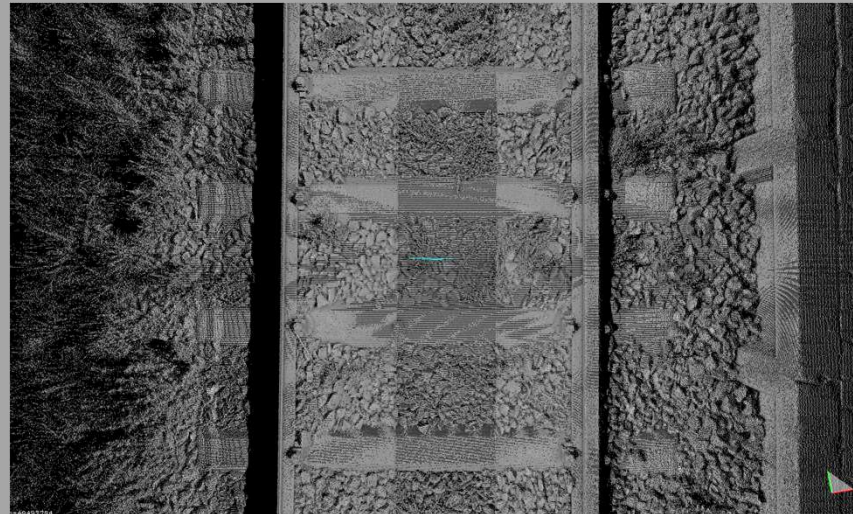
Single Head

Top view



Dual Head 90° Orientation

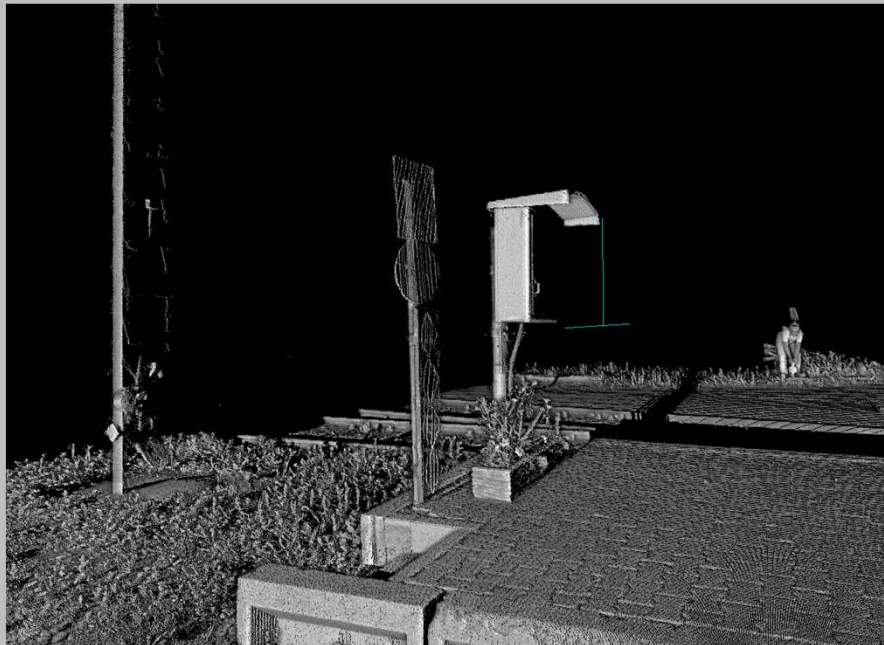
Top view



Trimble GEDO GX50 Head Orientation & Coverage

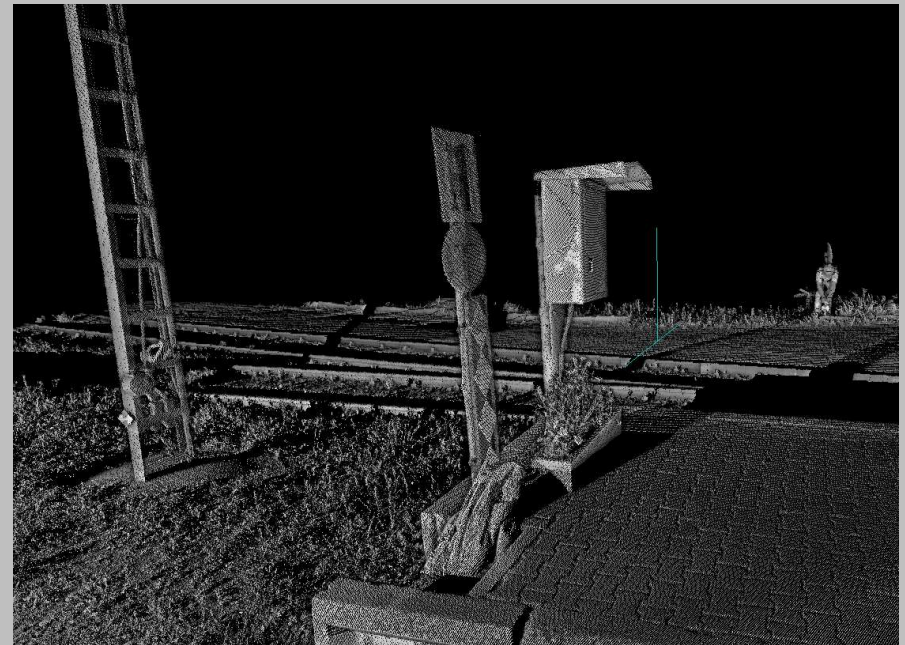
Dual Head 90° Orientation

Flat objects, perpendicular to the track



Dual Head 80° & BF Orientation

Flat objects, perpendicular to the track





GEDO IMS Scan Case Study

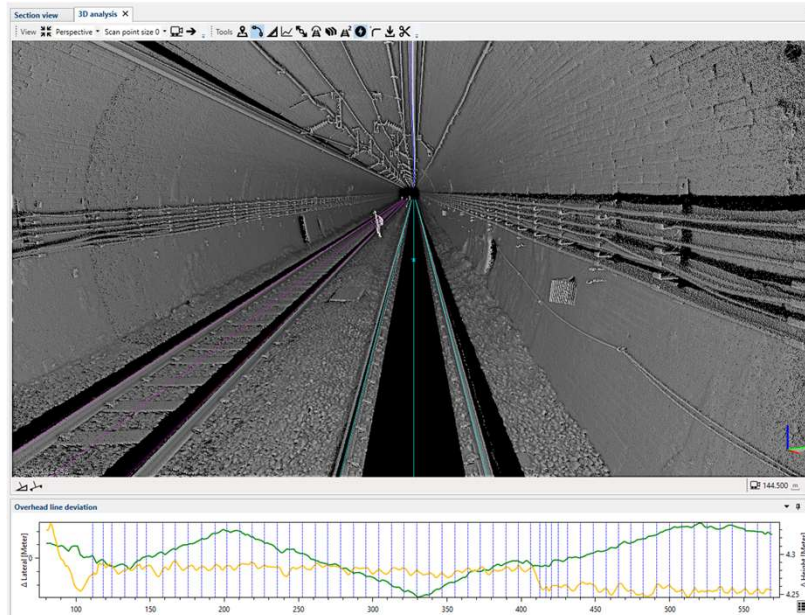
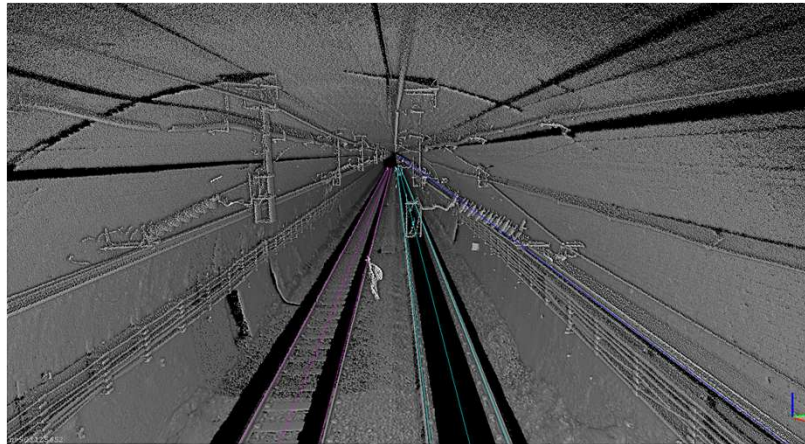
Case Study

Severn Tunnel

- Colas Rail – OLE Height & Stagger Survey
- The Severn Tunnel is 7,008m long (3620m under the river)
- The OLE systems was installed as part of the GWEP project in 2016.
- The traditional method used to take height & stagger measurements is with a T shape gauge with a laser measure. The operator needs to locate the desired cable with the red laser and physically take a measurement shot.

Colas Rail were tasked with taking measurements for:

- Height & Stagger measurements for the contact wire.
- Drop Tube heights and chainage locations.
- REFOS (Rail Edge Face Of Structure) measurements at every 5m throughout the tunnel.
- They assigned a workforce of 6 technicians to carry out the work over 5 weekends working 8 hour night shifts.
- A total of 480 hours to complete the task excluding the office work of transcribing the collected data back at the office.
- We carried out the scan using a GEDO IMS Scan system with TX8 scanner in approximately 6 hours and completed all processing in a further 10 hours.
- A Time Saving of circa 450 Hours.



Trimble GEDO Scan

Live Demonstration



GEDO Scan

Collision Test



GEDO Scan

Platform Gauging



GEDO Scan

Profile Creation &
Cross Sections



GEDO Scan

Height & Stagger Survey



Thank You

Questions?

For Questions or Feedback please contact:

- info@korecgroup.com

Or

- Ric.kirman@korecgroup.com

Or visit our website

- www.korecgroup.com/rail

Danke
GRAZIE **VINAKA**
TERIMA KASIH
THANK
YOU
TAKK
merci

감사합니다
다
謝謝
謝謝
ありがとう





The most dangerous phrase in the English language is;

“We’ve always done it this way”

QUESTIONS?