Presented By:
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Utilizing Trimble point cloud data for railway applications

27th July, 2023

Trimble

Agenda

Utilizing Trimble point cloud data for railway applications

01 **Railway Applications - Overview**
Primary application based on MX50/MX9 point cloud data

02 **Data processing and flow**
Delivering data to Trimble GEDO Scan Office

03 **Trimble GEDO Scan Office**
Matching point cloud analysis and railway applications

04 **Questions & Answers**
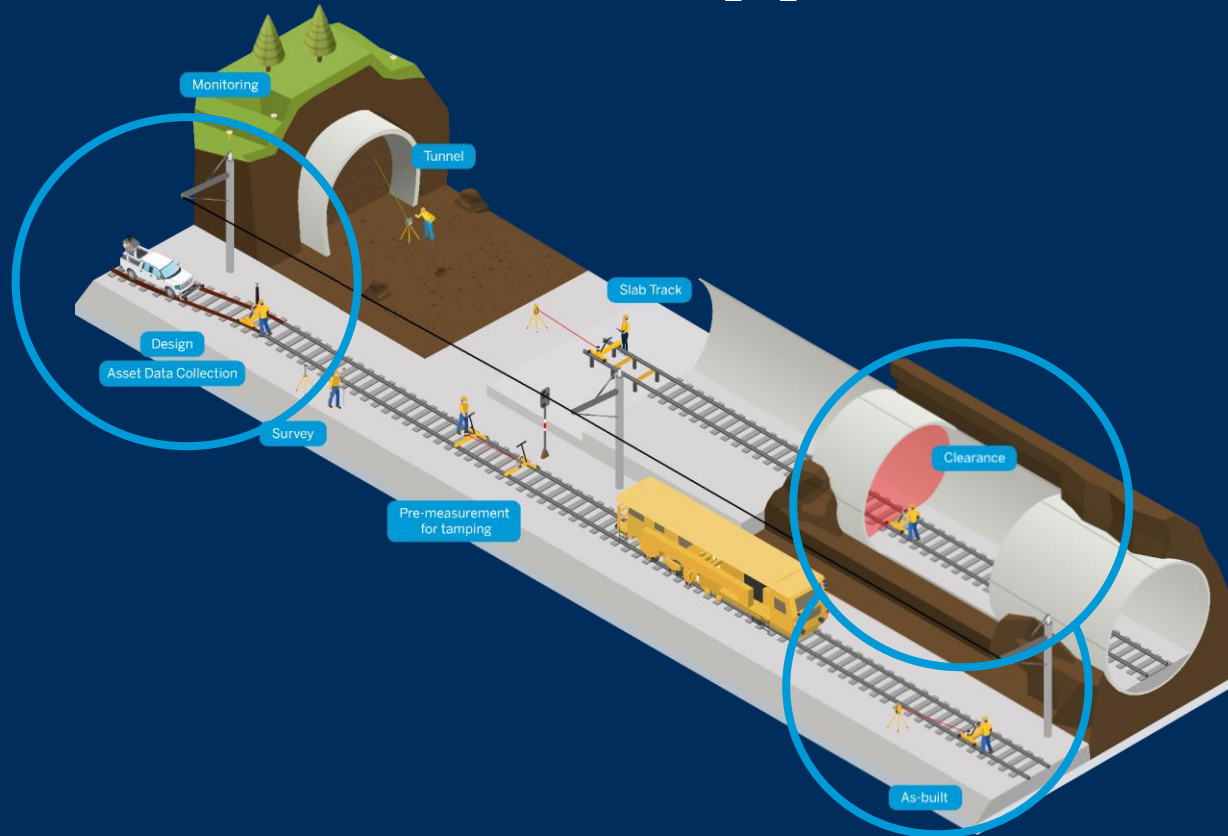Ask your Questions

Railway Applications

Overview

Primary application based on GX50/MX50/MX9 point cloud data

Rail Infrastructure Applications

Planning & Design

Accurate track spatial data to comply with today's BIM standards

Key Applications

- Point cloud data for railway environment modelling
- Mapping of existing tracks for re-planning
- Track structure conditions with assessment for rehab strategy
- Material volumes pre-estimation
- Overhead cables and catenary positional deviation evaluation
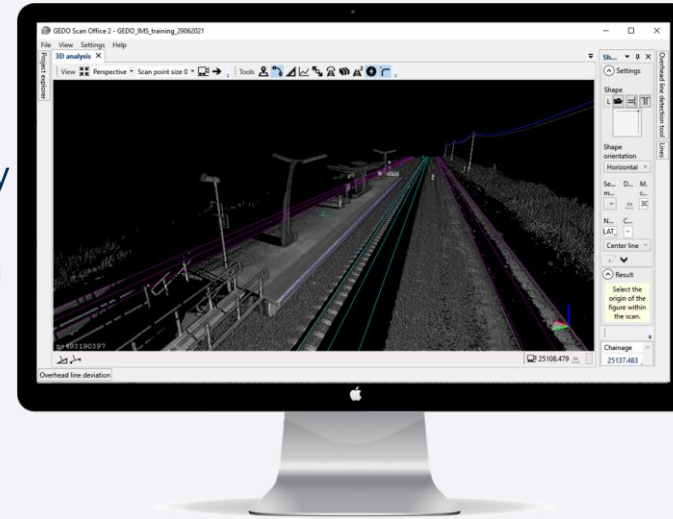
Construction

Detailed information to support construction phases

Key Applications

- Object extraction for as-built comparison with BIM model
- Platform verification (lateral and vertical offsets from track)
- As-built surface (ballast) mapping for volume calculation
- Heights & Stagger as-built for overhead cables

Maintenance & Operations

High quality data for safe infrastructure operations

Key Applications

- Structural clearance inspections during operation
- Periodical platform gauging inspections in station areas
- Clearance check for rolling stock and corridor safety approvals
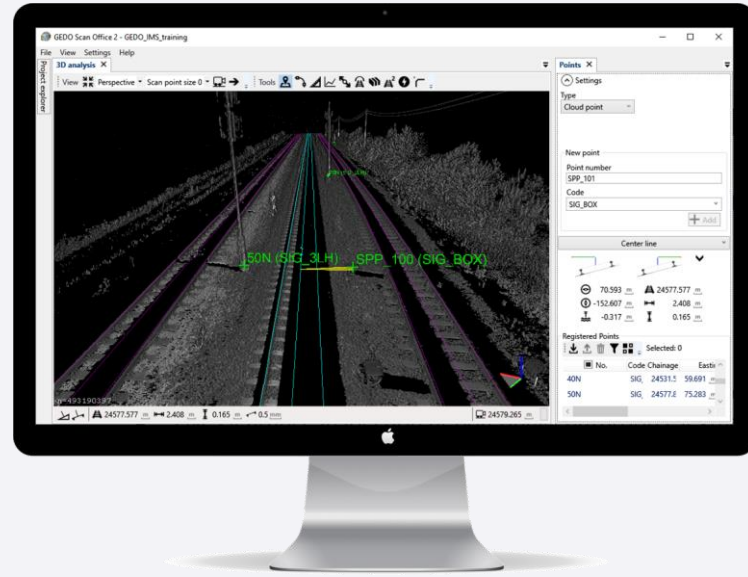- Evaluation of track geometry and deviations from design
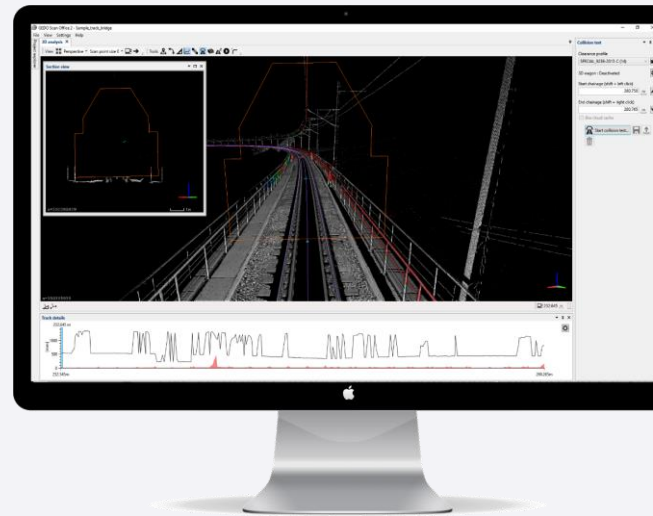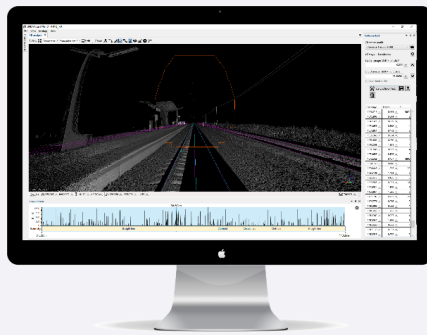
Rail Asset Inventory

Transparent data from track asset mapping & condition assessment

Key Applications

- Track corridor data for railway GIS and Asset Management Systems
- Asset data verification

02

Data processing and flow

Delivering data to Trimble GEDO Scan Office

Trimble Scanning and Mapping Portfolio for Railway Applications

Trimble Terrestrial Scanning

X7 X12

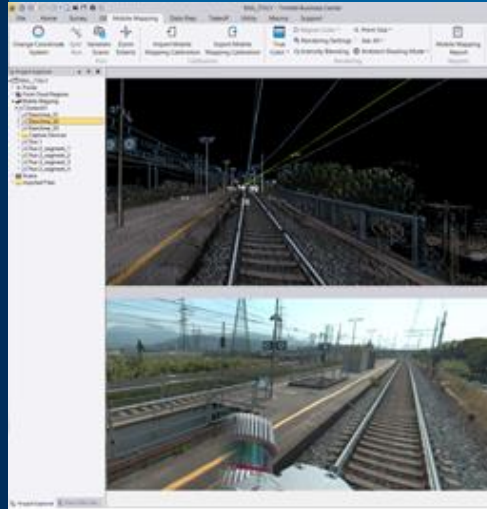## Trimble GEDO Scan Systems

Trimble Mobile Mapping

MX

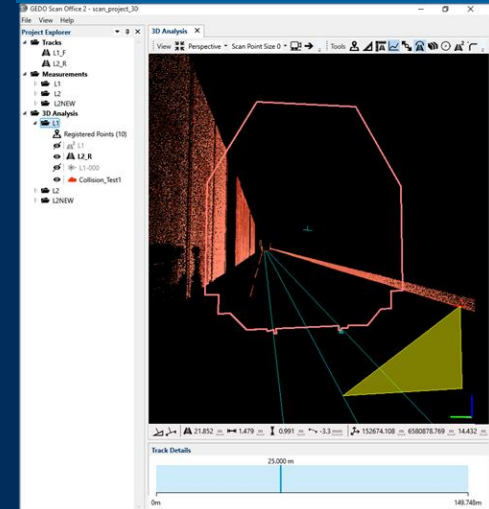# Railway point cloud data – workflow from field to office

Scan

Process

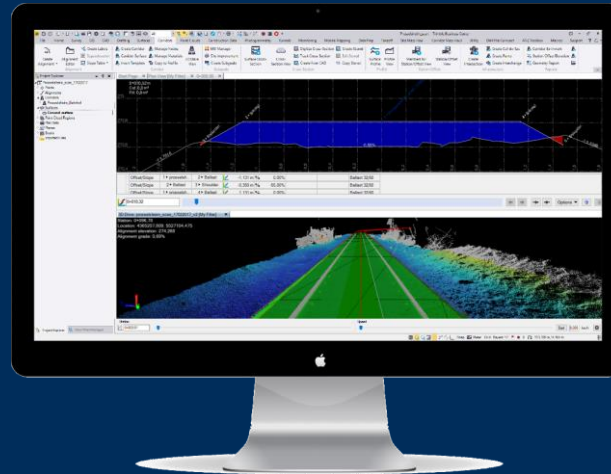**Analyze & Deliver**

Railway point cloud data Data Flow

Trimble scanning systems for railway

Trimble Business Center & Trimble RealWorks Software
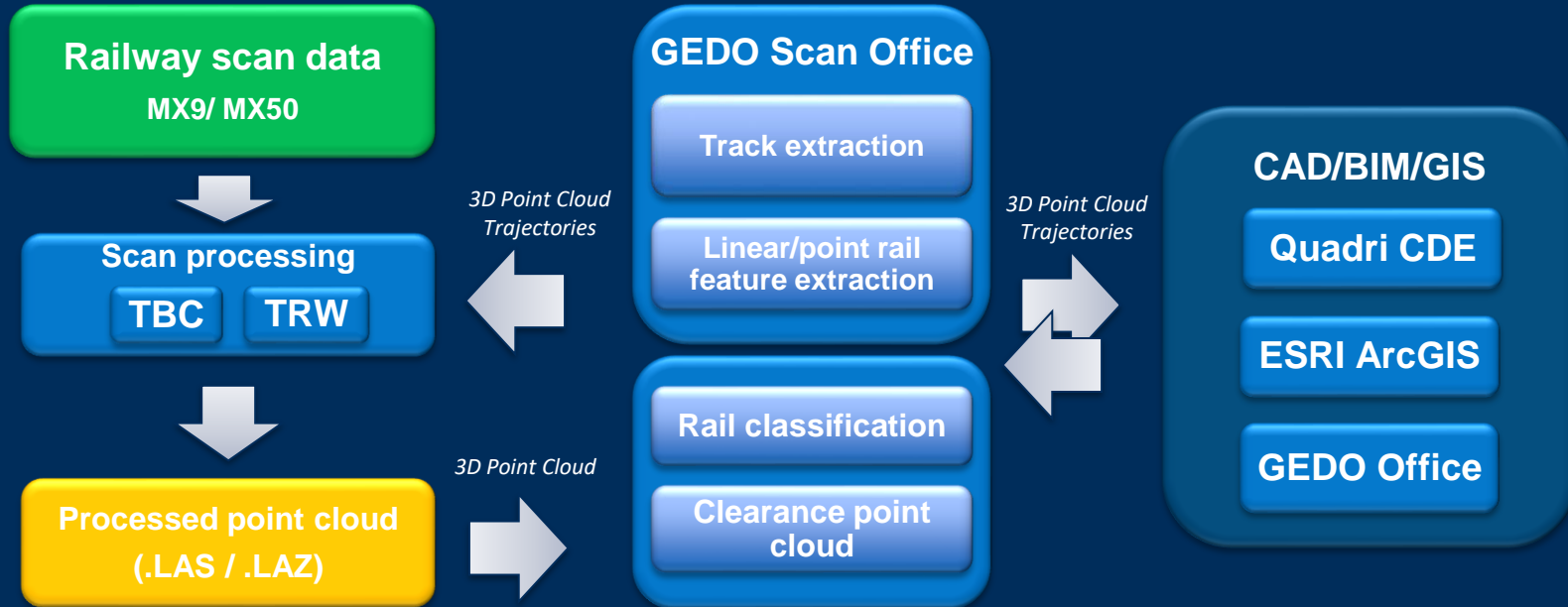
Trimble GEDO Scan Office Software

General data filtering, classification, feature extraction, design, volumes

Rail based analysis, track classification, rail infra extraction, documentation

# Point Cloud analysis and rail feature extraction

Railway scan data
MX9/ MX50

Scan processing
TBC | TRW

Processed point cloud
(.LAS / .LAZ)

3D Point Cloud Trajectories

3D Point Cloud

GEDO Scan Office

Track extraction

Linear/point rail feature extraction

Rail classification

Clearance point cloud

3D Point Cloud Trajectories

CAD/BIM/GIS

Quadri CDE

ESRI ArcGIS

GEDO Office

03

Trimble GEDO Scan Office

Matching point cloud analysis and railway applications

Trimble GEDO Scan Office – solution for handling rail point cloud data

Key functionality and features:

- Single and uniform project environment
- Highly intuitive UI and clear workflows working within railway corridors
- Trajectory locked navigation and 360° field of view
- Special engines for rail data extraction, modeling and classification
- Support of rail specific entities – OHL, tracks, linear objects and chainages
- Support of a large volume point cloud projects - 100 km and more
- Data interoperability based on CAD, point cloud and report formats
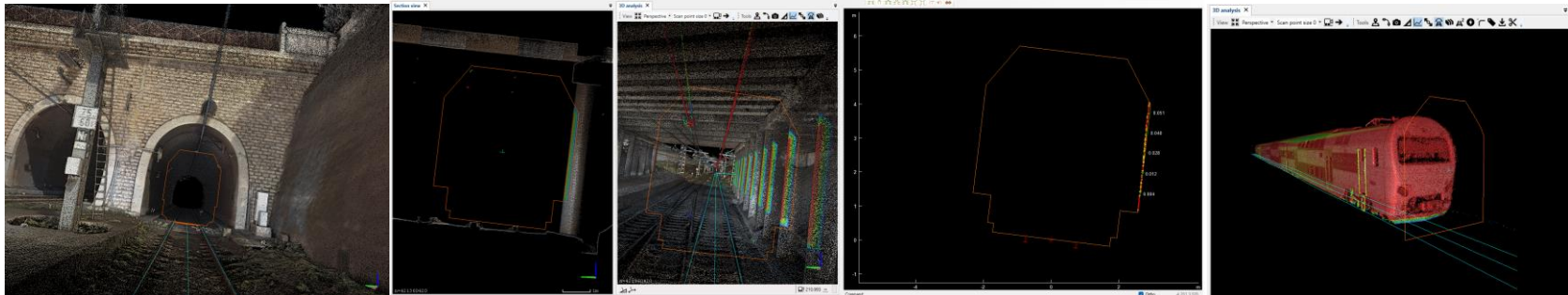
Trajectory based navigation

- Track trajectory-based navigation and object selection

- 360° view around the current position at the track

- Actual or design track as reference

- Global & local coordinate system
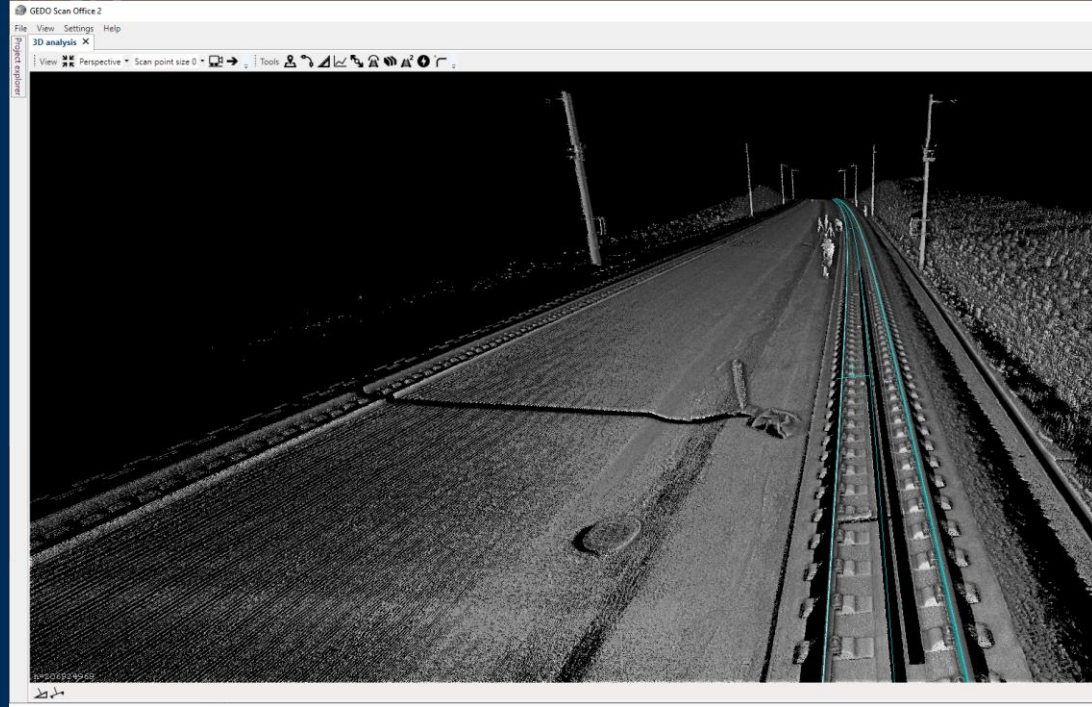
Colorized visualization

- Supported RGB and grey-shade colourization

- Possible to switch between intensity and color mode

- Independent colourization for collision and classification point cloud groups
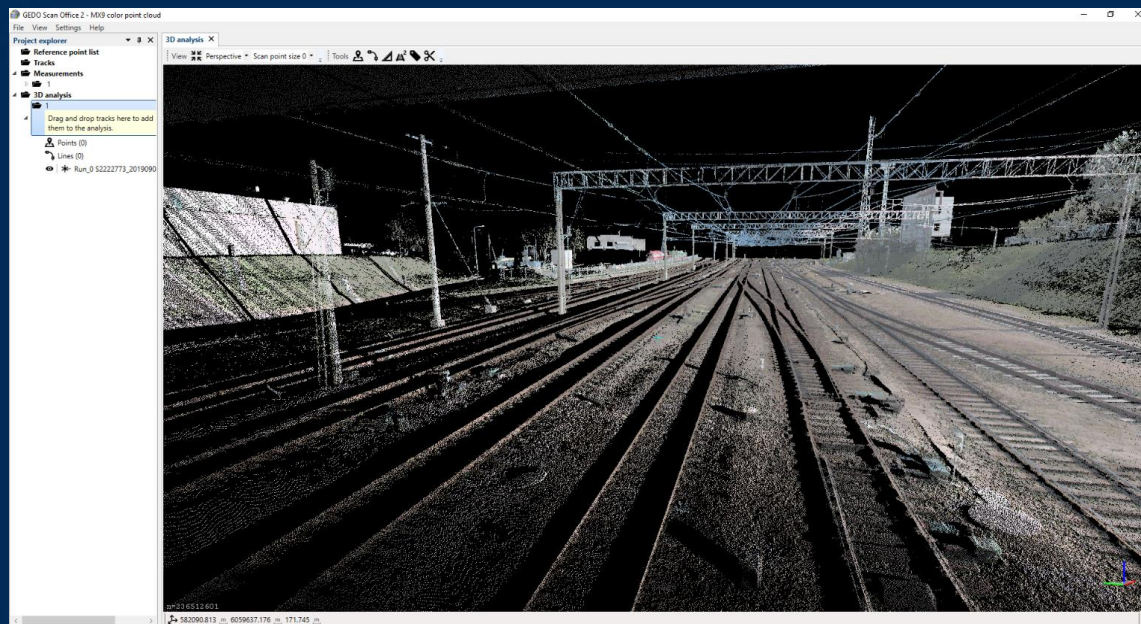
Mapping track trajectory

- Automatic track geometry extraction from the point cloud
- Rail shape matching based on IPC approach
- Gauge fitting based on a user defined settings
- Accuracy depends on rail distance, visibility and definition:
  - Height ~ 3-7 mm
  - Lateral ~ 5 mm
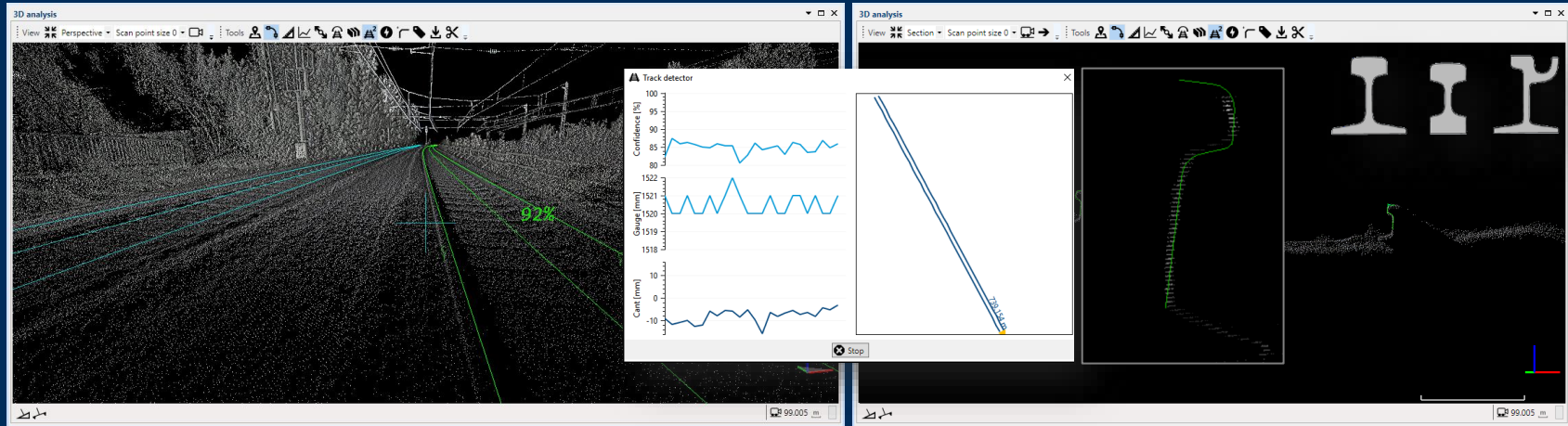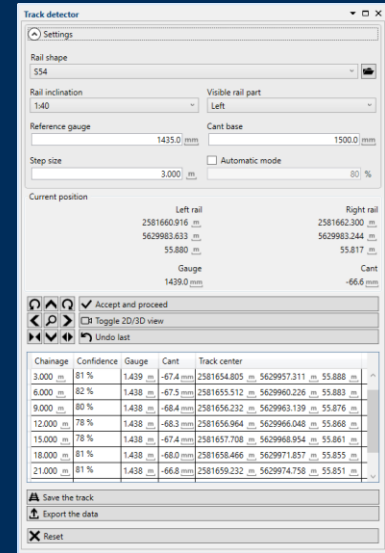
Mapping rail specific objects

- Offsets between track and objects

- Perpendicular and vertical deviations

- Relative information to the track

- Referencing to existing or design track trajectory

- Snapping to the plane, SP, CT and single point
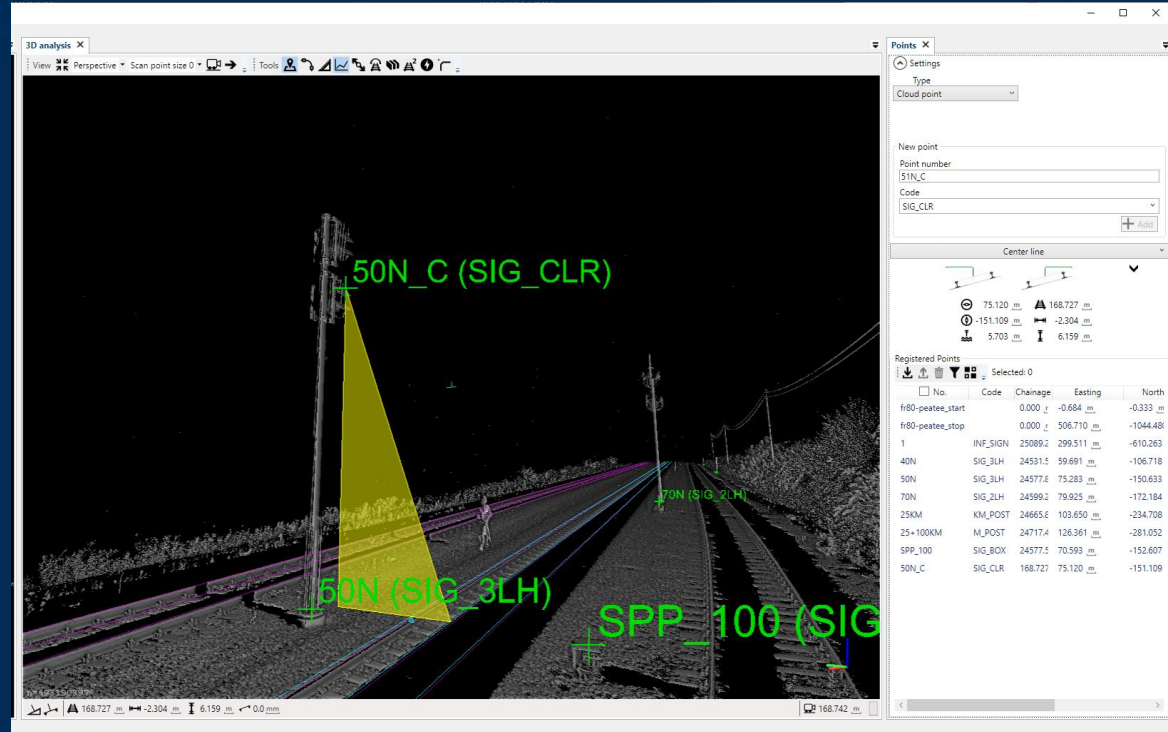
Mapping linear infrastructure

- Automated surface edge/break recognition and extraction
- Extraction is guided by user defined object shapes and QA index
- Extracted data is referenced to the track
- Result export to .DXF and .CSV file formats
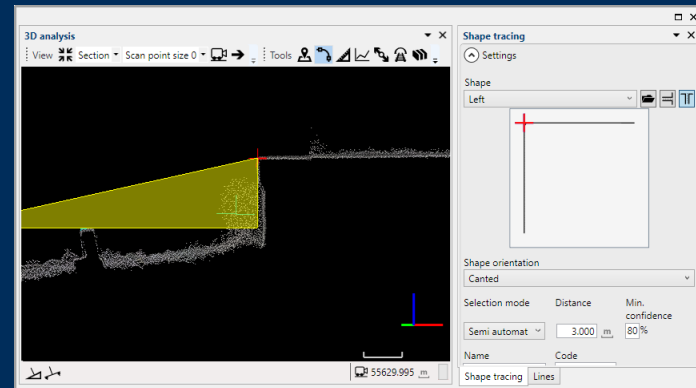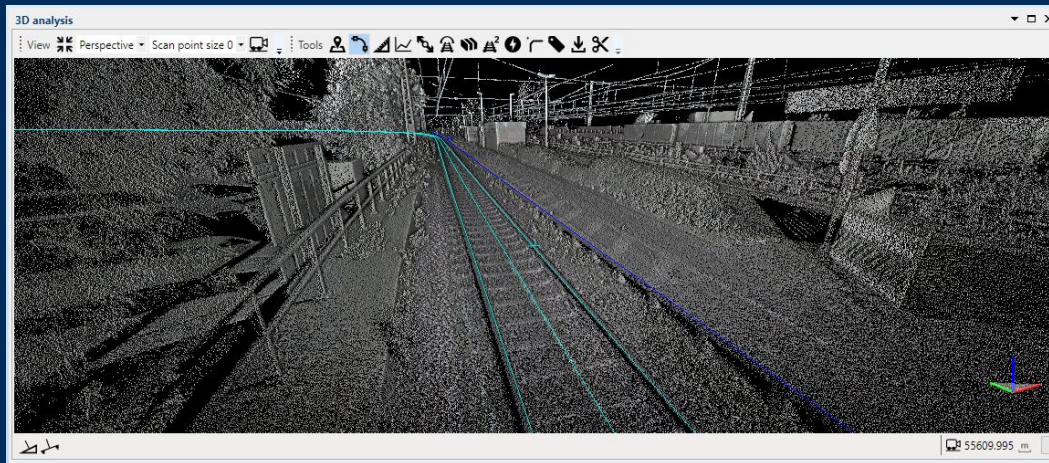
Mapping overhead lines (OHL)

- Automated OHL contact wire tracing
- Absolute and relative OHL referencing to the selected track
- Detection of OHL mounting points
- Result export to .DXF and .CSV file formats
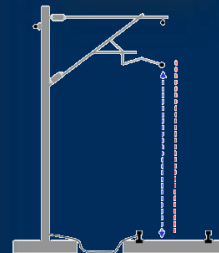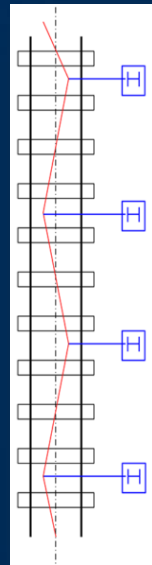
Clearance and free space analysis

- Automated clearance check based measured or design trajectory
- 3D dynamic profile based on cant and curvature
- Automated collision profiles
- Rolling stock library

http://www.chronik-berlin.de/bvg_u-bahn-2.htm

http://www.br.de/nachrichten/mittelfranken/inhalt/neue-u-bahn-zuege-vag-nuernberg-100.html
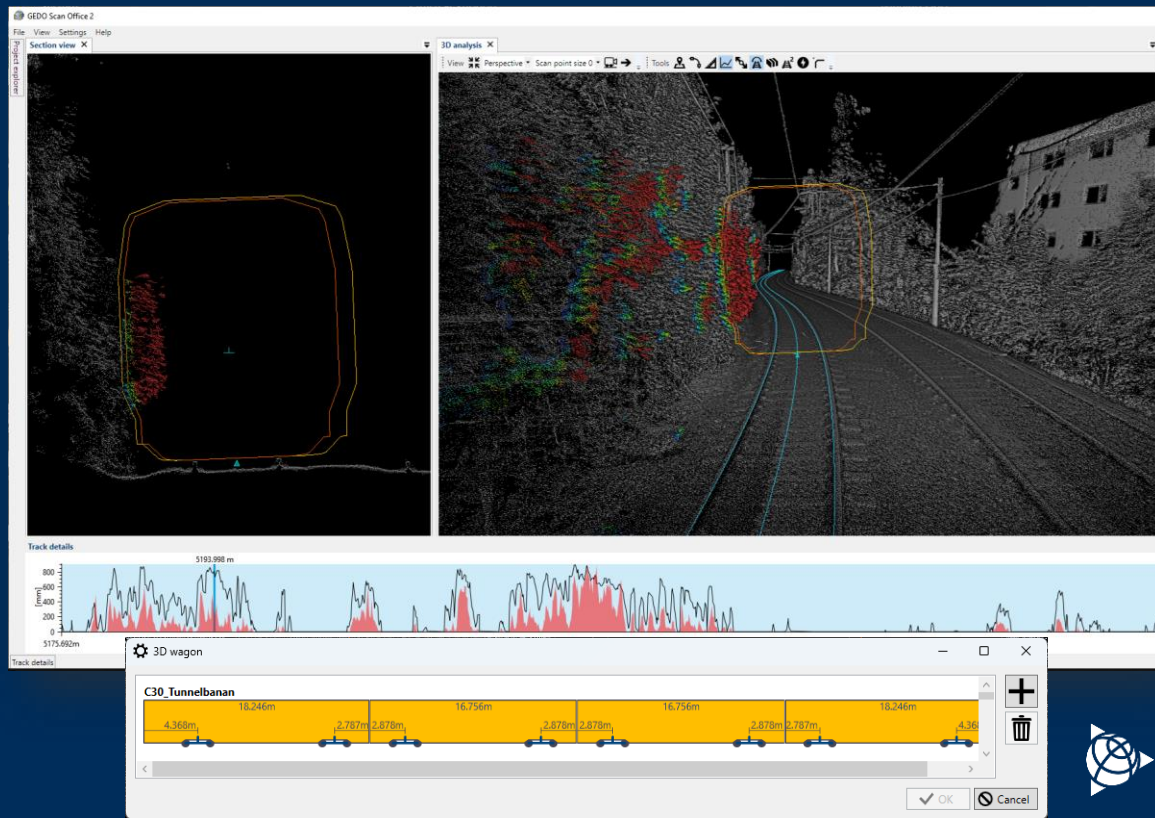
Image support and orthophoto

- Orthophoto at position of the collision
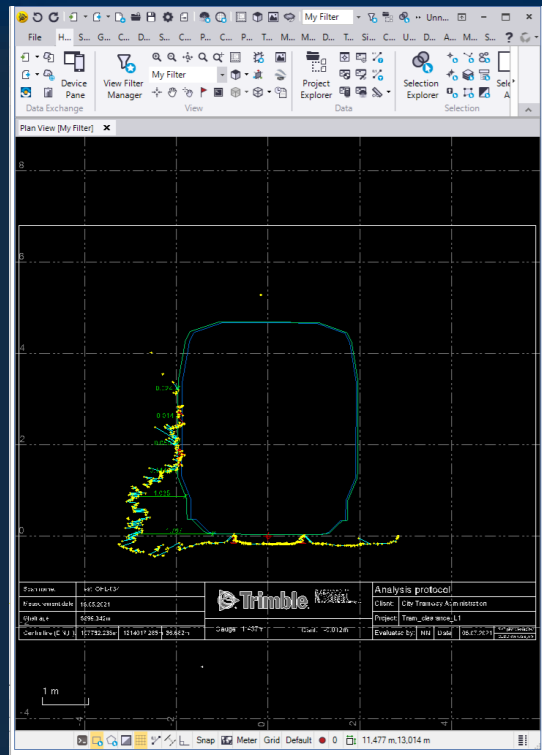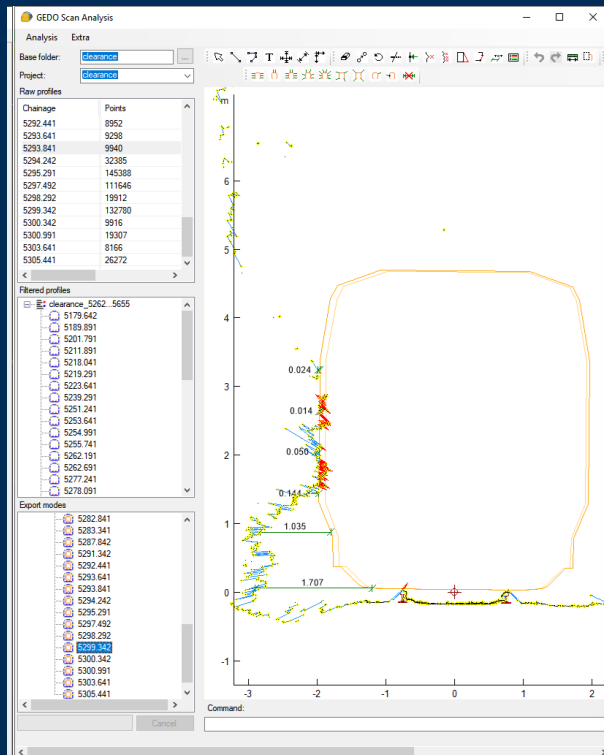- Combined image
- Images from Mobile Mapping systems[*]

Clearance reporting

- Vectorized collision sections
- Automated infringement dimensions
- Report export to 2D, 3D DXF and .CSV format
- Special reports for DB, BaneDenmark, NetworkRail, Stockholm Lokaltrafik

Optimal track alignment fitting

- Retro-fitting design alignment in the GEDO NovaTrack
- Adjacent map data for further constrain and alignment lateral and height offset control
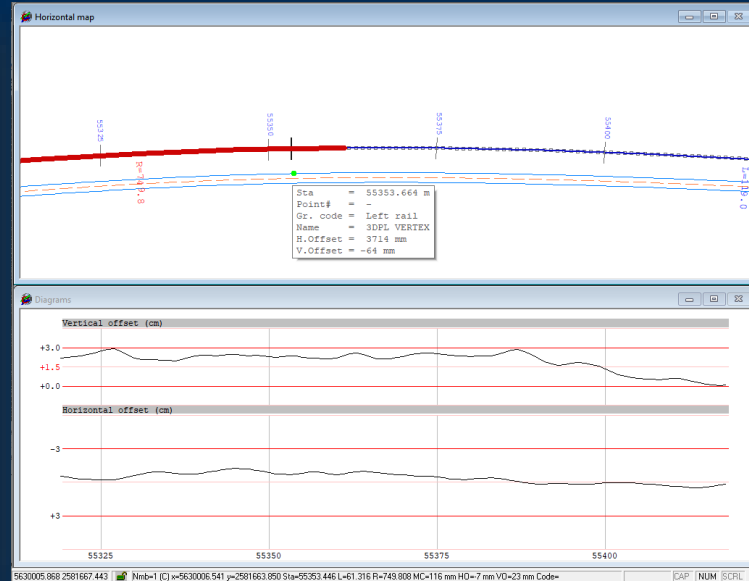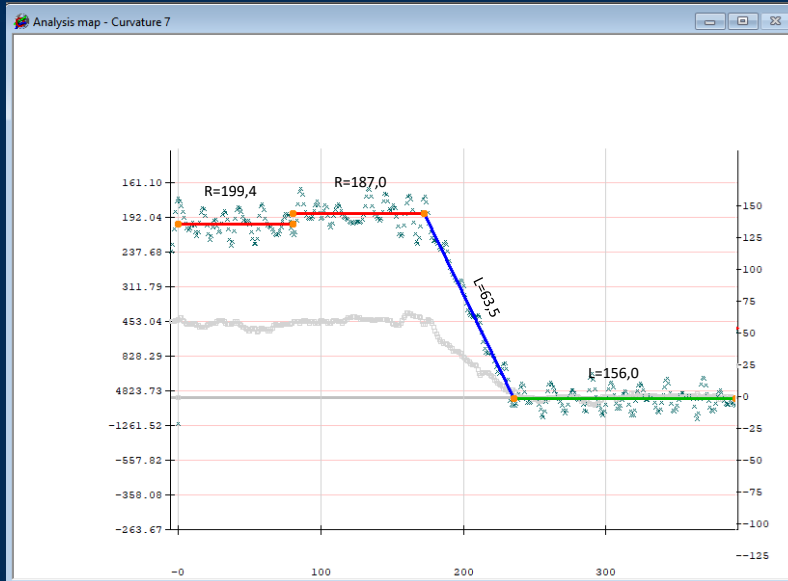
Colission data for design

- Vectorization of the collision point cloud areas
- Exchange collision results with Quadri/Novapoint or GEDO NovaTrack software to correct HAL/VAL/CANT
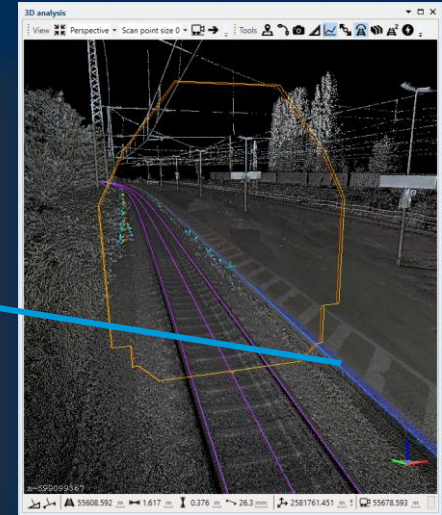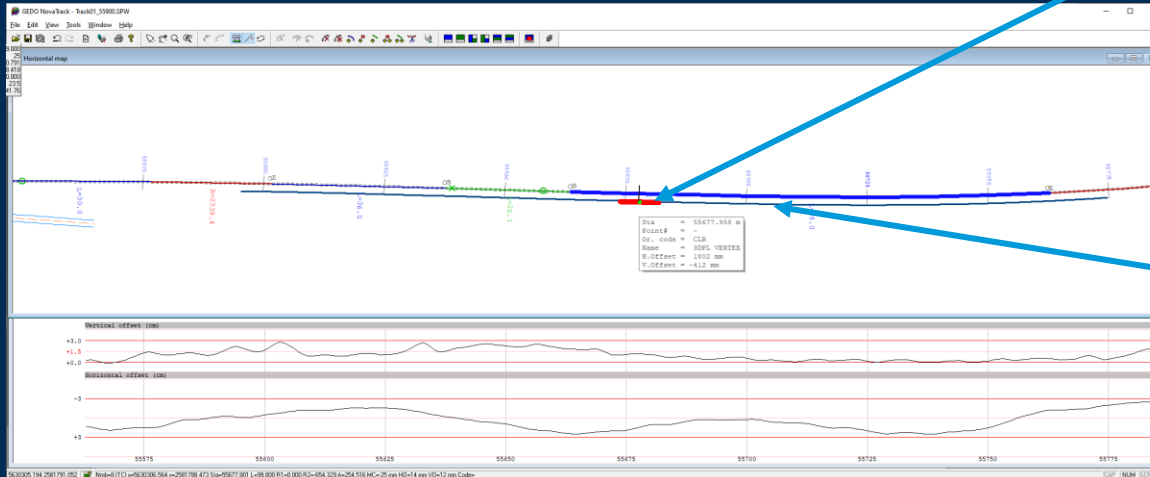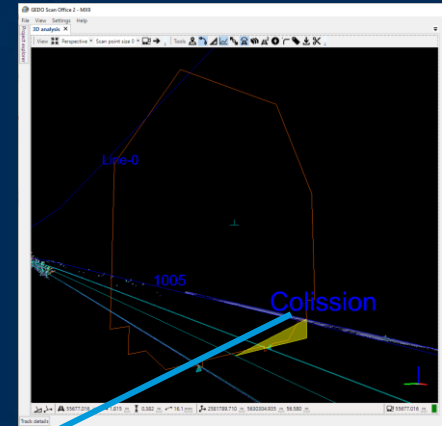
Railway specific classification

- Automated classification process along the track corridor
- Parametrical control
  - Width
  - Density
  - Selectable groups
- Classification groups
  - Sleepers with positions
  - Ballast
  - Rails
  - Poles (catenary)
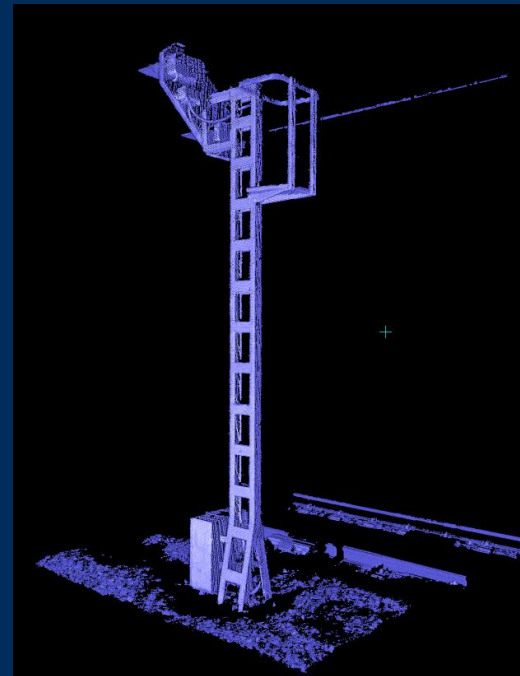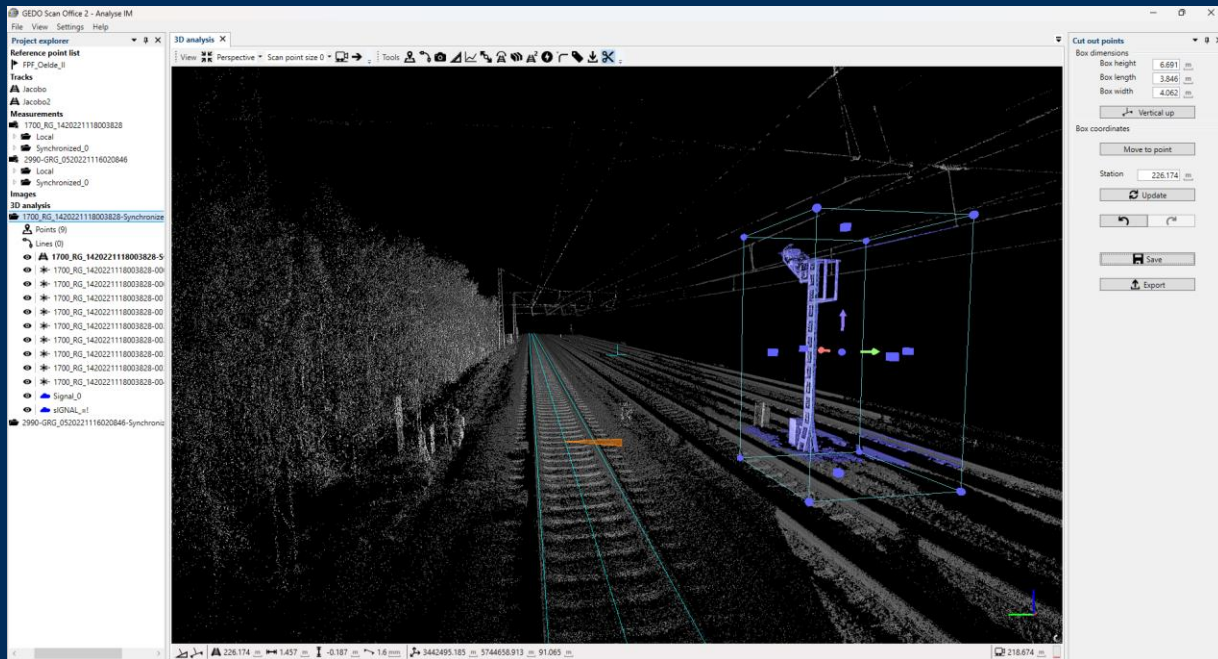- Machine learning and AI algorithm
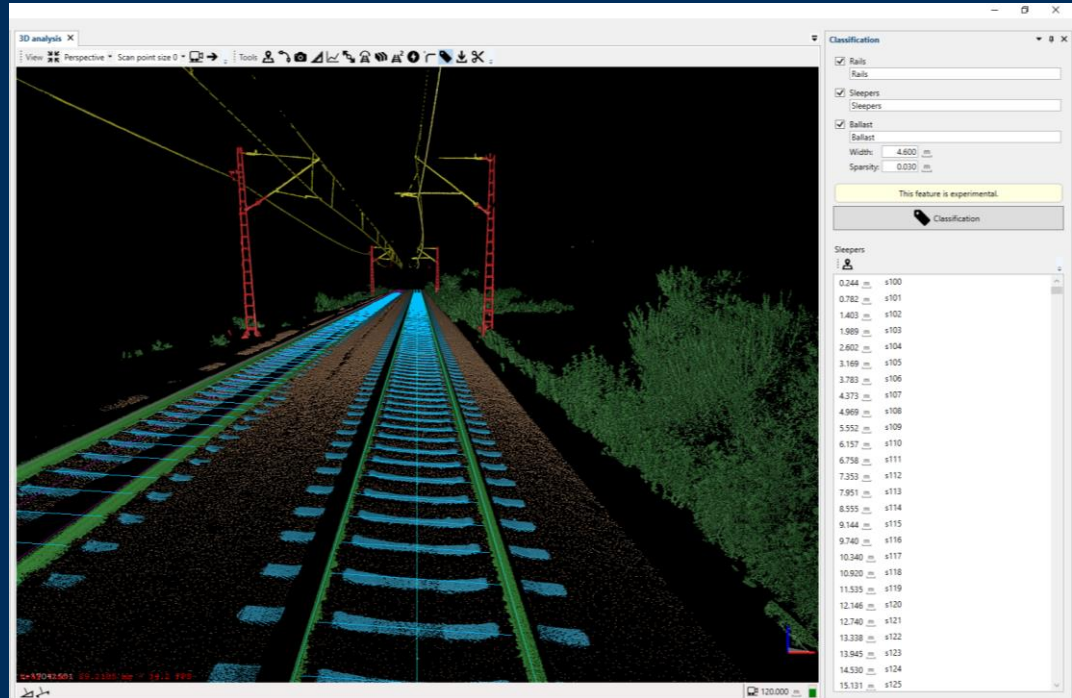
Ballast volume & cut/fill calculation

- Ballast classification point cloud
- Import design ballast DTM from GEDO Office
- Ballast Cut/Fill map and volume reports in TBC
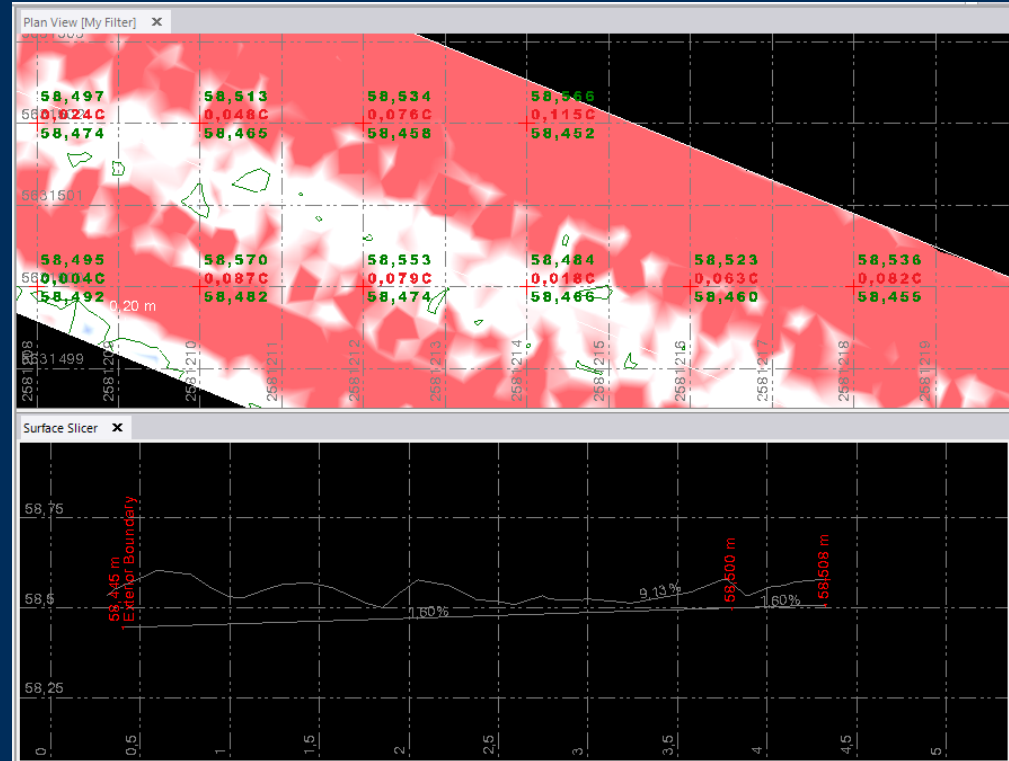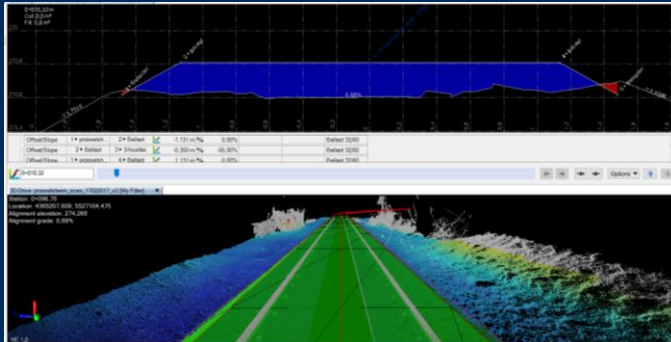
Box filtering for modelling

- Select area and share with modelling software

Point cloud data for Railway Applications

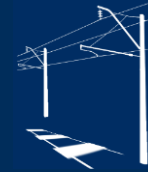Material Volumes

Clearance Check

Rolling Stock

Platform Gauging

Planning & Design

Applications

Asset Data

Overhead Lines

As-Built Check

Track Maintenance & Inspection

Deformations