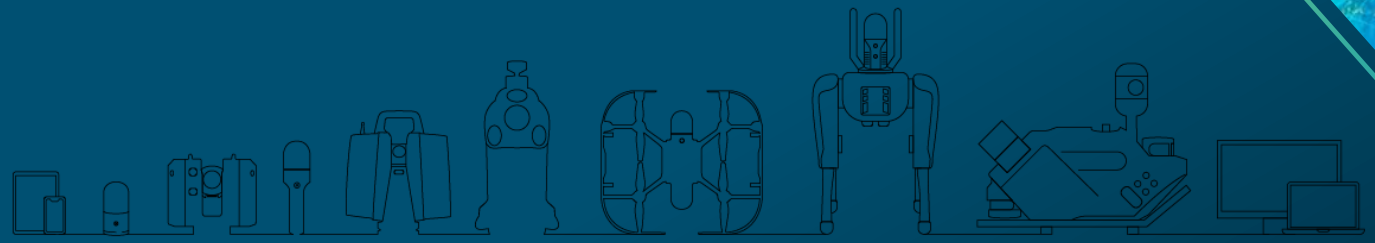
HEXAGON
empowering an autonomous future



From Pixels to Pavement

Tamas Safar – Leica Geosystems part of HEXAGON

ERPUG 2023, Athens, Greece

ERPUG

Global leader in **digital reality solutions**

that are empowering an autonomous, sustainable future by putting data to work

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Leica Geosystems part of Hexagon - Reality Capture Portfolio

Reality Capture portfolio

Special/Hybrid solutions

TLS

MMS

Autonomous

Accuracy

Millimeter level

Centimeter level

Nova MS60

ScanStation P50

RTC360

BLK360

BLK247

GS18i

BLK360

BLK2GO

BLKARC

BLK2FLY

Pegasus TRK500/700

Pegasus:Backpack

Advanced

High

Extreme

Productivity

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Why Mobile Mapping?

Safety

Traditional Surveying vs. Mobile Mapping

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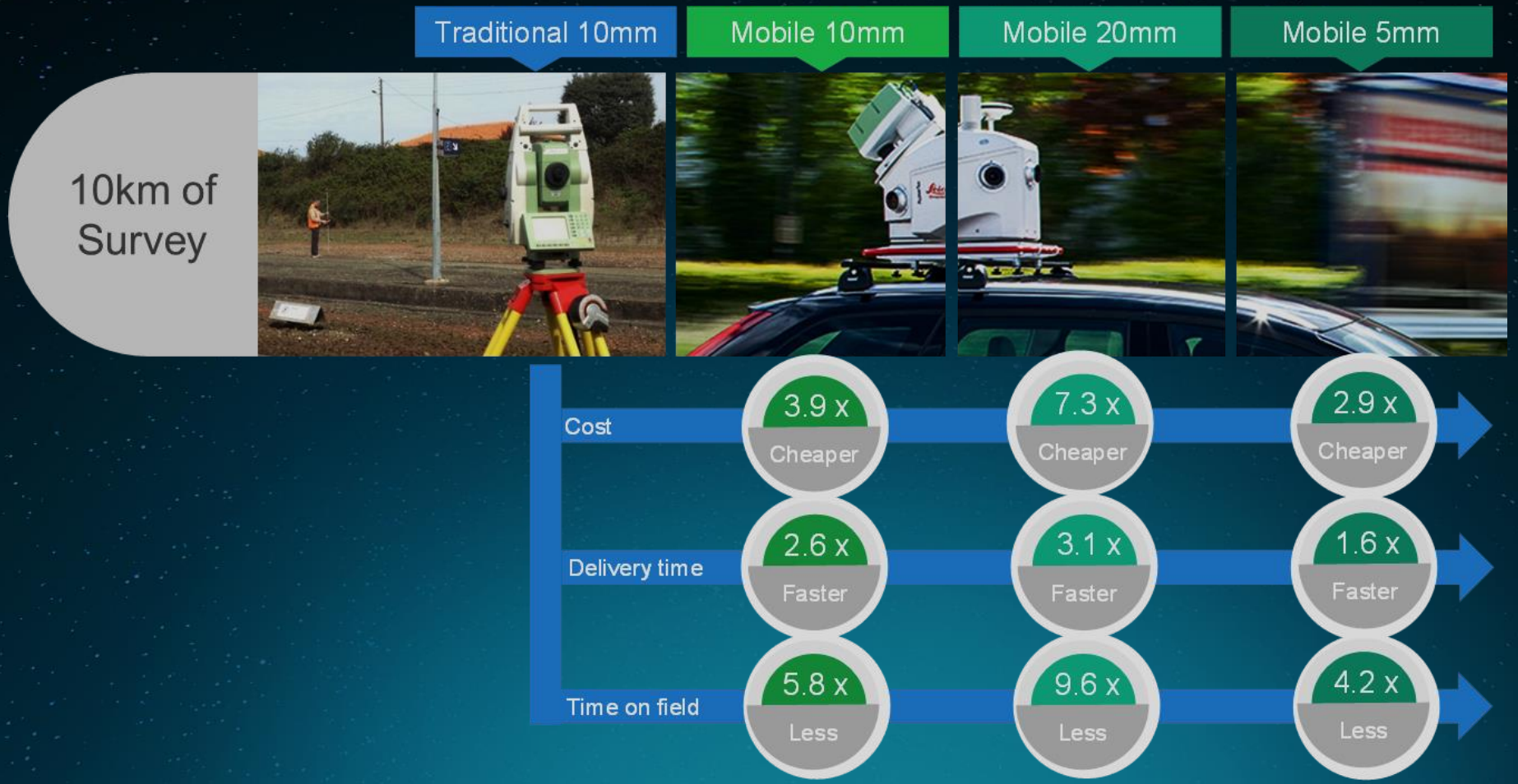
Why Mobile Mapping?

Productivity and cost efficiency

Comparison from 2018:



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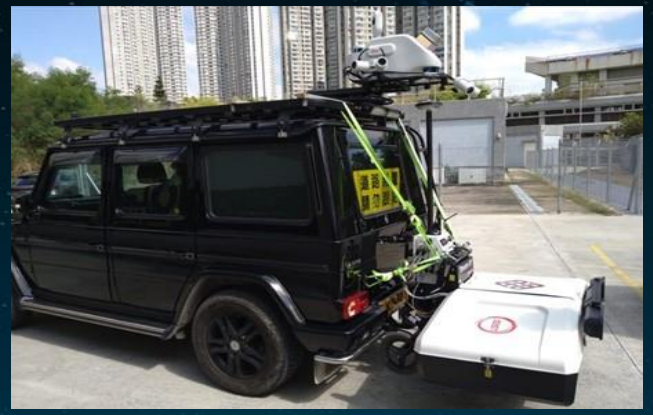
Why Mobile Mapping and Leica Pegasus TRK?

Flexibility

Specific road inspection solutions

Leica Pegasus TRK mobile mapping system



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Why Mobile Mapping and Pegasus TRK?

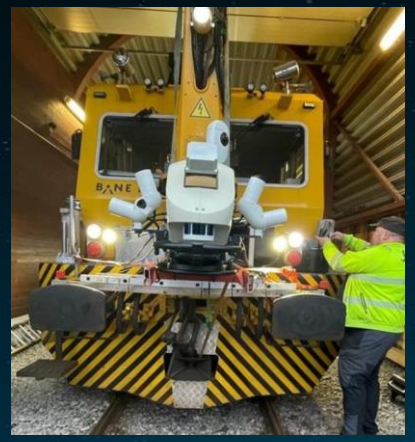
Flexibility

- platform independent
- agnostic
- straight-forward initialization
- intuitive

- front- or backwards looking

- front wagon
- flat wagon
- hybrid vehicles

Central Geo Kft. Hungary



Geodeesia24 Ltd. Estonia

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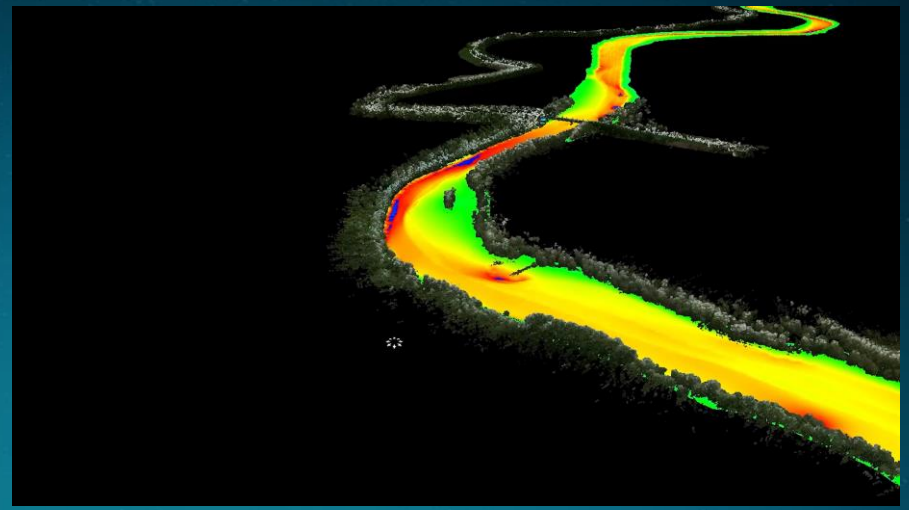
Why Mobile Mapping and Pegasus TRK?

Flexibility

- marine and river applications
- bank erosion monitoring
- complex data capture of bridges

General Directorate of Water Management, Hungary



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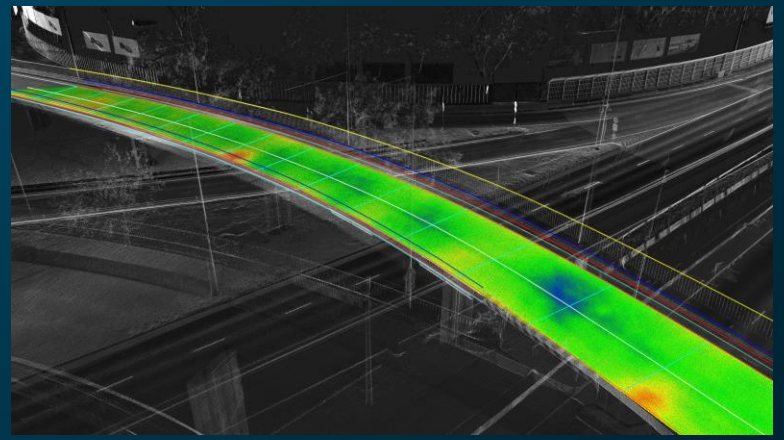
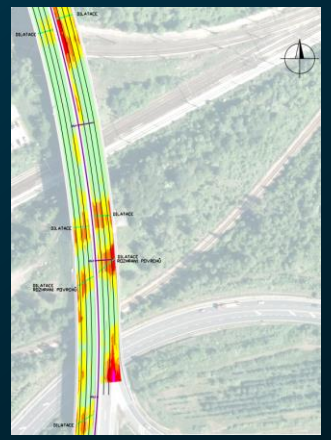
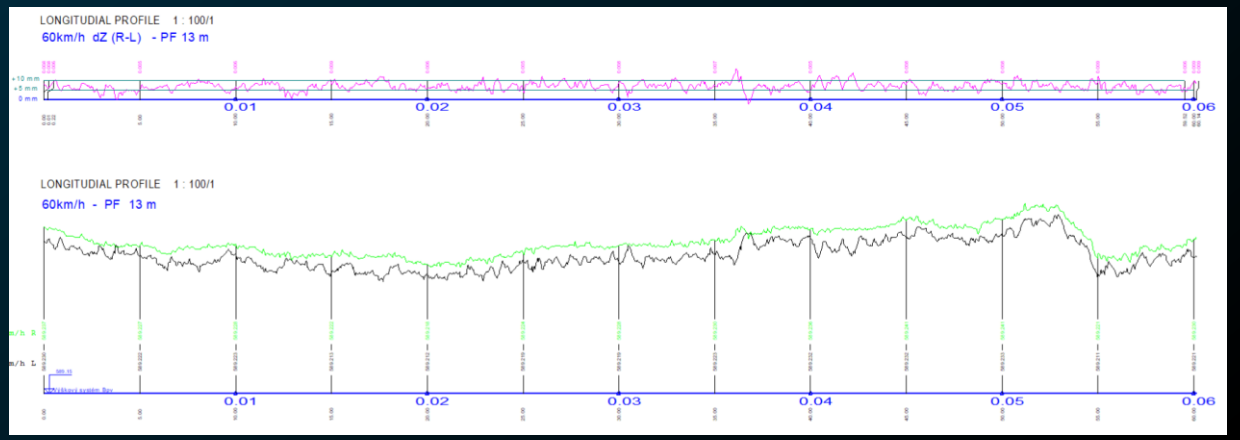
Why Mobile Mapping and Pegasus TRK?

Versatility: Potential of mass data

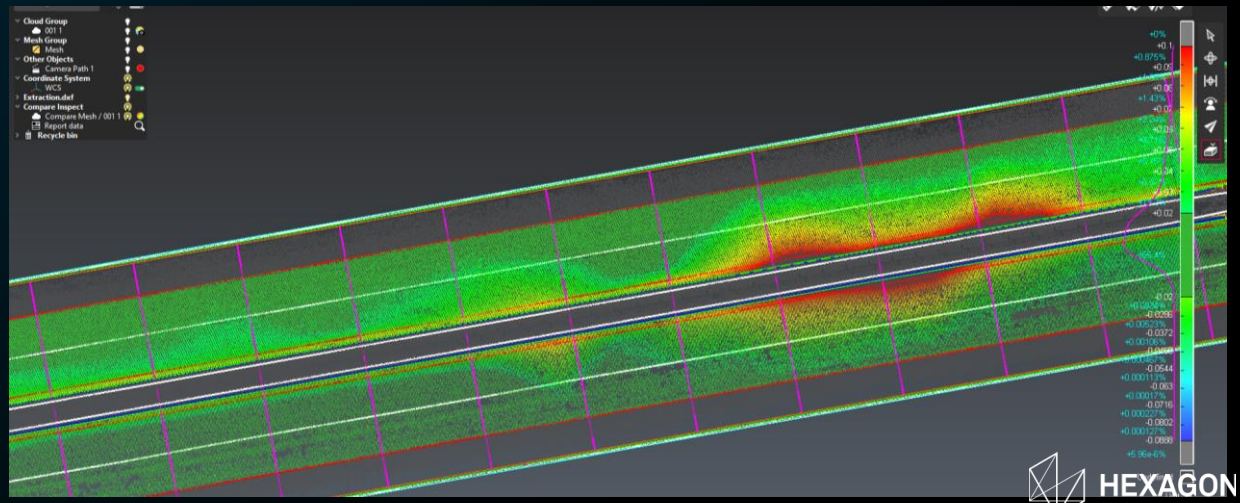
Road surface Inspection







- from 3D to 2D
- millimetre level relative and **absolute** accuracy
- synchronized high-resolution imagery data
- additional sensor fusion (eg. GPR for detecting cavities)



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Why Mobile Mapping and Pegasus TRK?

Versatility: Potential of mass data

Road design and infrastructural BIM

Duna Aszfalt Zrt. Hungary:

- BIM model creation
- Work progress tracking and monthly billing
- Analysis of design flaws
- Scheduling and cost attachments, 4D, 5D & 7D
- Road Restoration plans in CAD
- Side slope inspection
- Cross Sections
- Quality Control
- As-built documentation

DUNA ASZFALT

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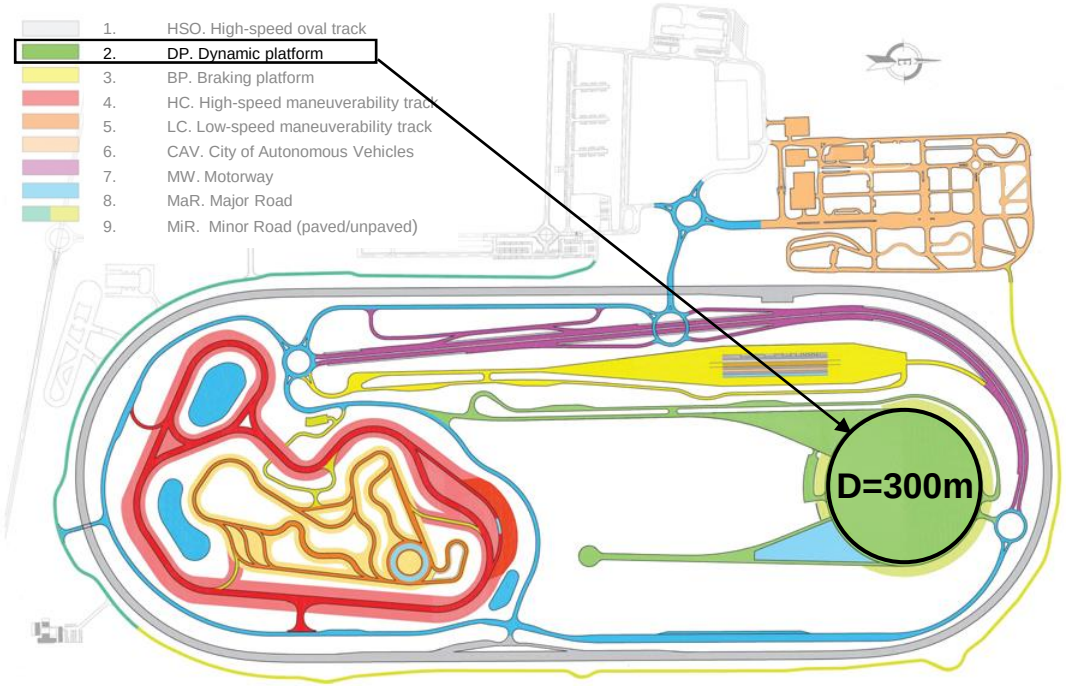
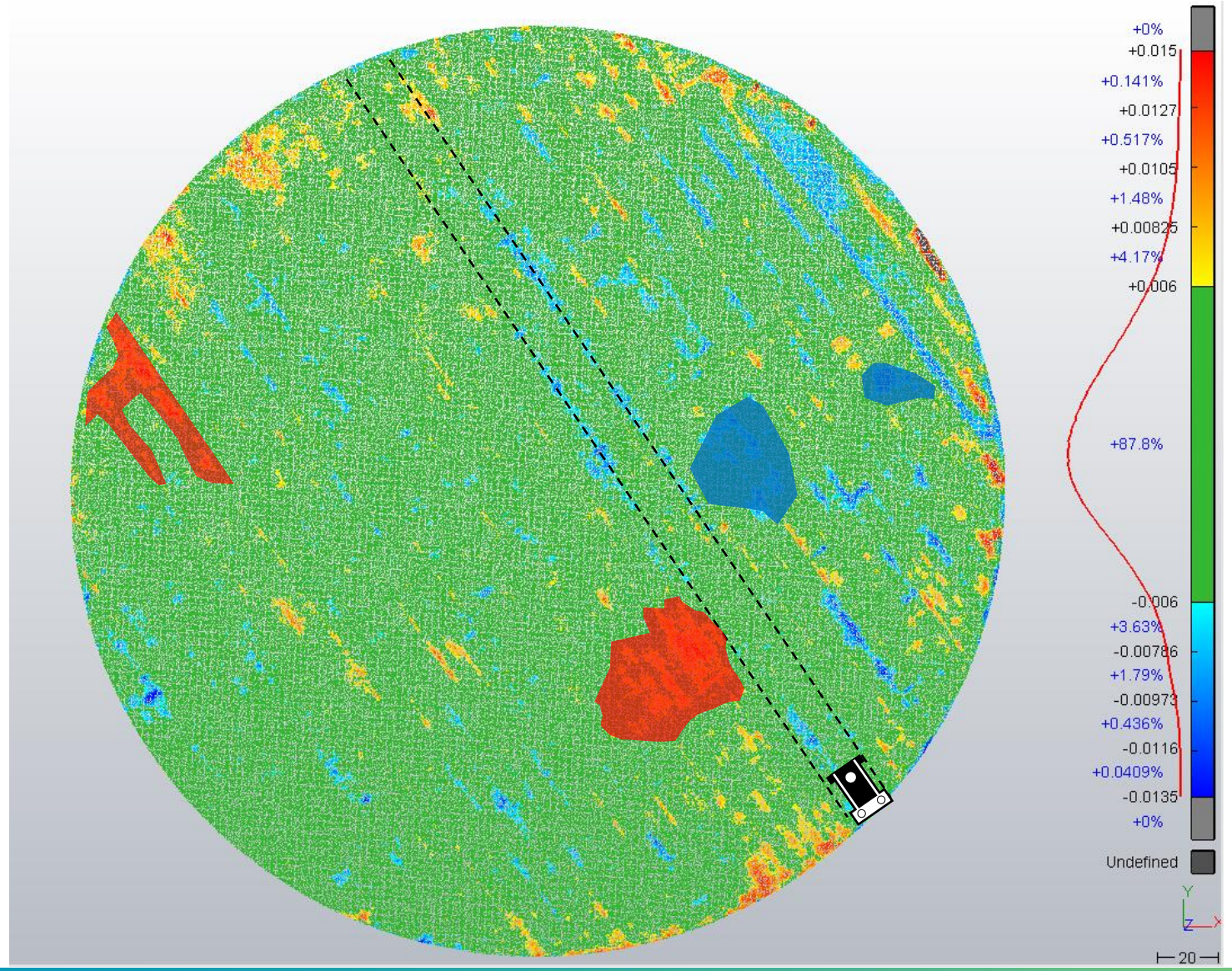
Pavement QA/QC with Leica laser scanning

- Autonomous Proving Ground, ZalaZone, Hungary
- 300 m diameter circular dynamic platform
- Quick and repeatable solution to check the surface flatness of the asphalt base layer, covering every square cm



Pavement QA/QC with Leica laser scanning



Green: within the specified +/-6mm

Red: protruding → correctable by milling

Blue: recessed → thicker bonding layer needed

Polygonizing the critical areas

↓

Steak out in the field for the correction

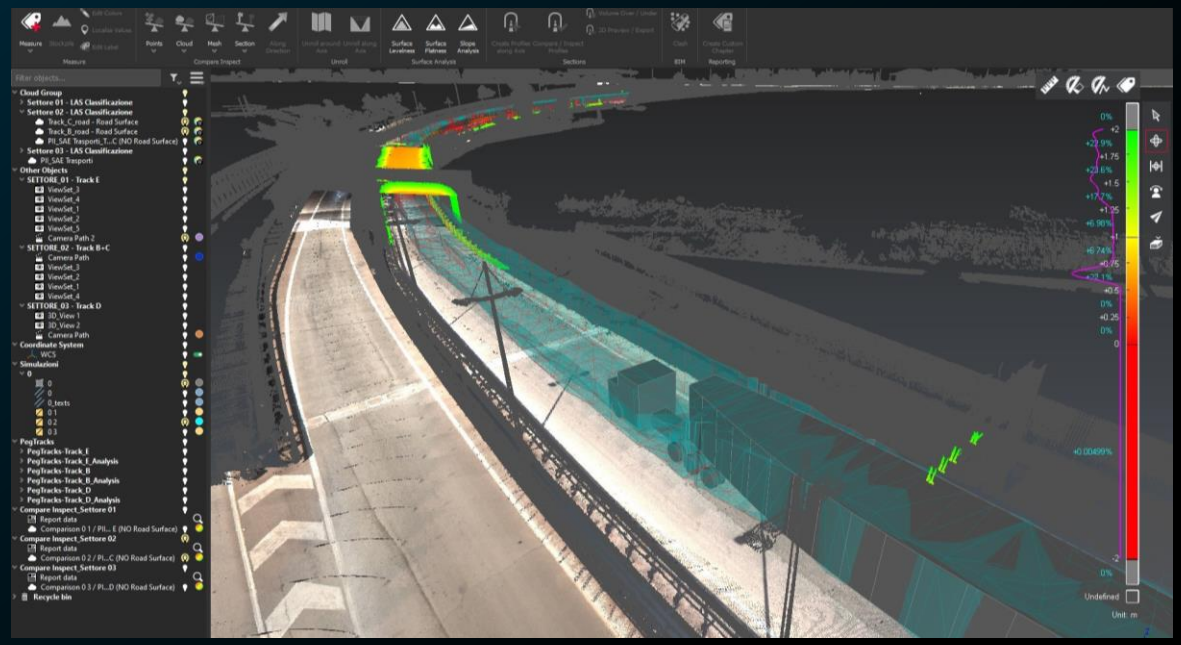
Why Mobile Mapping and Pegasus TRK?

Versatility: Potential of mass data

Transportation clash detection

Facing the problem on site

Simulating based on MMS data



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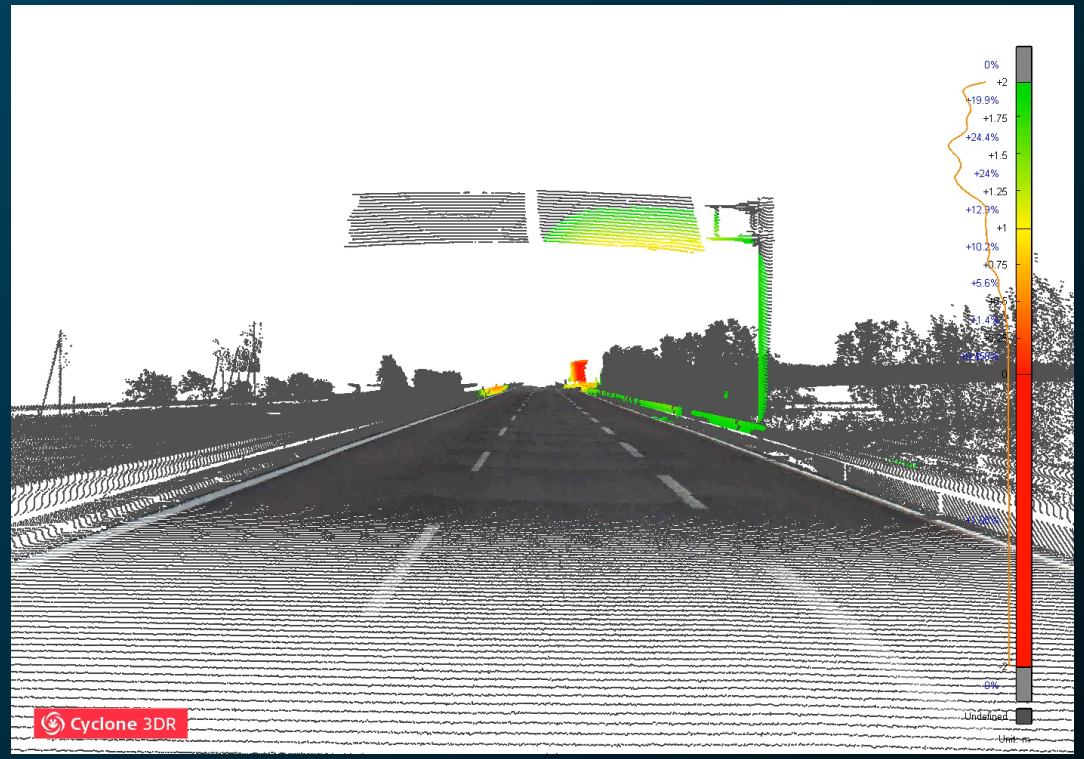
Why Mobile Mapping and Pegasus TRK?

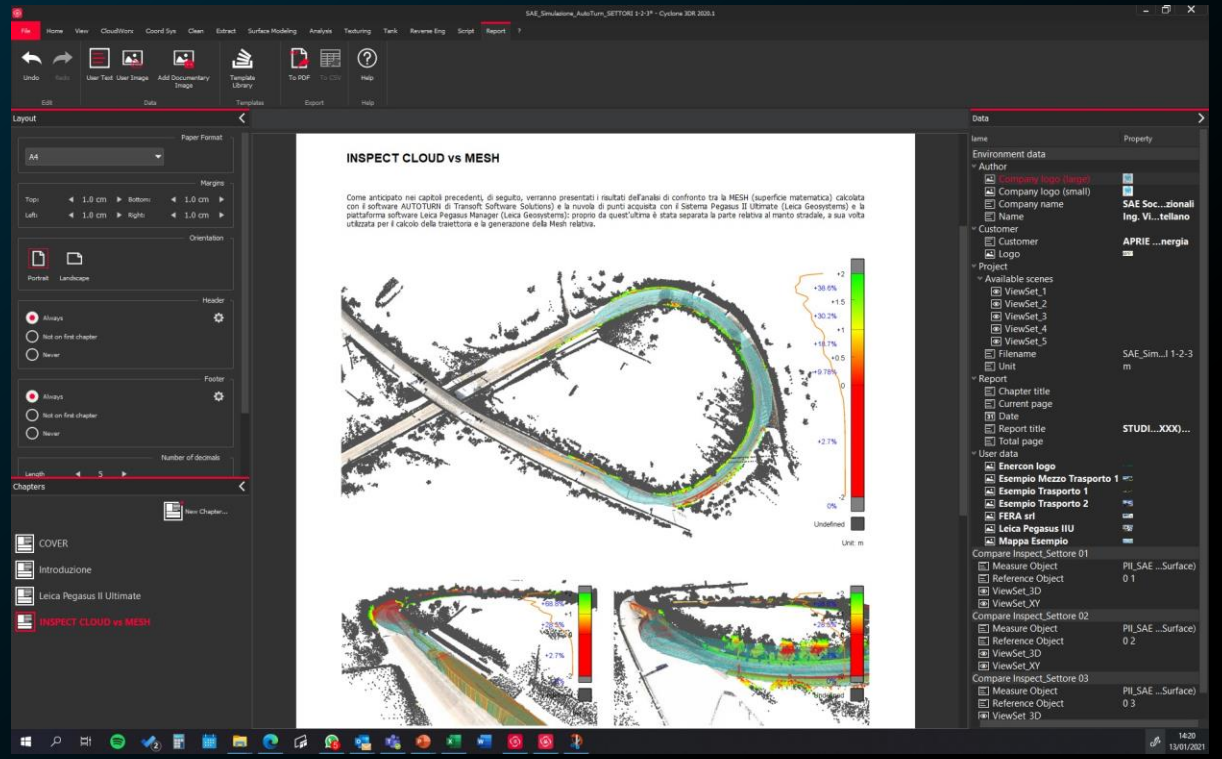
Versatility: Potential of mass data

Transportation clash detection

3D Dynamic Simulation



Report as 2D or 3D map



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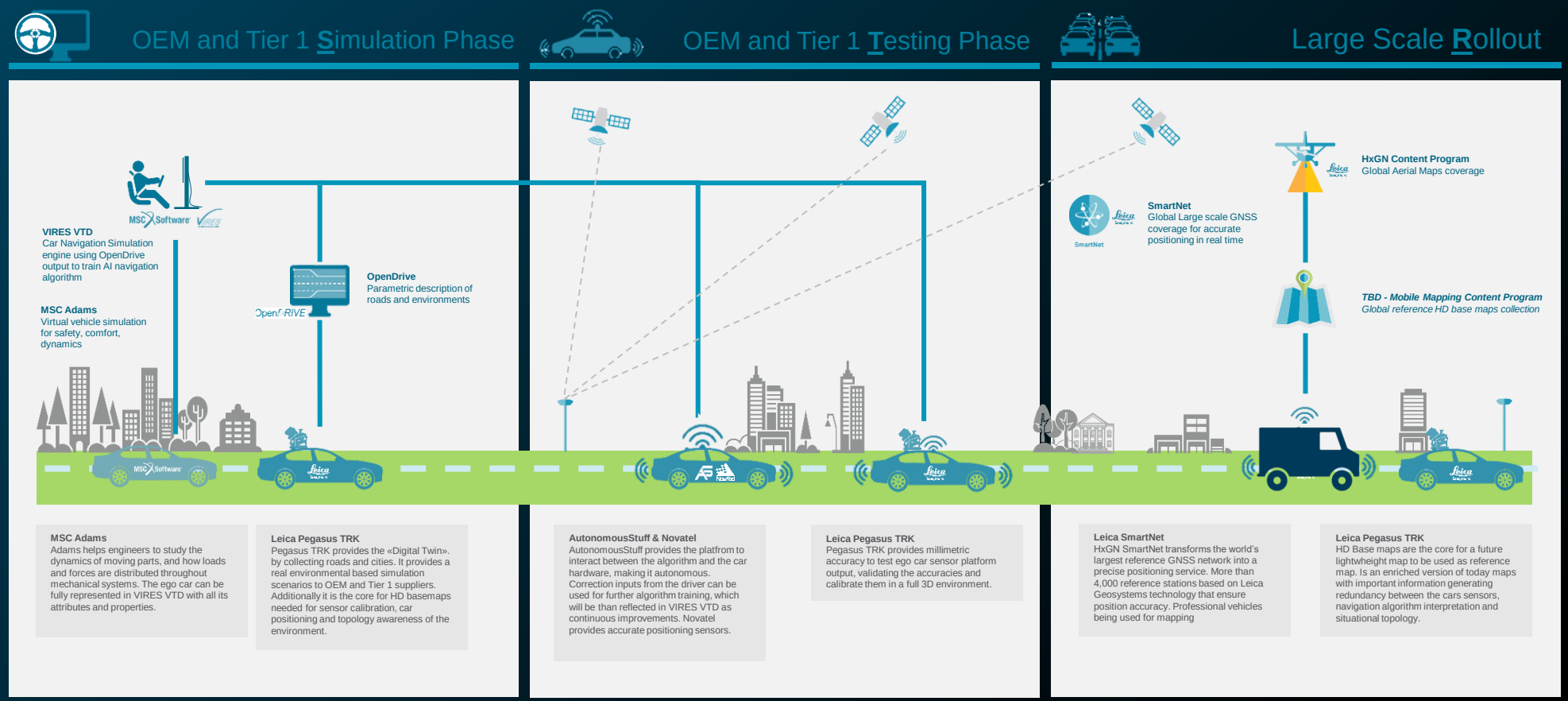
Why Mobile Mapping and Pegasus TRK?

Versatility: Potential of mass data

Autonomous Vehicles Ecosystem



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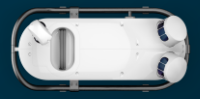
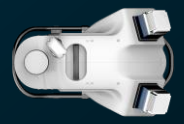
Pegasus TRK systems

TRK100 vs TRK Neo vs TRK Evo





	Pegasus TRK100	Pegasus TRK Neo	Pegasus TRK Evo
MAIN APPLICATIONS			
ASSETS	Road signs, telco/power lines		
MODELLING	City modelling, simulations		
SURVEYING	Cadaster, road-constr.		
AUTONOMOUS	HD Base Maps		
MARINE	Costal **erosion, canals**		
MINING	Volumetric analysis		
ENGINEERING	As built, structure analysis, deformation		
RAIL	Track geometry, as built, inspection		
RELATIVE ADVANTAGES			
ABSOLUTE ACCURACY	19/11 mm	11/11mmm	11/11mm
SCANNER PRECISION	10 mm*	3mm	1mm
RANGE	100m	490m	182m
DENSITY	0.6 Mio	0.5–1Mio	1–2 Mio
DYNAMIC RANGE	High	High	Medium
HYBRID MODULE / SLAM	n/a	Yes	Yes
OPERABILITY	8h	7h	3.5h
PROTECTION	IP67	IP67	IP65
WEIGHT	14 kg	18/23 kg	21/29kg

* *MatchPoint* technology applied

Pegasus TRK systems

Unique features

UPGRADABLE

Pegasus TRK100 *Pegasus TRK Neo* *Pegasus TRK Evo*

ONE-MAN OPERATION

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Pegasus TRK systems

Unique features

POST PROCESSING

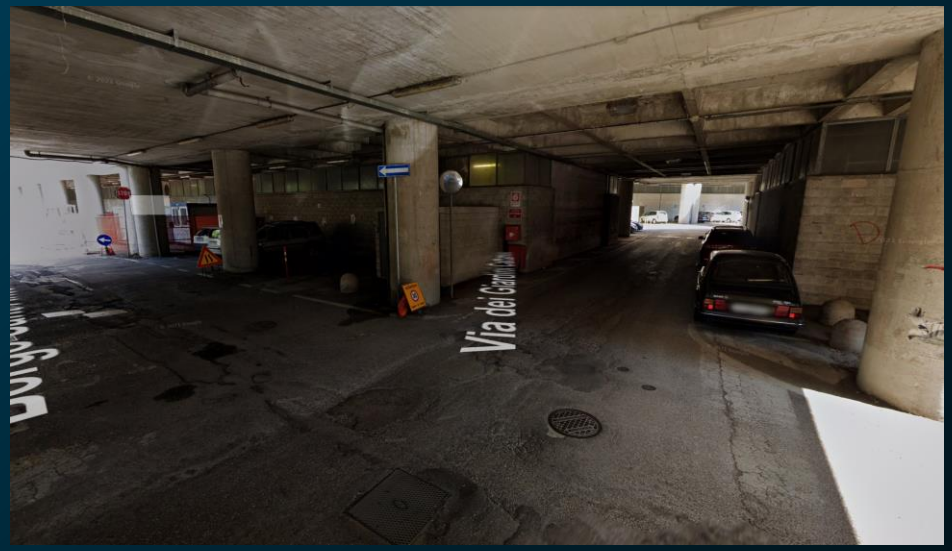
	DX	DY	DZ
stdev	0.008	0.008	0.011

RTK

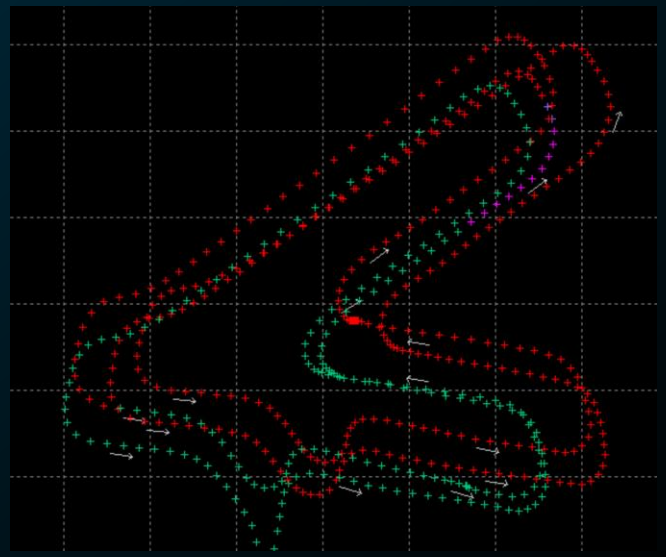
	DX	DY	DZ
stdev	0.009	0.009	0.012

DEDICATED SLAM SCANNERS

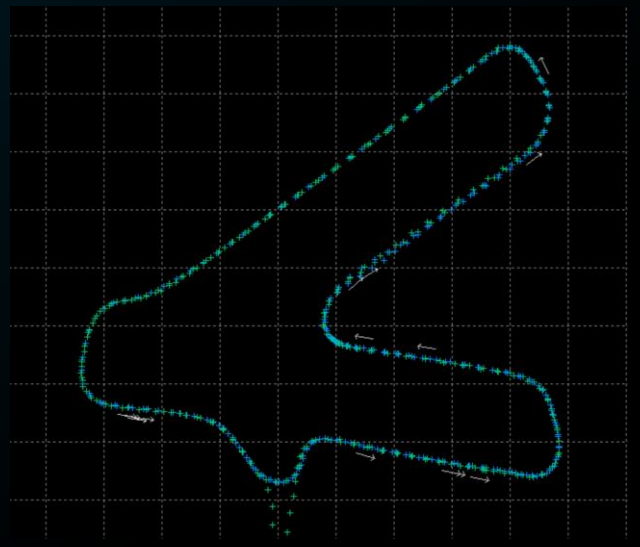
- Underground parking
- 12min GNSS outage



- w/o SLAM



- with SLAM



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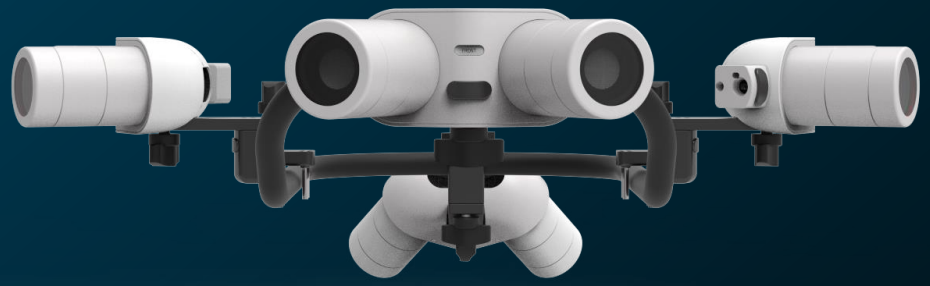
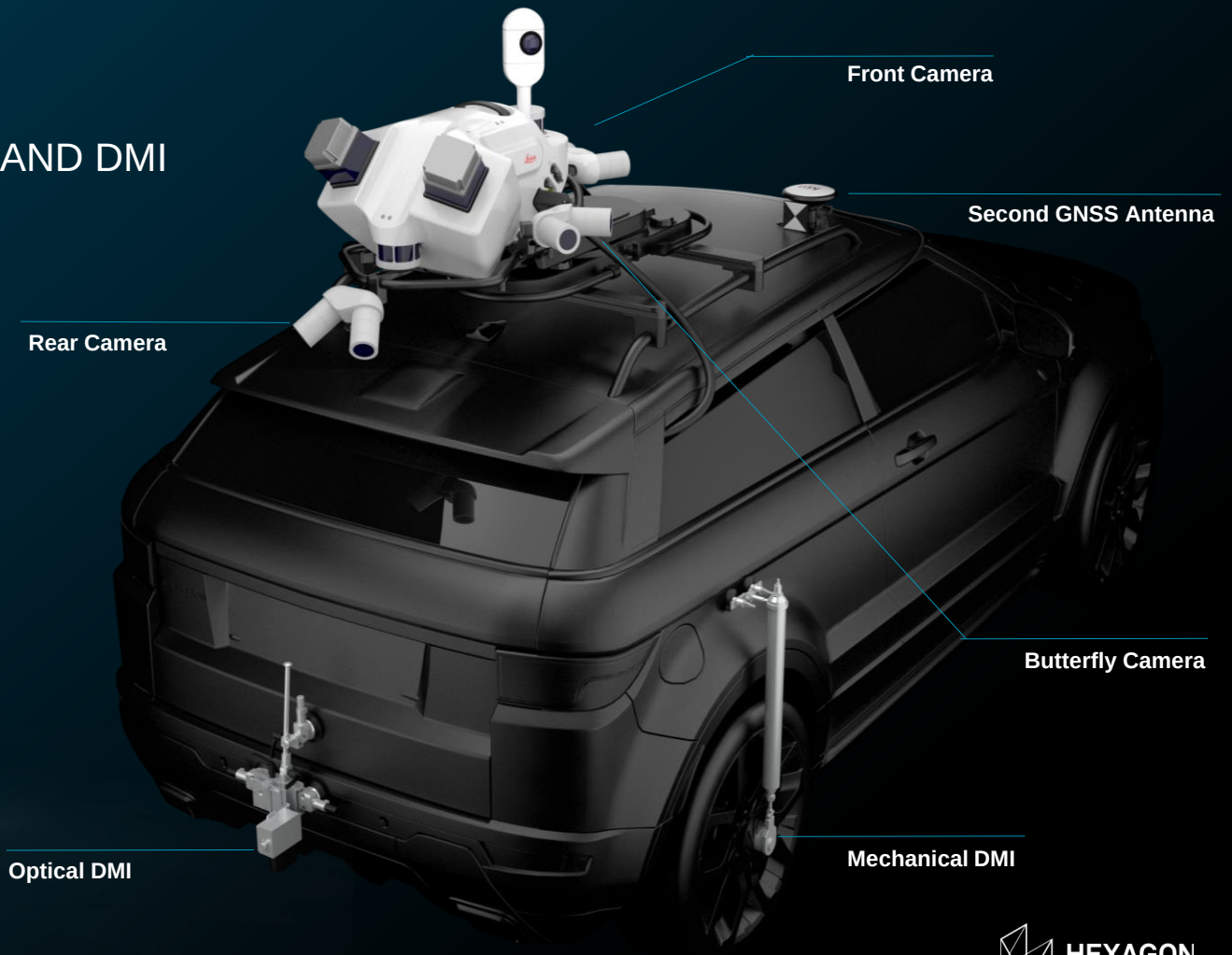
Pegasus TRK systems

Unique features

OPTIONAL HIGH RESOLUTION CAMERA SYSTEM AND DMI





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Pegasus TRK systems

Unique features

INTUITIVE FIELD OPERATION

- Platform independent (iOS, Win, Android)
- Smart Mission Planing
- RTK and PPK mode
- Audio and Visual guidance
- Real-time 3D point cloud
- Advanced Quality Control
- Real-Time Data Processing
  - Smart Fusion Camera System
  - Georeferenced, RGB colorized 3D point cloud (**.E57, *.LAS, *.LGS*)

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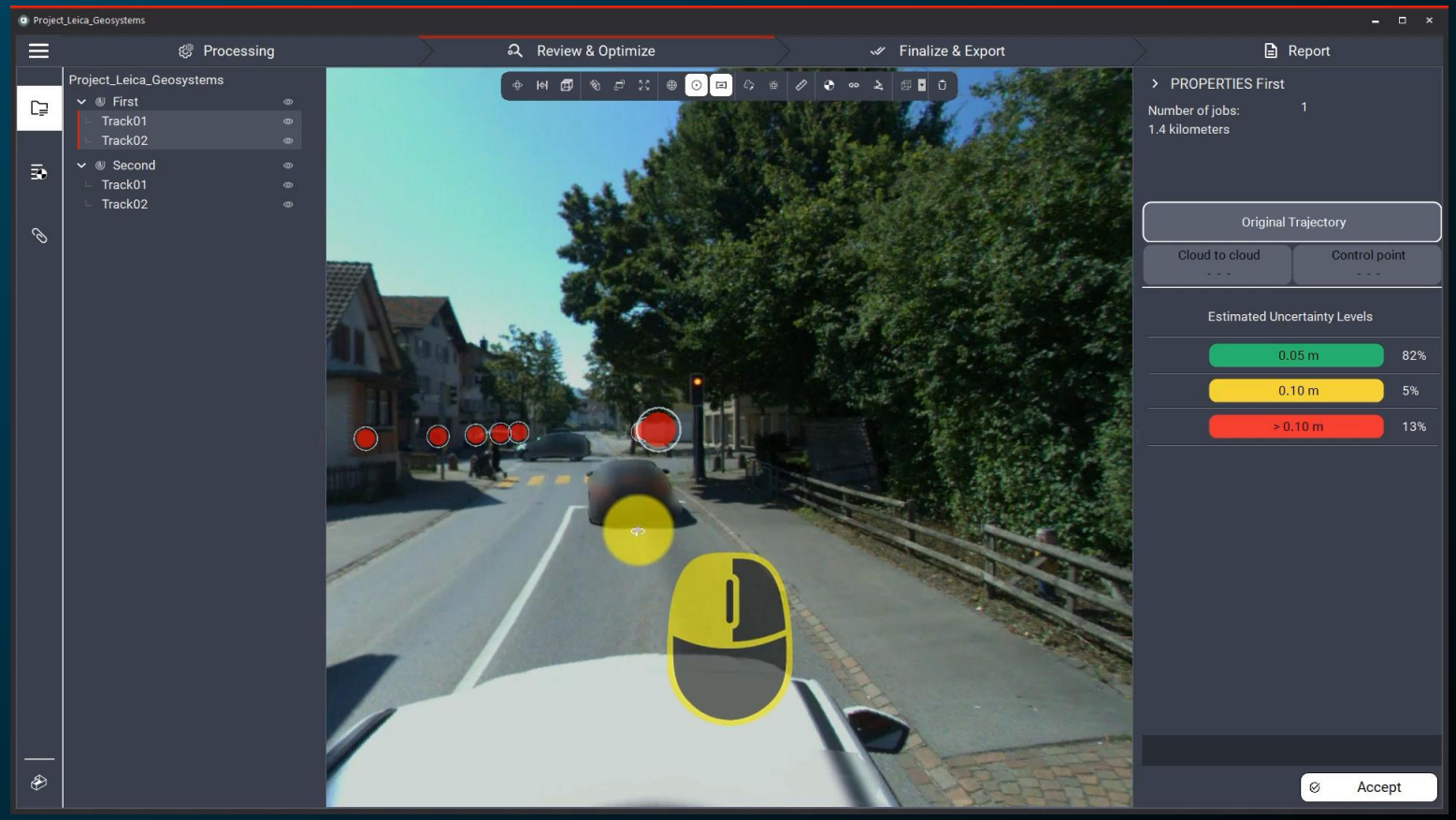
Pegasus TRK systems

Unique features

AI BASED REAL TIME ANONYMIZATION



- GDPR compliance
- Built In privacy
- Blurring vehicles
- Blurring people
- Based on Artificial Intelligence

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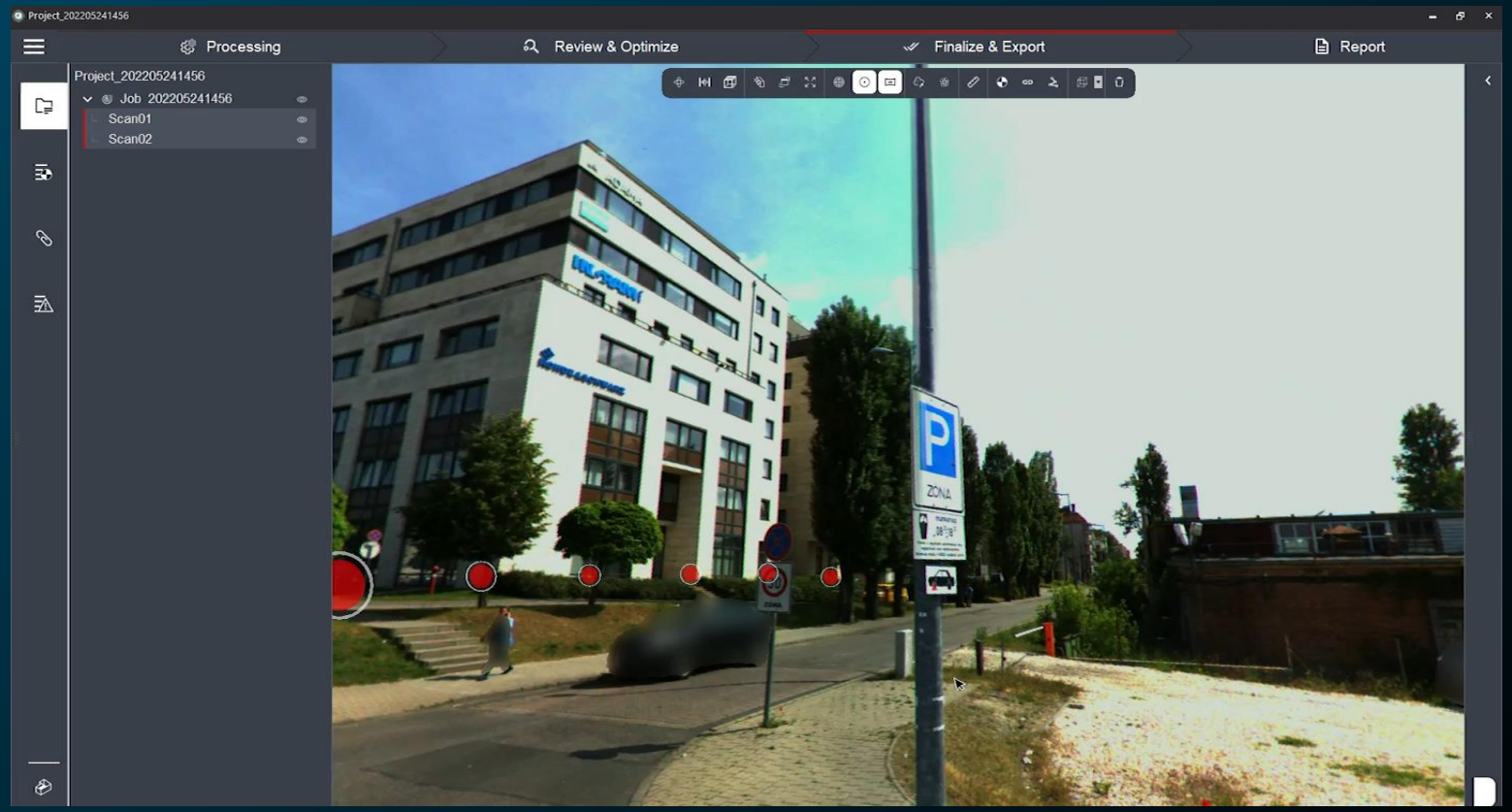
Pegasus TRK systems

Unique features

AUTOMATIC CAMERA CALIBRATION



- High Resolution Cameras (Front, Side, Rear)
- Side Camera in Landscape or Portrait mode
- Automatic Calibration Imagery Data

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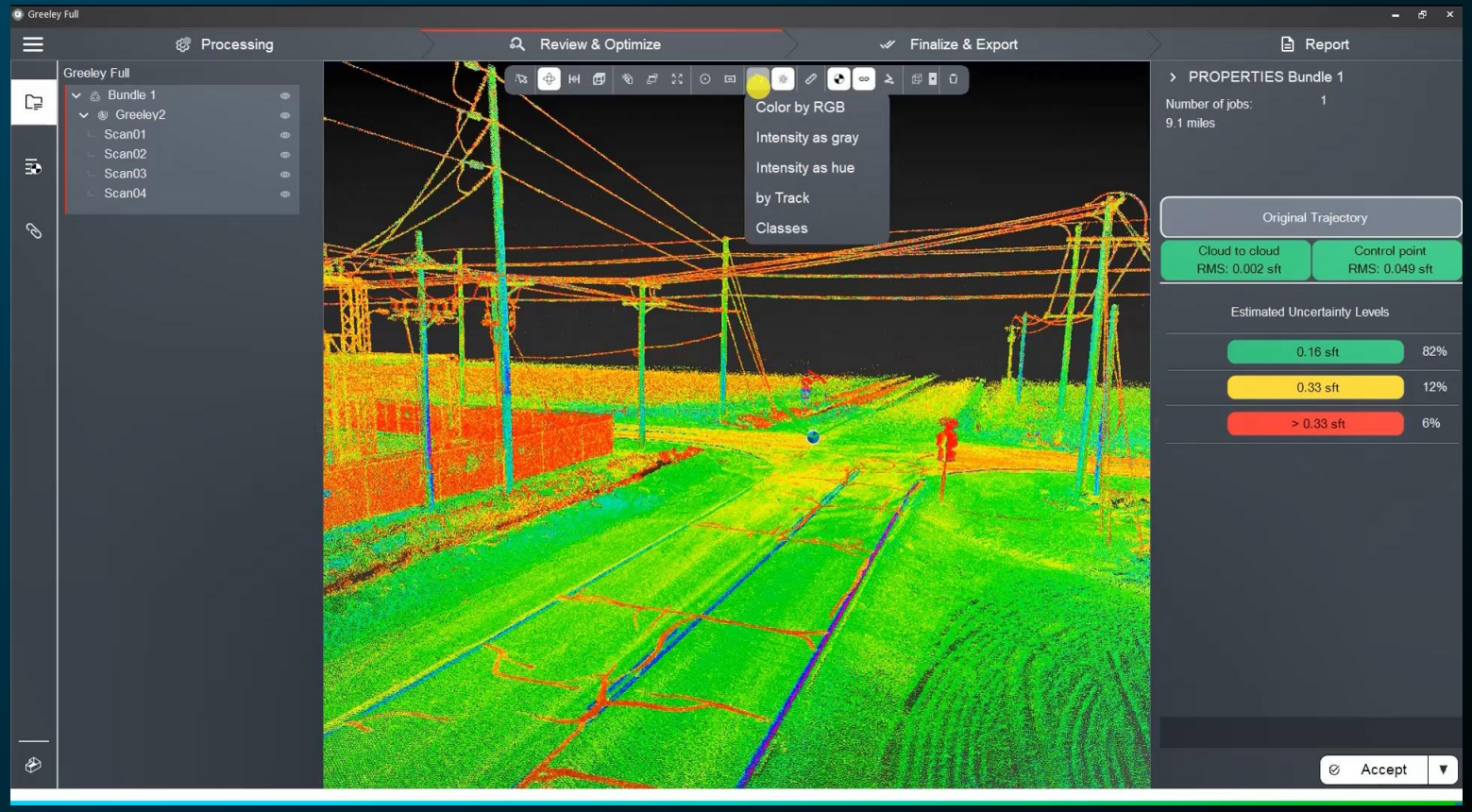
Pegasus TRK systems

Unique features

AI BASED POINT CLOUD CLASSIFICATION



- Point Cloud classification
- Ordering to layers
- Hiding, deleting unnecessary points

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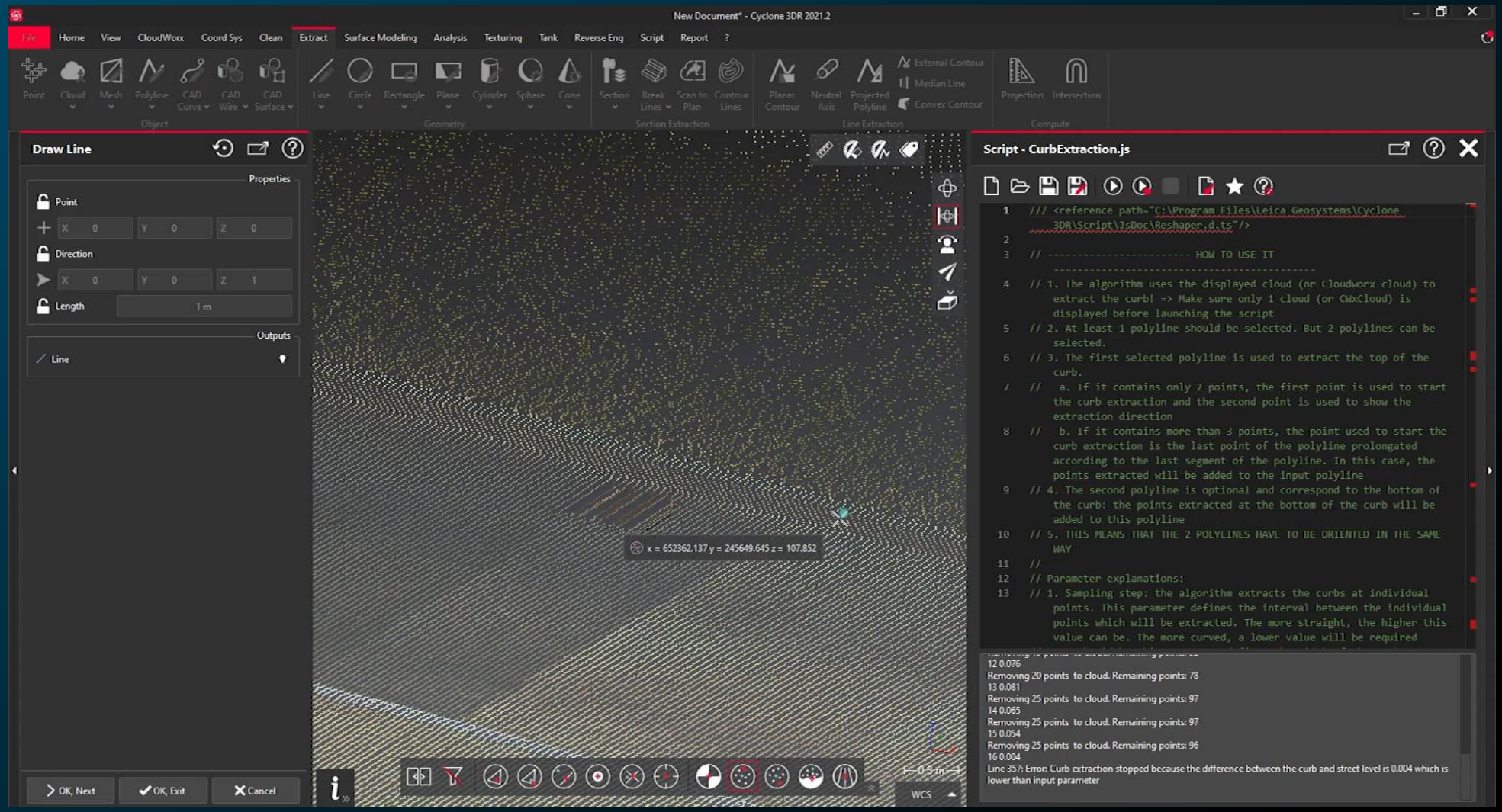
Data Extraction Options

Automatic Curb Extraction – Cyclone 3DR



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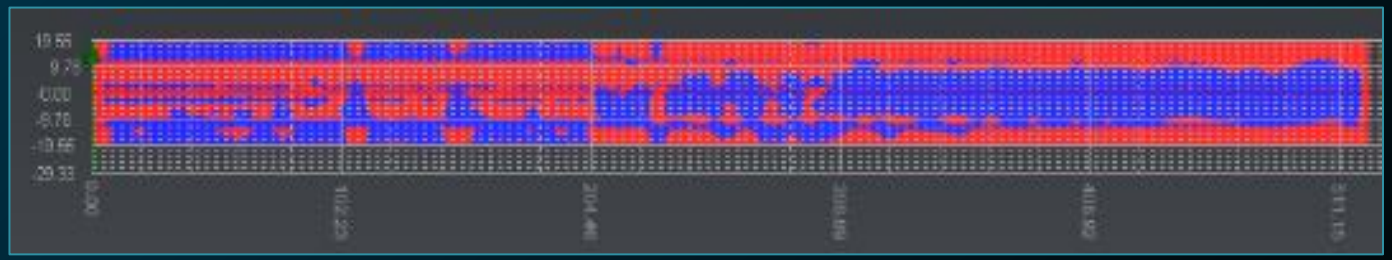
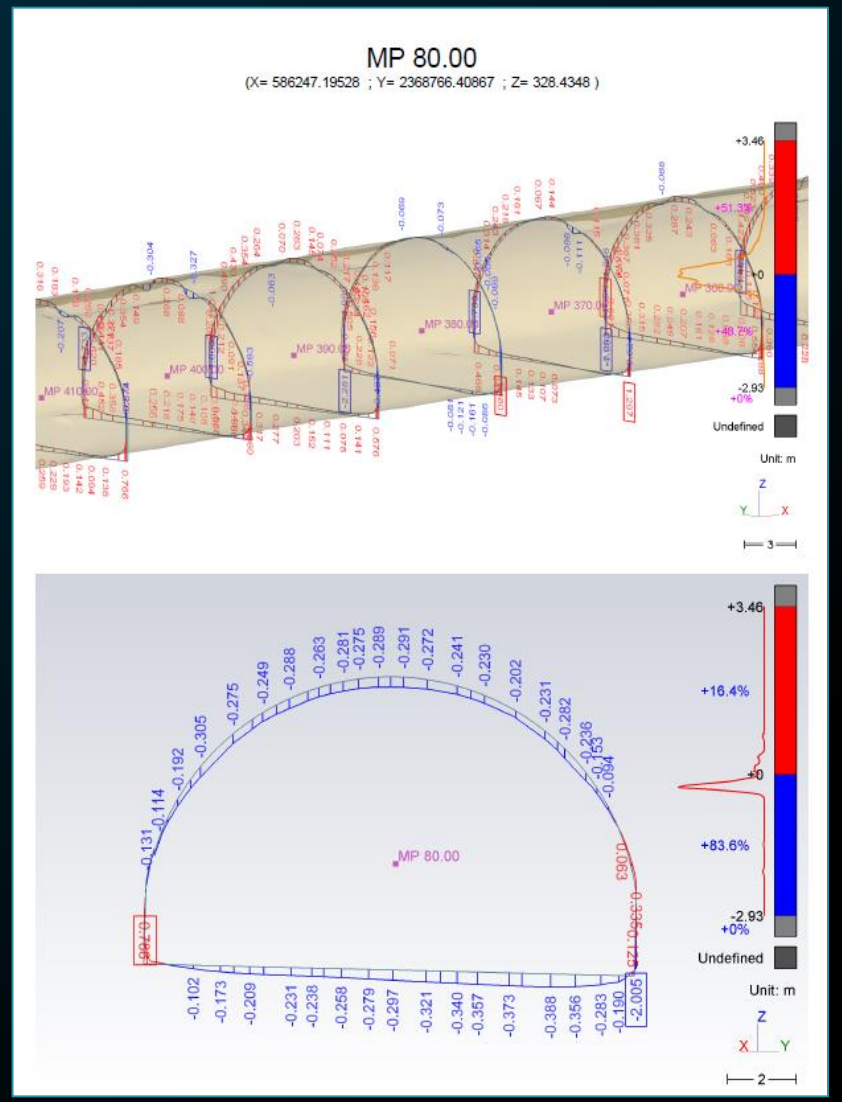
Data Extraction Options

Cross Section Analysis

Road and Tunnel workflow

- Import or design the CAD model
- 3D Surface comparison
- Cross-sections analysis along the axis
- Unroll 2D map colour map
- Export profiles to AutoCAD in 2D or 3D
- Compute overbreaks and underbreaks volume
- Generate a 2D or 3D PDF report with one page per section





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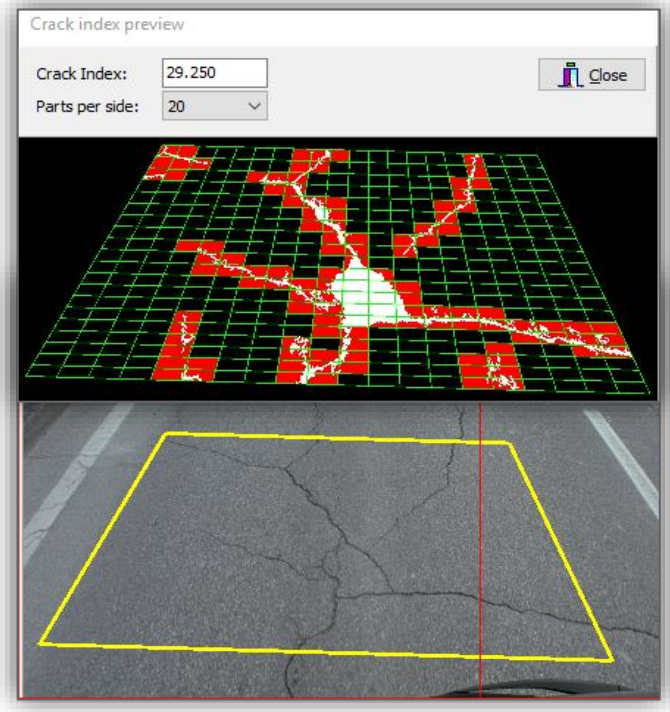
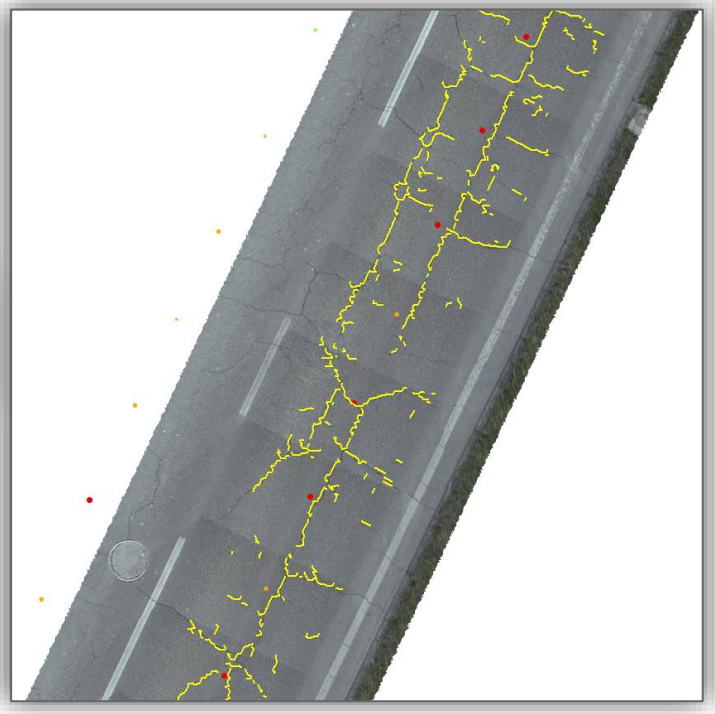
Data Extraction Options

Crack Detection – Road:Factory

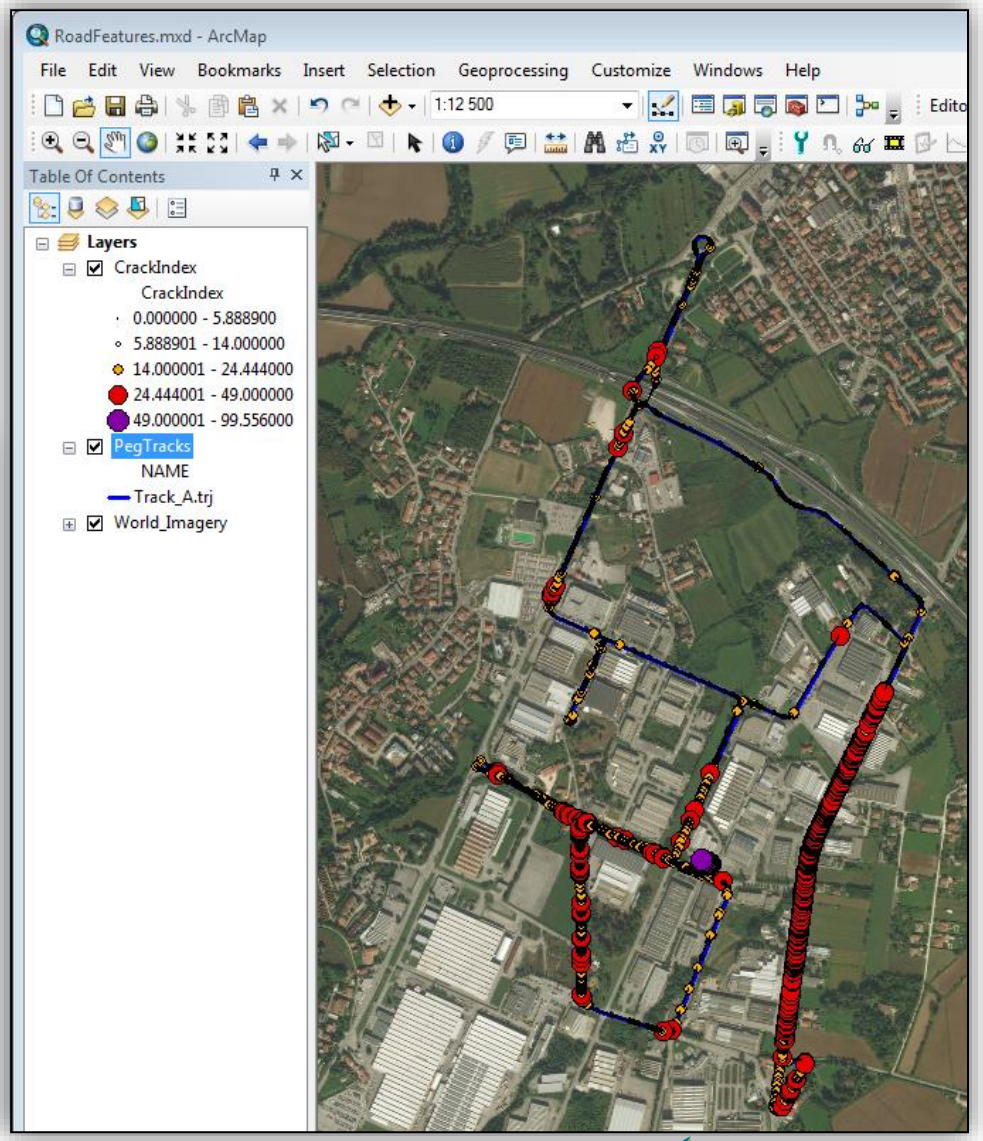
Camera Frame
Cluster definition



Georeferenced orthopohoto



Crack density map (GIS)



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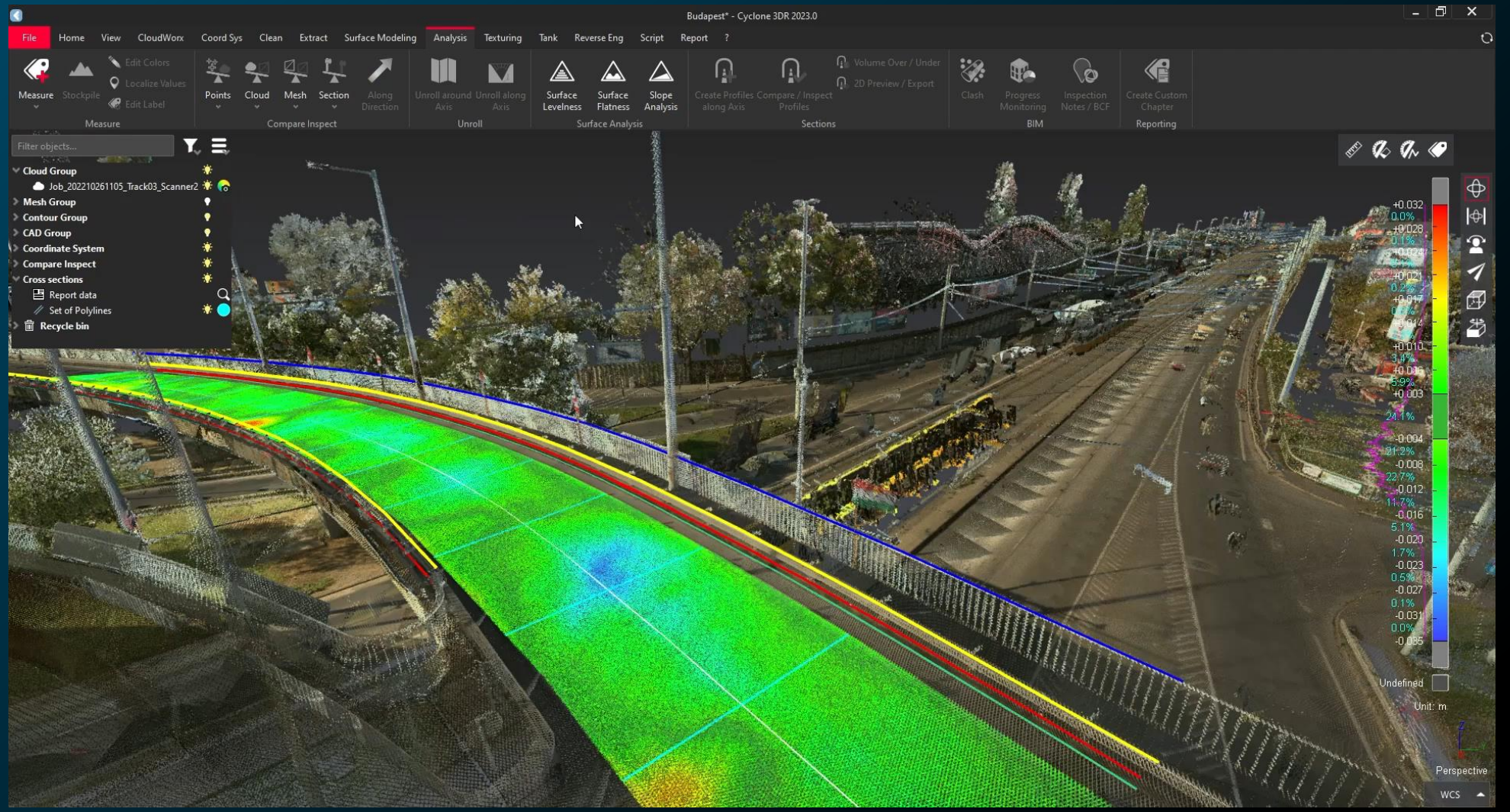
Data Extraction Options

Surface Flatness analysis – Cyclone 3DR



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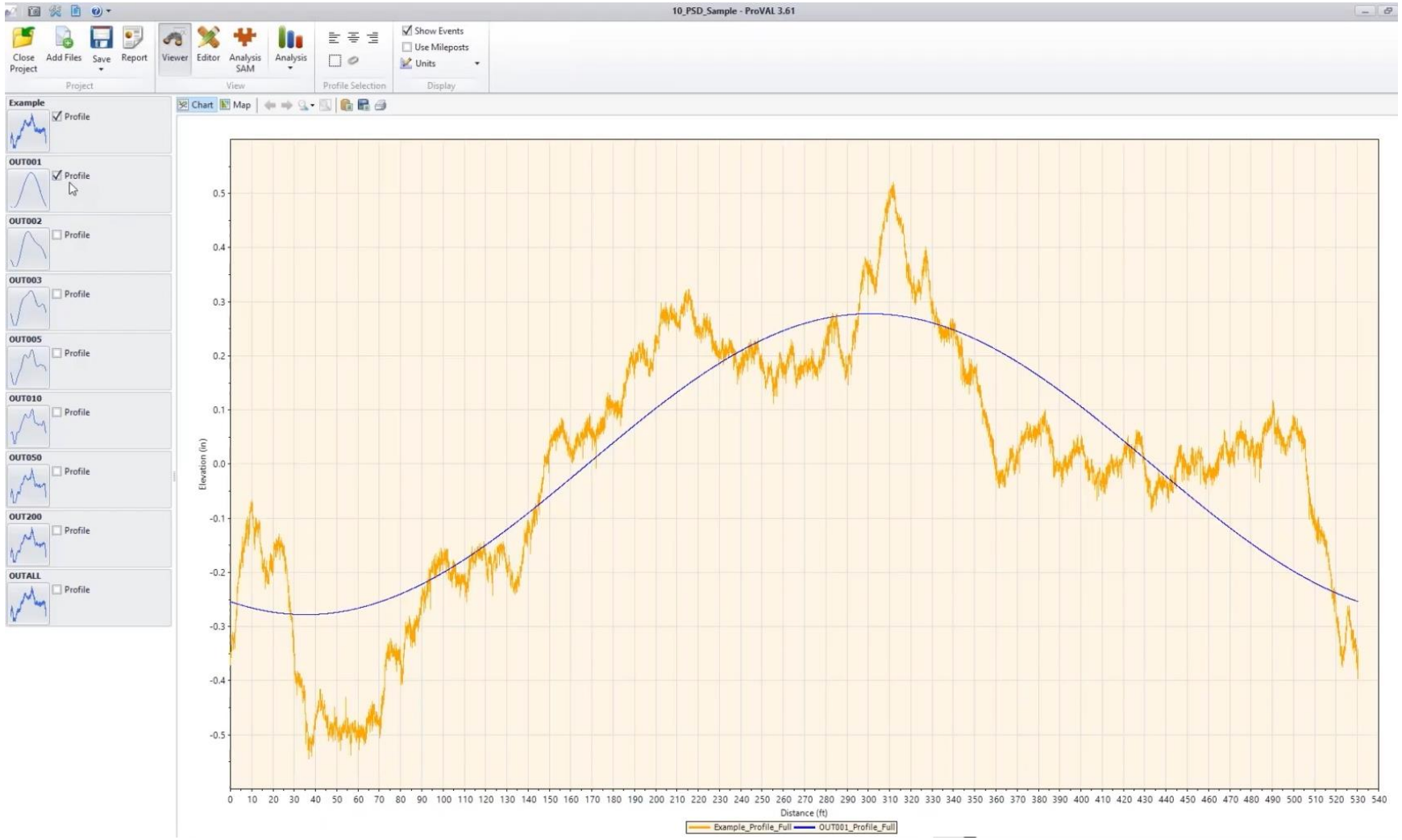
Data Extraction Options

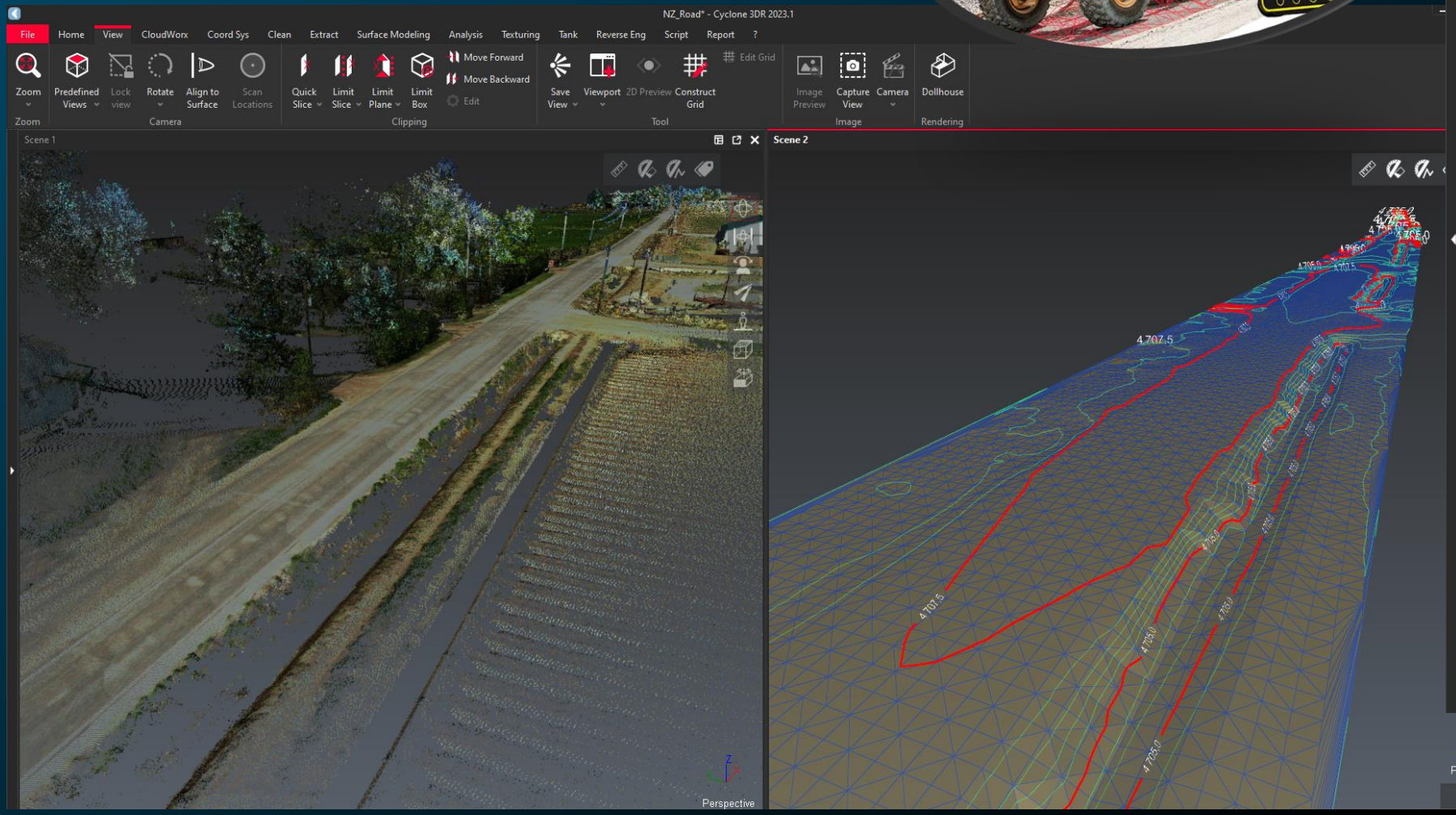
3rd party software – ProVAL by Transtec Gr.

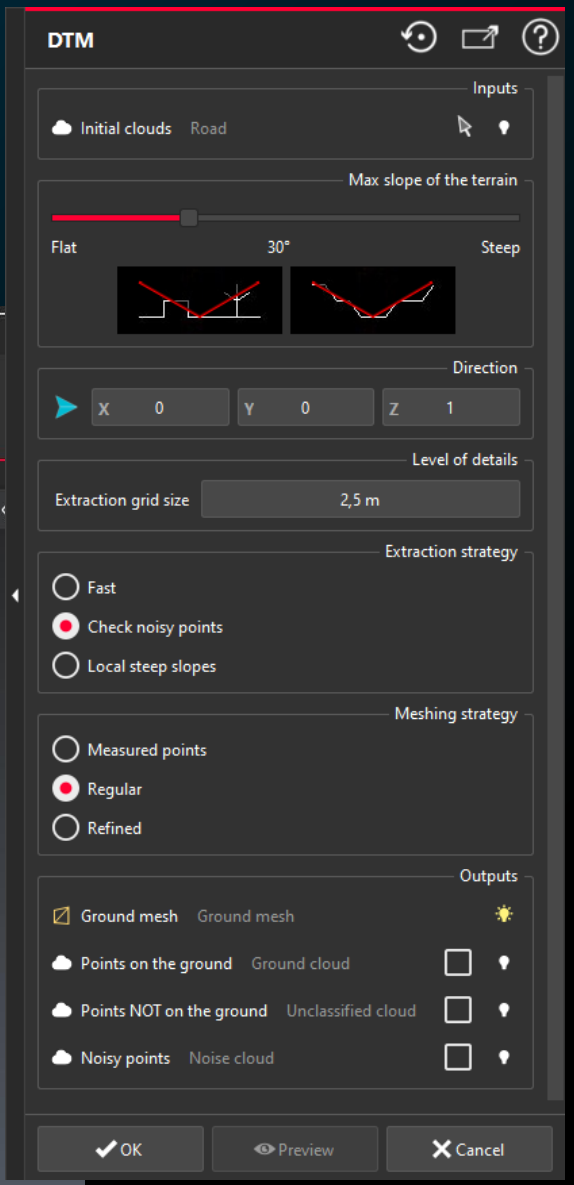


PROVAL HEXAGON

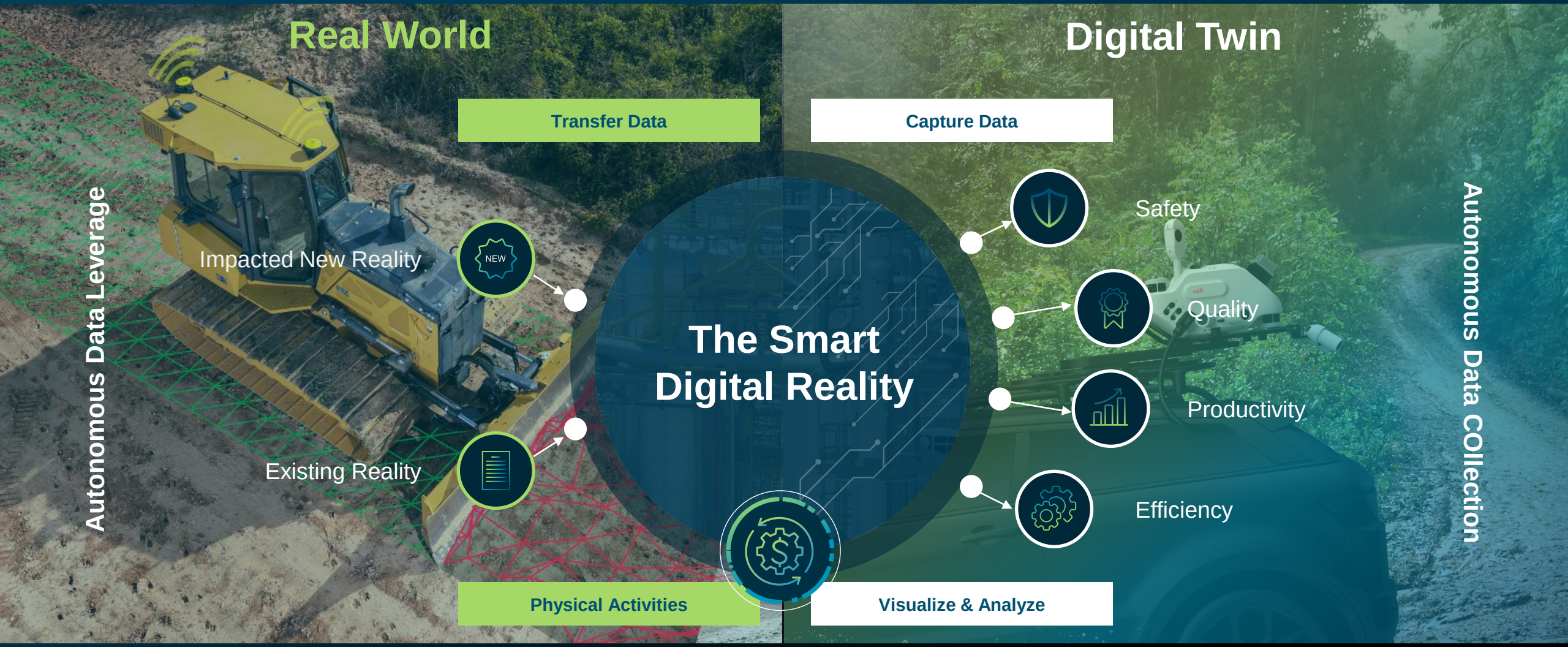
Data Extraction Options

DTM creation





The Autonomous Future - Foundation of the Smart Digital Reality



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Thank you.

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