Advanced Tools for Infrastructure Design & Management

Section 7
Road 4, km 58-61

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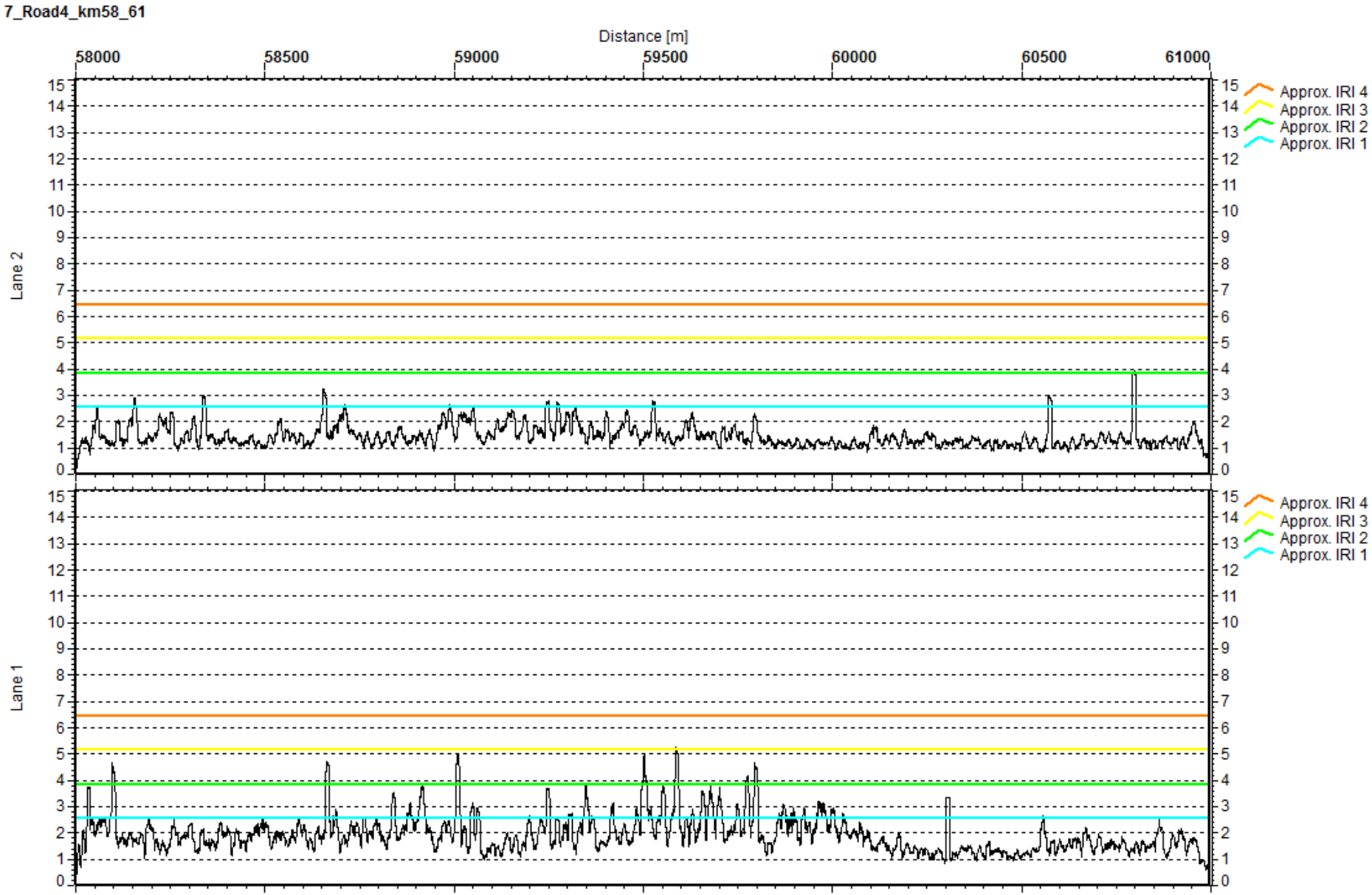
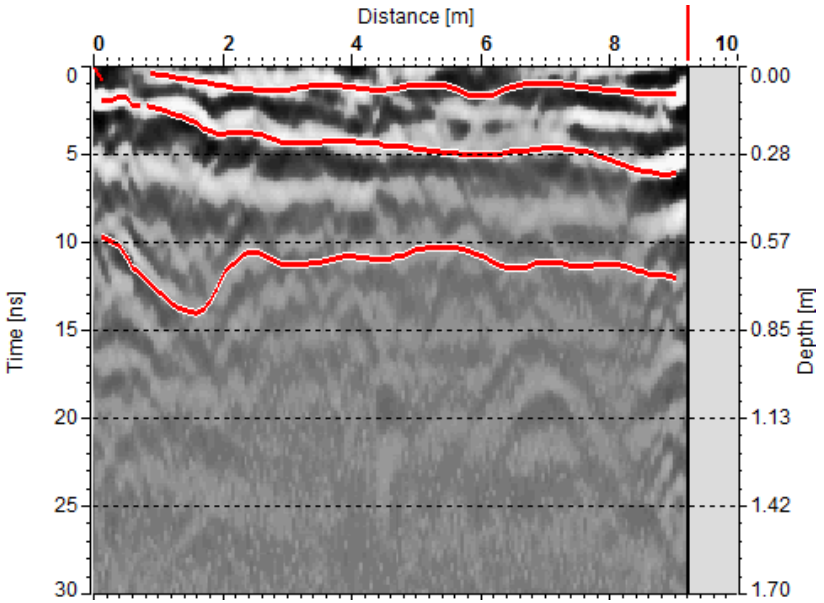
Roughness from Accelerometer Data



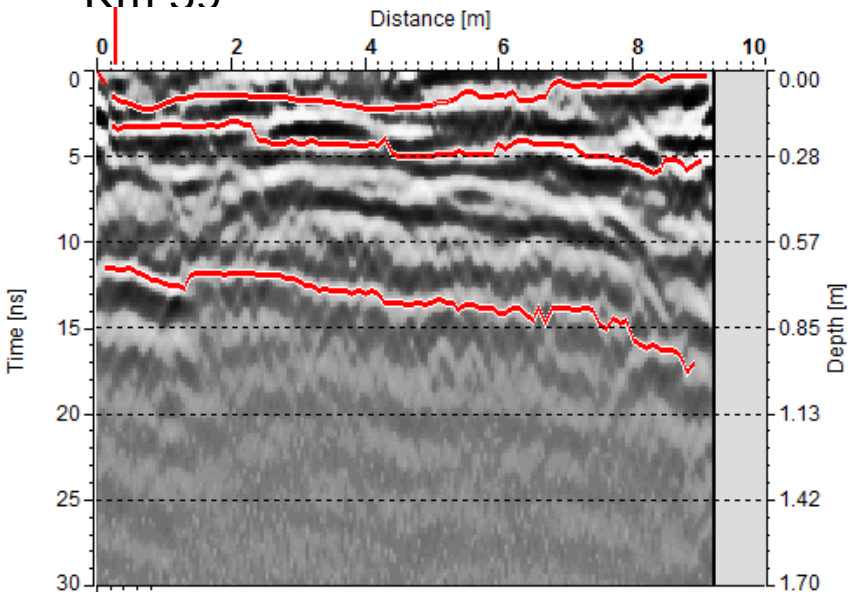
GPR Cross Sections

Materials	[cm]
Dense Asphalt concrete TAB 12I	4
Porous Asphalt concrete PAB 16 A	6
Bitumen stabilisation mix BS 32	15

Km 58



Km 59



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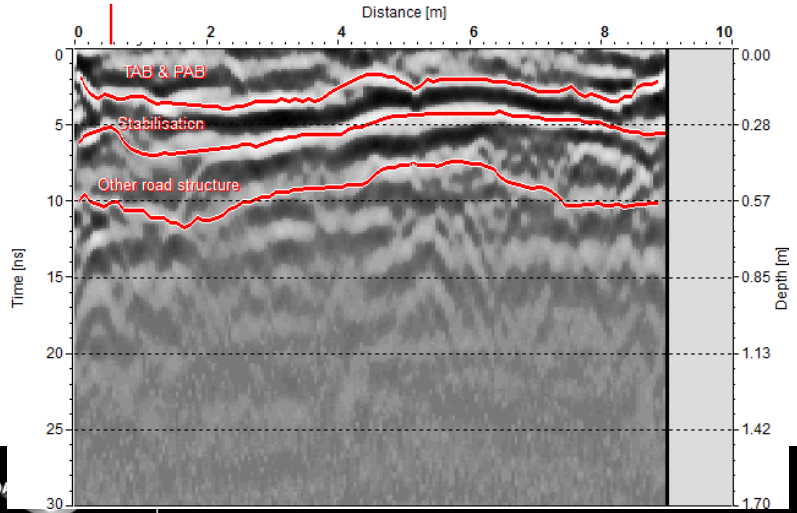

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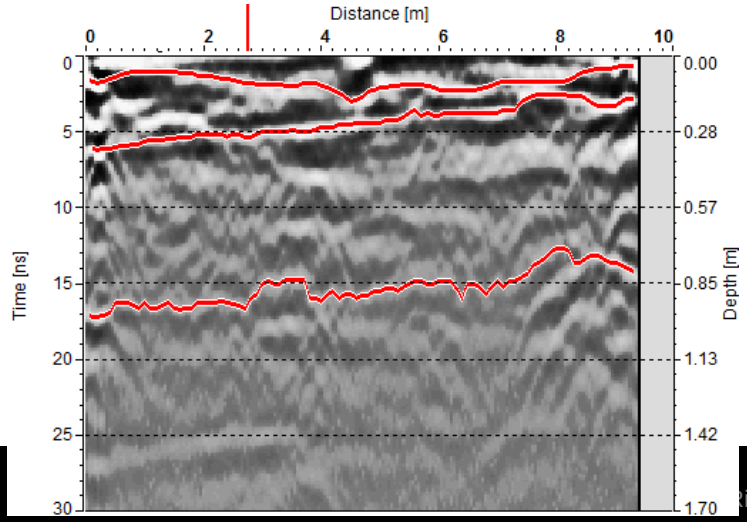

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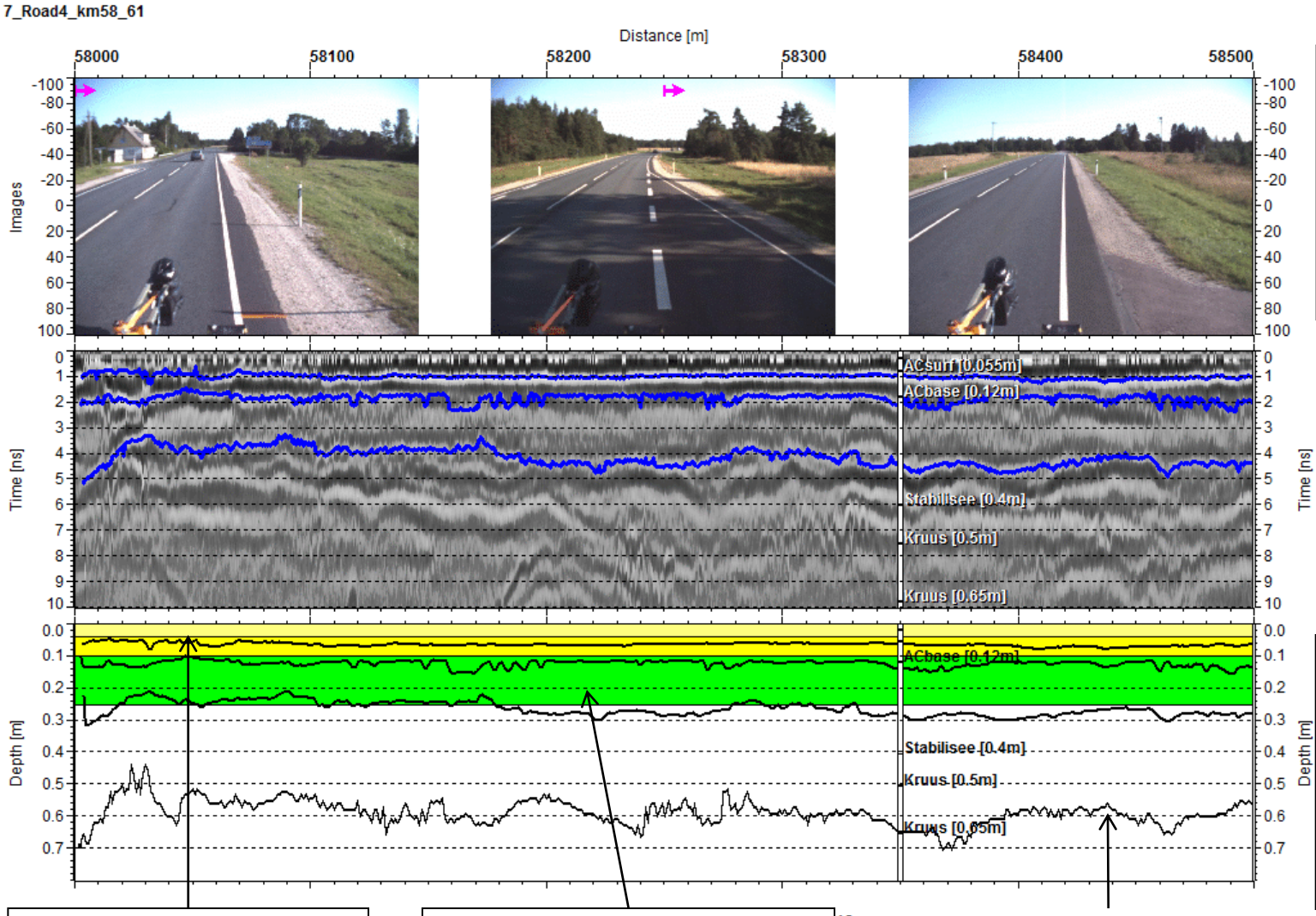
Explanation for longitudinal profiles

-Profiles are presented from Lane 1, right wheelpath



Images in 250m intervals

Air coupled GPR data with interpretation

Interpretation compared to designed plan

Yellow:
TAB12 4cm & PAB16 6cm

Green:
Bitumen stabilisation 15cm

Presented also total structure thickness

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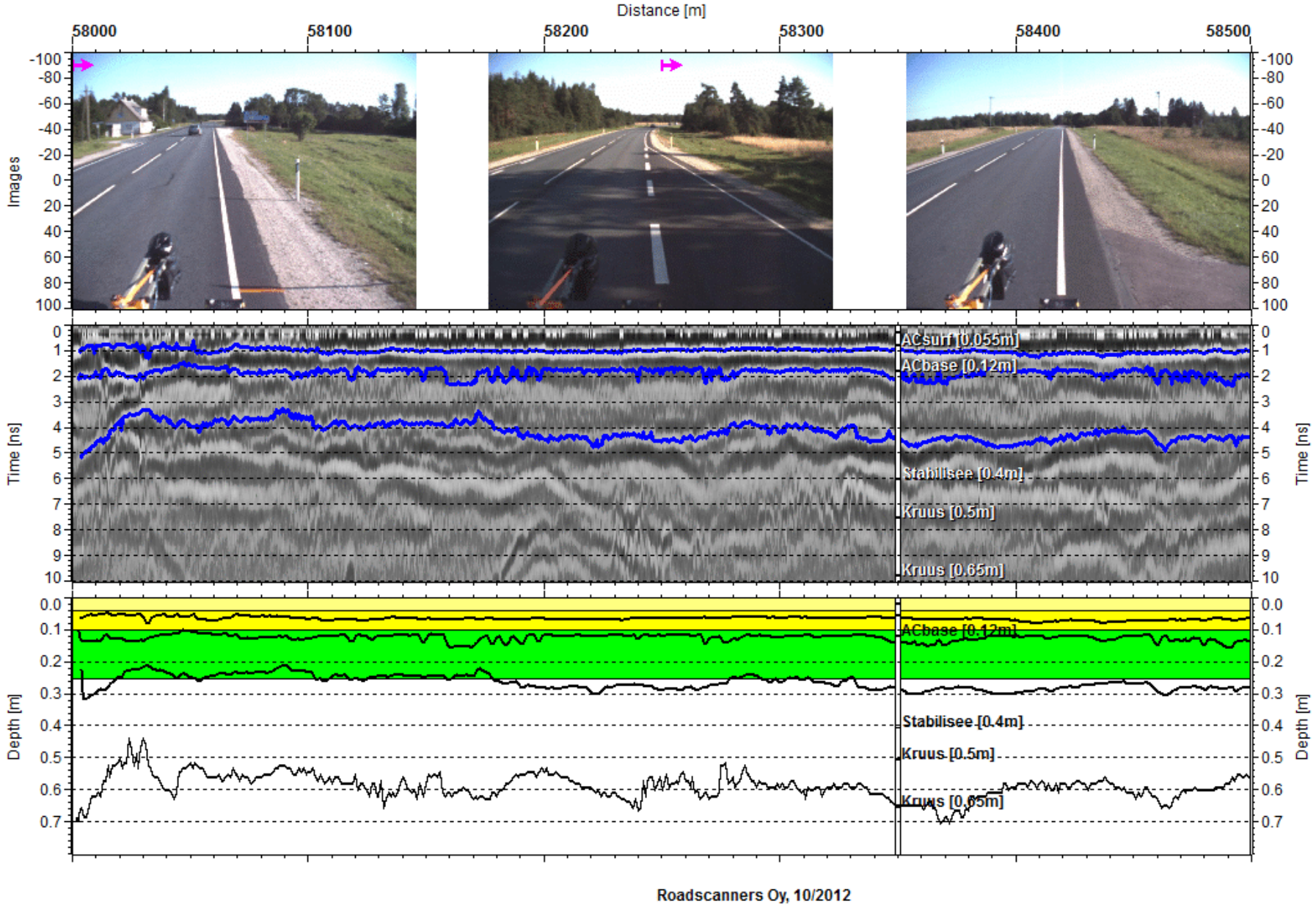
7_Road4_km58_61



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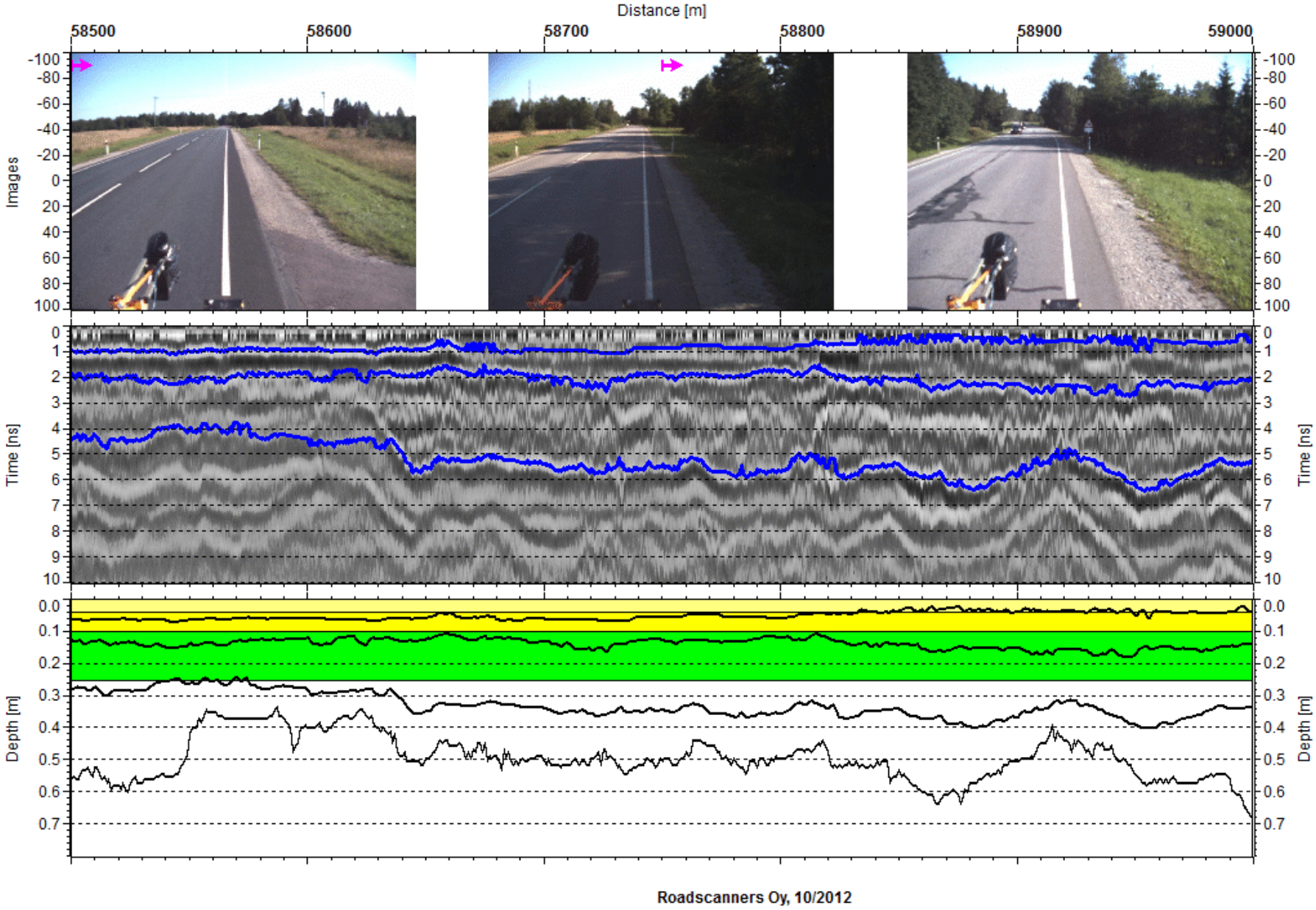

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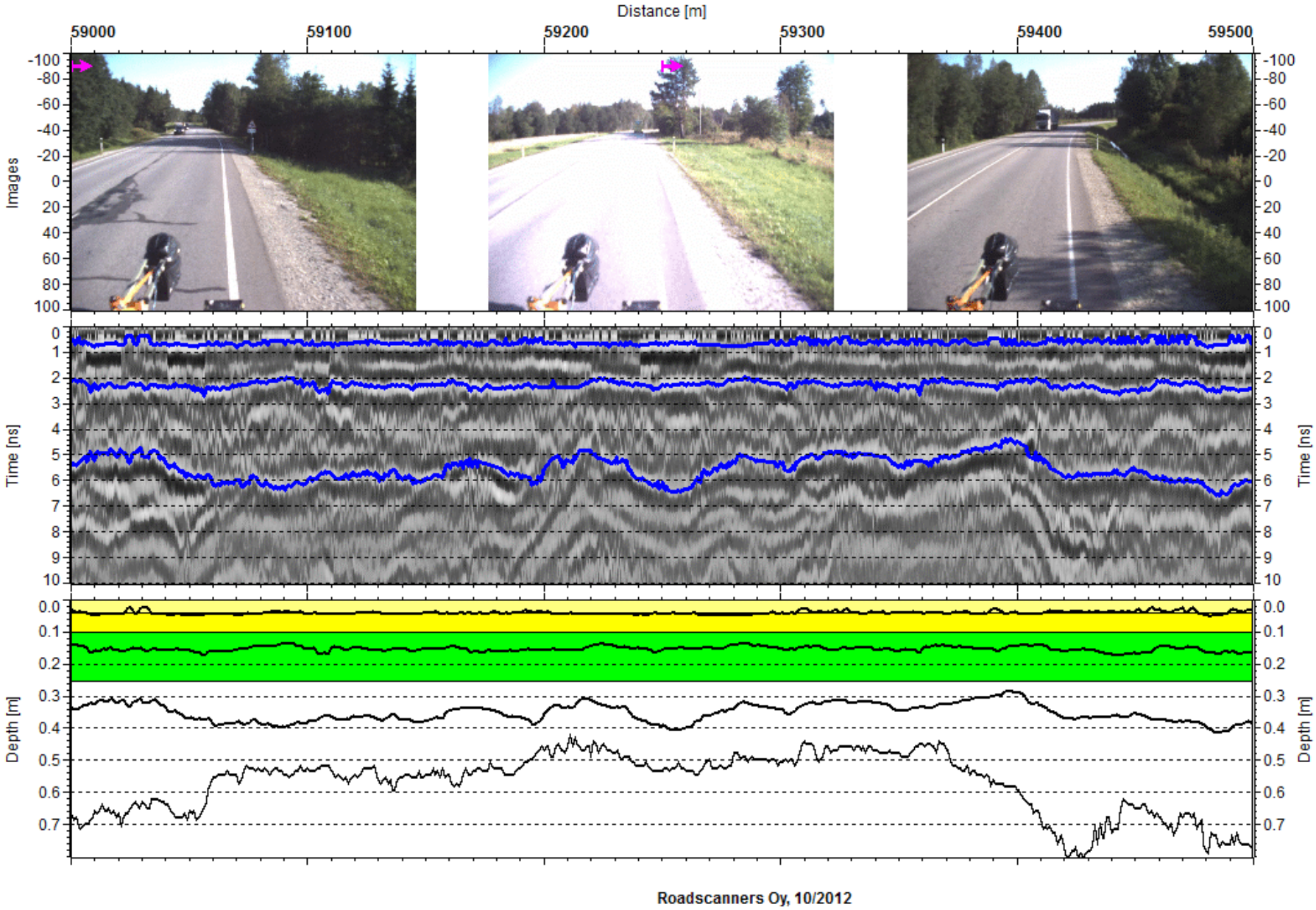

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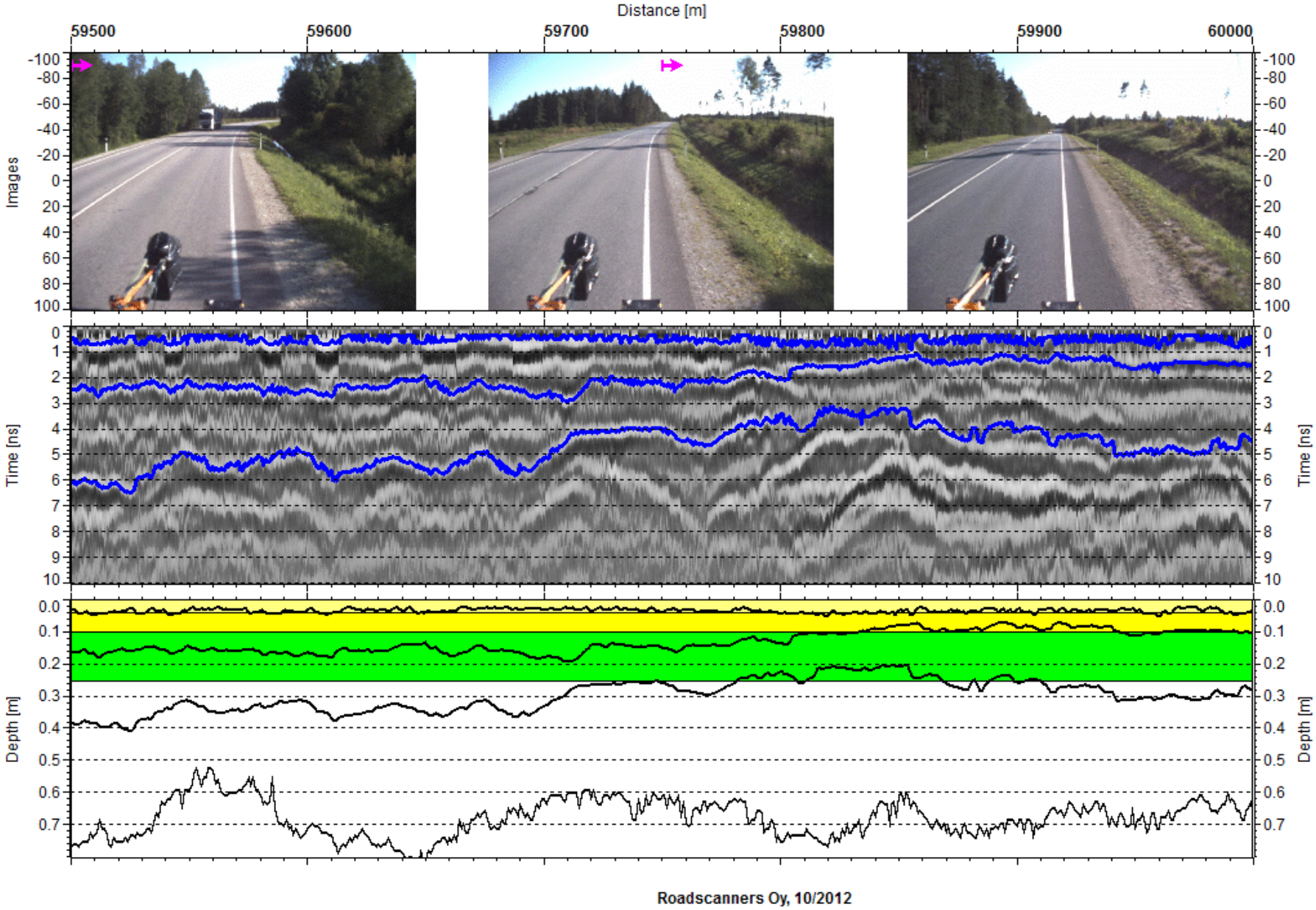

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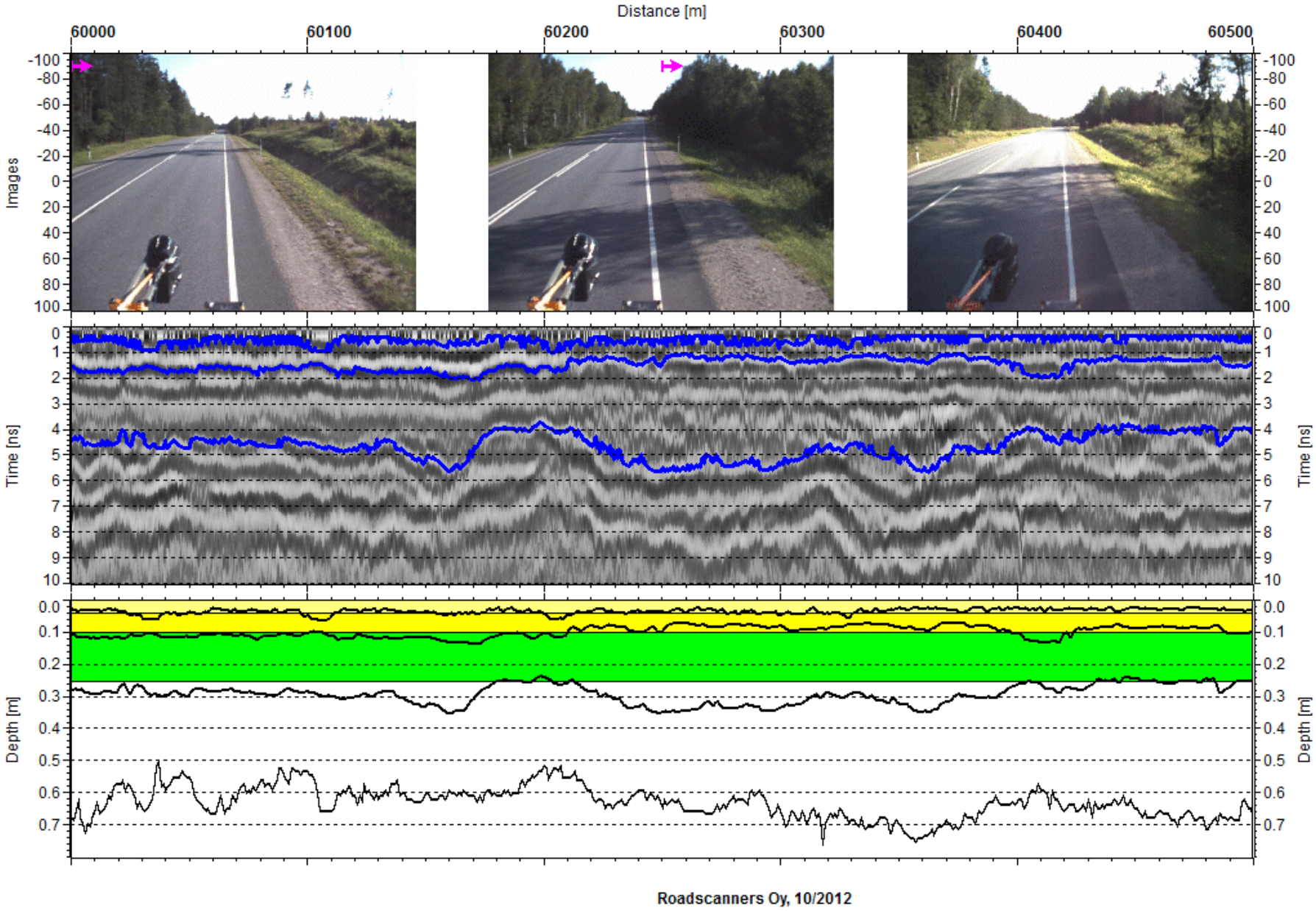

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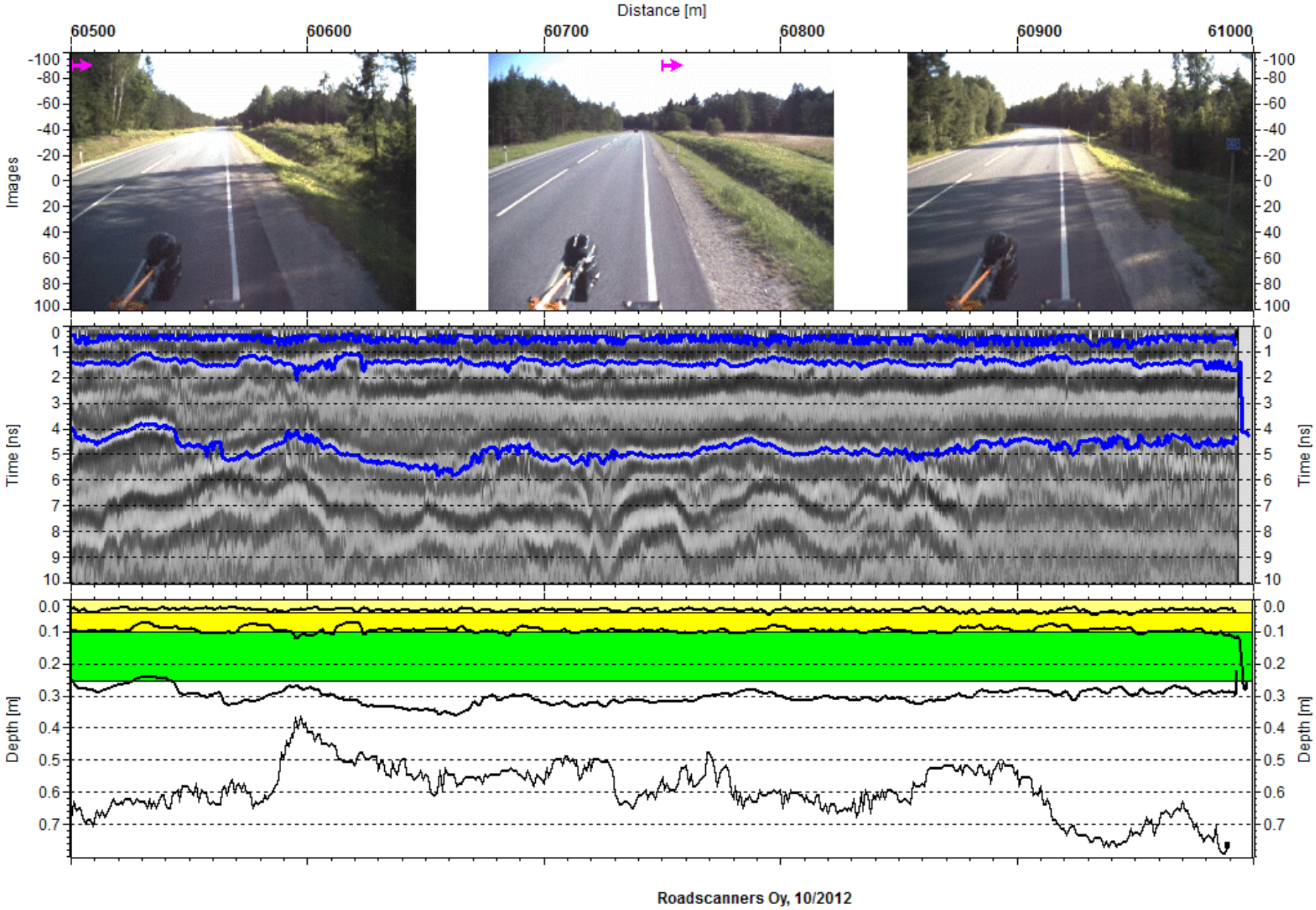

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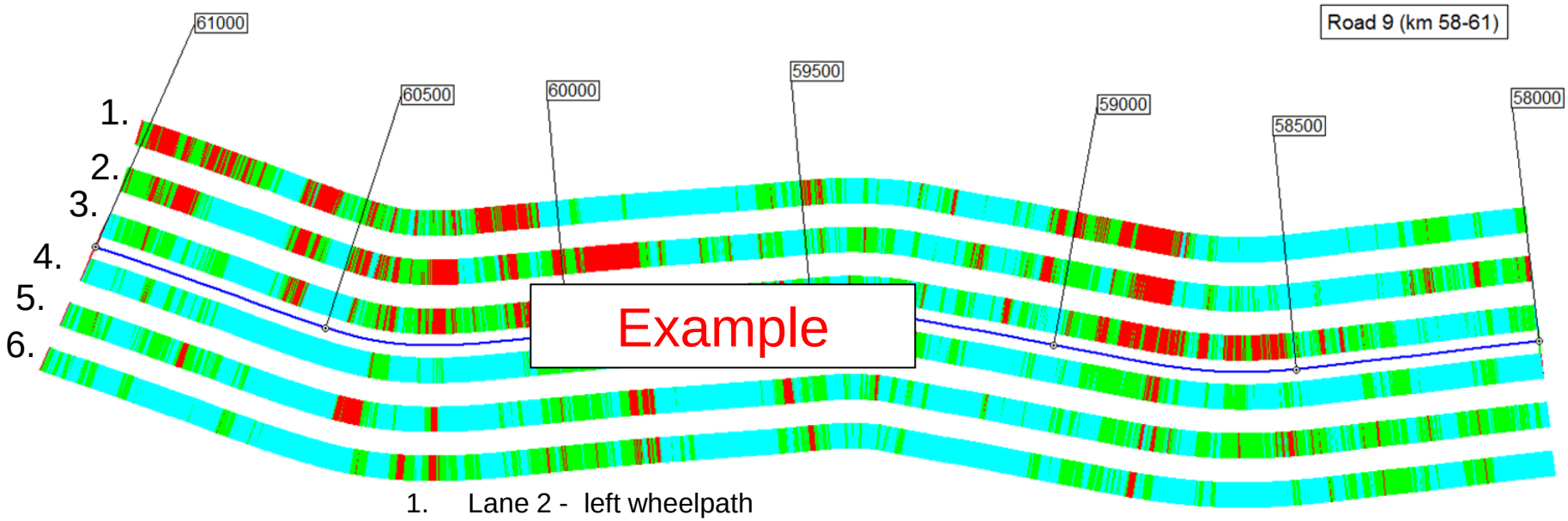
Explanation of Thickness Statistics and Maps

Table of average and statistical values:

Planned thickness = 0,04 m (TAB 12)	L2 right	L2 middle	L2 left	L1 left	L1 middle	L1 right
Average layer thickness (m)	0.063	0.064	0.064	0.061	0.061	0.063
% of distance where thickness is more than 10 % under	0.0	0.0	0.0	0.0	0.0	0.0
Average undershoot from planned in "more						
% of distance where thickness is more than 1	.0	100.0	100.0	99.9	100.0	99.4
Average overshoot from planned in "more than 10 % over" class (m)	0.023	0.024	0.024	0.021	0.021	0.023
% of distance where thickness is between +- 10 %	0.0	0.0	0.0	0.1	0.0	0.6
Standard deviation (m)	0.005	0.004	0.006	0.006	0.004	0.005

Example



1. Lane 2 - left wheelpath
2. Lane 2 – in the middle of lane
3. Lane 2 – right wheelpath
4. Lane 1 – left wheelpath
5. Lane 1 – in the middle of lane
6. Lane 1 – right wheelpath

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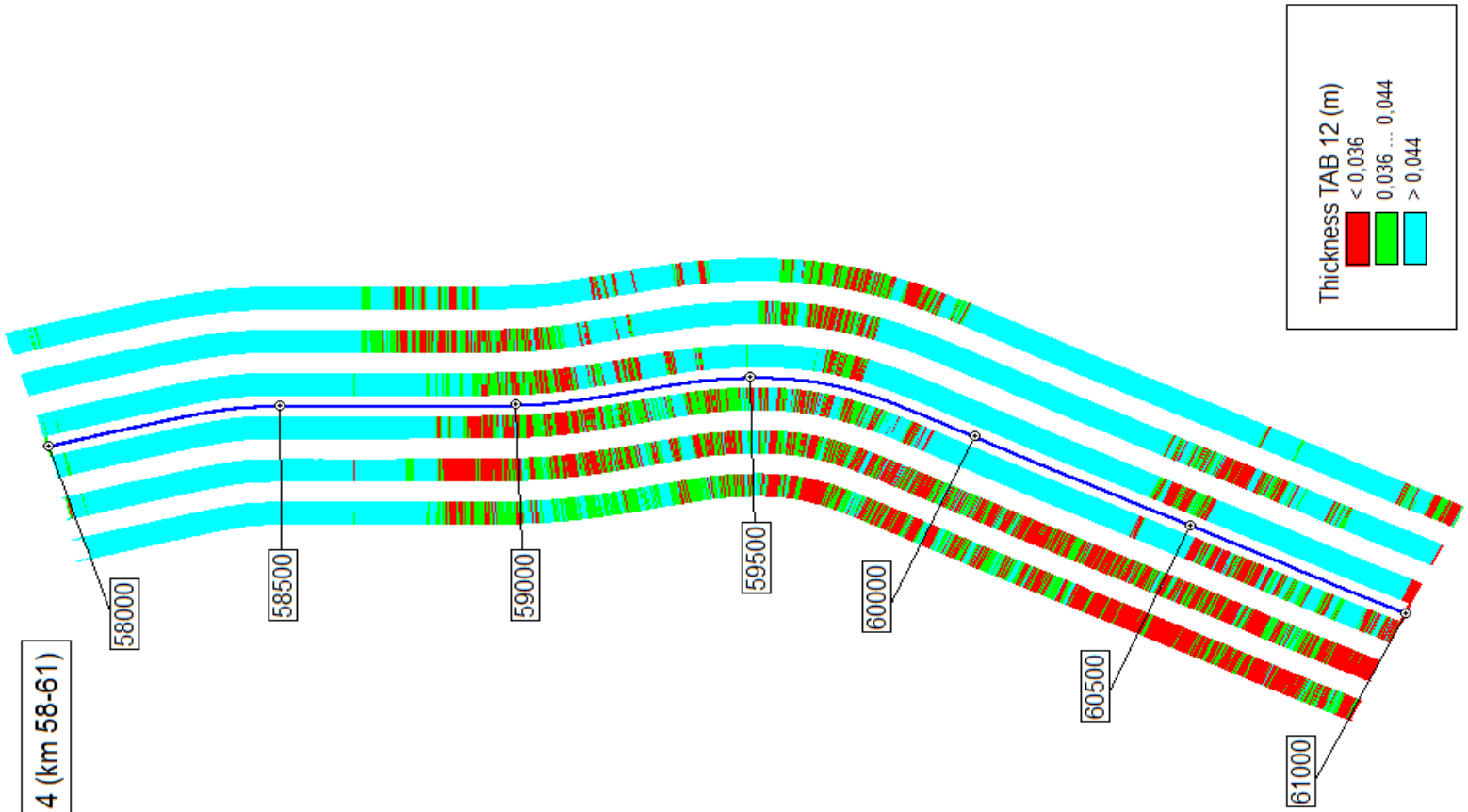
Maps of Layer Thicknesses [1/3]

Planned thickness = 0,04 m (TAB 12)	L2 right	L2 middle	L2 left	L1 left	L1 middle	L1 right
Average layer thickness (m)	0.071	0.067	0.069	0.055	0.043	0.043
% of distance where thickness is more than 10 % under	8.1	13.9	9.0	19.6	40.3	36.2
Average undershoot from planned in "more than 10 % under" class (m)	-0.011	-0.011	-0.011	-0.012	-0.012	-0.010
% of distance where thickness is more than 10 % over	81.1	70.4	80.7	62.1	33.6	35.3
Average overshoot from planned in "more than 10 % over" class (m)	0.040	0.041	0.038	0.028	0.023	0.020
% of distance where thickness is between +- 10 %	10.8	15.7	10.4	18.3	26.1	28.5
Standard deviation (m)	0.023	0.026	0.022	0.019	0.016	0.014



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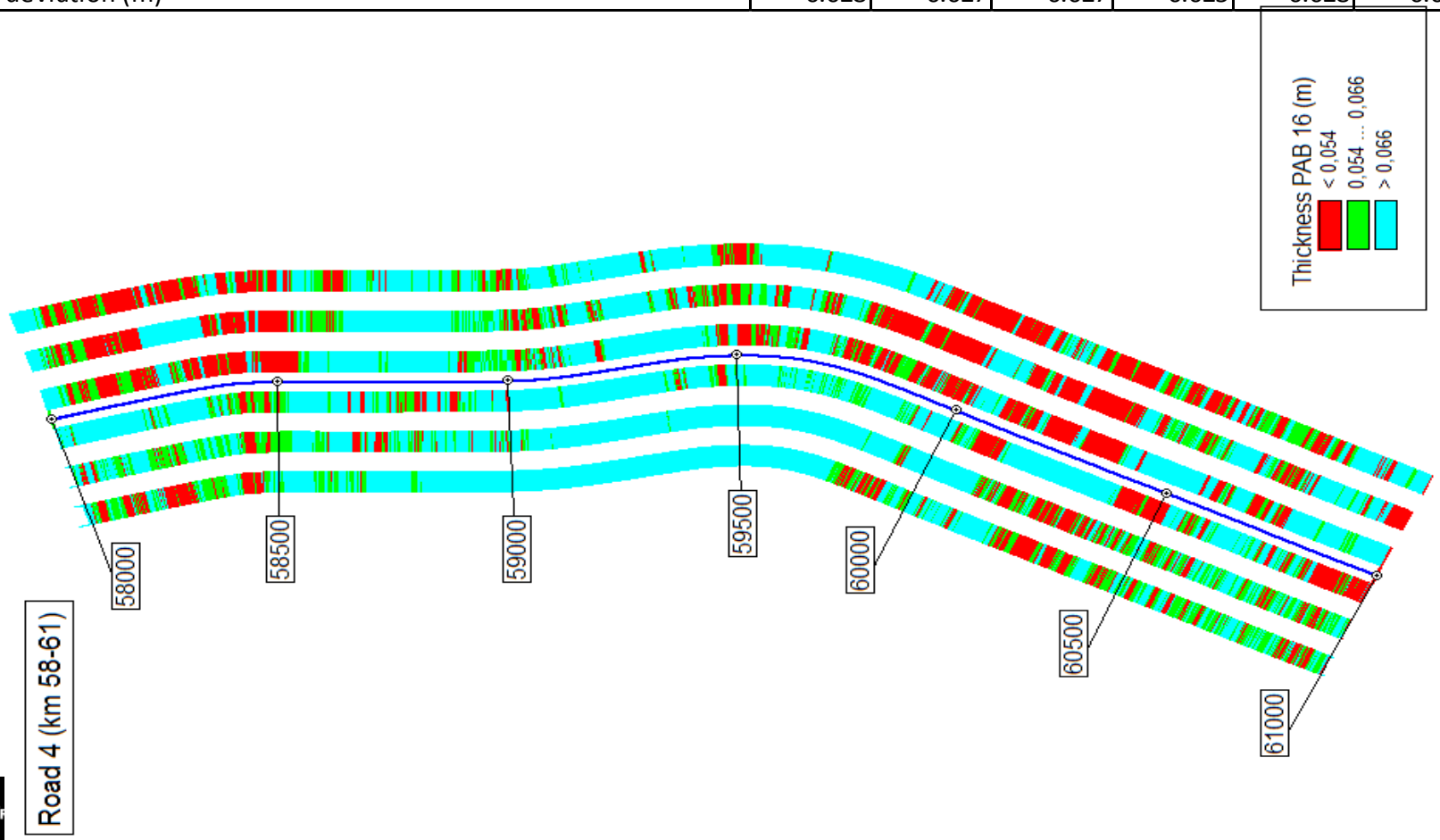
Maps of Layer Thicknesses [2/3]

Planned thickness = 0,06 m (PAB 16)	L2 right	L2 middle	L2 left	L1 left	L1 middle	L1 right
Average layer thickness (m)	0.068	0.066	0.068	0.077	0.082	0.080
% of distance where thickness is more than 10 % under	35.3	36.4	33.7	17.2	14.3	17.7
Average undershoot from planned in "more than 10 % under" class (m)	-0.019	-0.020	-0.020	-0.020	-0.013	-0.014
% of distance where thickness is more than 10 % over	46.5	43.8	48.9	66.8	61.5	60.4
Average overshoot from planned in "more than 10 % over" class (m)	0.033	0.031	0.030	0.030	0.038	0.037
% of distance where thickness is between +- 10 %	18.2	19.9	17.4	16.1	24.2	22.0
Standard deviation (m)	0.028	0.027	0.027	0.025	0.028	0.028



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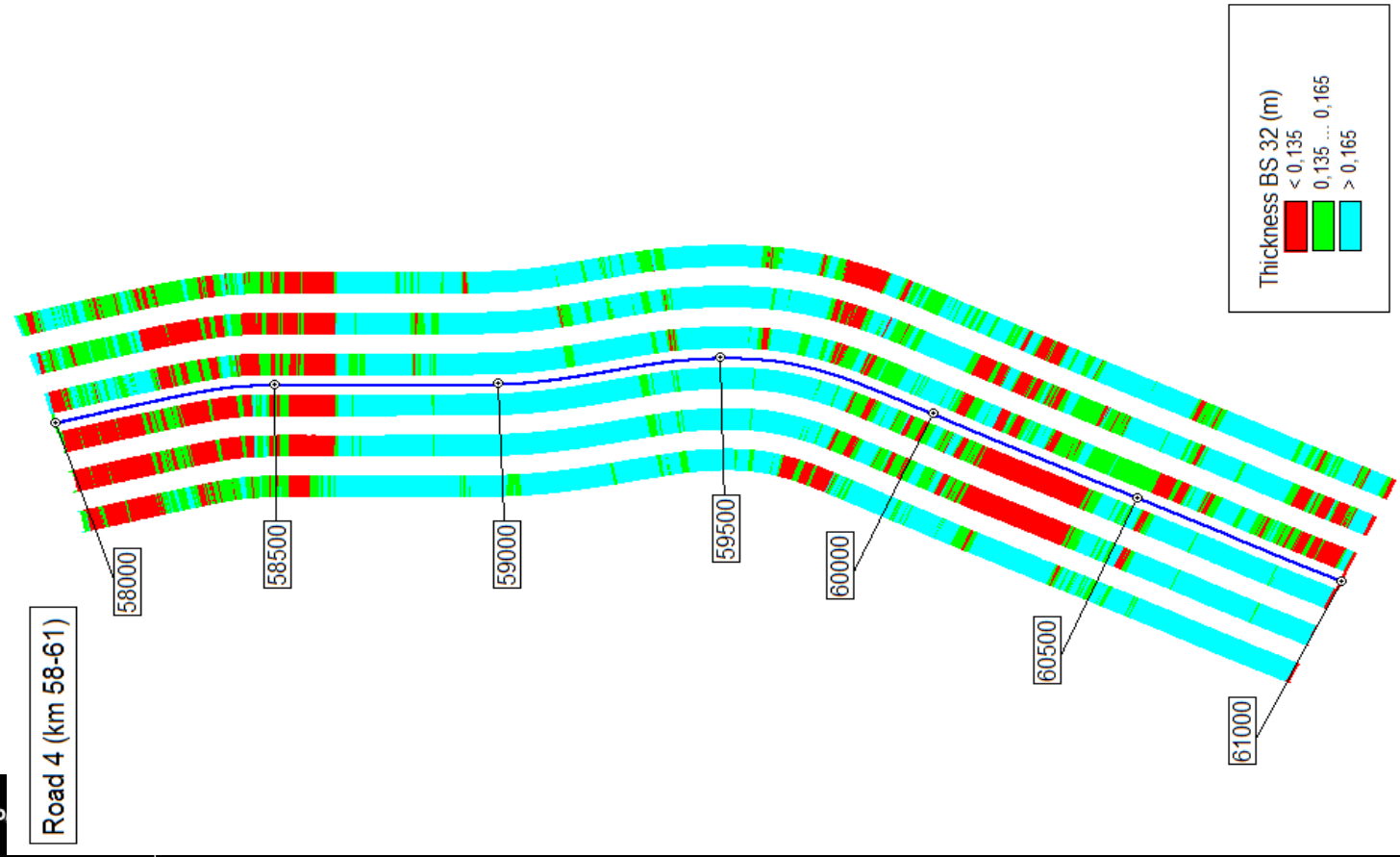
Maps of Layer Thicknesses [3/3]

Planned thickness = 0,15 m (BS 32)	L2 right	L2 middle	L2 left	L1 left	L1 middle	L1 right
Average layer thickness (m)	0.177	0.171	0.166	0.171	0.177	0.181
% of distance where thickness is more than 10 % under	14.4	22.0	19.8	27.2	22.7	12.9
Average undershoot from planned in "more than 10 % under" class (m)	-0.034	-0.034	-0.037	-0.043	-0.036	-0.035
% of distance where thickness is more than 10 % over	59.6	52.1	46.4	57.0	63.2	65.9
Average overshoot from planned in "more than 10 % over" class (m)	0.053	0.054	0.051	0.058	0.056	0.053
% of distance where thickness is between +- 10 %	26.0	25.9	33.8	15.8	14.1	21.3
Standard deviation (m)	0.040	0.044	0.041	0.050	0.045	0.039



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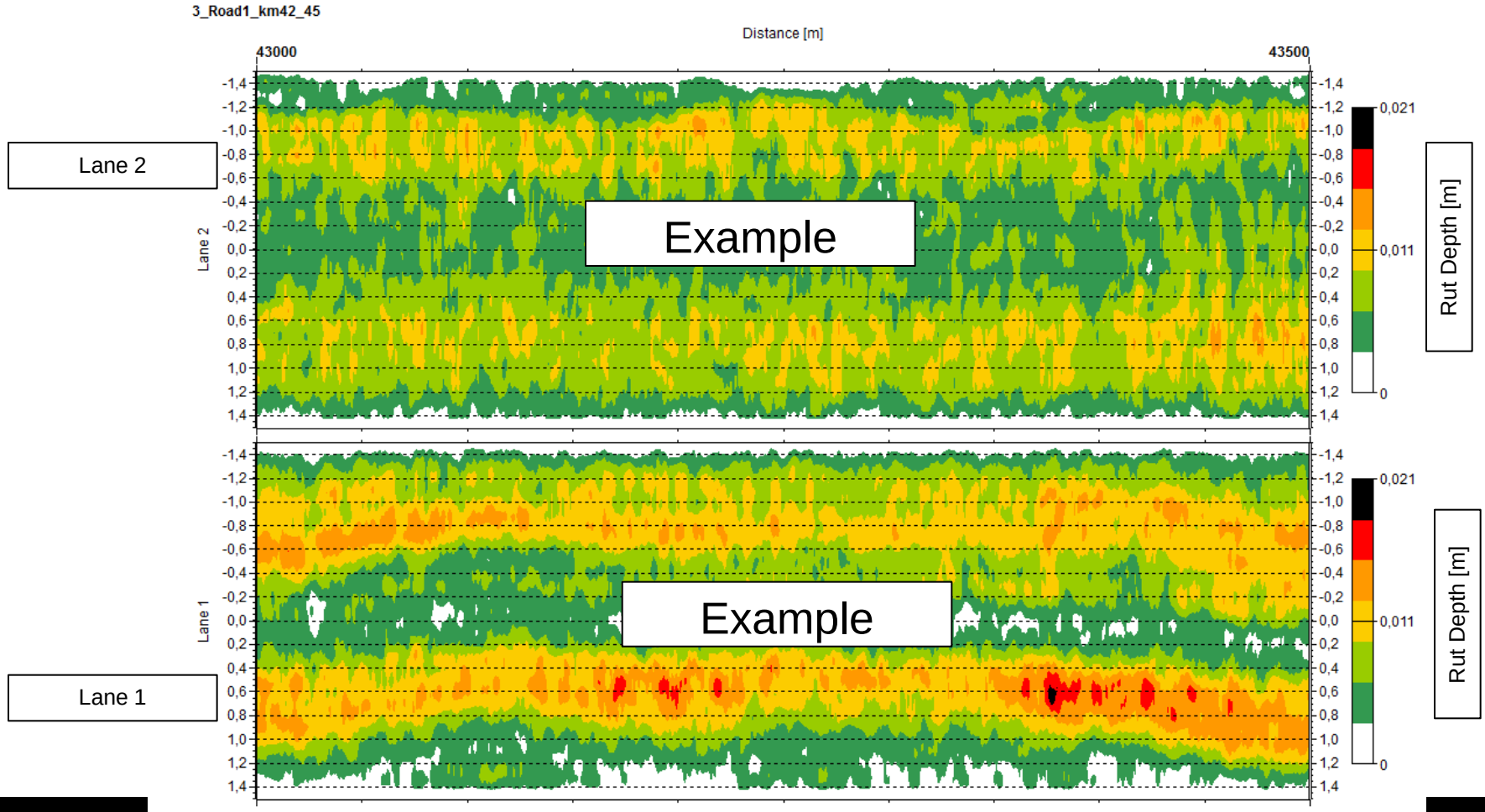
Explanation of Rut Analysis from Laser Scanner Data

- Rutting was calculated from the laser scanner data using the wire rutting method and rutting was averaged over 5m distances.
- Rutting was analyzed from both driving lanes and from both wheel tracks.



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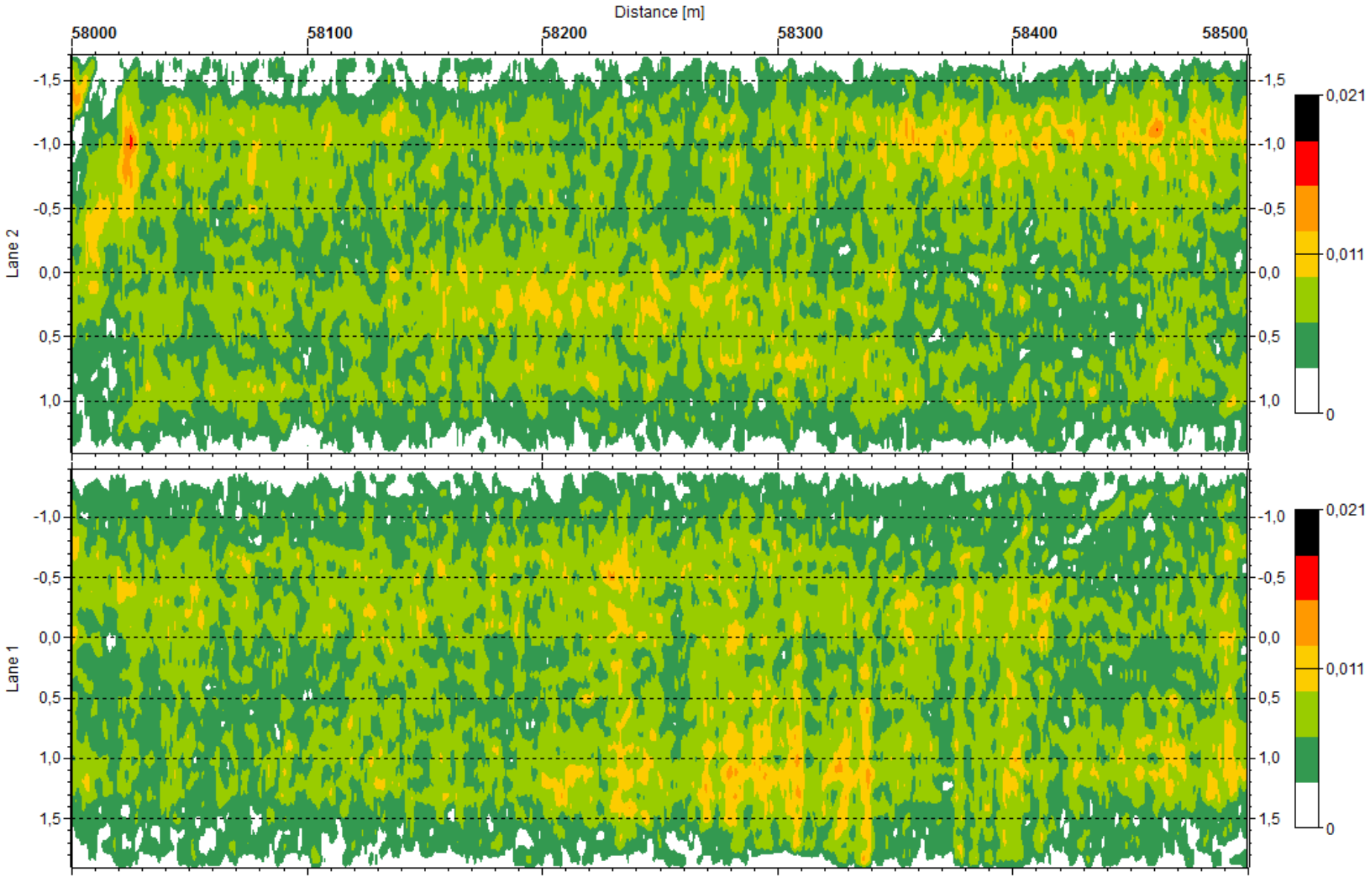

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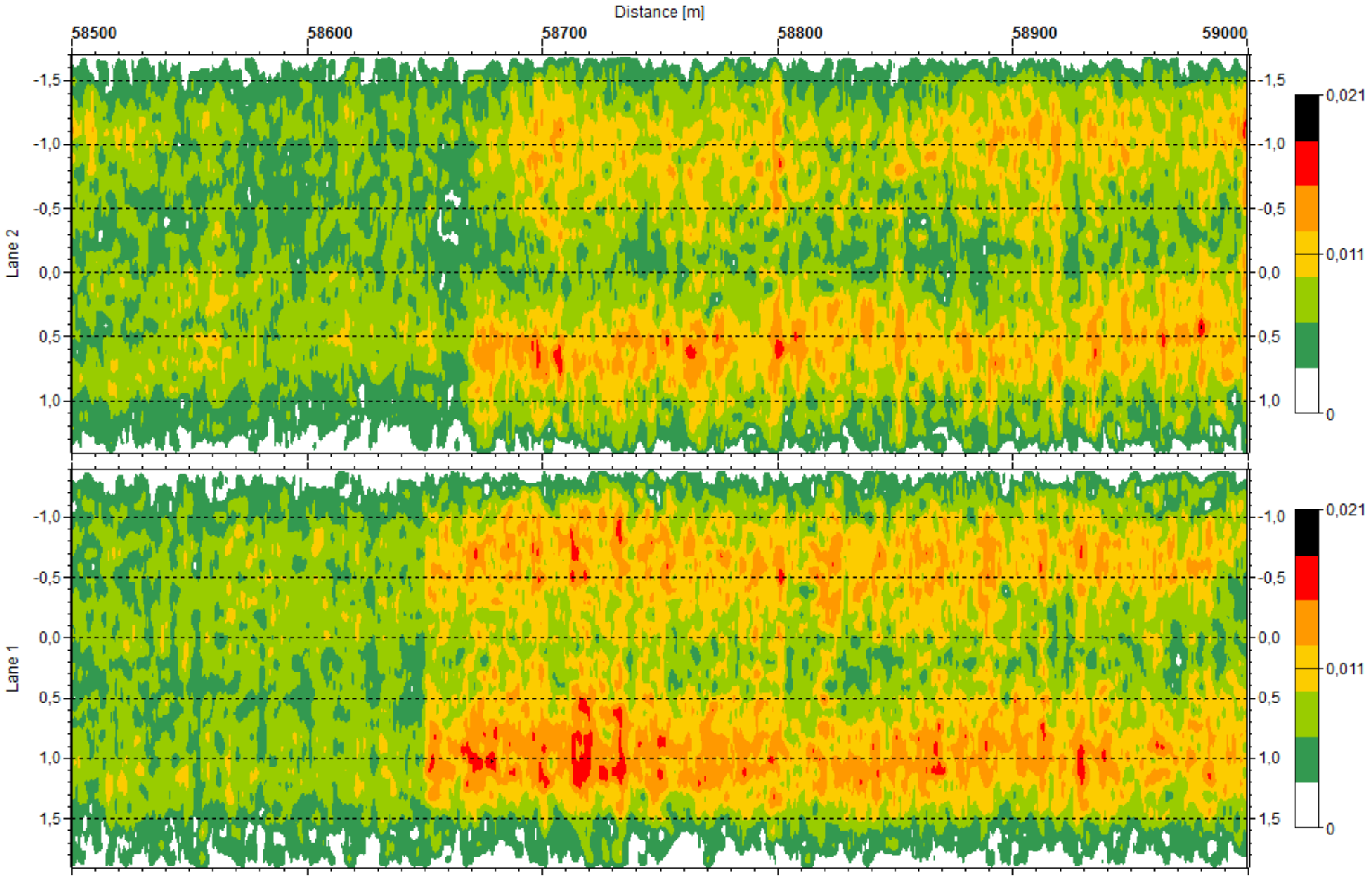

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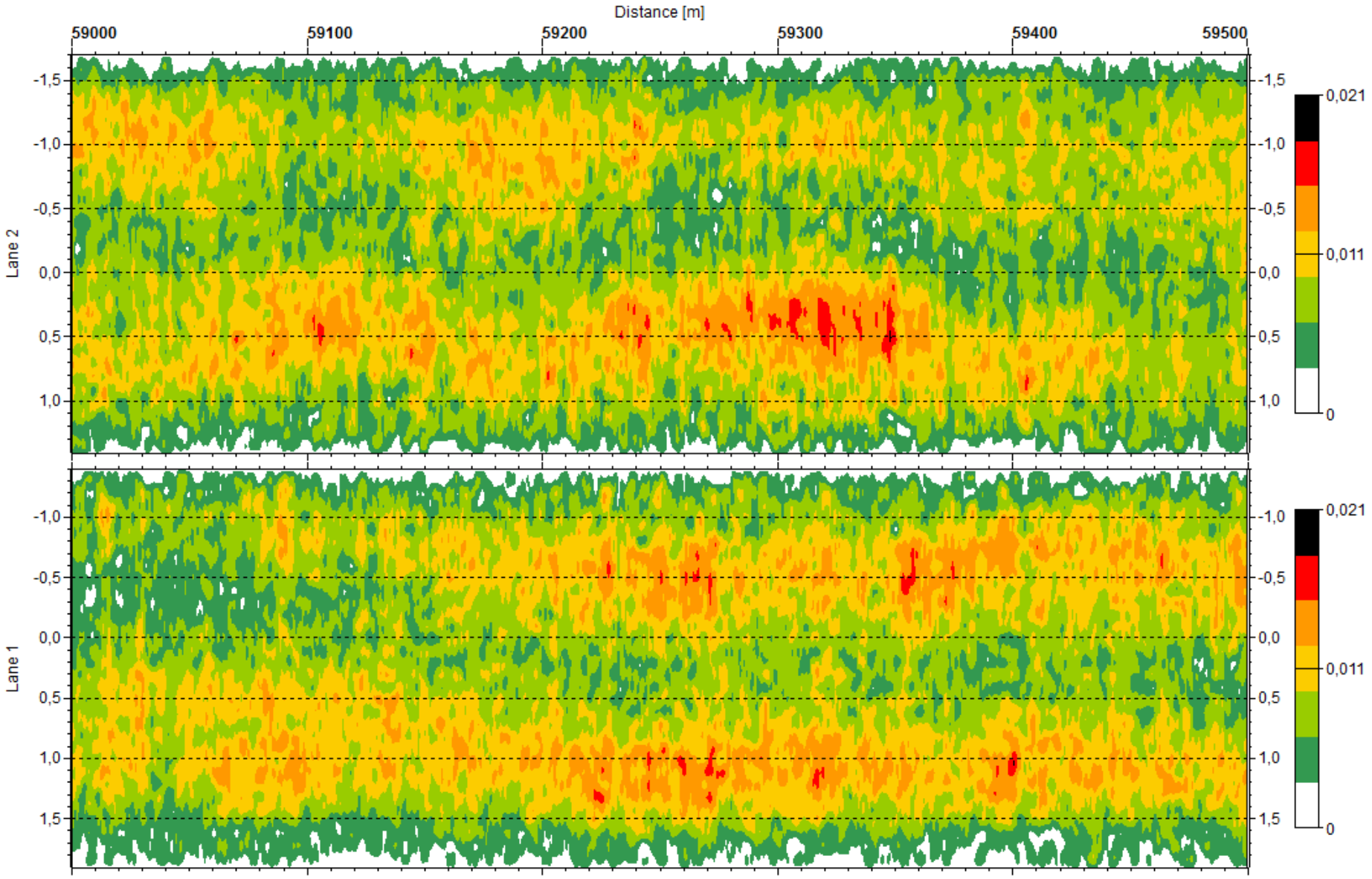

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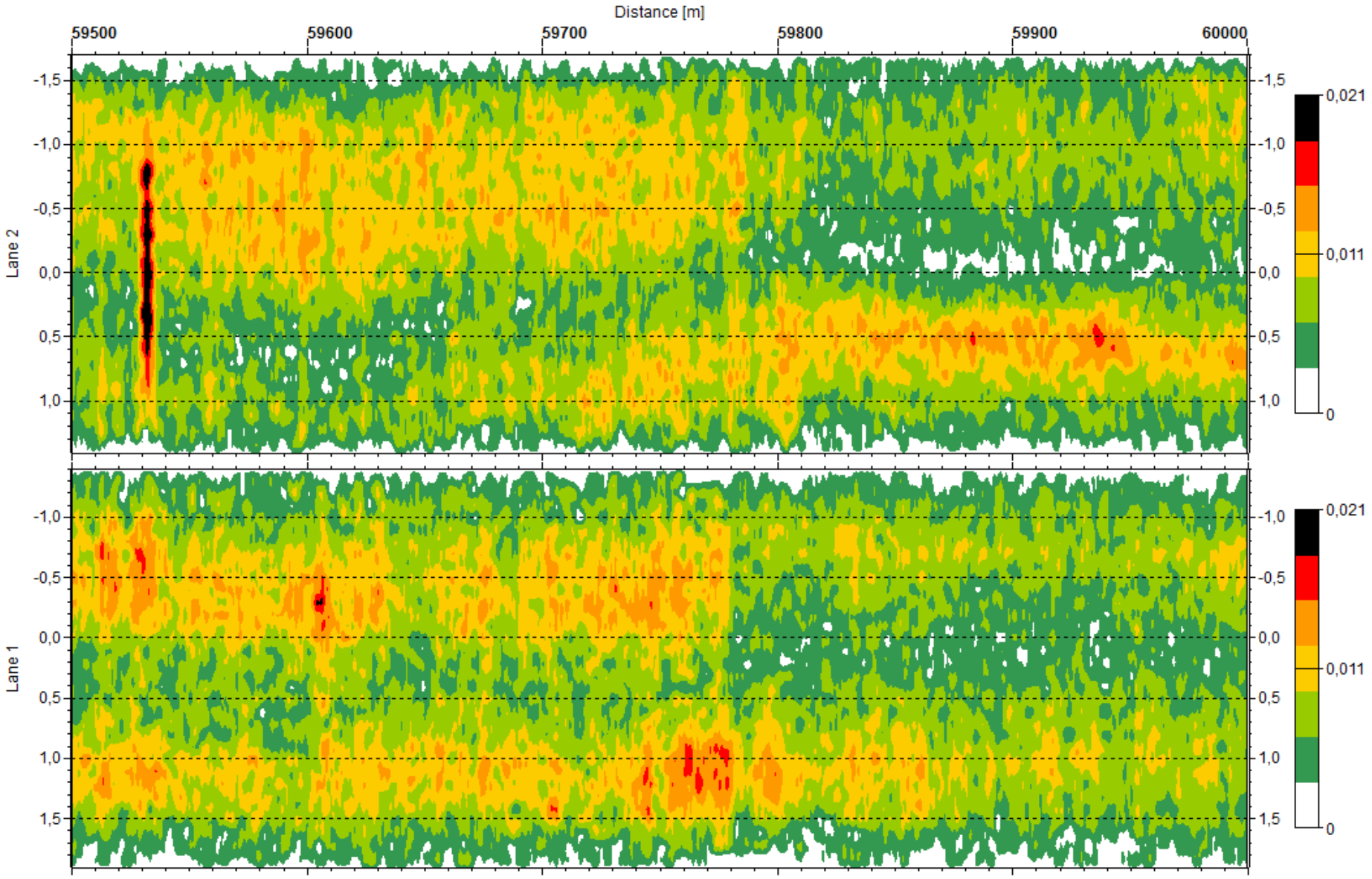

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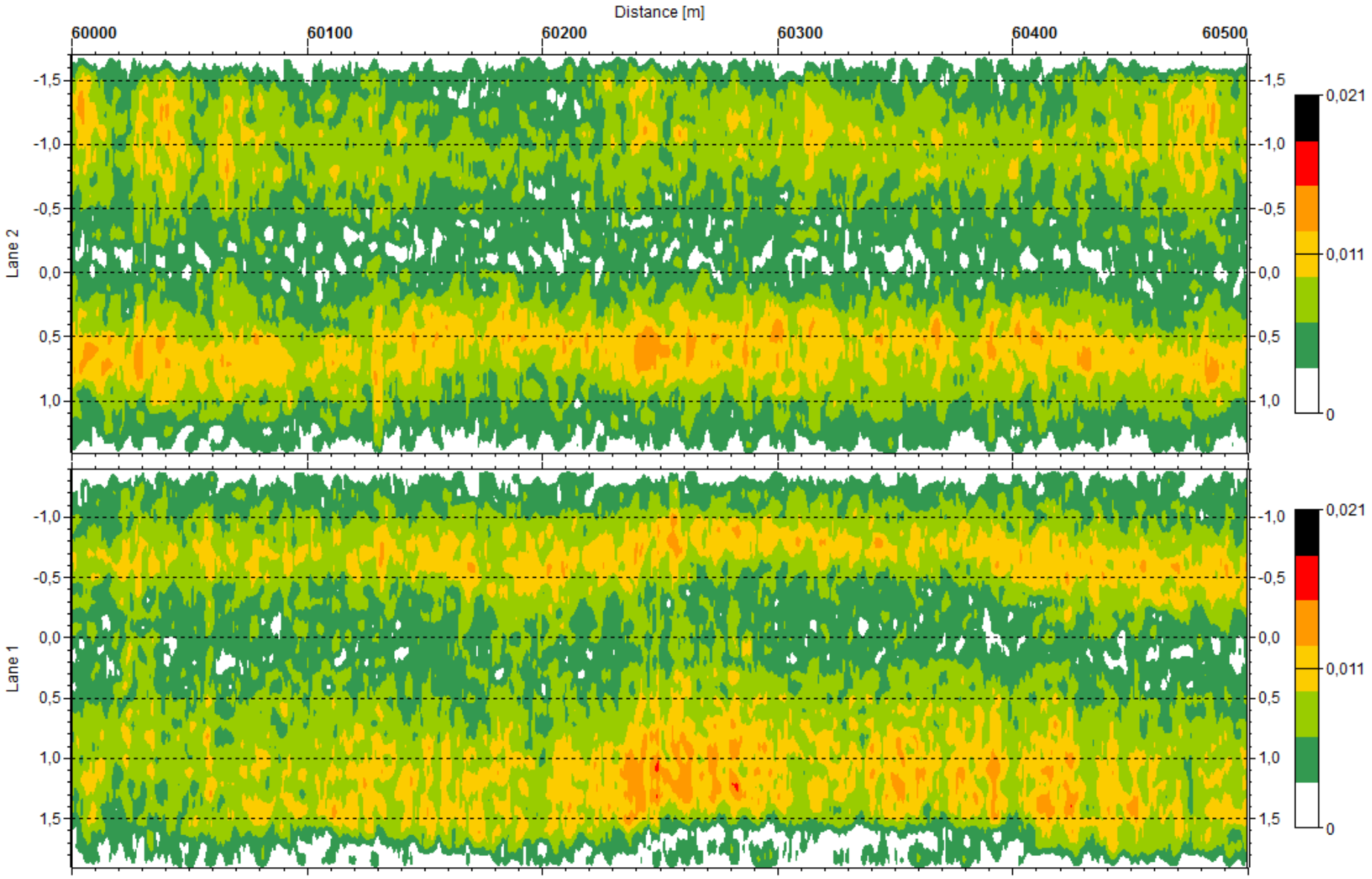

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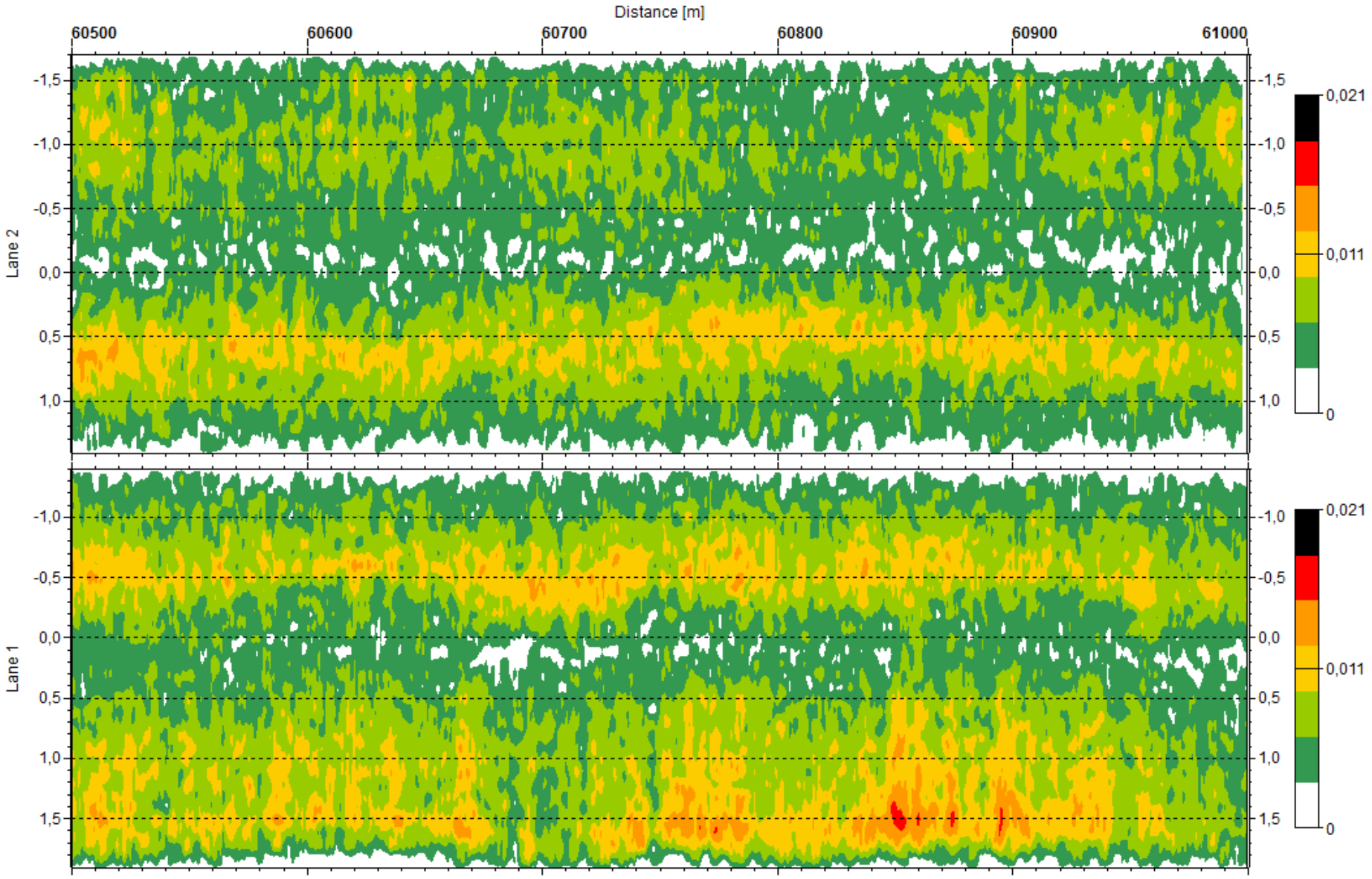

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Example of Laser Scanner Data

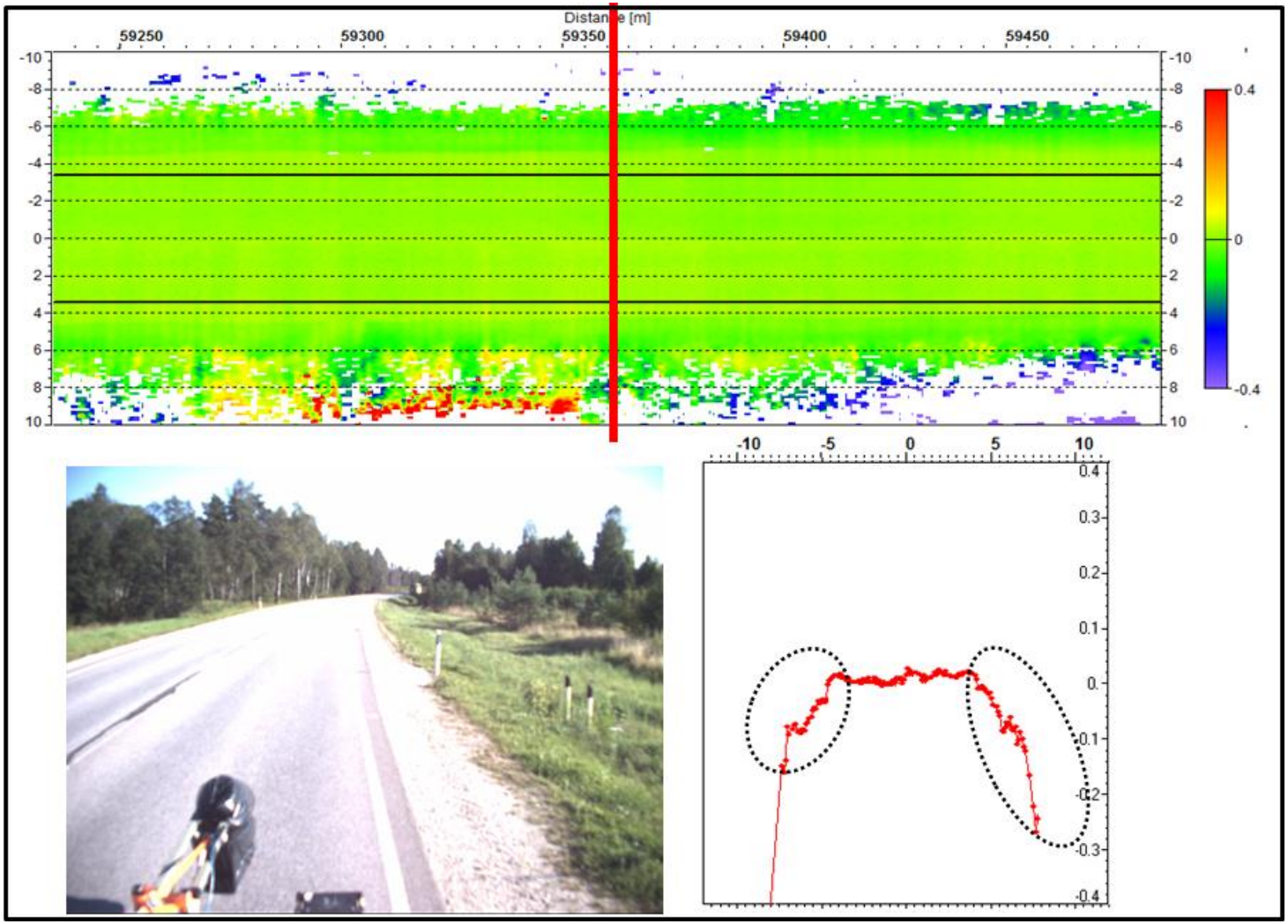

Figure xx. Laser scanner surface elevation map from section 7 (road 4). The still image and cross section profile is picked from chainage 59 360m.
The black lines on surface map represent the approximated road edges. With black dash line is marked the protruded inner slope.

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