

SaferRoads 5th International Conference Auckland 21-24 May 2017

*Assessment of different road markings
performance under different operating
conditions and surfacing types*



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Assessment of different road markings performance under different operating conditions and surfacing types

Overview of the presentation

1. Introduction and Background
2. Mobile Reflectometer
3. Identification of route sections
4. Variables tested
5. Results and observations
6. Recommendations



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Introduction and background

- Different standards for minimum acceptable retro reflectivity threshold
- Lack of consistency in retro reflectivity degradation models
- Variability in predicted life spans of different markings
- Need to know the expected initial retro reflectivity value for all paint types
- Compare performance vs non performance based contracts
- Need to understand performance of the different types of line markings on different surfacing and conditions
- Need to understand what factors contribute significantly to performance of the different line markings under different operating conditions



Mobile reflectometer

- Delta LTL-M machine used
- Past research show uncertainty of 7-15% error
- Measurements done every 50cm
- Calibration done with handheld reflectometer



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Mobile reflectometer

- “ R_L left or R_L Right” show the retro reflection of the full width of a marking, i.e. provide the retro reflection as the driver will see it.
- “ R_L Centre left or R_L Centre right” gives the retro reflection of the centre 5 cm of a marking

Note: From the results of the two set of measurement data, if the the marking measured has been a worn one, we typically see the R_L Centre left/right constantly significantly higher compared to the R_L left/right.

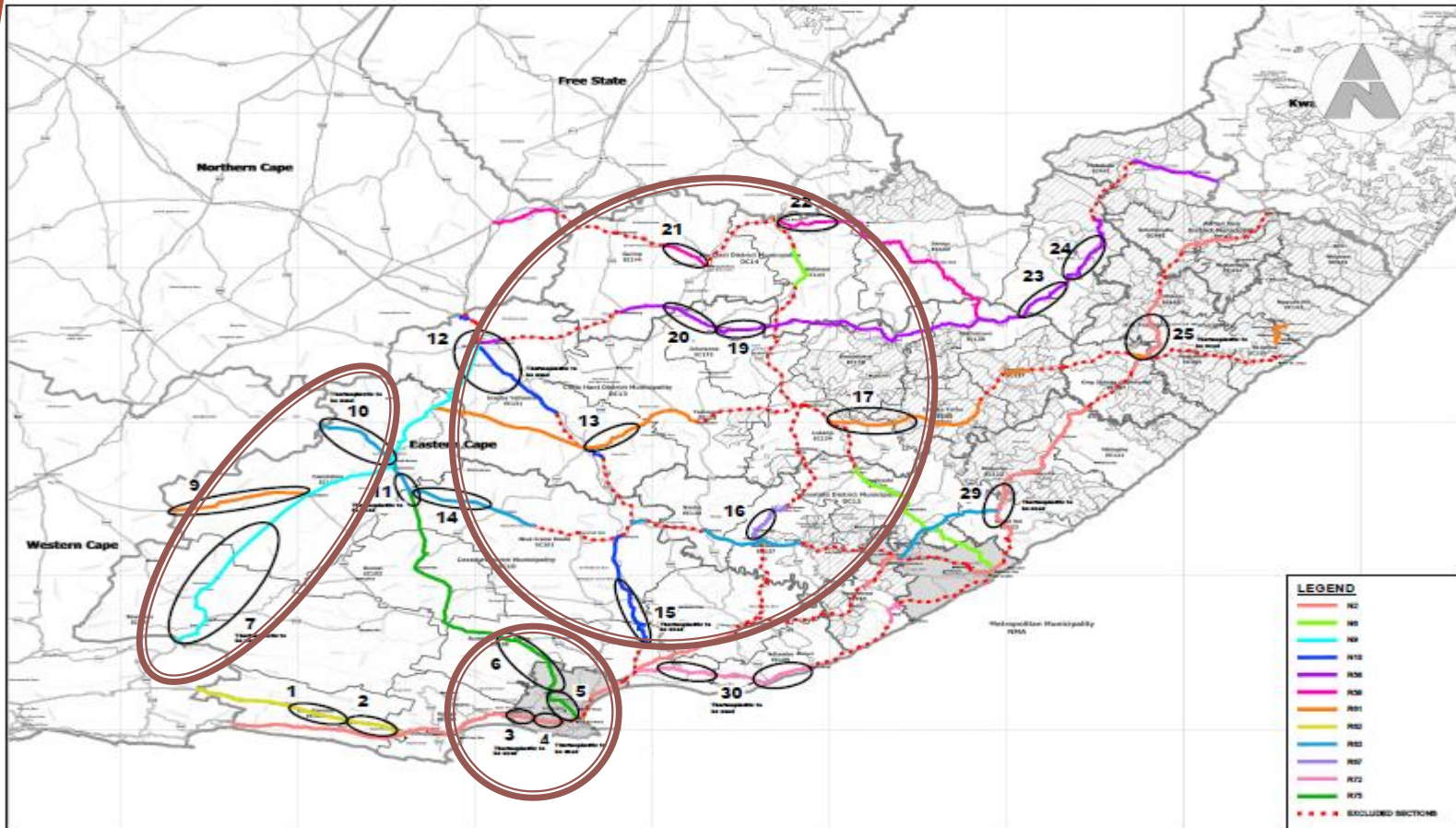


Variables for the research

- Type of paint (including supplier)
- Line marking age
- Quantity of glass beads
- Quality of glass beads
- Traffic
- Surface type
- Geographical location
- Marking thickness/paint application
- Cross section ie Surfaced/no shoulder/dual carriageway



The Road Network and research sections



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Results and observations

- ▶ Continuous yellow edge lines and centre line tested
- ▶ Minimum of 25 km and maximum of 100km length of section tested

| Period | R _L specified white lines | R _L specified yellow lines |
|------------|--------------------------------------|---------------------------------------|
| 1-2 months | 250 | 160 |
| 12 months | 150 | 100 |
| 24 months | 120 | 80 |

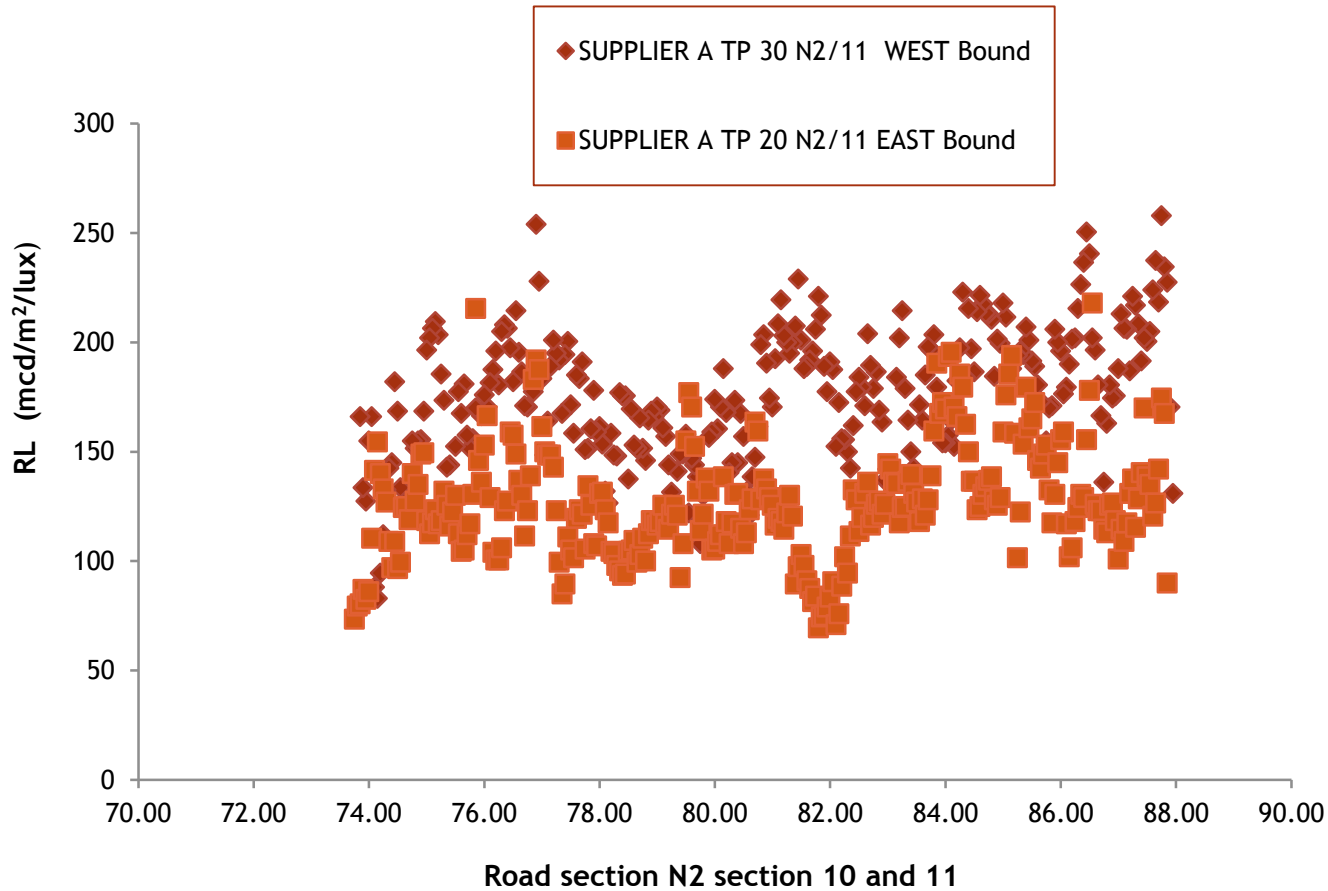


Results and observations

- ▶ Varying thermoplastic paint under same environment and traffic (RS3)
 - Dual carriageway
 - Traffic < 3000 ADT
 - Surface type: Asphalt
 - Coastal section
 - Age of markings: 16 months
 - N2-10 km 73 to km 80 SUPPLIER A TP20-RETRO @ 1,2mm sprayed (0,34 kg/m² glass beads)
 - N2-11 km 0 to km 8 SUPPLIER A TP30-RETRO @ 1,2mm sprayed (0,34 kg/m² glass beads)



Varying Thermoplastic quantity



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16 months min $R_L = 100$



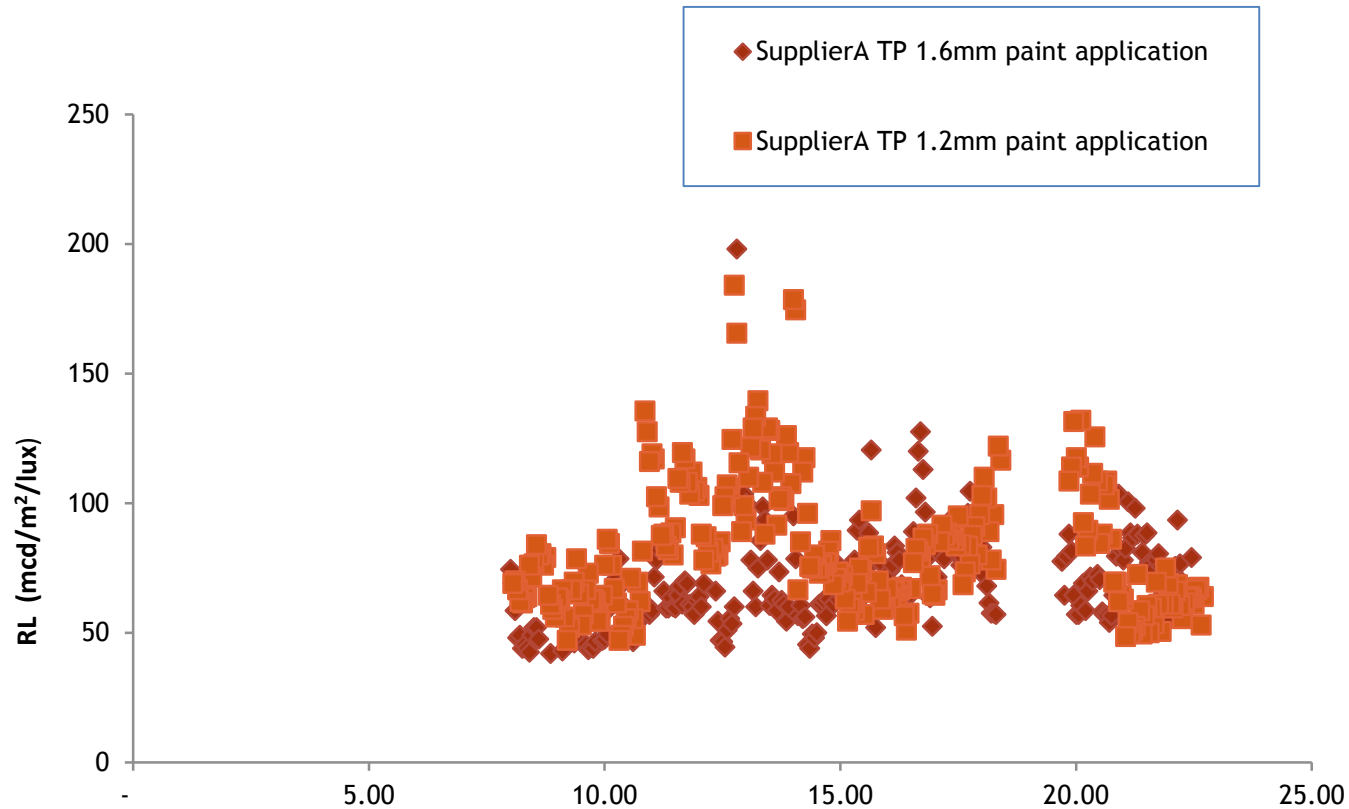
Reg. No. 1998/009584/30

Results and observations

- ▶ Varying thermoplastic paint under same environment and traffic (RS4)
 - Dual carriageway
 - Traffic < 3000ADT
 - Surface type: Seal
 - Coastal section
 - Age of markings: 16 months
 - SUPPLIER A TP20-RETRO @ 1,2mm sprayed (0,34 kg/m² glass beads)
 - SUPPLIER A TP20-RETRO @ 1,6mm sprayed (0,34 kg/m² glass beads)



Results and observations



Road Section N2 Section 11

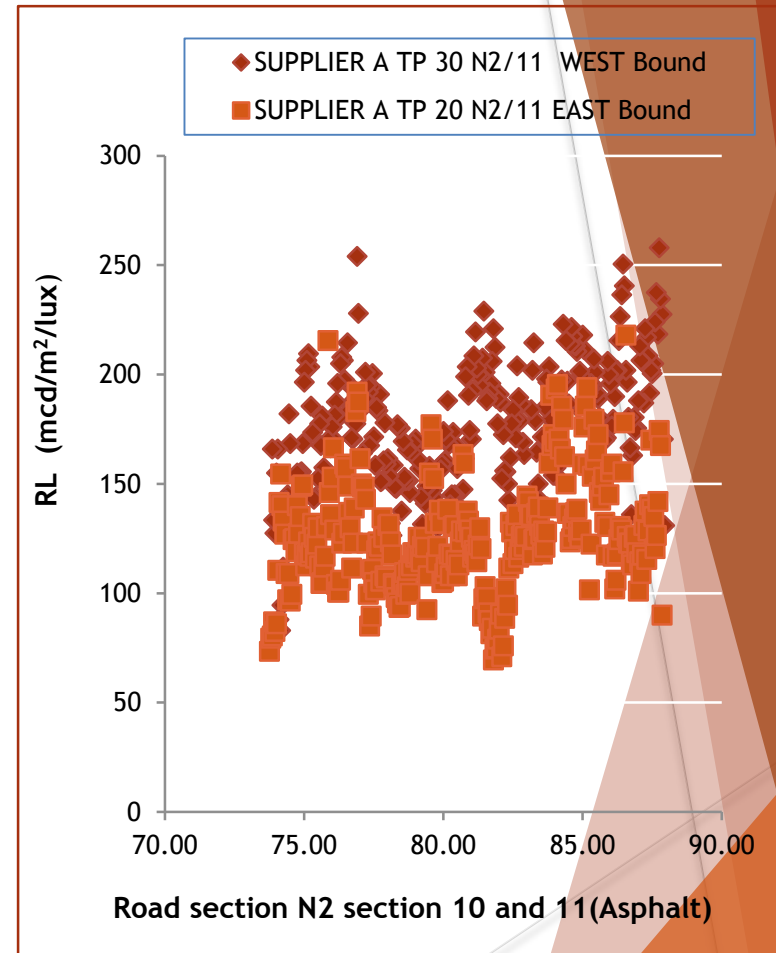
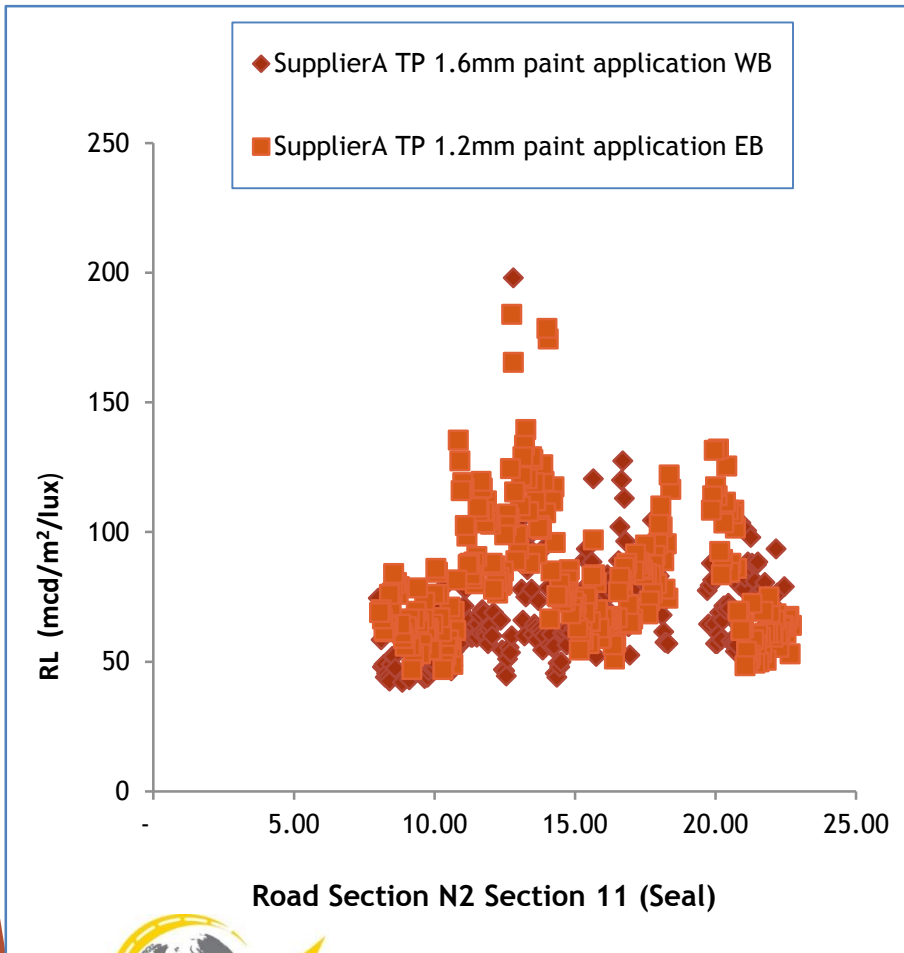
16 months min $R_L = 100$



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Influence of surface type



Results and observations



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Results and observations

Influence of Glass beads quantity

(RS7)

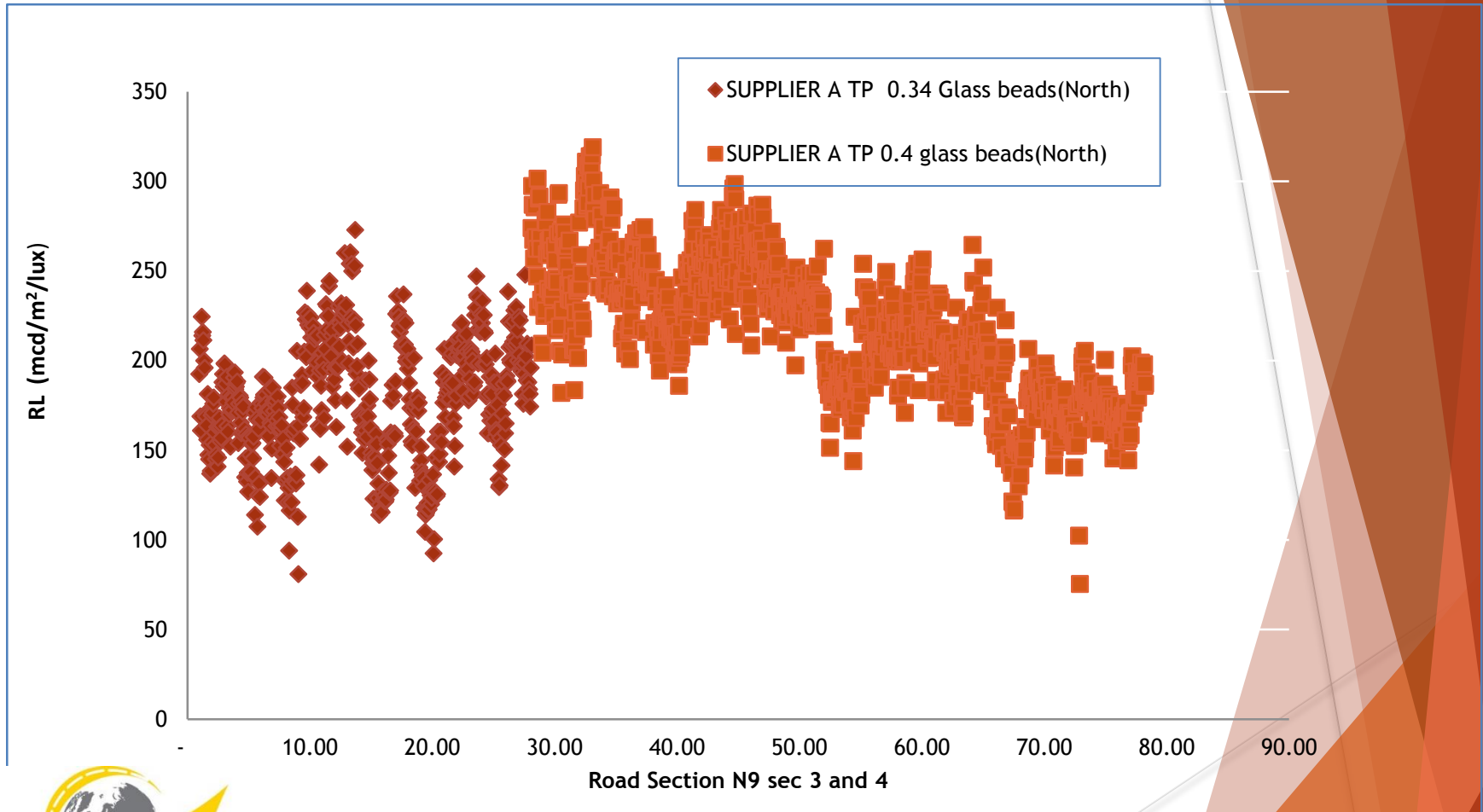
- Age of markings: 17 months
- <1000ADT
- Surface : Seal
- SUPPLIER A TP20-RETRO @ 1,2mm sprayed (0,34 kg/m² glass beads)
- SUPPLIER A TP20-RETRO @ 1,2mm sprayed (0,4 kg/m² glass beads)



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Results and observations



16 months min $R_L = 100$

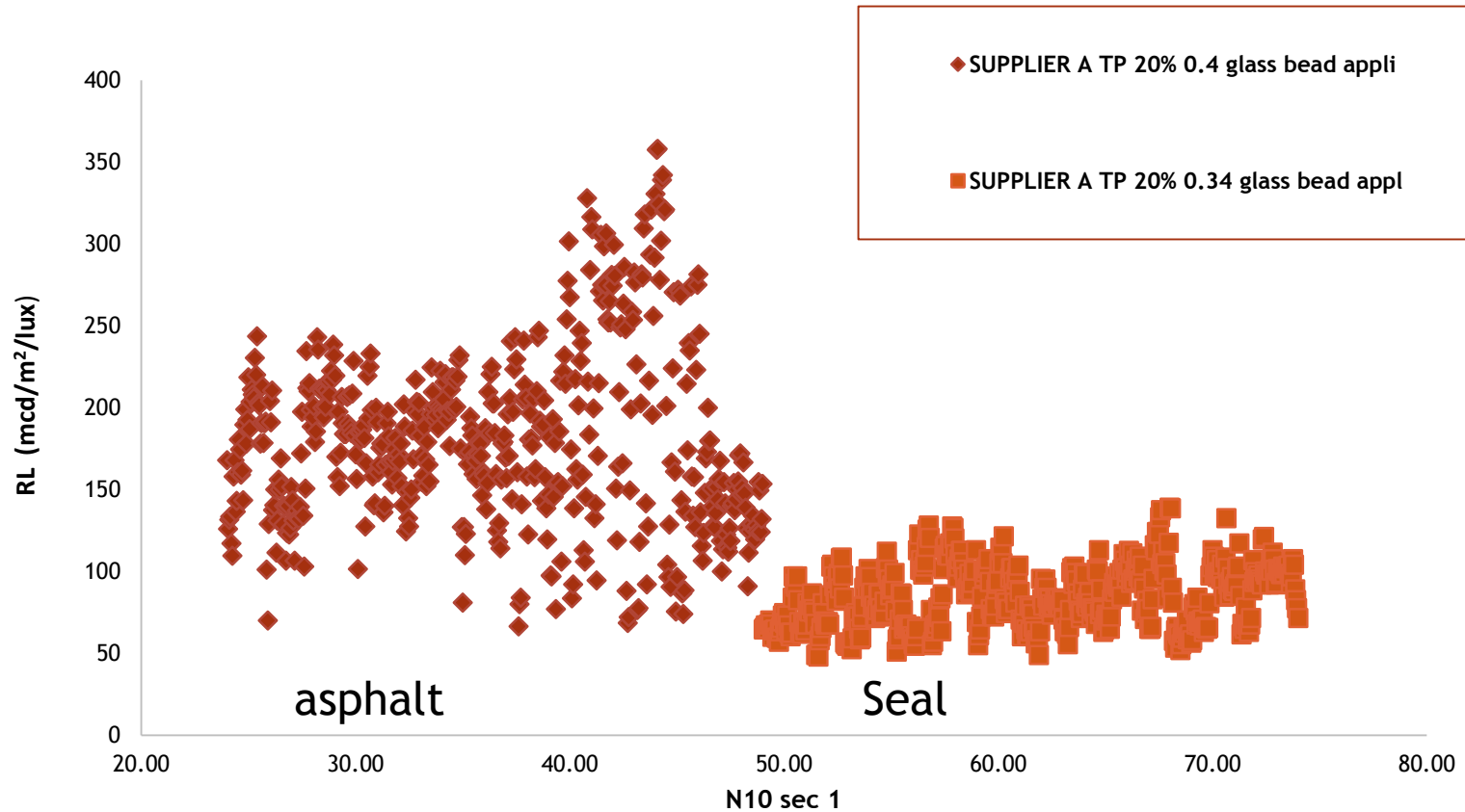


Results and observations

- ▶ Varying glass beads application rates (RS15) under same environment and different surface type
 - Surface type: Asphalt and Seal
 - Traffic >1000ADT
 - Age of lines 15 Months
 - Supplier A TP20-HI-RETRO @ 1,2mm sprayed (0,4 kg/m² glass beads)
 - Supplier A TP20-HI-RETRO @ 1,2mm sprayed (0,34 kg/m² glass beads)



Results and observations



16 months min $R_L = 100$

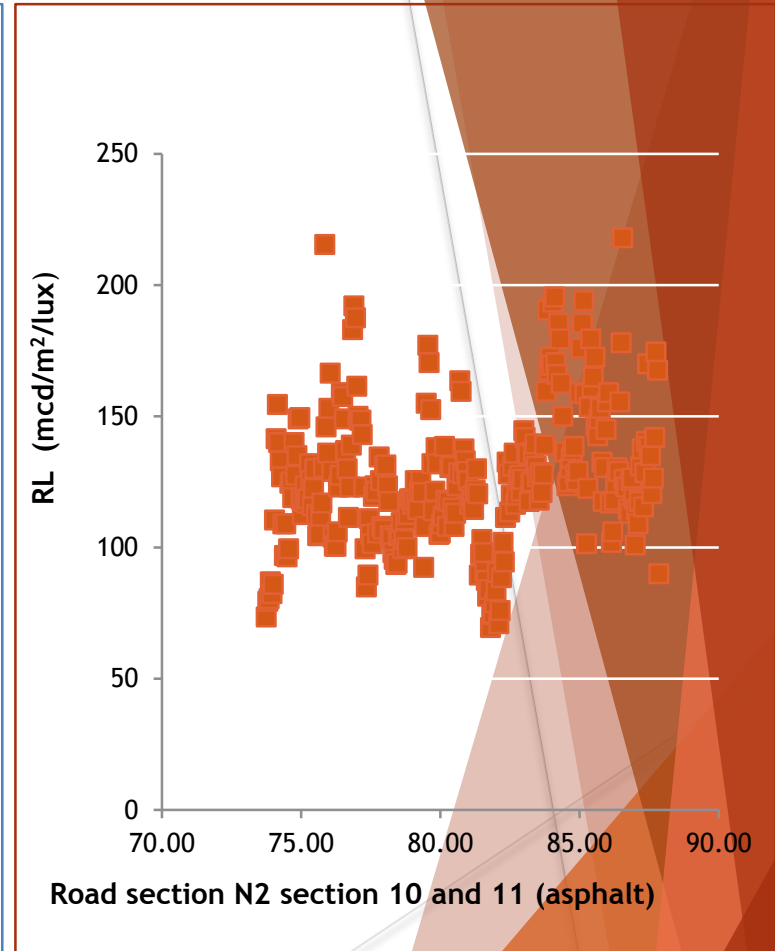
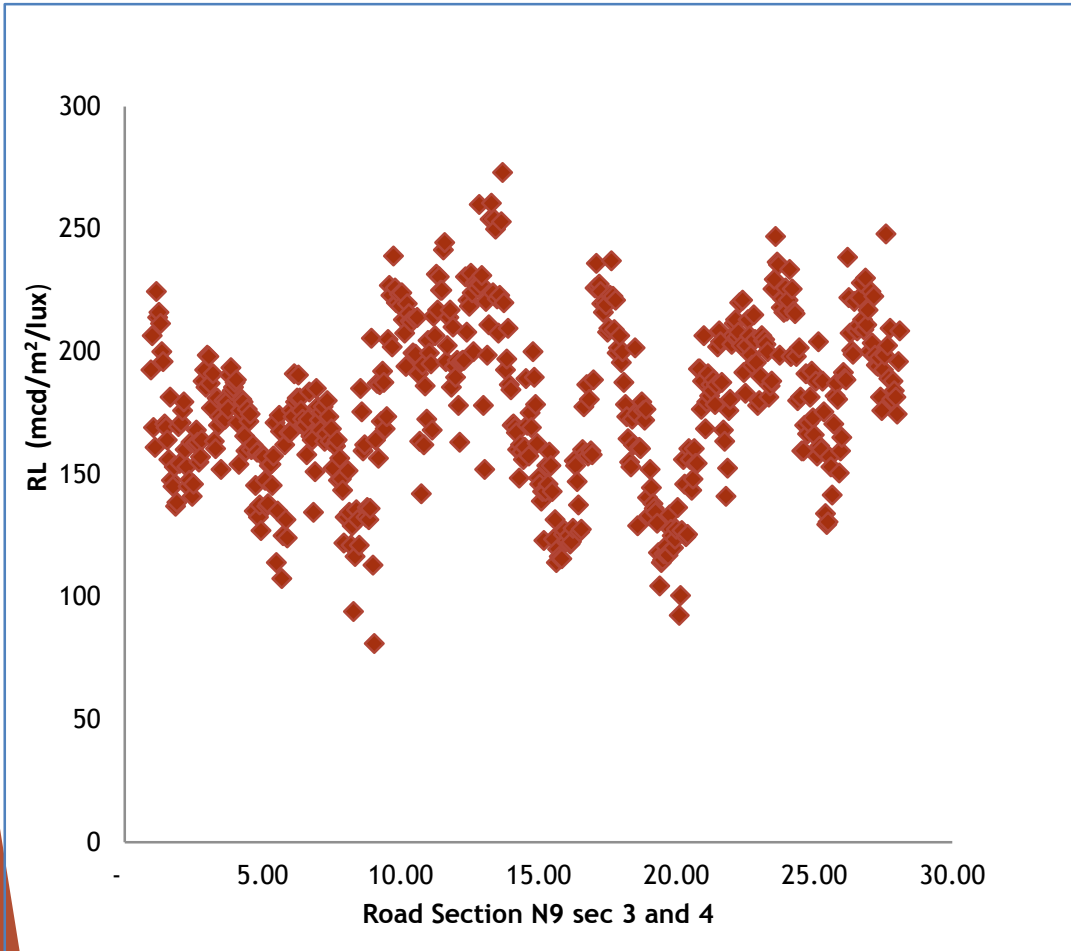
Results and observations

- ▶ Influence of traffic, surface and environmental conditions (RS3 and RS7)

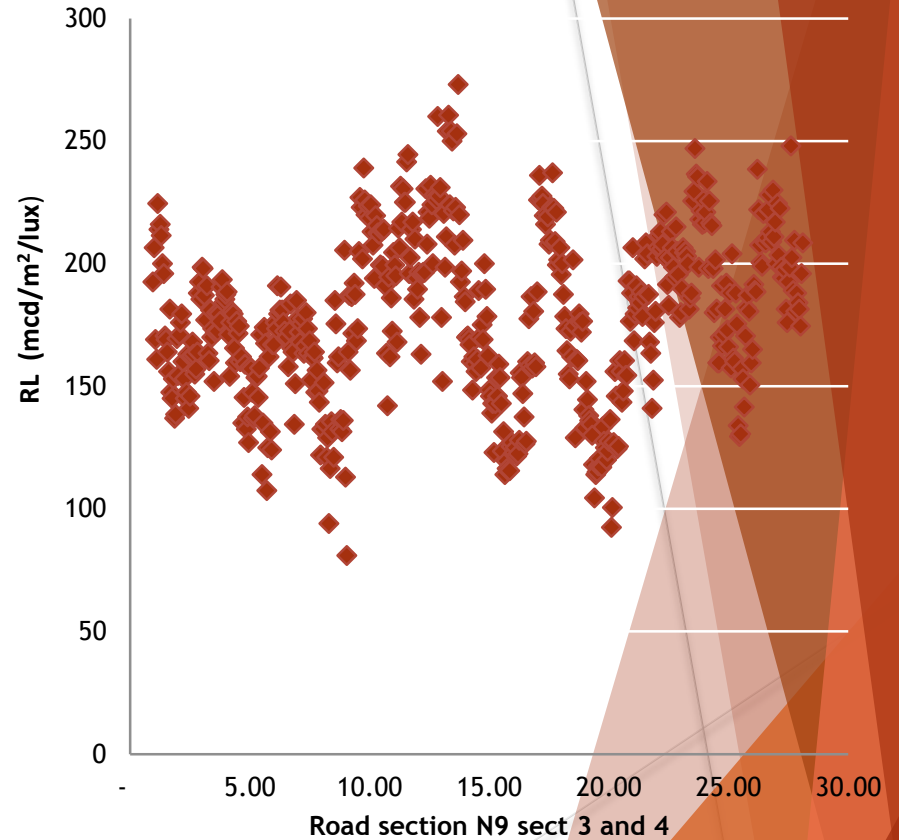
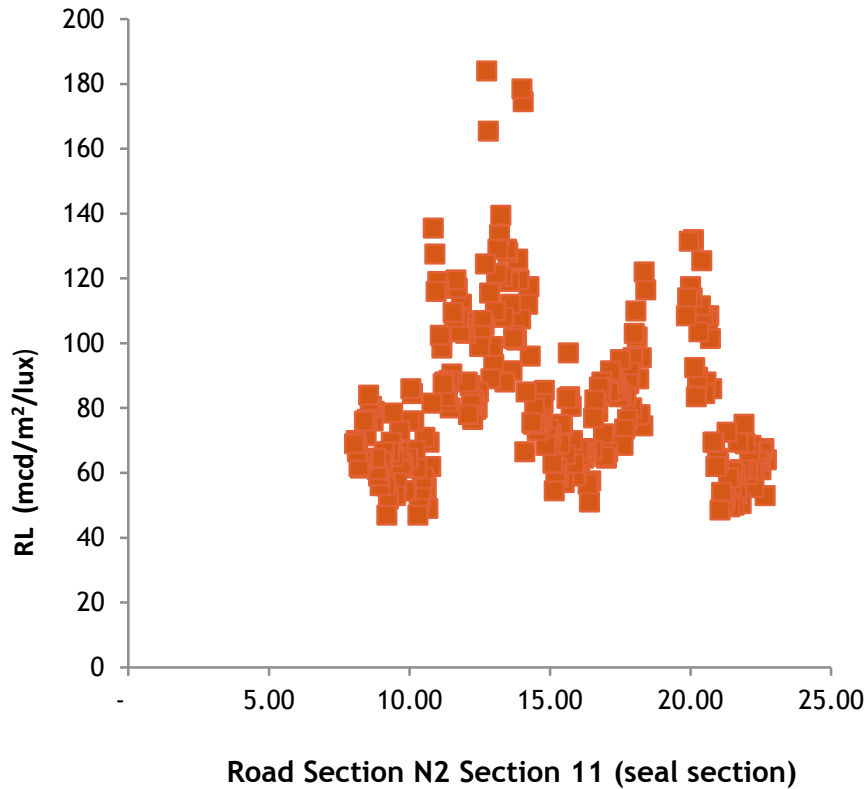
| | RS3 | RS7 |
|--------------|------------------|--------------------|
| Traffic | <3000ADT | <1000 ADT |
| Age of lines | 16 months | 17 months |
| Surface type | Asphalt | Seal |
| Geometry | Dual Carriageway | Single Carriageway |



Supplier A Thermo 20% 1.2mm application and 0.34kg/m² glass beads

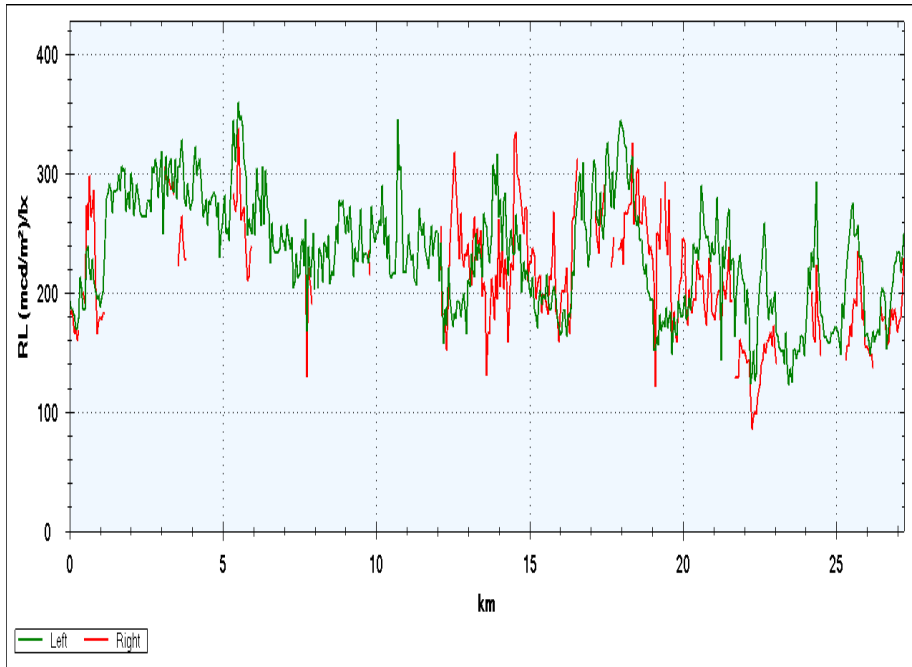


Influence of Traffic on the lines

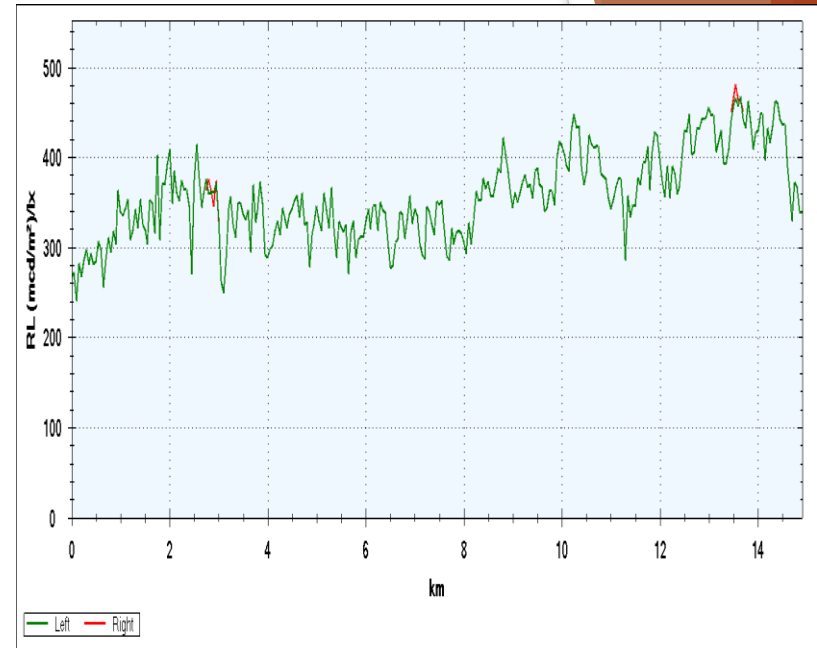


16 and 17 months $\min R_L = 100$

Influence of traffic on dual and single carriageway



Single carriageway
centre line



Dual carriageway
dividing line



Results and observations

► Varying paint type, supplier and application rates (RS6) under same environment and surface type

- Surface type: seal
- Traffic <1000ADT
- No surfaced shoulder
- Age of lines 5 months

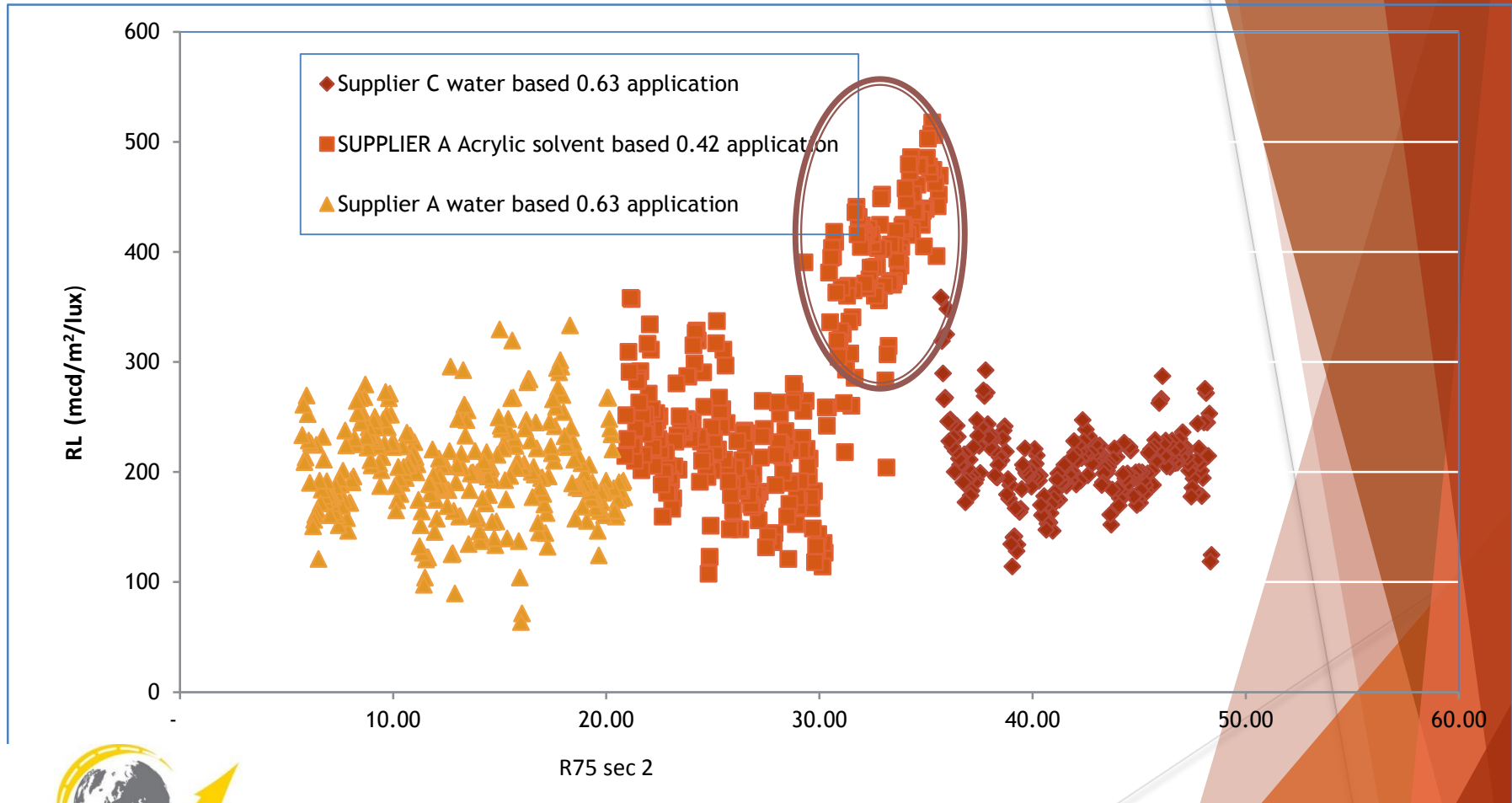
Supplier A WBP-RETRO @ 0,63 l/m² (0,8 kg/m² glass beads)

Supplier A ASP-RETRO @ 0,42 l/m² (0,8 kg/m² glass beads)

Supplier C WB @ 0,63 l/m² (0,8 kg/m² glass beads)



Results and observations



5 months 160 R_L

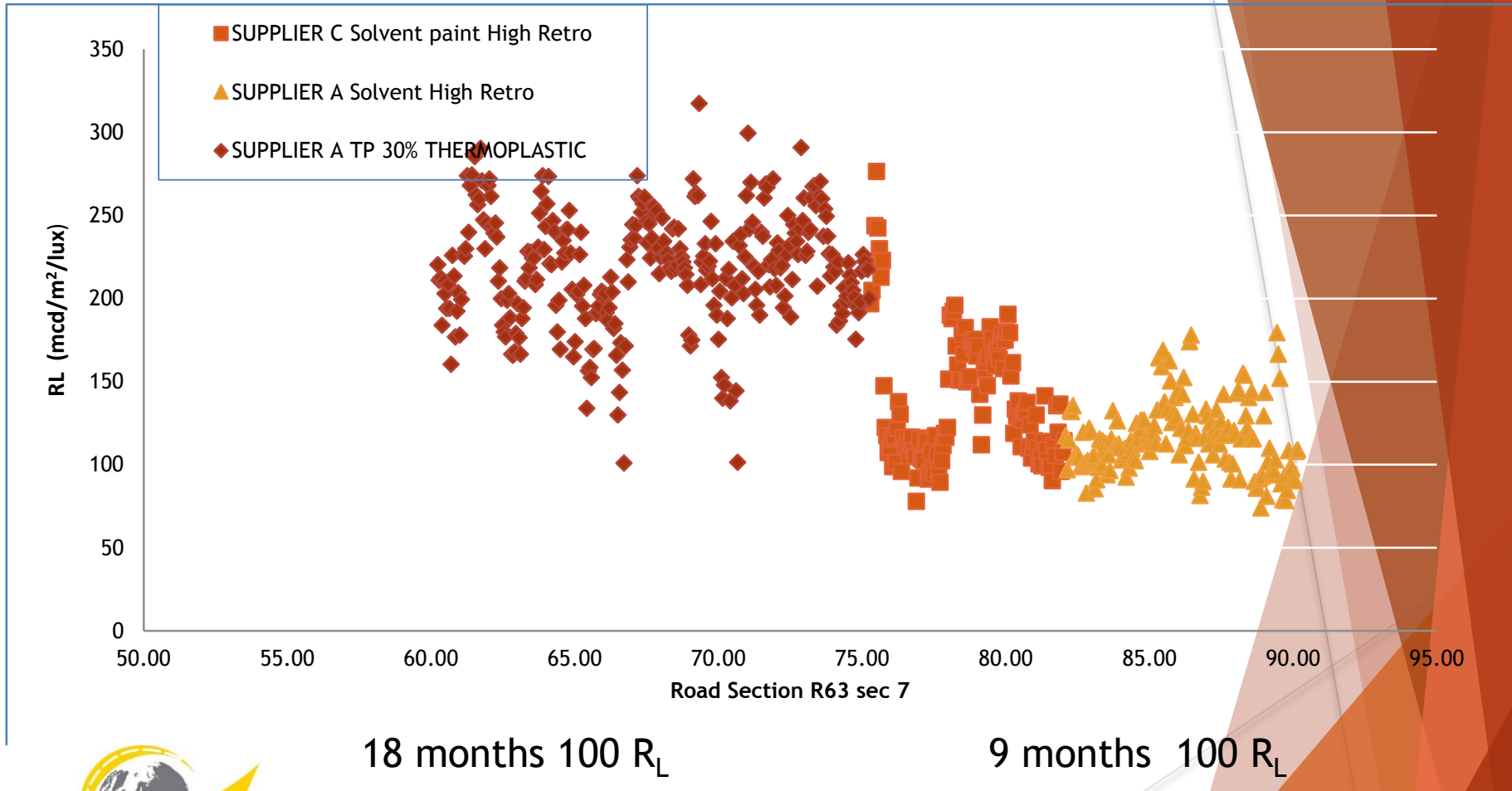


Results and observations

- ▶ Varying paint type, supplier and application rates (RS10) under same environment and surface type
 - Surface type: seal
 - Traffic <1000ADT
 - No shoulder
 - Age of lines 18 months thermo and 9 months solvent
 - R63/7 km 40 to km 90
 - SUPPLIER A ASP-RETRO @ 0,5 l/m² (0,96 kg/m² glass beads)
SUPPLIER C ASP @ 0,5 l/m² (0,96 kg/m² glass beads)
SUPPLIER A TP30-RETRO @ 1,6mm sprayed (0,4 kg/m² glass beads)



Results and observations



Performance based vs specified type contract

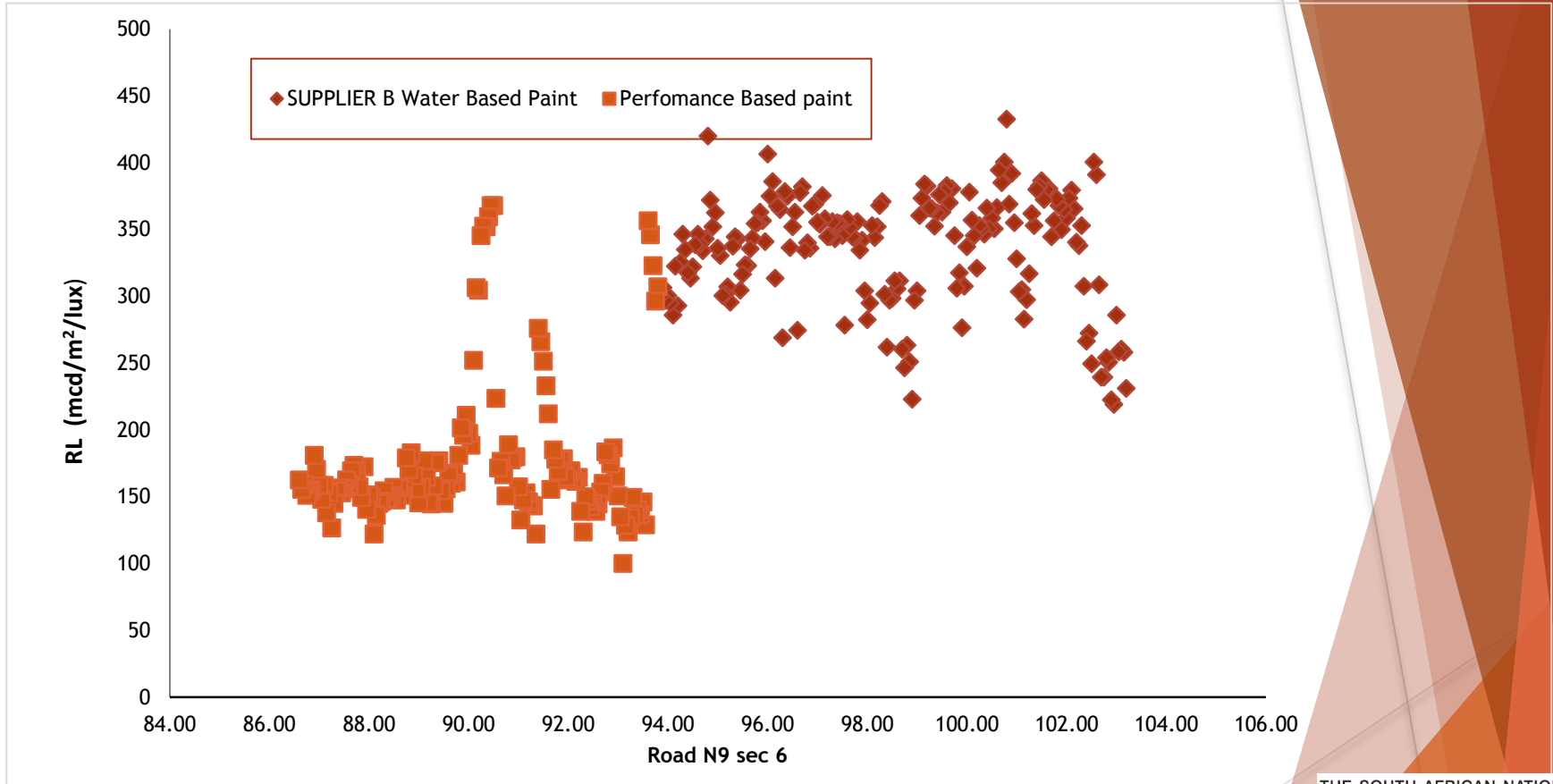
- ▶ Comparing contract type, and application rates (RS12) under same environment and surface type
 - Surface type: Seal
 - Traffic <1000ADT
 - Age of lines 18 months performance and 12 months Water based
 - SUPPLIER B WBP @ 0,42 l/m² (0,8 kg/m² glass beads (high quality))



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Results and observations



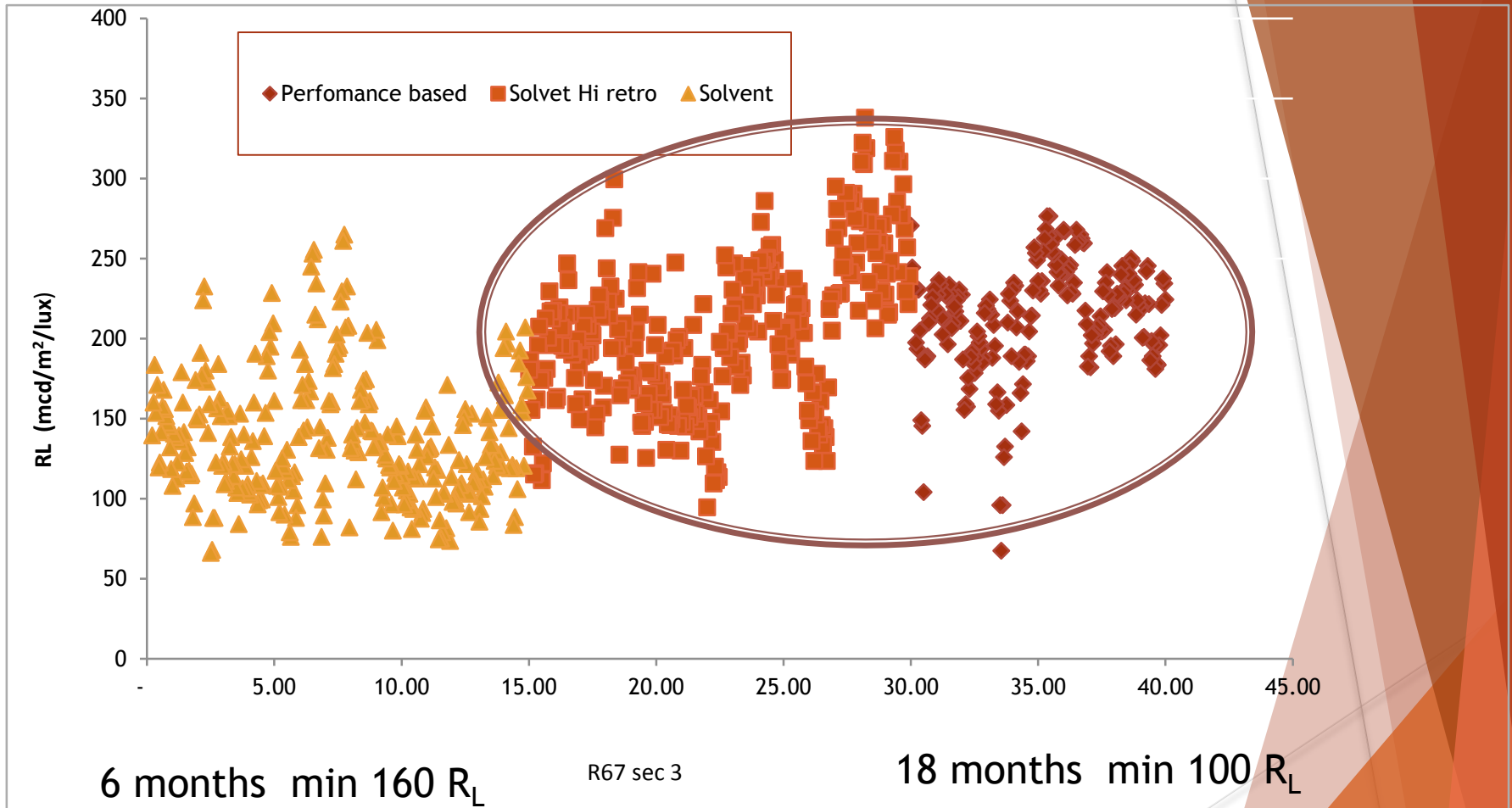
18 and 12 months min 100 R_L

Results and observations

- ▶ Comparing contract type, line marking type including glass beads, with application rates (RS16) under same environment and surface type
 - Surface type: Seal
 - Traffic >1000ADT
 - Age of lines 15 months performance and 6 months solvent based
 - SUPPLIER A ASP-RETRO @ 0,42 l/m² (0,8 kg/m² glass beads)
SUPPLIER A ASP-HI-RETRO @ 0,42 l/m² (0,8 kg/m² glass beads)



Results and observations

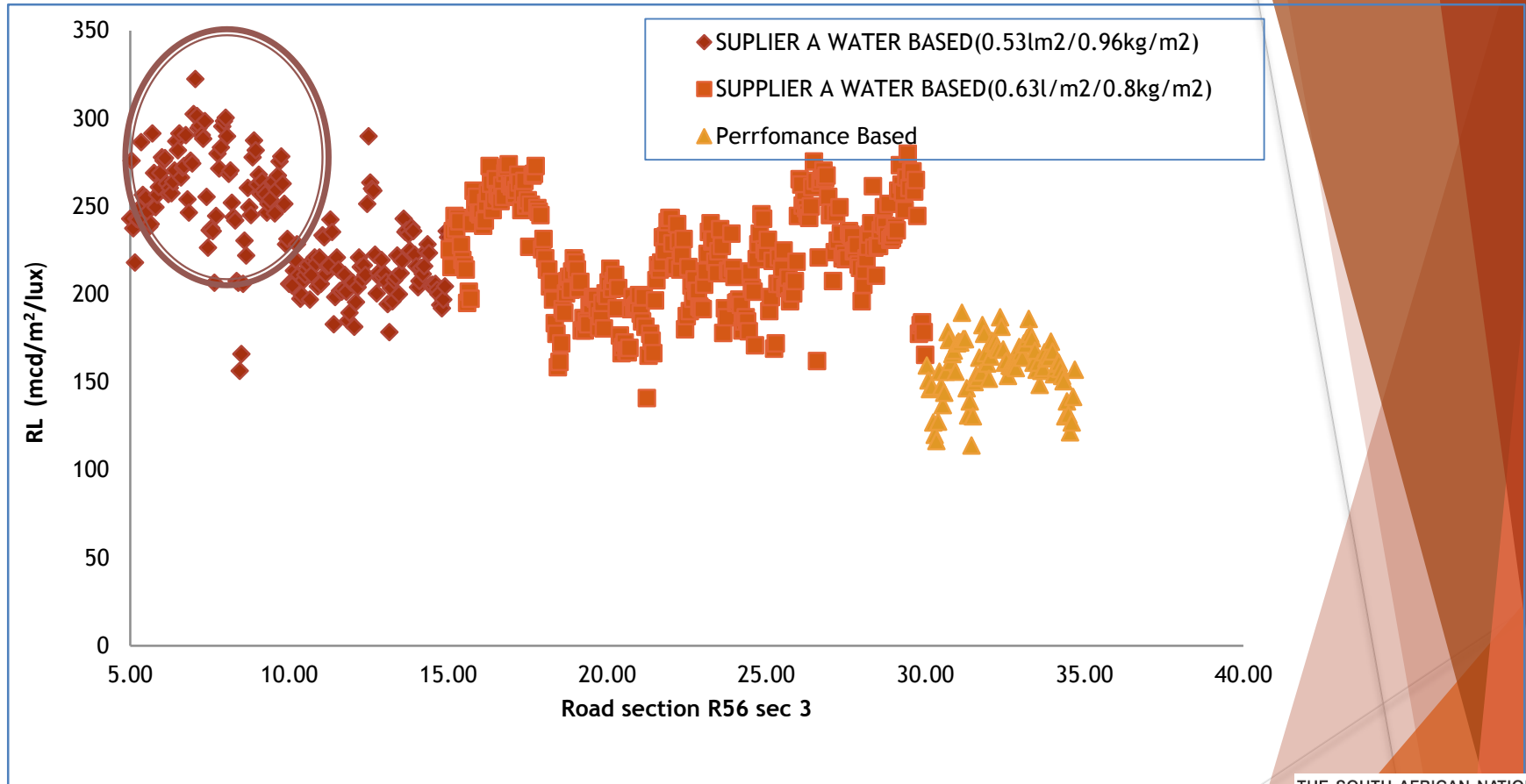


Results and observations

- ▶ Comparing contract type, varying application rates (RS19) under same environment and surface type
 - Surface type: Seal
 - Traffic <1000ADT
 - Age of lines 6 Months Performance based and 8 months water based
 - SUPPLIER A WBP-RETRO @ 0,53 l/m² (0,96 kg/m² glass beads)
 - SUPPLIER A WBP-RETRO @ 0,63 l/m² (0,8 kg/m² glass beads)



Results and observations



6 months min $R_L = 160$

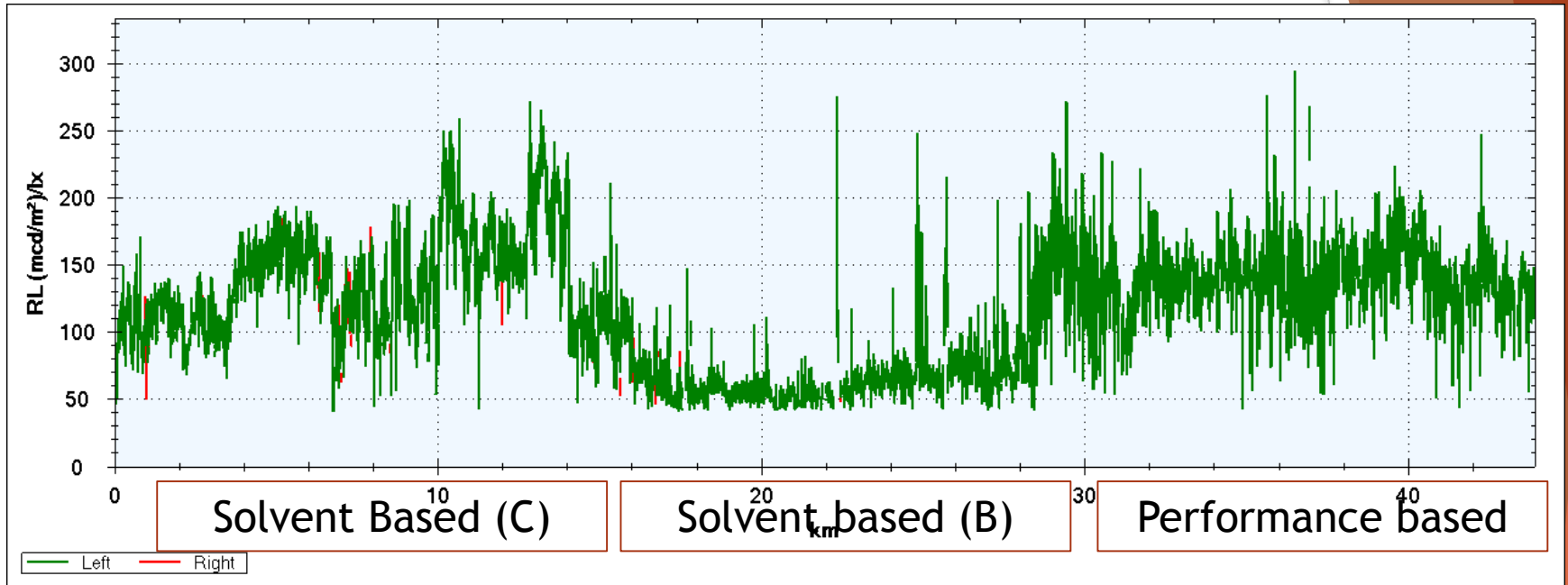


Results and observations

- ▶ Comparing contract type and varying line marking supplier(RS22) under same environment and surface type
 - Surface type: Seal
 - Traffic <1000ADT
 - Age of lines 7 months performance and solvent based
 - SUPPLIER C ASP @ 0,42 l/m² (0,8 kg/m² glass beads)
 - SUPPLIER B ASP @ 0,42 l/m² (0,8 kg/m² glass beads)



Results and observations



R58 sec 4

6 months min $R_L = 160$



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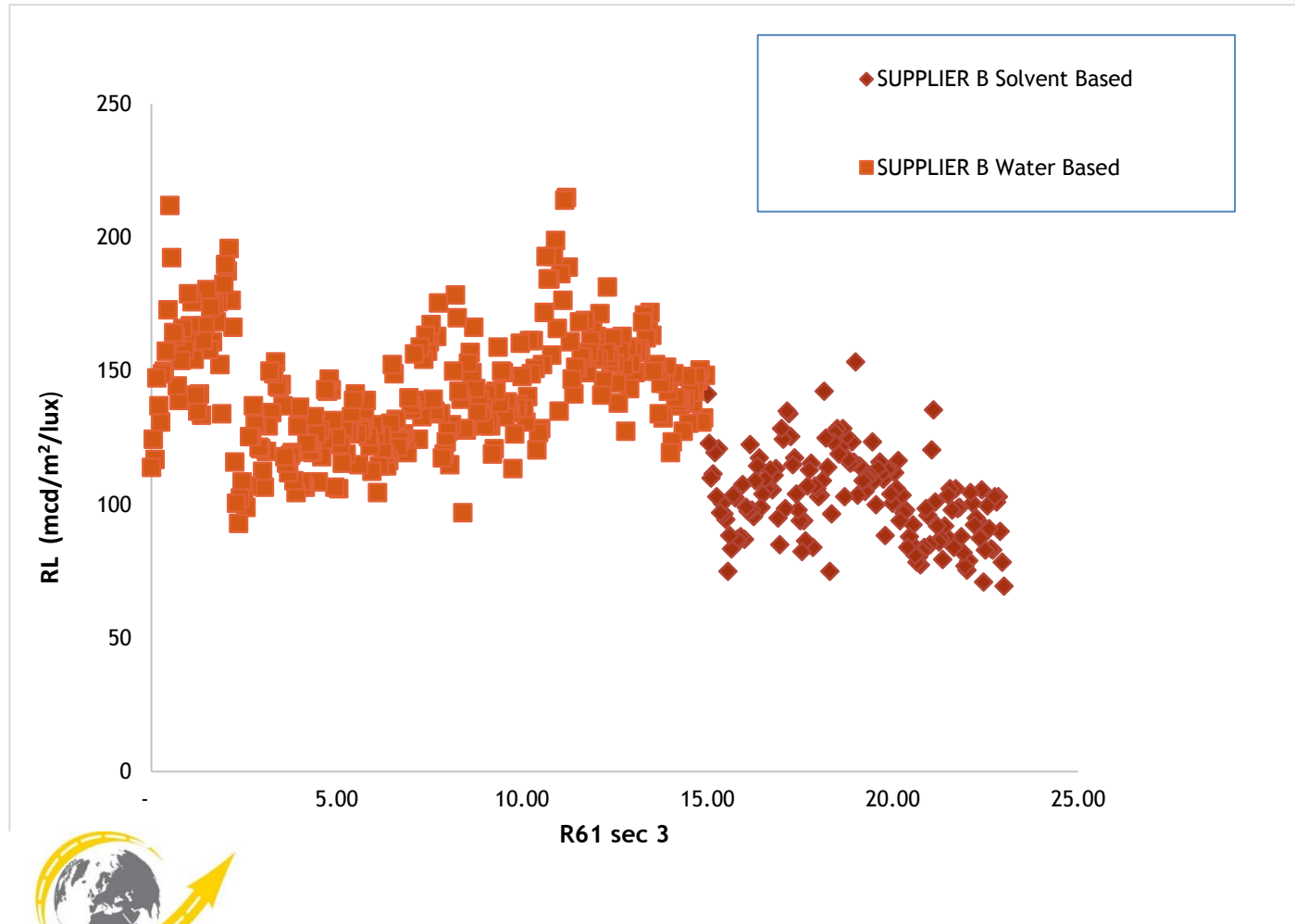


Results and observations

- ▶ Varying line marking types from same supplier including glass beads, with application rates (RS13) under same environment and surface type
 - Surface type: Seal
 - Traffic >1000ADT
 - Age of lines :6 months solvent and water based
 - SUPPLIER B ASP-RETRO @ 0,42 l/m² (0,8 kg/m² glass beads)
 - SUPPLIER B WBP @ 0,42 l/m² (0,8 kg/m² glass beads)

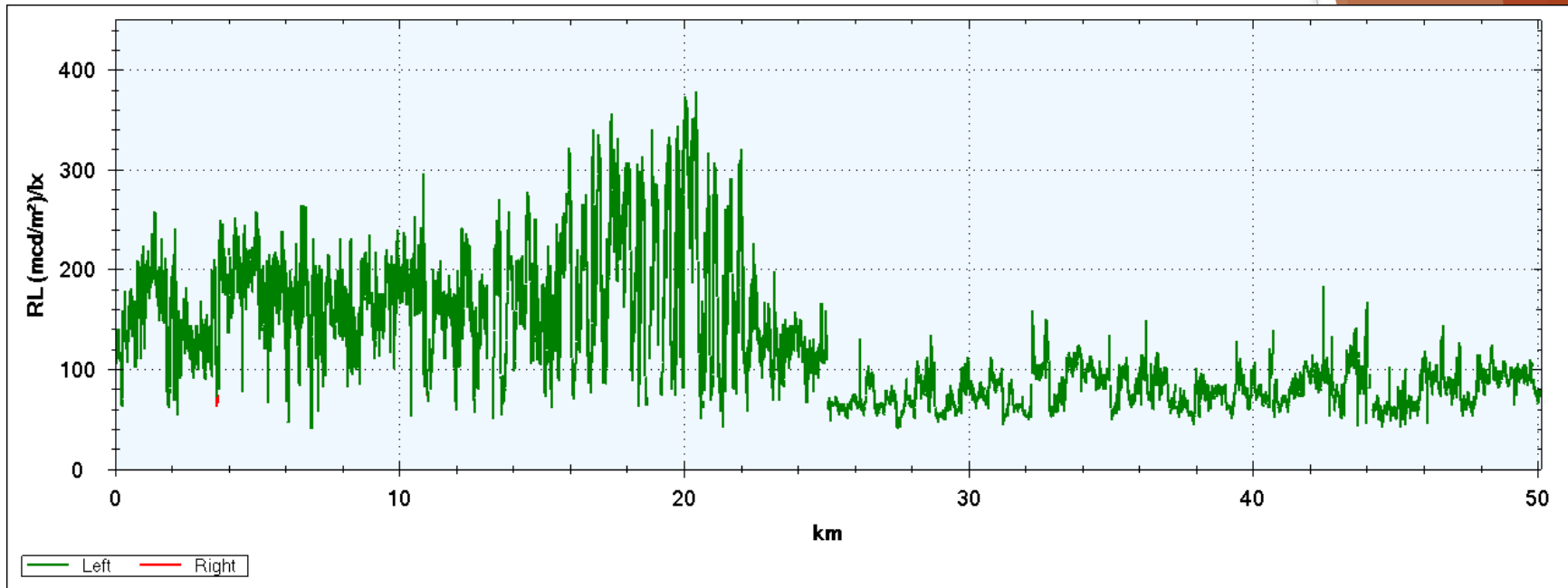


Results and observations



6 months min $R_L = 160$

Results and observations



6 months min $R_L = 160$



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Photos



Conclusions

- ▶ Benefits of increasing quality and quantity of glass beads observed in all paint types
- ▶ Traffic and age of line influences retro reflectivity values
- ▶ Paint thickness and glass bead quantity influence the initial values of the lines
- ▶ Not much difference is observed in varying the paint and glass beads on thermoplastic in the initial months over same environment and surface type.
- ▶ Reflectivity values decrease more on seal surface than on asphalt surface
- ▶ Not much differences from the paint suppliers on the performance of both water based and solvent based paint type.
- ▶ Premiums paid over performance based contract need to be further looked at especially in terms of long term performance and the minimum initial threshold for reflectivity value



Recommendations

- ▶ Correlate texture measurements of different surfacing with the retro reflective measurements
- ▶ Investigate influence of line marking placement direction on the retro reflectivity
- ▶ Investigate the influence of environmental effect on pavement markings (time markings was painted and its performance period)
- ▶ Investigate the balance of increasing the glass beads and paint application rate for the 3 type of paints.
- ▶ Investigate retro reflectivity of different markings in wet conditions
- ▶ Investigate the influence of existing line marking type and condition on the adhesion of the new line marking and influence on the initial retro reflectivity
- ▶ Investigate the influence of type of surface, age of surface, environment and traffic on what performs better between solvent and water based paint for low traffic roads.
- ▶ More research on glass bead technology and their application
- ▶ Line markings degradation curves

Special Thanks

- ▶ SANRAL who funded the project
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- ▶ SMEC SA (Port Elizabeth) Consulting Engineers on the project.
- ▶ Contractor Lanino Line Markings
- ▶ Technicians Sinanzo, Menzi and Onthathile



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Thank you



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