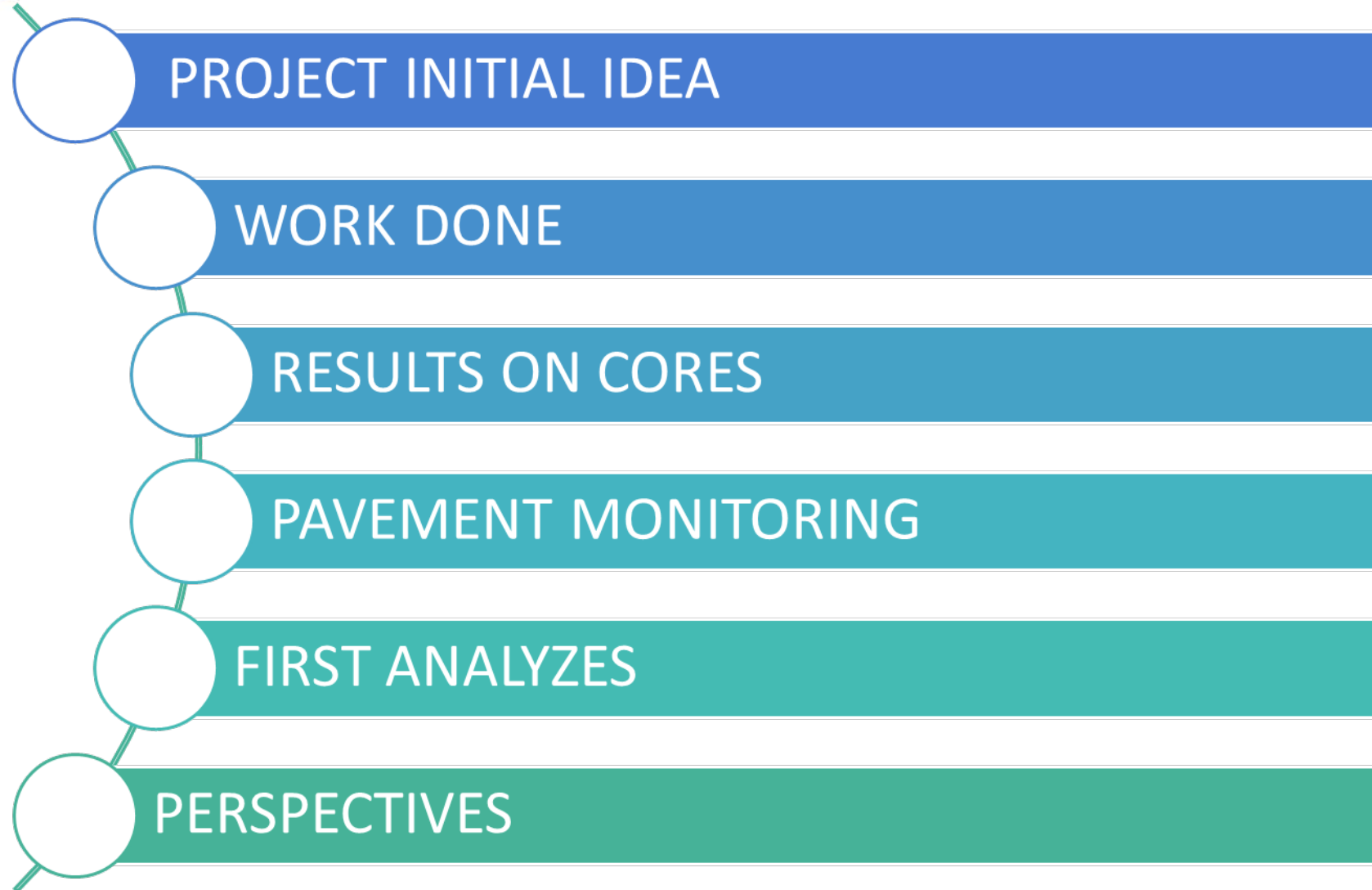


WORKSHOP ON BITUMEN EMULSION TECHNOLOGY

**10TH JUNE 2026
VIENNA, AUSTRIA**

**DURABILITY OF EMULSION
BASED WEARING COURSES**

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CURRENT SITUATION



Well adapted for low traffic road

Low knowledge on in situ behavior

Low carbon footprint solution –
Important for our Roadmap

Need data to support
development



IDENTIFICATION OF CONSTRUCTION SITES

- Select different jobsites with increasing ages
- Agreement from clients for survey & take cores



PAVEMENT MONITORING

- Damage quantification
- Significant network



SAMPLING

- Cores : Void content / Binder aging



PERSPECTIVES

- Argue on CO2 footprint based on durability !
- Communicate on new data

Select
1 Production plant of Easycold
ECOULFLANT



Formula

- As constant as possible
- Composition
- Emulsion (knowledge)
- Quality control
- In situ QC
 - MTD, thickness, void content

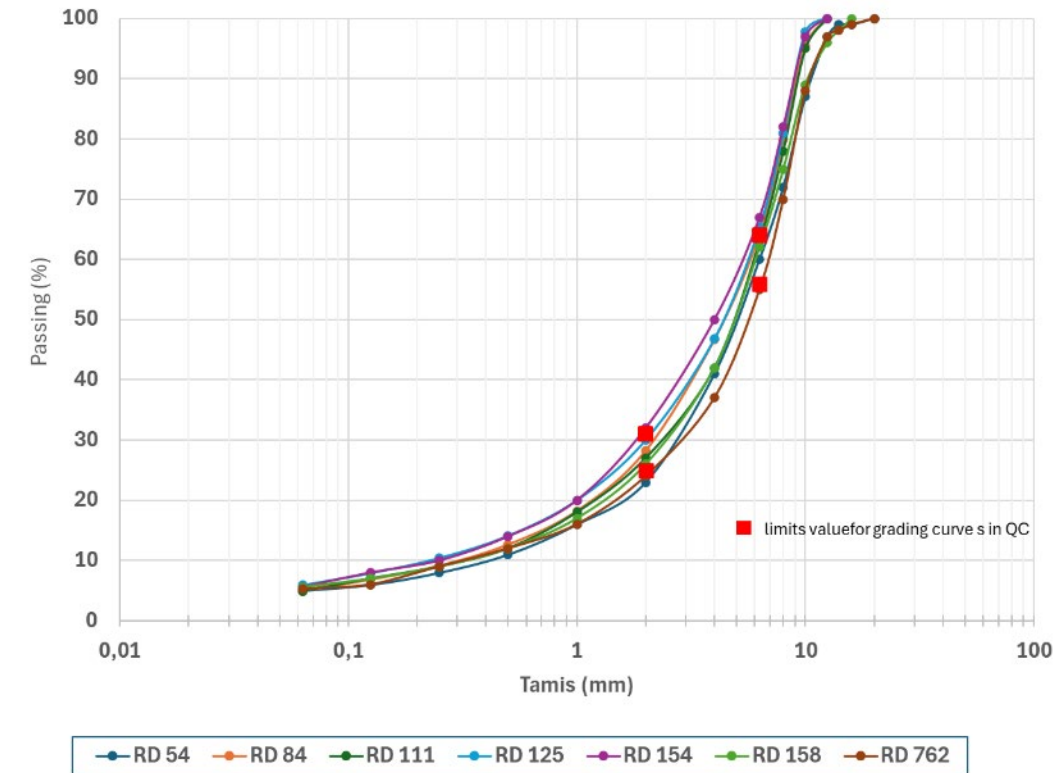
Jobsites

- Localisation
- Traffic
- Date on paving
- Damage evaluation
- coring

NEW APPROACH

SINGLE PRODUCTION SITE
VERY STABLE RECIPE
TOTAL BINDER CONTENT & GRADING CURVE)

	2009	2012	2018	2021
MVRe (kg/m ³)	2621	2603	2605	2604
Voids (40 girations)	19	-	19,9	19,9
Water resistance I/C	0,85	0,81	0,72	0,82



SELECTION OF JOBSITES

RD 125



RD 54



RD 158

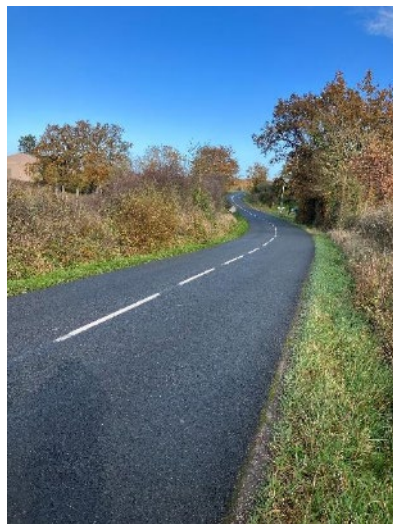
RD 762

SELECTION OF JOBSITES

RD 154



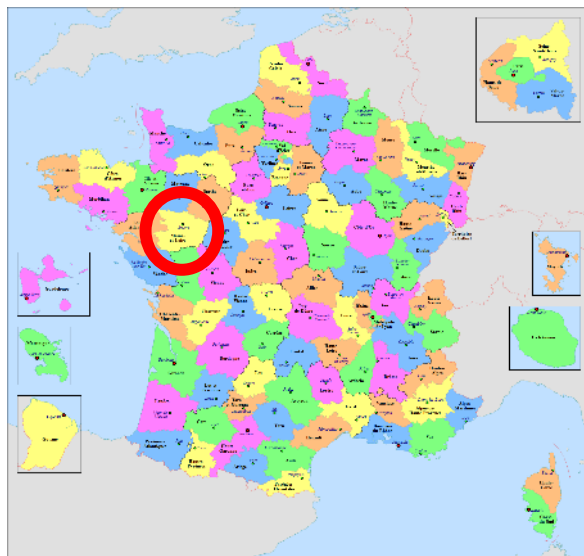
RD 751



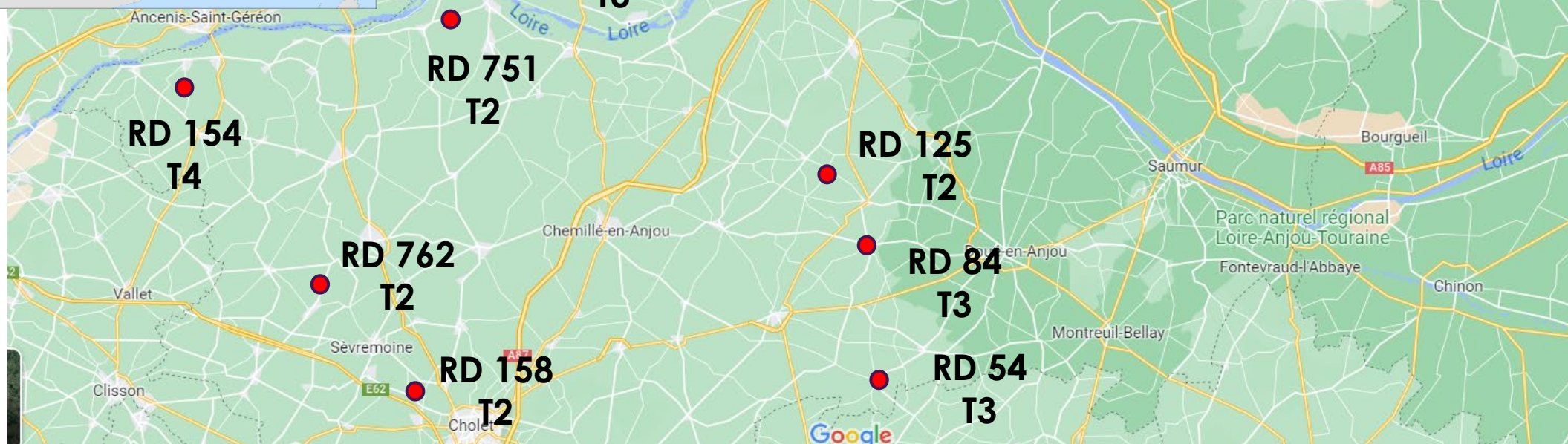
RD 111

RD 84

SELECTED JOBSITES MAINE AND LOIRE (49)



REF	listing chantier	Age
RD 154	PR 9+530 à 10+270 (2010)	14
RD 751	PR 77+65 PR 79+28 (2011) (ESU 2024) ?	13
RD 111	PR 10+885 à 11+620 Epiré	13
RD 84	PR 24+174 à 28+166 Tigné St georges	10
RD 125	PR 0+750 à 6+42 Martigné briand Thouarcé	10
RD 54	PR 0+34 à 5+22 Cléré sur layon	5
RD 158	PR 9+359 à 11+00 ST andré de la Marche	5
RD 762	PR 30+334 à PR 32+915 Villedieu la Blouère	3



CORE SAMPLING – ON SITE MEASUREMENTS



Coring - FWD -PMT : 25,26 & 30 April + 13&14 May 2024
Survey (Evalis 3D TN) : 13&14 May 2024

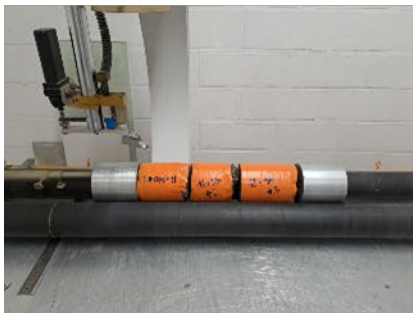
	RD 54 (2019)	RD 84 (2014)	RD 111 (2011)	RD 125 (2014)	RD 154 (2010)	RD 158 (2019)	RD 751 (2011)	RD 762 (2021)
Photos								
Structure	Easycold 5cm, 2019	Easycold 4 cm, 2014	Easycold, 4 cm, 2011	Easycold, 3 cm, 2014	Easycold 4 cm, 2010	Easycold, 4 cm, 2019	Easycold, 3 cm, 2011	Easycold, 4 cm, 2021
	SD 1 cm, 2005	SD, 1 cm, 2002		SD, 1 cm, 2003		SD, 1 cm, 2008	SD, 1 cm, 1998	ECF*, 1.5 cm, 2011
	SD, 1 cm, 1995	SD, 1 cm, 1992	SD, 1 cm, 1999	SD, 1 cm, 1992	SD, 1 cm, 2000	SD, 1 cm, 1996	SD, 1 cm, 1988	SD, 1 cm, 1991
	SD, 1 cm, 1987	Road Base asphalt, 6.5 cm, 1970	SD, 1 cm, 1989	GRH*, 45 cm, 1989		SD, 1 cm, 1986	SD, 1 cm, 1987	SD, 1 cm, 1988
	Old pavement, 10 cm, 1965	SD, 1 cm, 1962	SD, 1 cm, 1983	As dug gravel, 30 cm, 1989	SD, 1 cm, 1990	Sand asphalt, 1.5 cm, 1963	GRH*, ?, 1987	Graded aggregates, 20 cm, 1988
		SD, 1 cm, 1958				Cement treated gravel, 9 cm, 1963	SD, 1 cm, 1978	SD, 1 cm, 1987
Traffic	744 veh/d	1377 veh/d	2371 veh/d	2226 veh/d	1634 veh/d (4,3 % trucks)	2083 veh/d (8,4 % trucks)	3516 veh/d (8,2% trucks)	6900 veh/d (8,4 % trucks)

*Easycold ColdAC mix
*SD : Surface dressing
*GRH : Graded aggregate

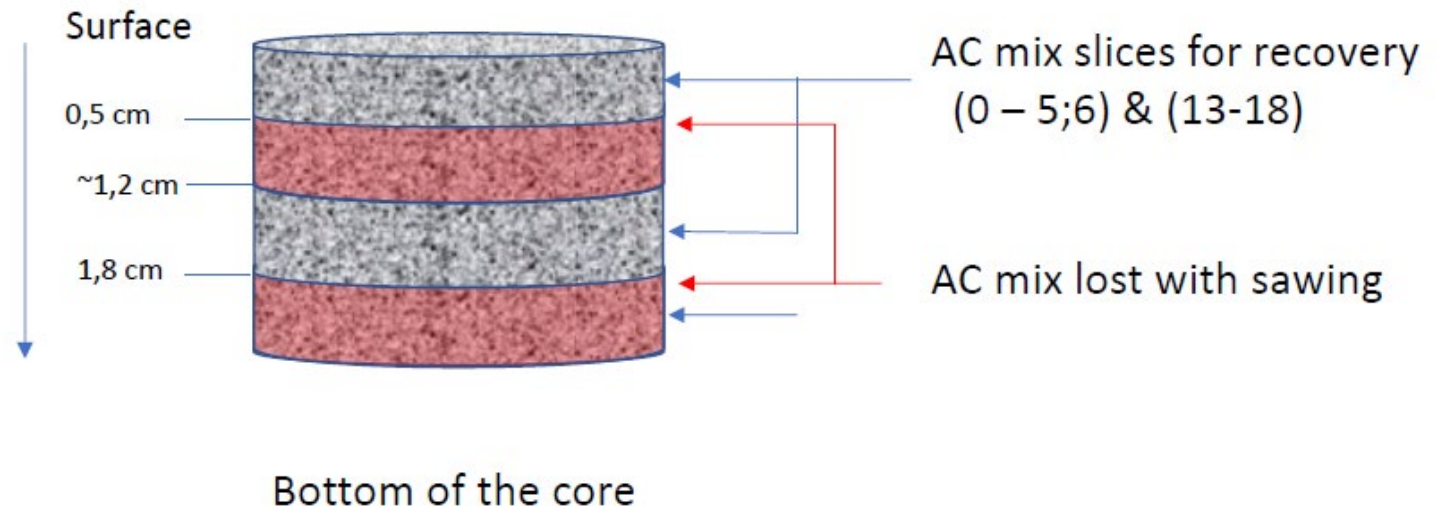
Source : Data from Department for pavement structure and 10 past maintenance operations on Easycold.

	RD 154	RD 751	RD 111	RD 84	RD 125	RD 54	RD 158	RD 762
JOBSITES SELECTION	●	●	●	●	●	●	●	●
Paving date	Juin 2010	2011	Juin 2011	Juin 2014	Juin 2014	Sept 2019	Avril 2019	Avril 2021
Pavement structure (Dpt)	●	●	●	●	●	●	●	●
Traffic (Dpt)	●	●	●	●	●	●	●	●
Maintenance (Dpt)	●	●	●	●	●	●	●	●
Production Quality control	Juin (92/8)	?	●	●	●	●	●	●
Pavement structure (Cores)	●	●	●	●	●	●	●	●
Survey TN	●	●	●	●	●	●	●	●
MTD measurements(TO)	●	●	●	●	●		●	●
Cores (TO)	●	●	●	●	●	●	●	●
FWD (TO)	●	●	●	●	●	●	●	●

	RD 154	RD 751	RD 111	RD 84	RD 125	RD 54	RD 158	RD 762
Photo	●	●	●	●	●	●	●	●
Thickness Easycold	●	●	●	●	●	●	●	●
Banc gamma	●	●	●	●	●	●	●	●
<i>Sawing</i>	●	●	●	●	●	●	●	●
ITSM (modulus)	●	●	●	●	●	●	●	●
Sawing	●	●	●	●	●	●	●	●
Binder recovery	●	●	●	●	●	●	●	●
Rheological test (DSR)	●	●	●	●	●	●	●	●

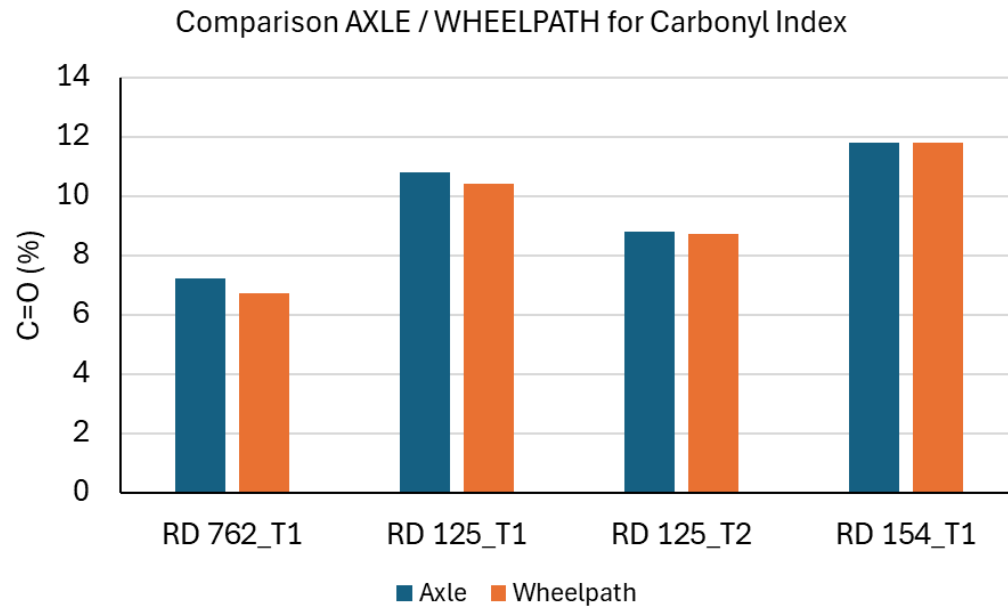


RESULTS ON CORES



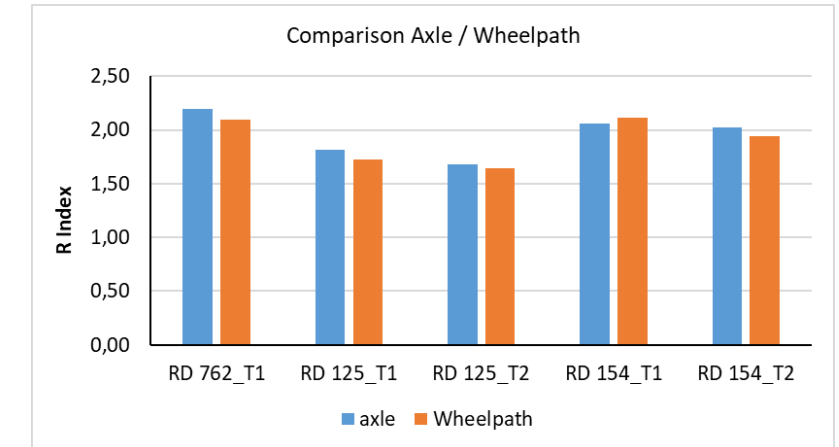
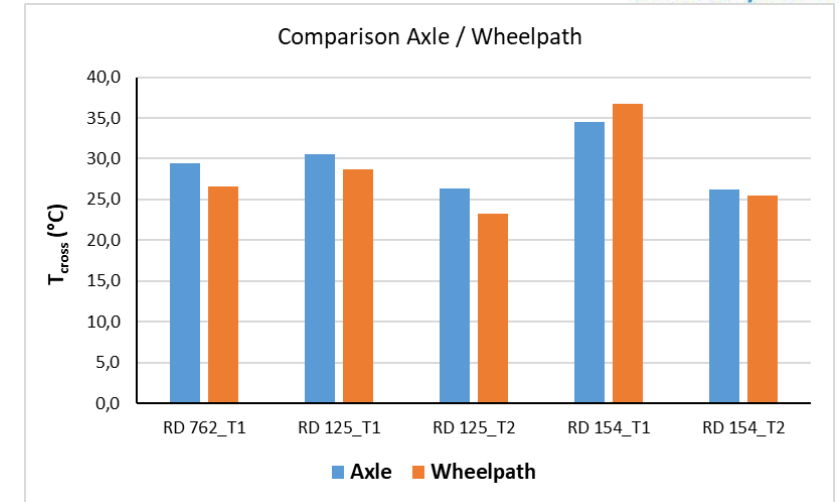
2 recovered binders / sections
(surface and « bottom »)

COMPARISON Wheelpath – AXLE

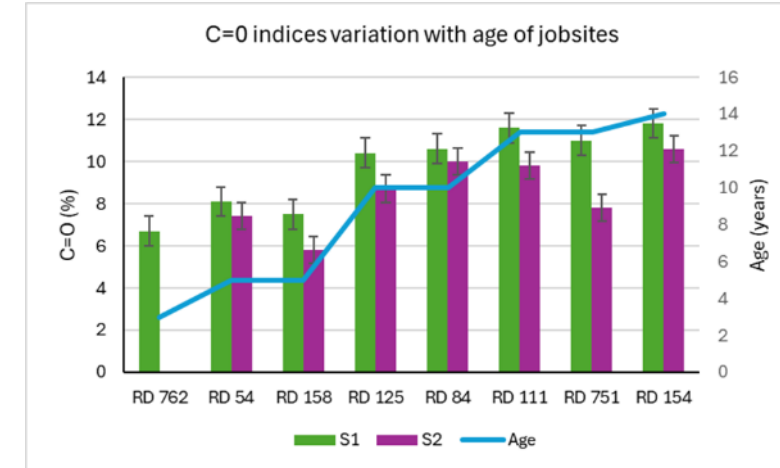
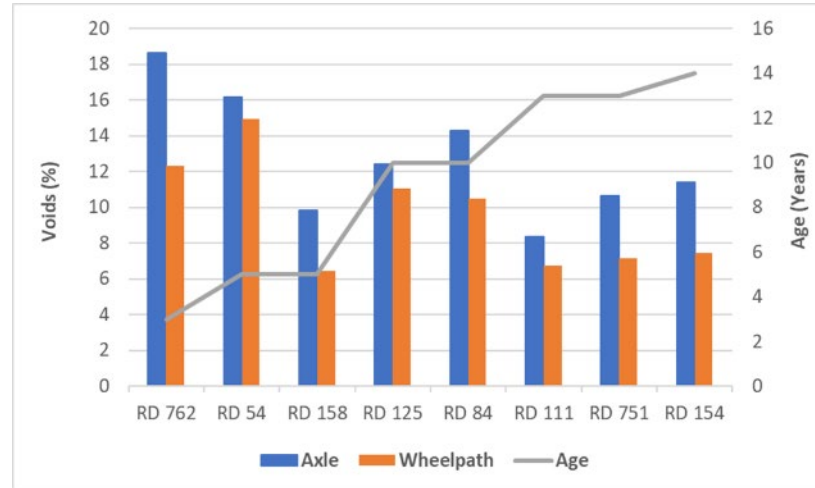


Limited difference
(for surface & bottom)

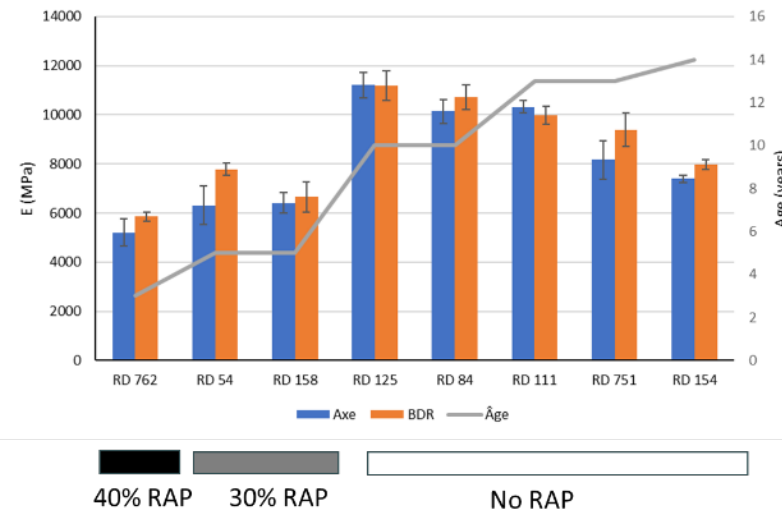
Difference in modulus
= Difference in voids content



Next step : only recovered
Binder from WP

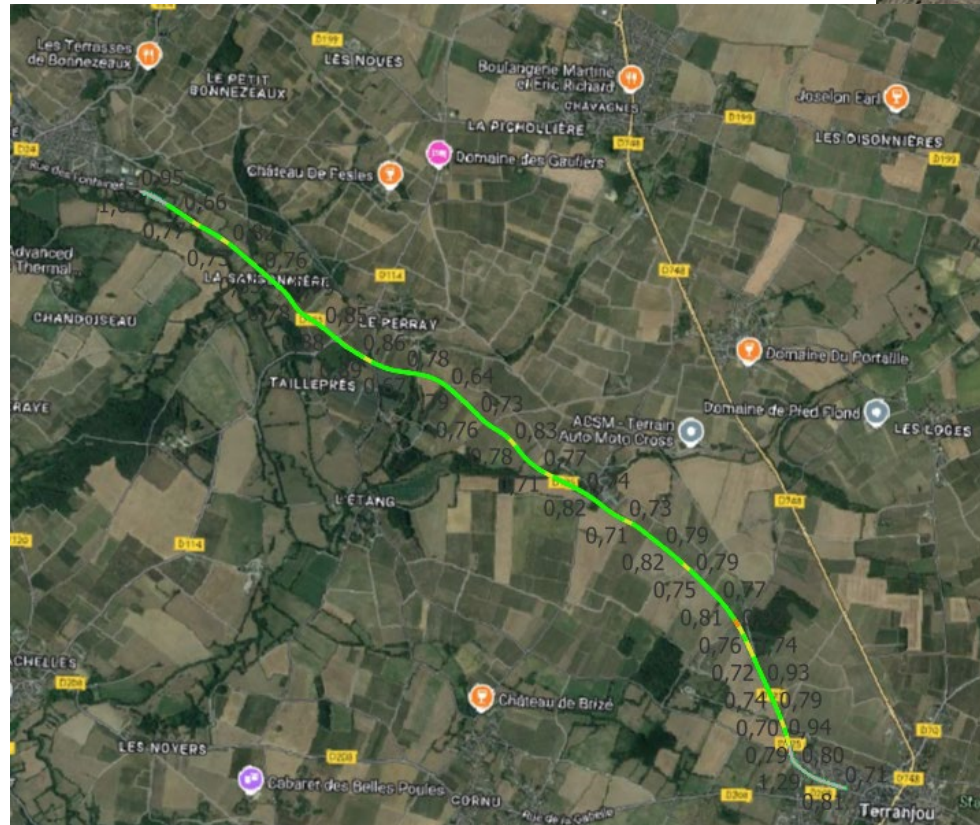


Indirect tensile stiffness modulus @ (10°C, 124ms)



40% RAP 30% RAP No RAP

Binder	R-value	Crossover Modulus (Pa)	Crossover T @10 Hz (°C)	ωa 15°C (Hz)	G* 10 Hz 15°C (MPa)	G-R (kPa)	ΔT_c (°C)
RD 54 bdr t1	2,03	7,0E+06	31,3	1,4E-02	8,8E+01	611	-6,4
RD 54 bdr t2	1,72	1,6E+07	22,5	1,7E-01	8,8E+01	126	-1,1
RD 84 bdr t1	2,16	3,1E+06	45,6	4,5E-04	9,2E+01	3190	-19,9
RD 84 bdr t2	1,81	9,7E+06	25,6	7,3E-02	7,0E+01	178	-8,1
RD 111 bdr t1	2,04	7,4E+06	33,8	7,3E-03	1,1E+02	1056	-7,3
RD 111 bdr t2	1,83	7,5E+06	21,5	2,3E-01	3,7E+01	48	-8,6
RD 125 bdr t1	1,72	1,4E+07	28,7	2,7E-02	1,3E+02	585	-5,2
RD 125 BDR t2	1,64	1,5E+07	23,3	1,3E-01	8,6E+01	133	-3,7
RD 154 bdr t1	2,11	6,4E+06	36,8	2,9E-03	1,2E+02	1835	-5,9
RD 154 BDR t2	1,95	5,7E+06	25,5	7,6E-02	4,2E+01	112	-11,4
RD 158 bdr t1	1,86	1,2E+07	24,6	9,7E-02	7,7E+01	171	-3,8
RD 158 bdr t2	1,80	1,4E+07	20,0	3,5E-01	6,1E+01	58	-1,0
RD 751 bdr t1	2,16	3,8E+06	37,6	2,8E-03	7,4E+01	1109	-17,2
RD 751 bdr t2	1,69	1,3E+07	19,6	4,2E-01	5,2E+01	39	-4,3
RD 762 bdr t1	2,10	4,1E+06	26,6	6,0E-02	3,3E+01	109	-14,4
RD 762 BDR t2	1,64	3,0E+06	-4,8	2,0E+02	5,5E-01	0	#VALEUR!



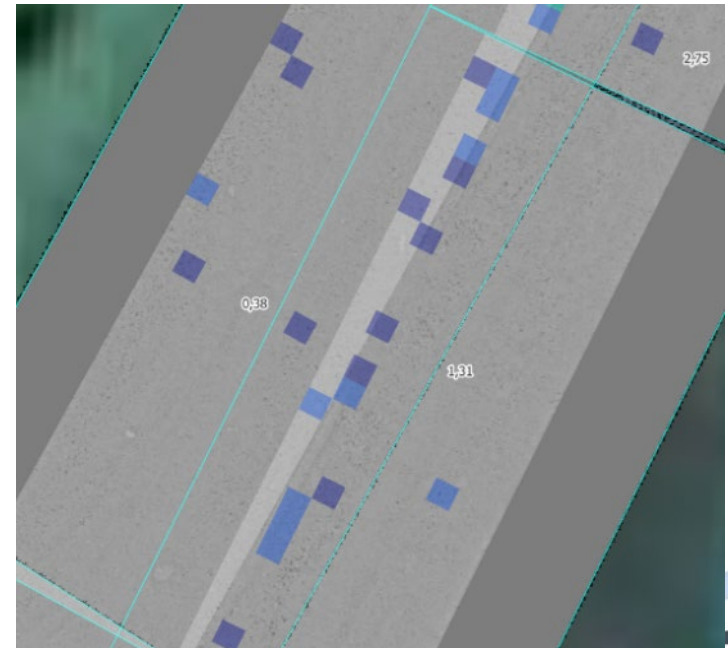
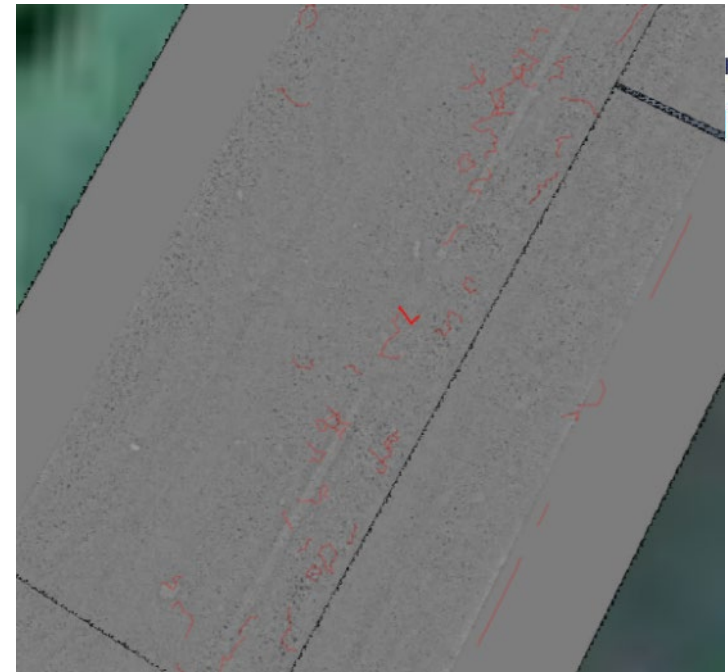
EX RD 125

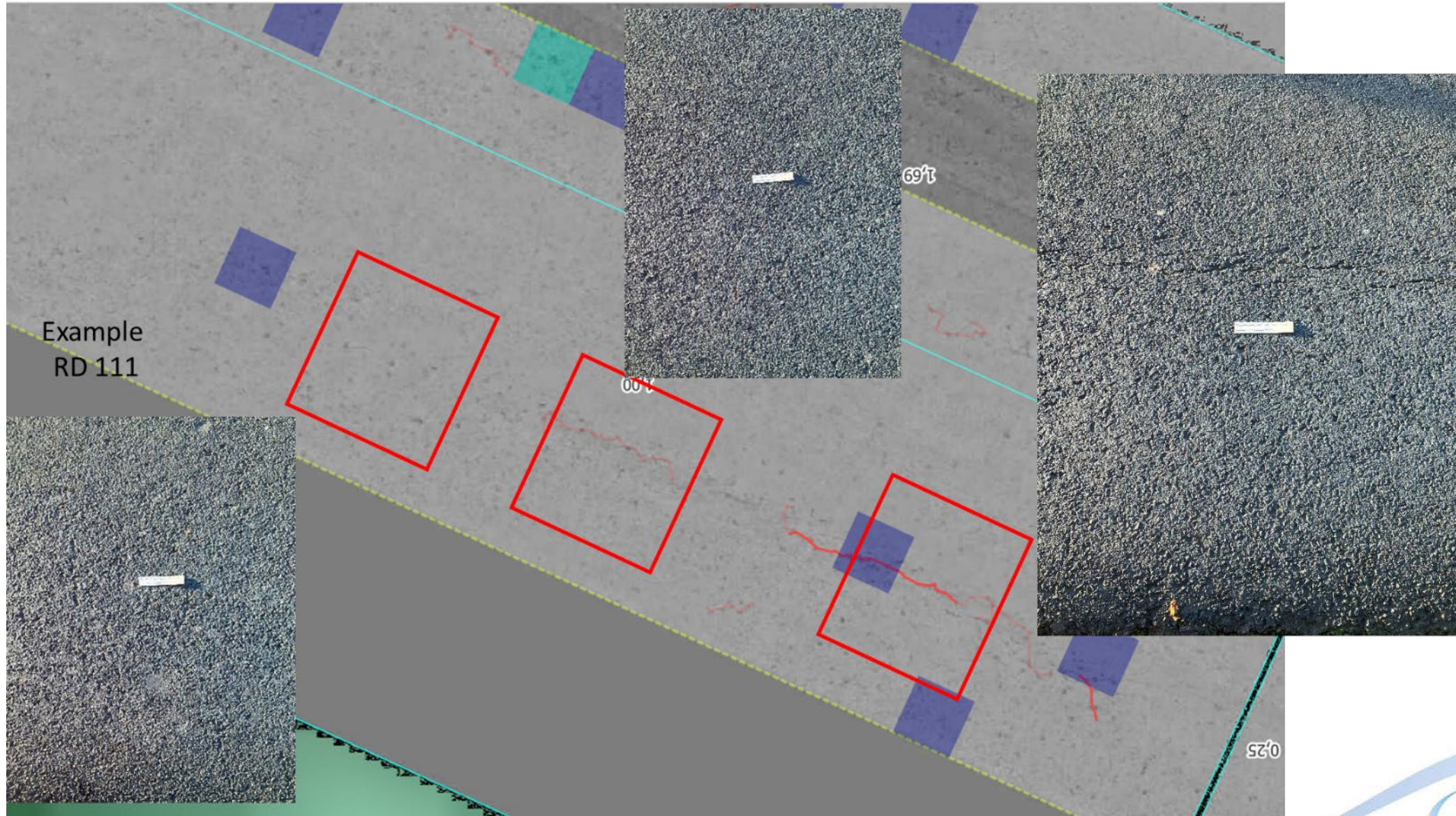


Detection limits

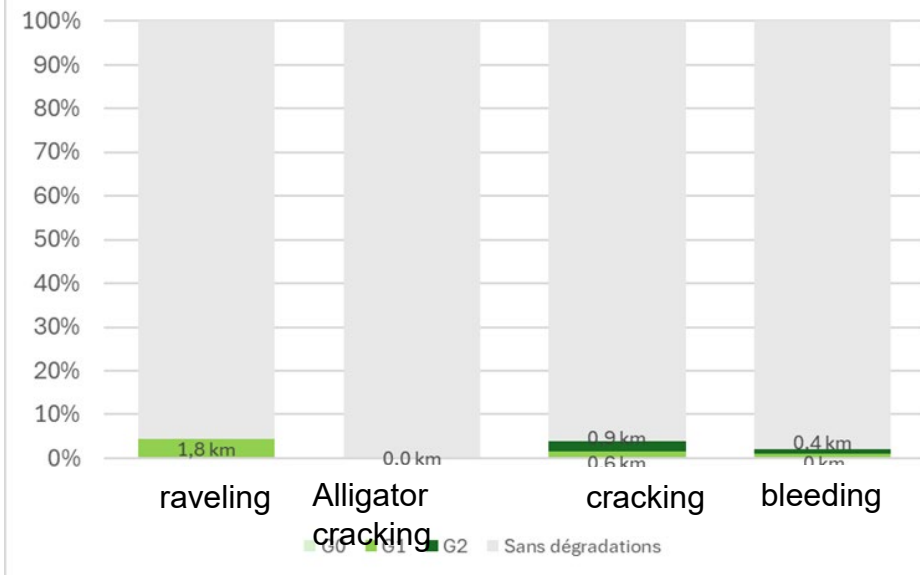
Possible confusions small ravelling/crack ?

Adaptation on algorithms – Ongoing
localised damage

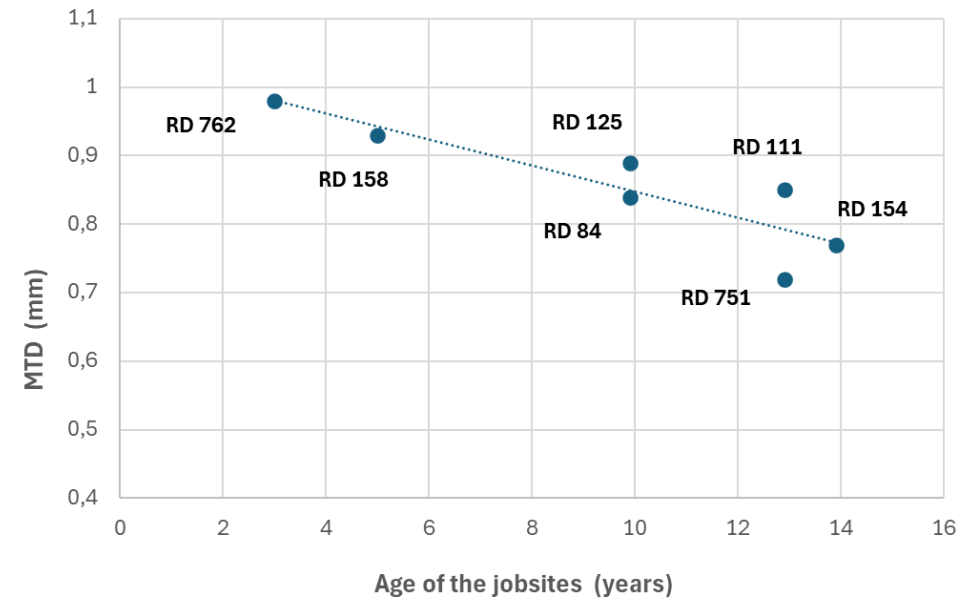
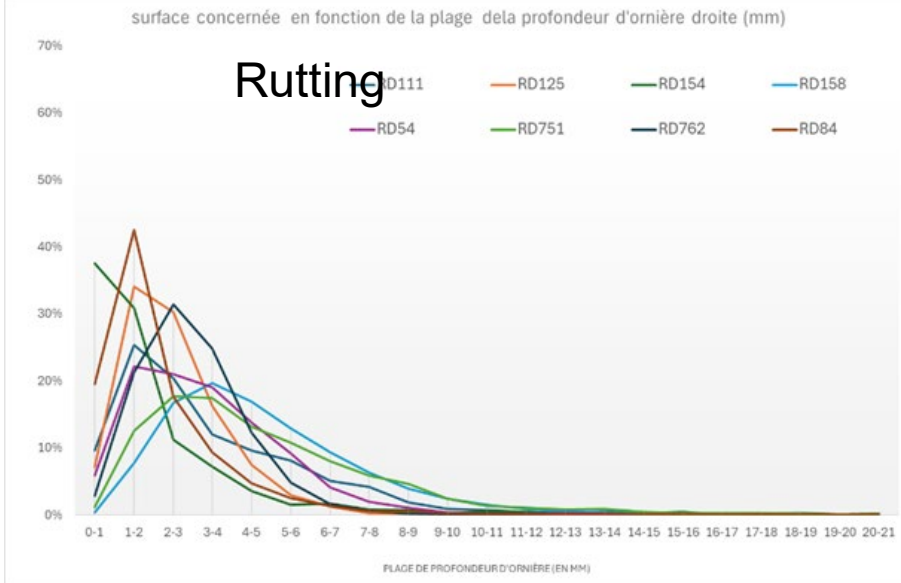




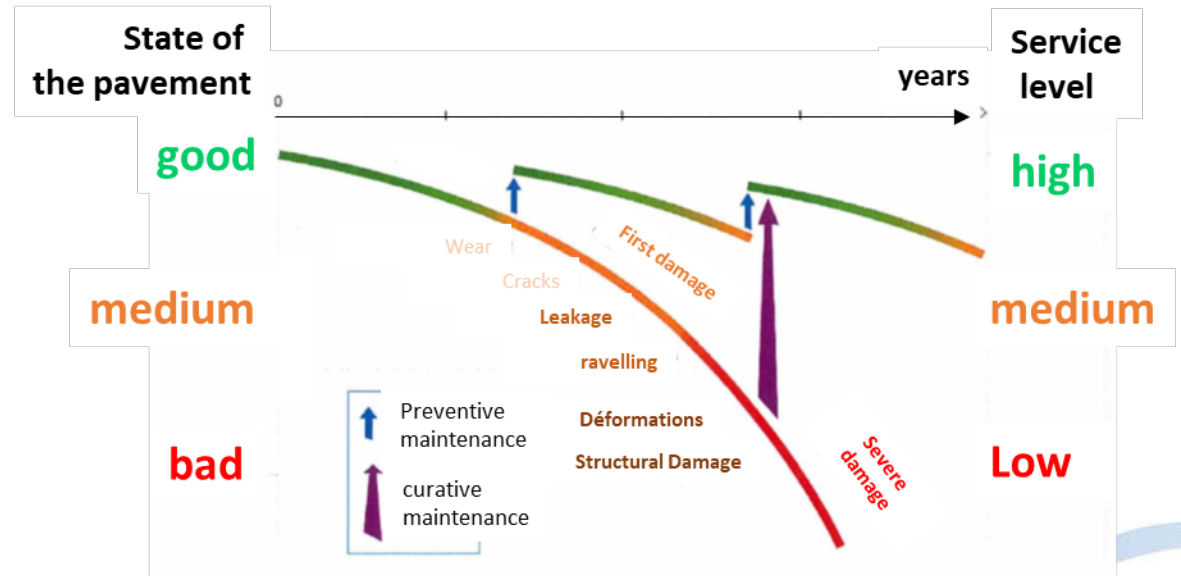
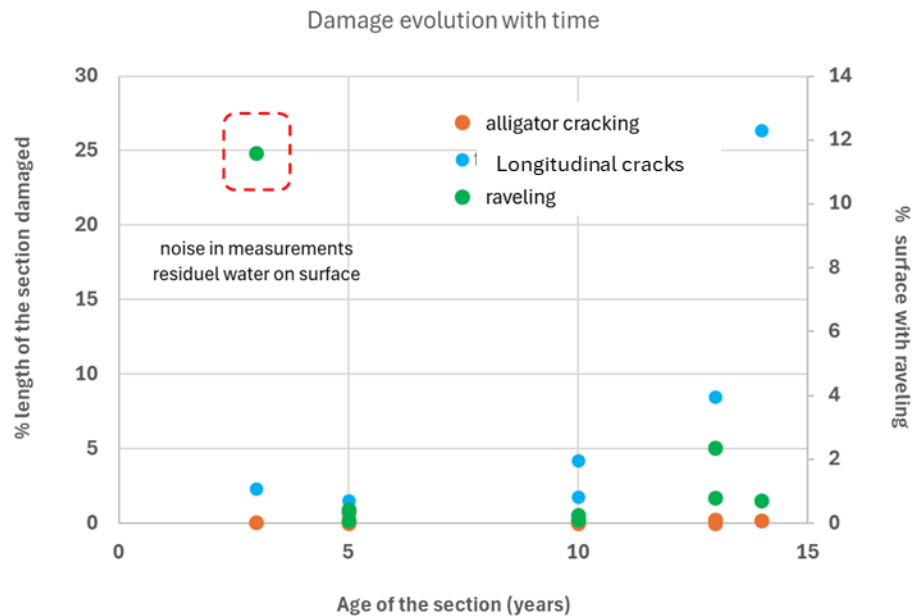
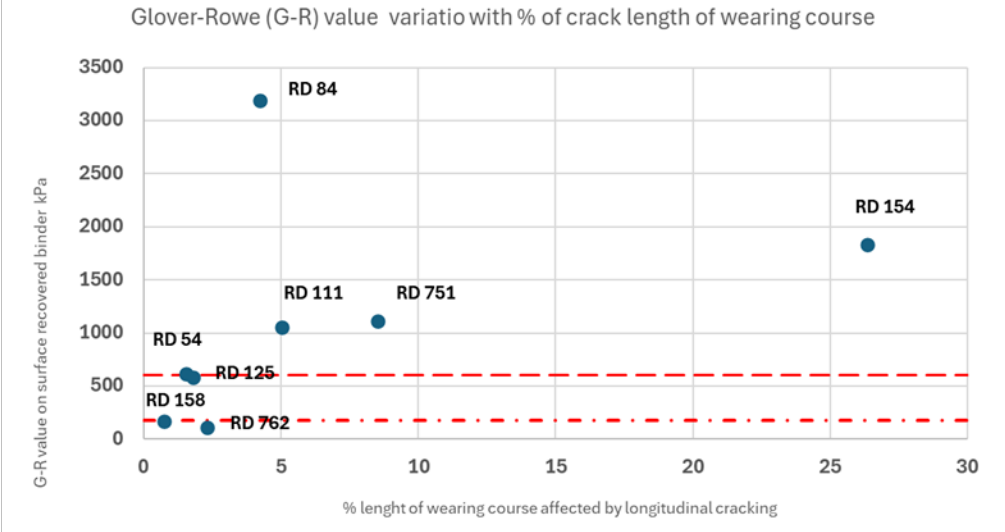
General damage all sections 40 km



Rutting



Existing rheological parameters on binders
Not necessary relevant.





FIRST ASSESSMENT

- Sustainability figures on EASYCOLD
- Lifetime > 12-13 Years !
- Possible way to define damage curves of wearing courses



ADDITIONNAL RESEARCH - NEEDS

- Improve relevancy on rheological parameters on binders (Effect of Aging)
- Adaptation of algorithms : quatify very small damages



NEXT STEP ?

- Way to quantify lifetime in situ ?
- Shall we think about maintenance differently ?

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