National Center for Asphalt Technology
NCAT
at AUBURN UNIVERSITY

Structural Benefit Of Preservation

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SEVENTH
RESEARCH CYCLE

NCAT TEST TRACK CONFERENCE

Background

- Preservation treatments can address multiple issues
- Considered **functional** interventions
  - Should be placed on structurally sound pavements
- Can they also extend the structural life of the pavement?

Data Collection

- FWD testing performed periodically
- Lee Road 159
  - 2012 – 2018 monthly
  - Since 2018 quarterly
  - 2 random locations per section in each lane
- US 280
  - Quarterly
  - 3 random locations per section
- US 169 & CSAH 8
  - 3 times per year
  - 3 random locations

Data Collection

- Deflections are normalized and temperature corrected
- Surface distress and ride quality can also indicate structural damage
  - Cracking
  - Rutting
  - IRI

Data Analysis

- Deflection Basin Parameters (DBPs)

Parameter	Equation	Significance	Benchmark values
Base Damage Index (BDI)	$BDI = d_{12} - d_{24}$	Base layer	Sound: <8 mils Warning: 16 mils Severe: >16 mils
Base Curvature Index (BCI)	$BCI = d_{24} - d_{36}$	Subgrade	Sound: <4 mils Warning: 8 mils Severe: >8 mils
Area Under Pavement Profile (AUPP)	$AUPP = \frac{(5d_0 + 2d_{12} + 2d_{24} + d_{36})}{d_0}$	Surface	Lower values indicate stiffer layer

Data Analysis

- Lee Road 159 sections have the most data
- Time series analysis
  - Forecast performance based on observed values
  - Each observation is correlated to one or more data points on the same series
  - Used first 48 months to “train” model
  - Predict up to 120 months of service

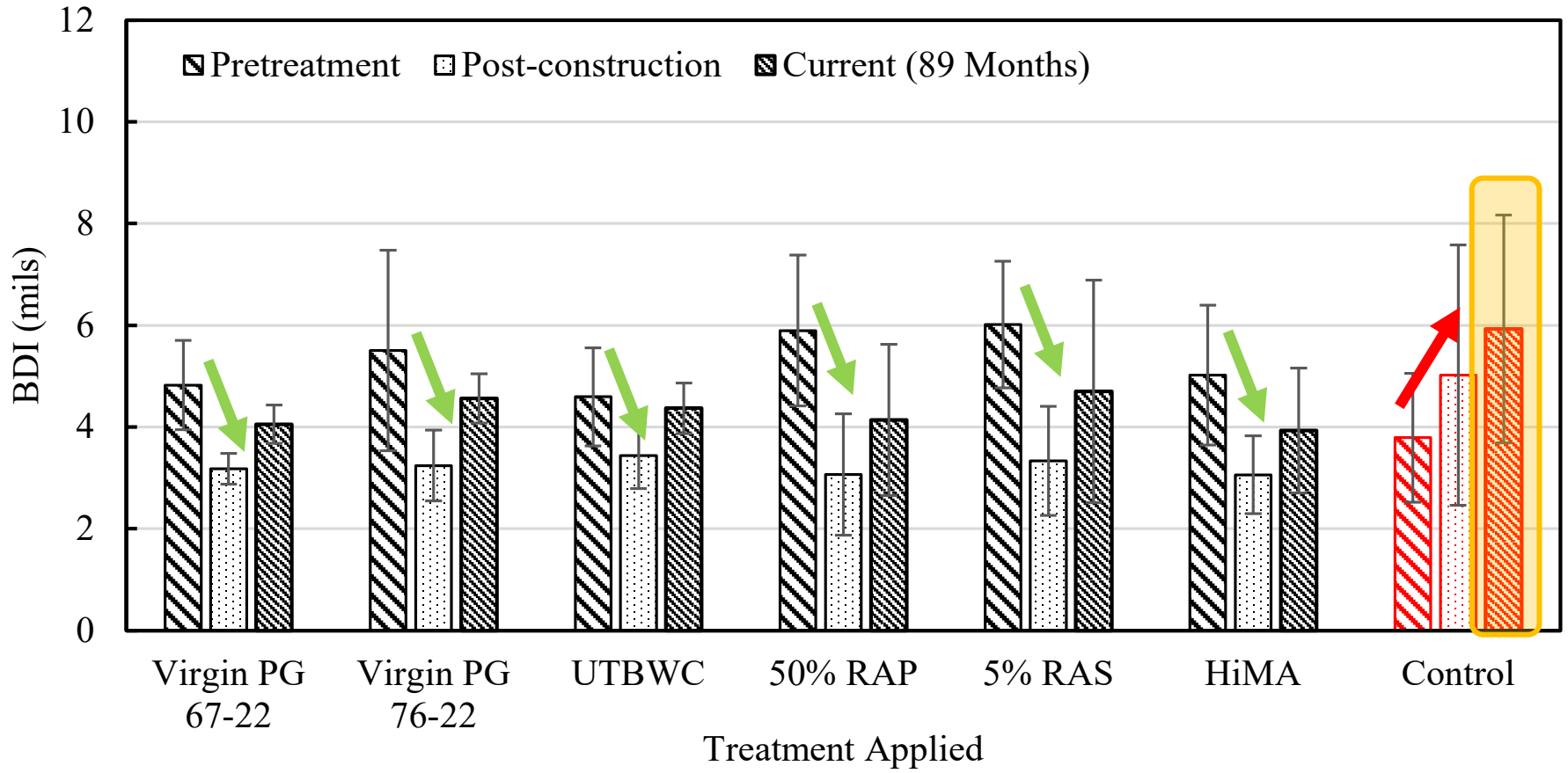
Results - Example

- Will use thin overlays to illustrate results
  - Still functional treatments
  - All ¾” thick
  - No milling
- Other treatments show similar trends

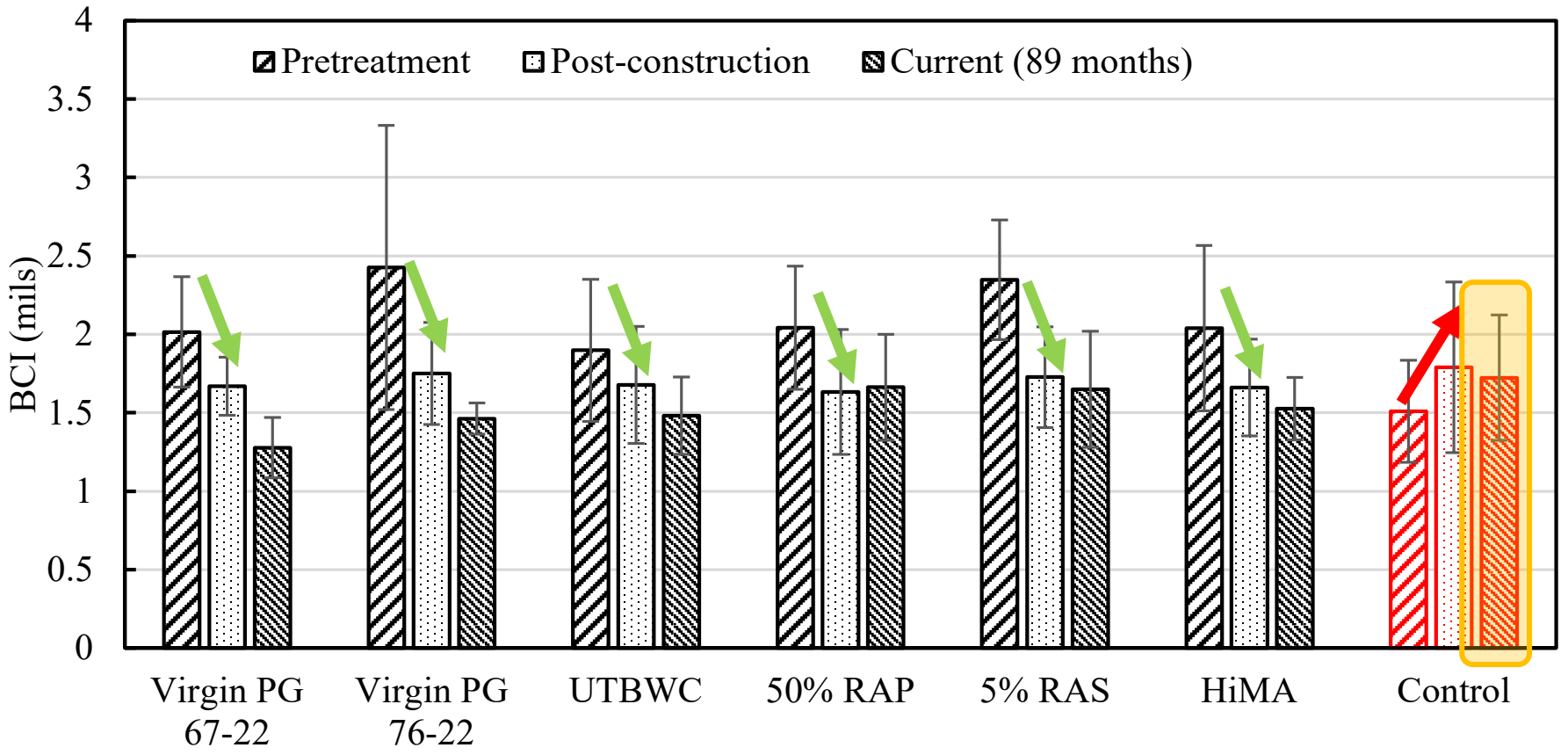
Results - Example

Section	Description
Virgin PG 67-22	4.75 NMAS thin virgin overlay with PG 67-22 binder
Virgin PG 76-22	4.75 NMAS thin virgin overlay with PG 76-22 polymer modified binder
UTBWC	12.5 NMAS Ultra-thin bonded wearing course placed with spray paver with PG 76-22 polymer modified binder
50% RAP	4.75 NMAS thin overlay with 50% fractionated recycled asphalt pavement (RAP)
5% RAS	4.75 NMAS thin overlay with 5% post-consumer recycled asphalt shingles (RAS)
HiMA	4.75 NMAS thin virgin overlay with high polymer modified binder (7.5% SBS)

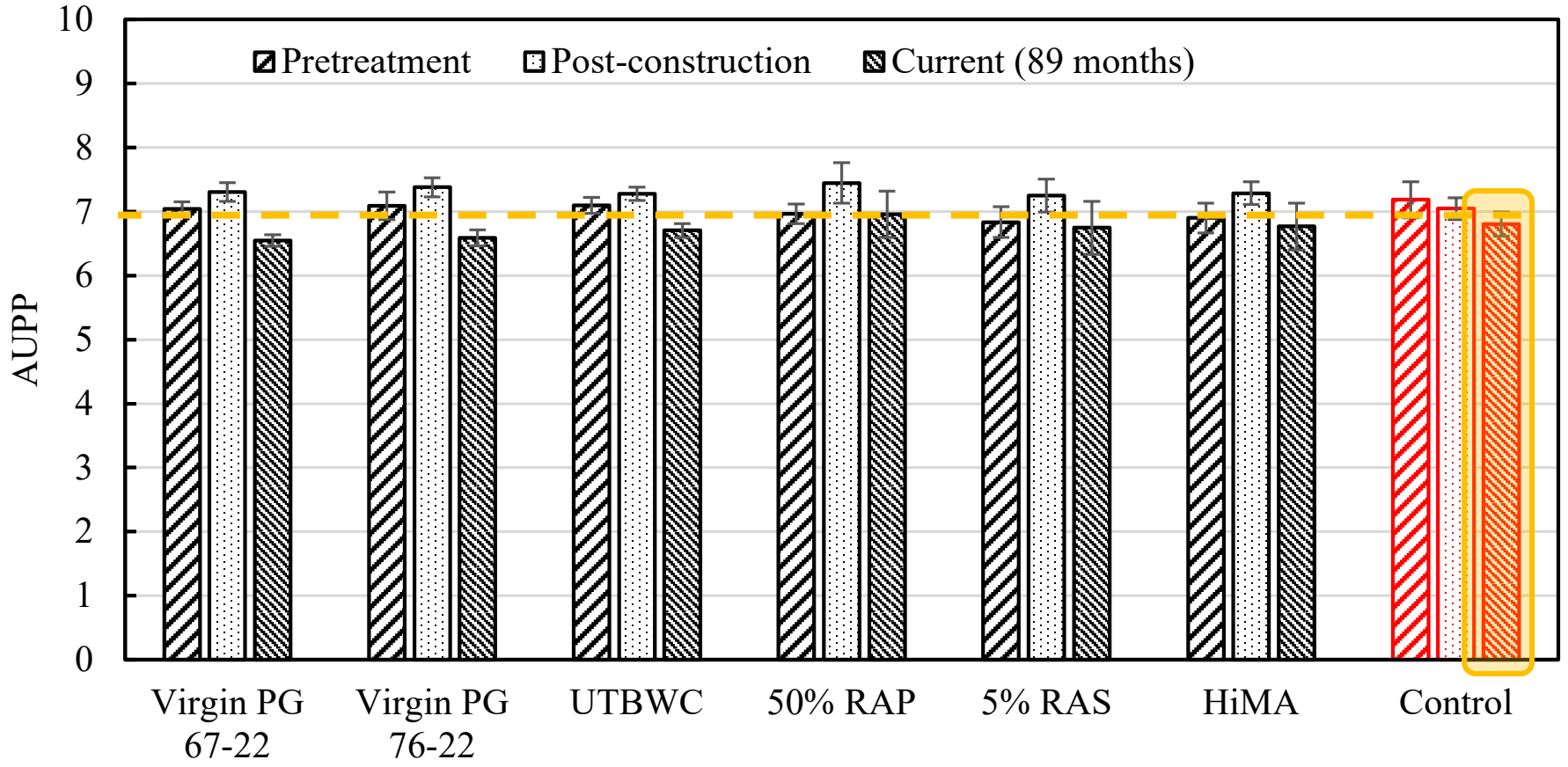
Results - Example



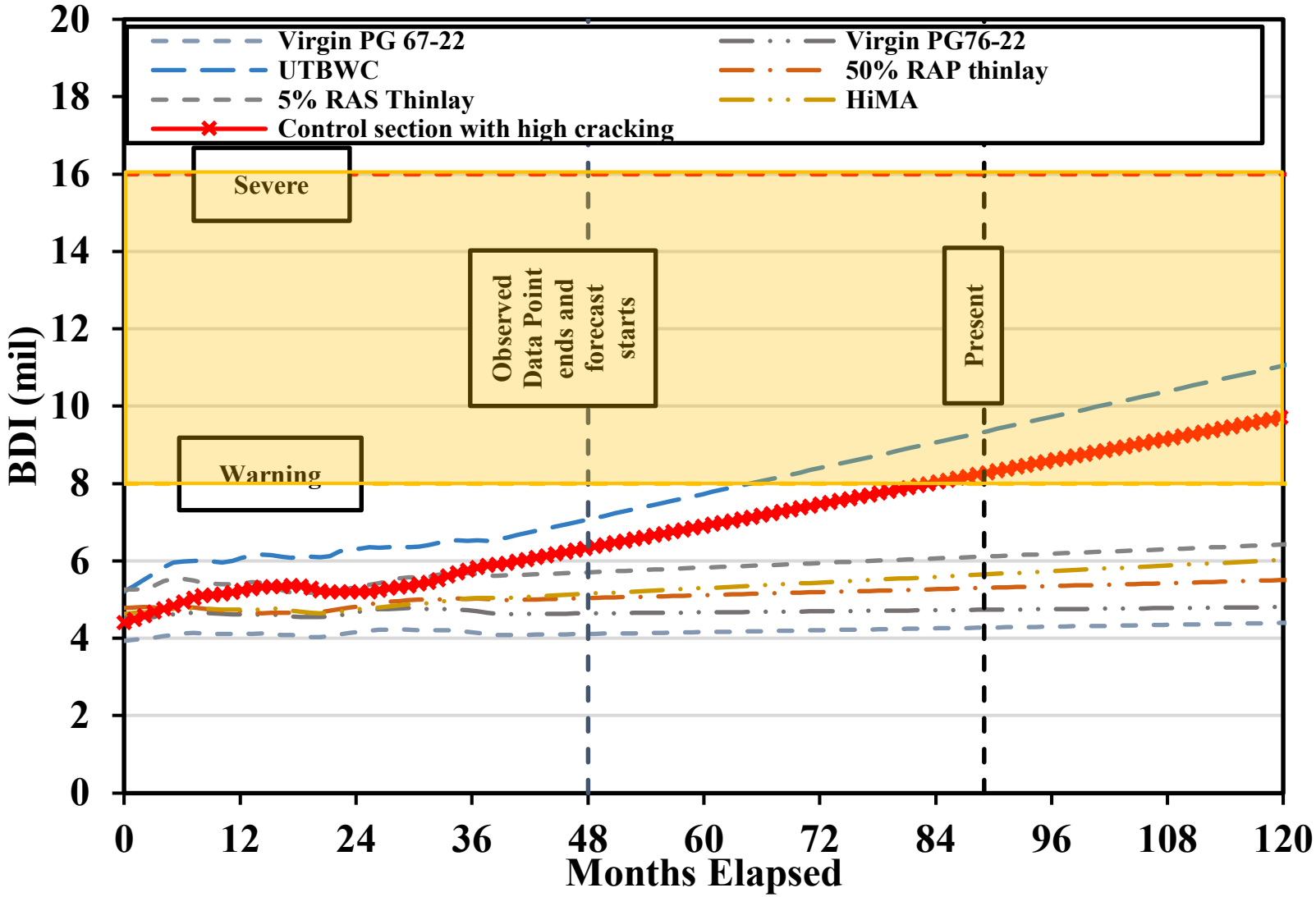
Results - Example



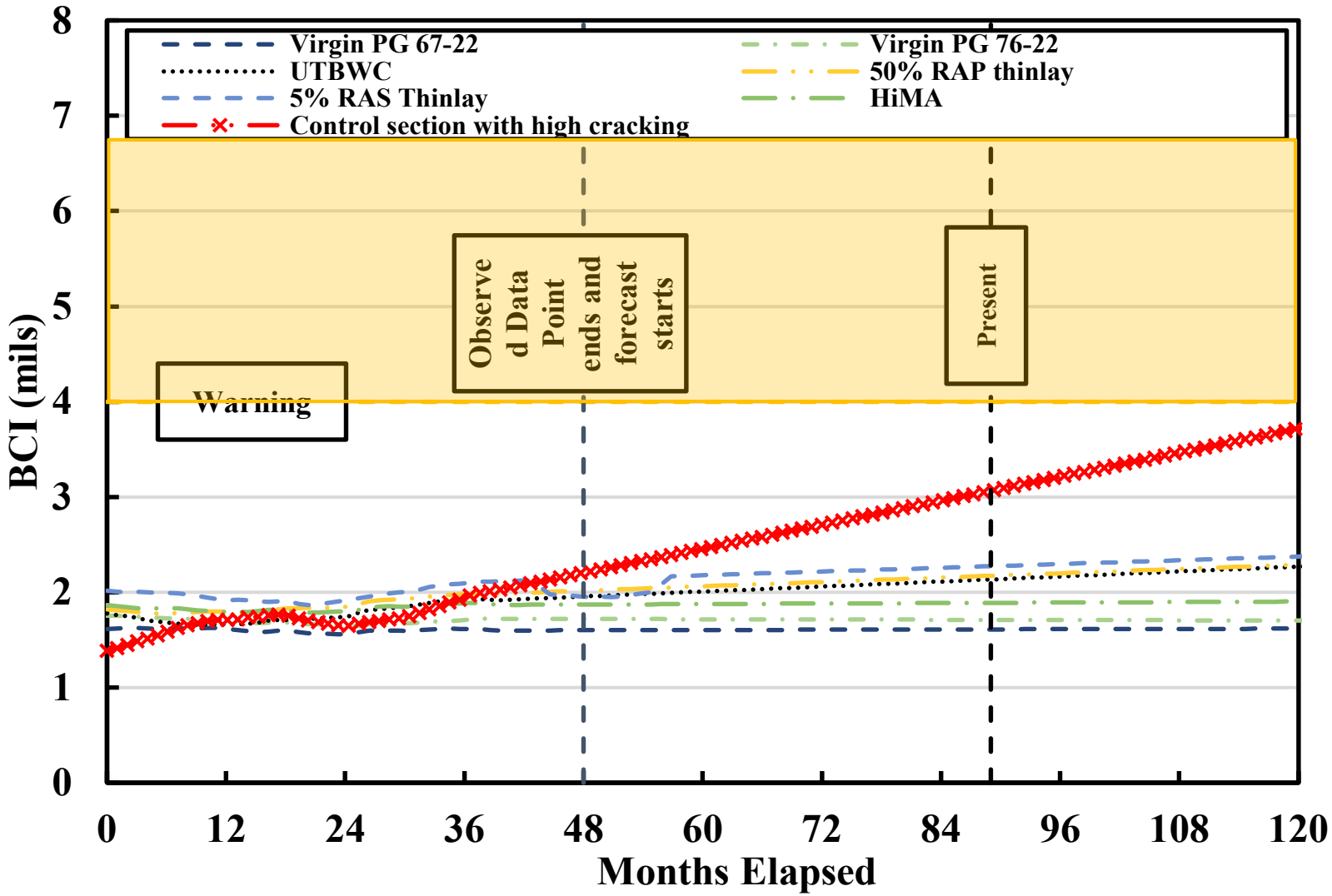
Results – Example

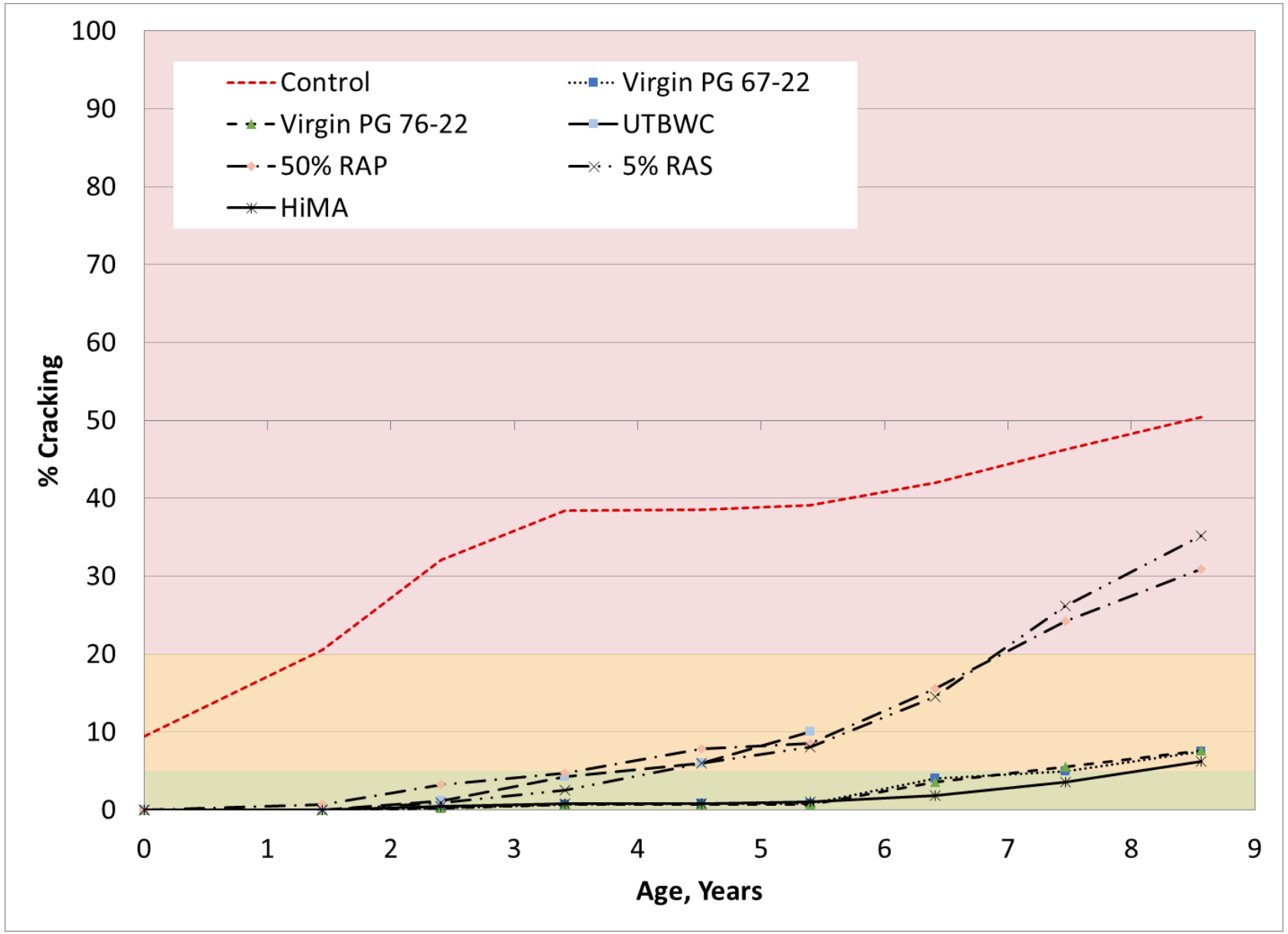


Results - Example



Results - Example




Control
Virgin PG 67-22
Virgin PG 76-22
UTBWC
50% RAP
5% RAS
HiMA
% Cracking
Age, Years
0
10
20
30
40
50
60
70
80
90
100
0
1
2
3
4
5
6
7
8
9


50% RAP

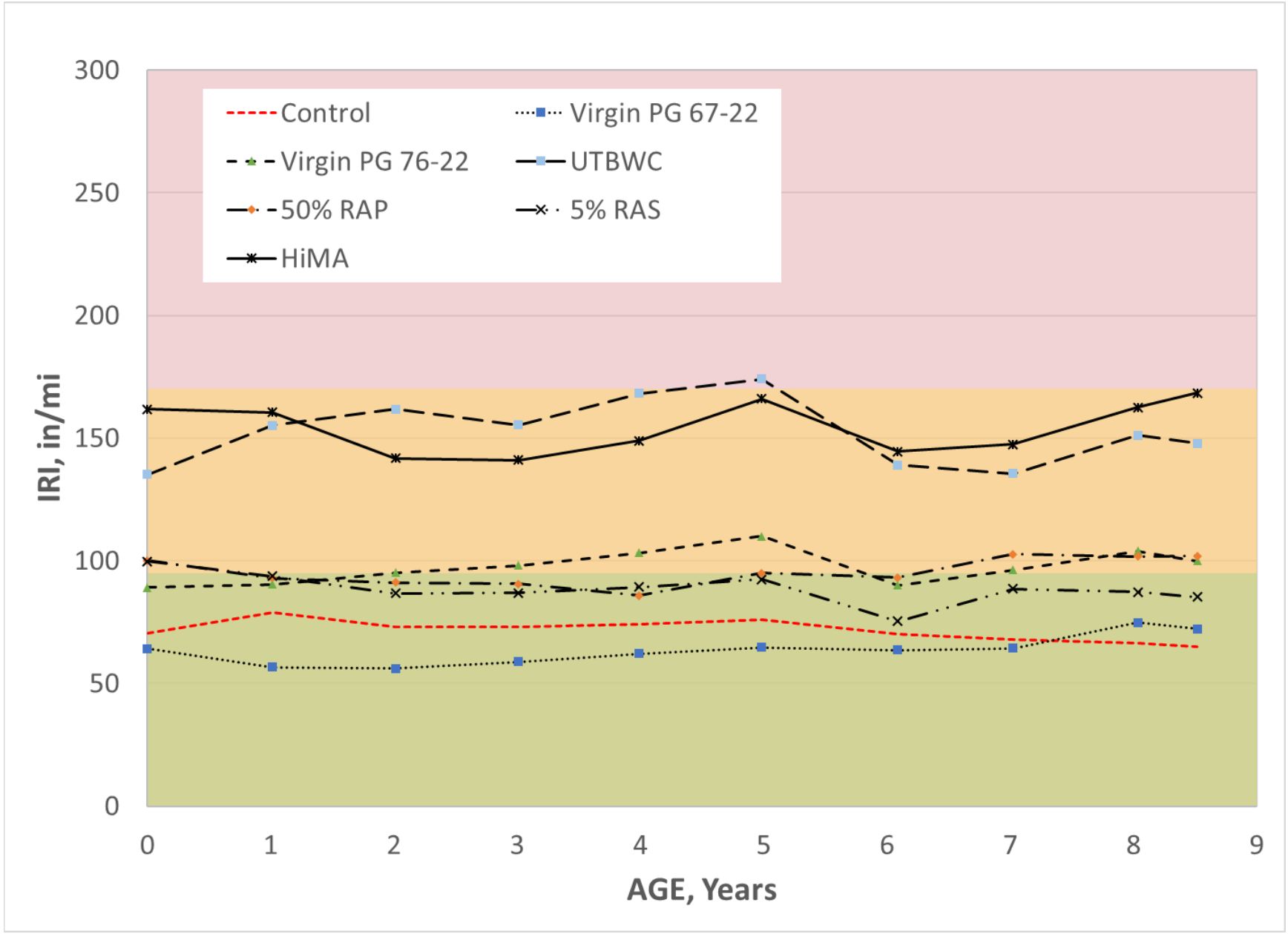

5% RAS

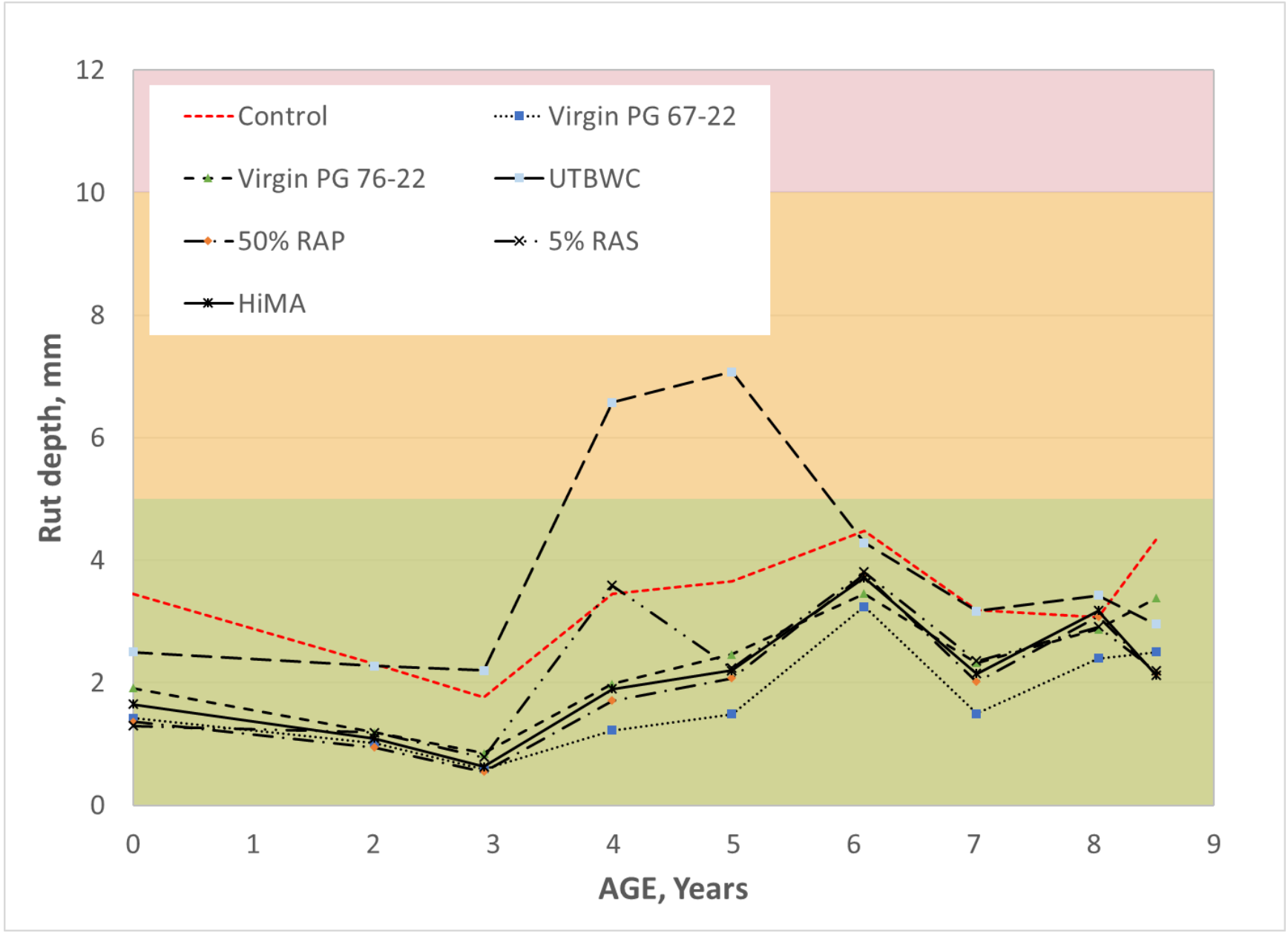

Virgin PG 67-22


Virgin PG 76-22


UTBWC

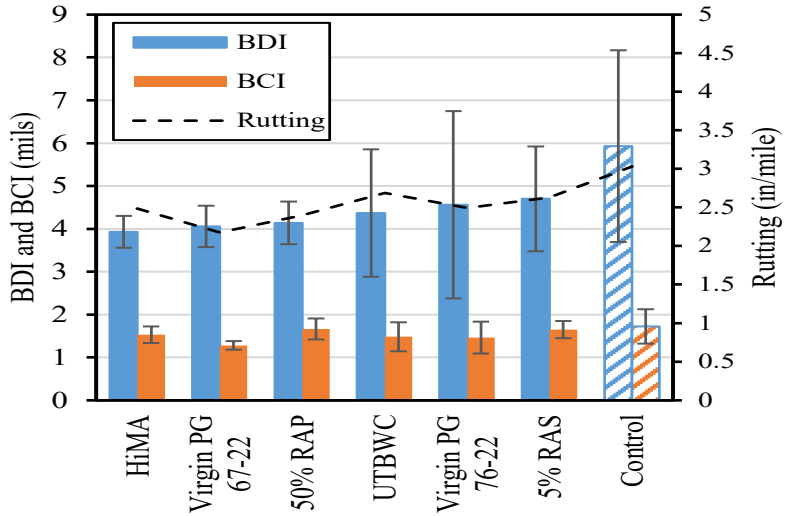

HiMA

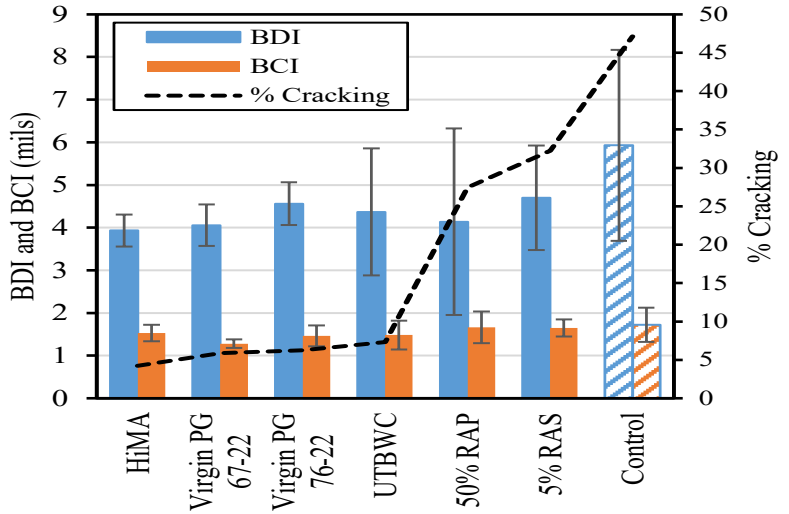

300
250
200
150
100
50
0
IRI, in/mi
Control
Virgin PG 67-22
Virgin PG 76-22
UTBWC
50% RAP
5% RAS
HiMA
0
1
2
3
4
5
6
7
8
9
AGE, Years


Control
Virgin PG 67-22
Virgin PG 76-22
UTBWC
50% RAP
5% RAS
HiMA
Rut depth, mm
AGE, Years
0
2
4
6
8
10
12
0
1
2
3
4
5
6
7
8
9

Correlation

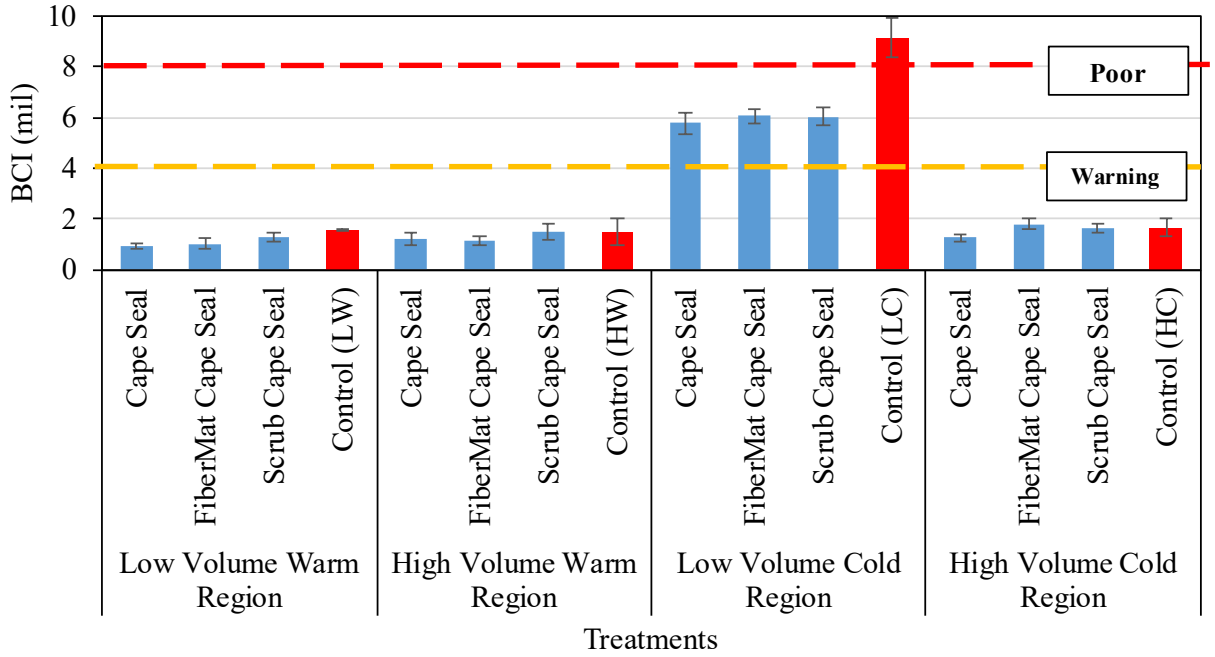
	BDI	BCI	AUPP	Cracking	IRI	Rutting
BDI	1					
BCI	0.593	1				
AUPP	0.149	0.825	1			
Cracking	**0.796**	**0.836**	0.586	1		
IRI	-0.572	-0.184	0.046	-0.644	1	
Rutting	**0.865**	**0.715**	0.339	0.674	-0.116	1

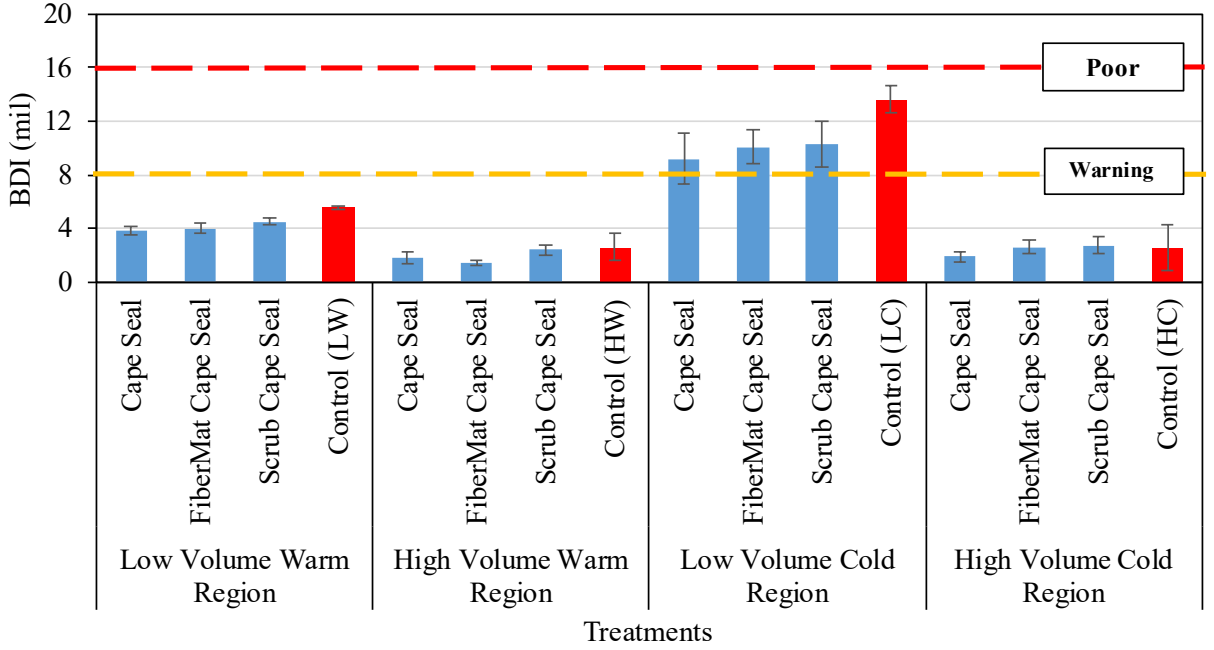




Other Treatments and Locations

- Cape seals – current condition





Summary

- May see a small effect following treatment
- Long term – treated sections deteriorate at a lower rate
- Improved surface condition
- Correlation between cracking / rutting and BDI / BCI
- Time in service and testing frequency not enough for forecasting in locations other than Lee Road 159
  - Still similar trends

Questions and Answers

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