

Structural Integrity and Long-Term Performance of Permeable Pavements

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Presentation overview

- Background of permeable pavements
- Structural integrity of permeable pavements – Catherine Yung
- Long-term performance of permeable pavements – Sachi Kodippily

Why do we need permeable pavements?

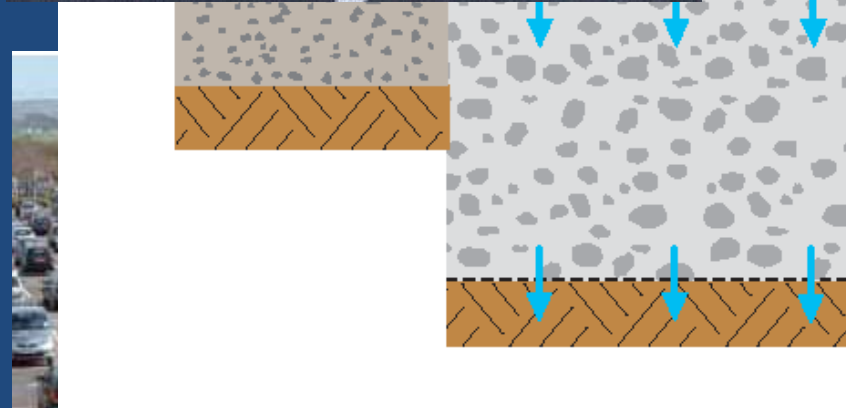
- Reduces impact on the environment
- Controls water quantity
- Improves water quality
- Preservation of the hydrological cycle



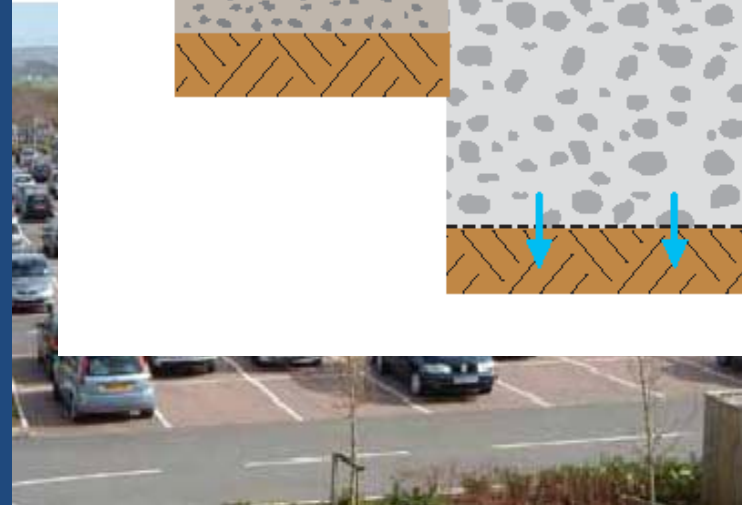
Project objectives

- To investigate the permeable pavement design and its function
- To identify the limitations which affects the functionality of the permeable pavement
- Test to see if CIRCLY can be used to analyse this pavement
- To investigate the behaviour of permeable pavement in terms of its structural defects
- To analyse the life cycle costs of permeable pavements

What is a permeable pavement?



Upper geotextile



The functioning of layers in permeable pavement

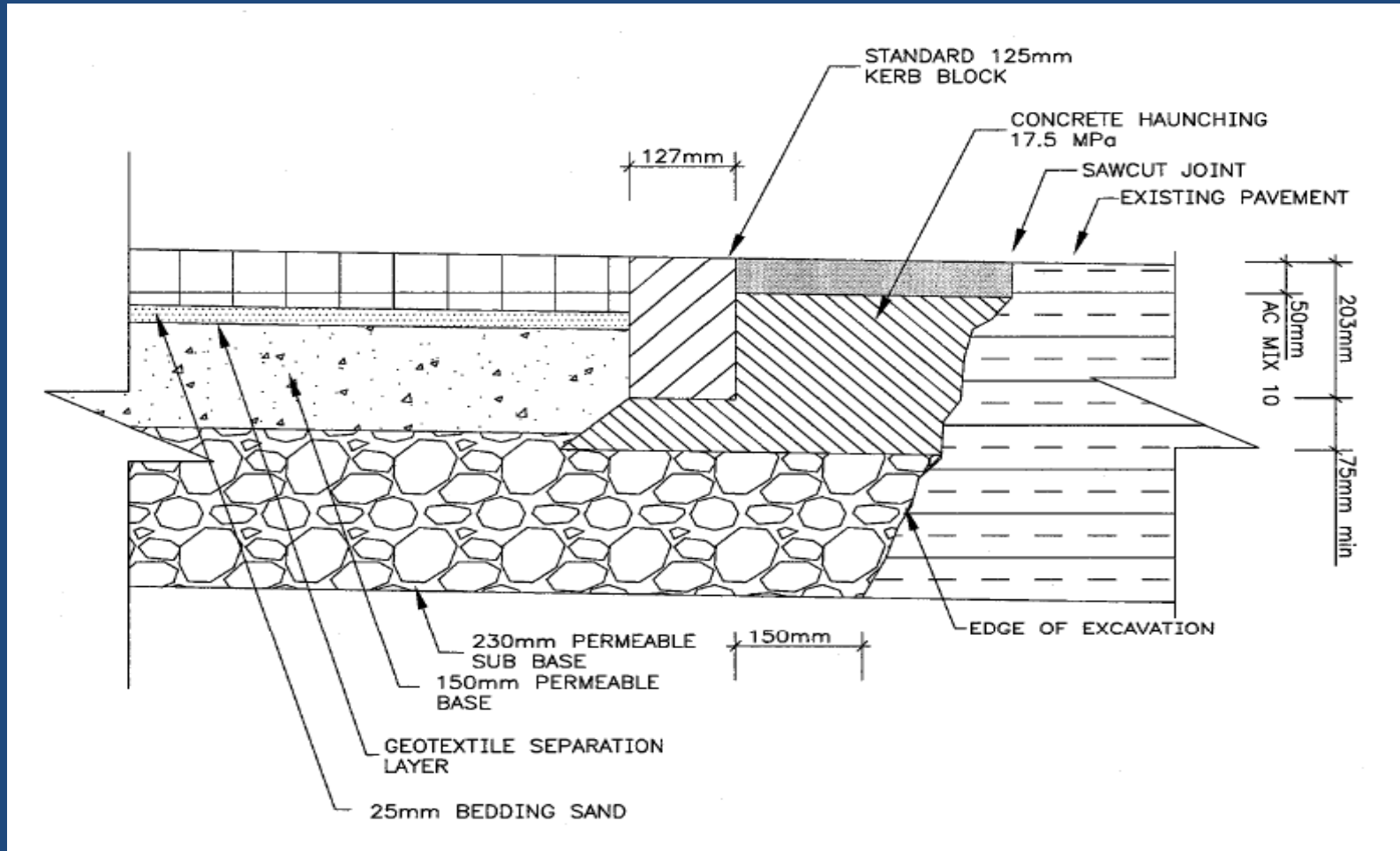


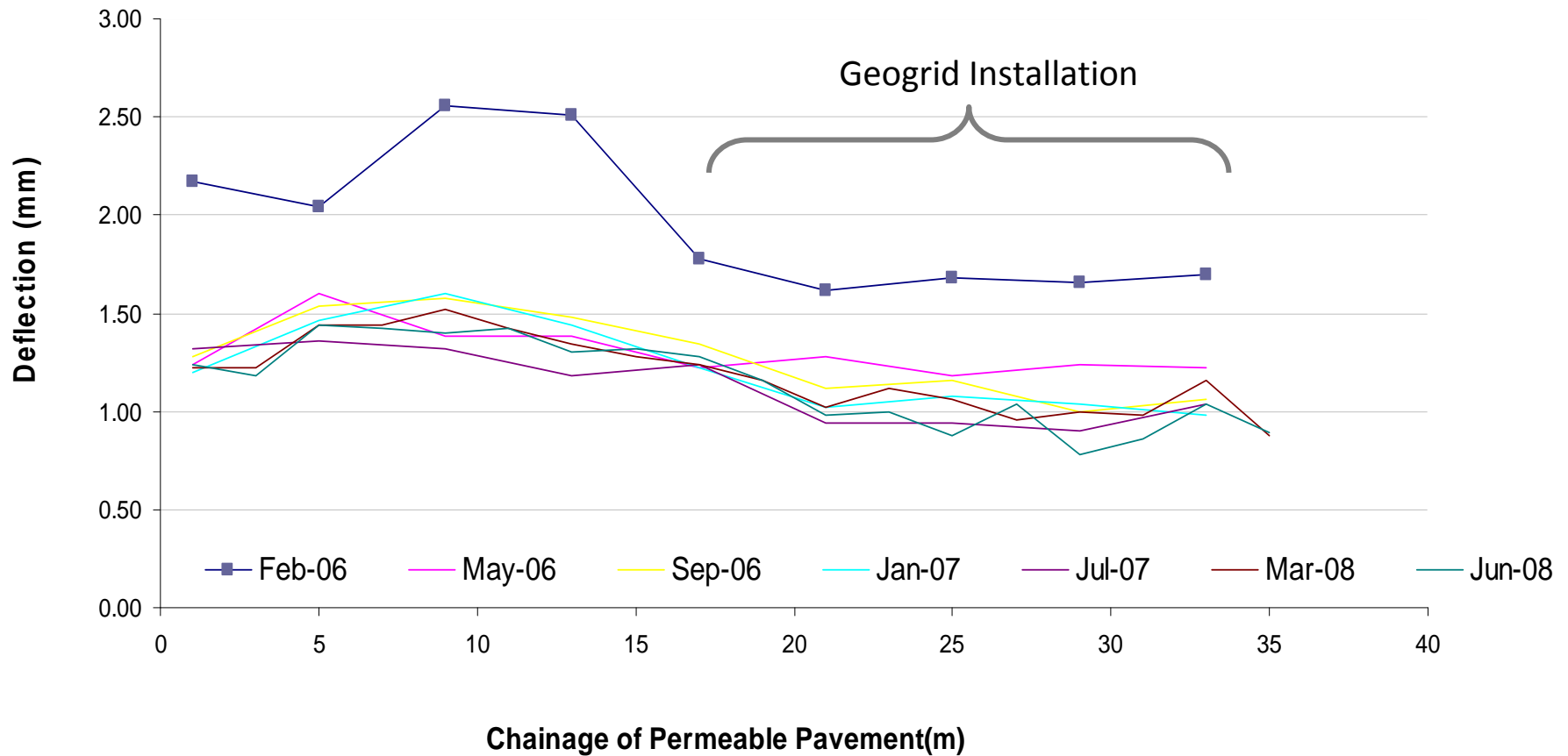
Figure 2: Cross section of the North Shore permeable pavement

Some limitations of permeable pavements

- Land topography;
- Subgrade;
- Type of land use; and
- Geological stability.

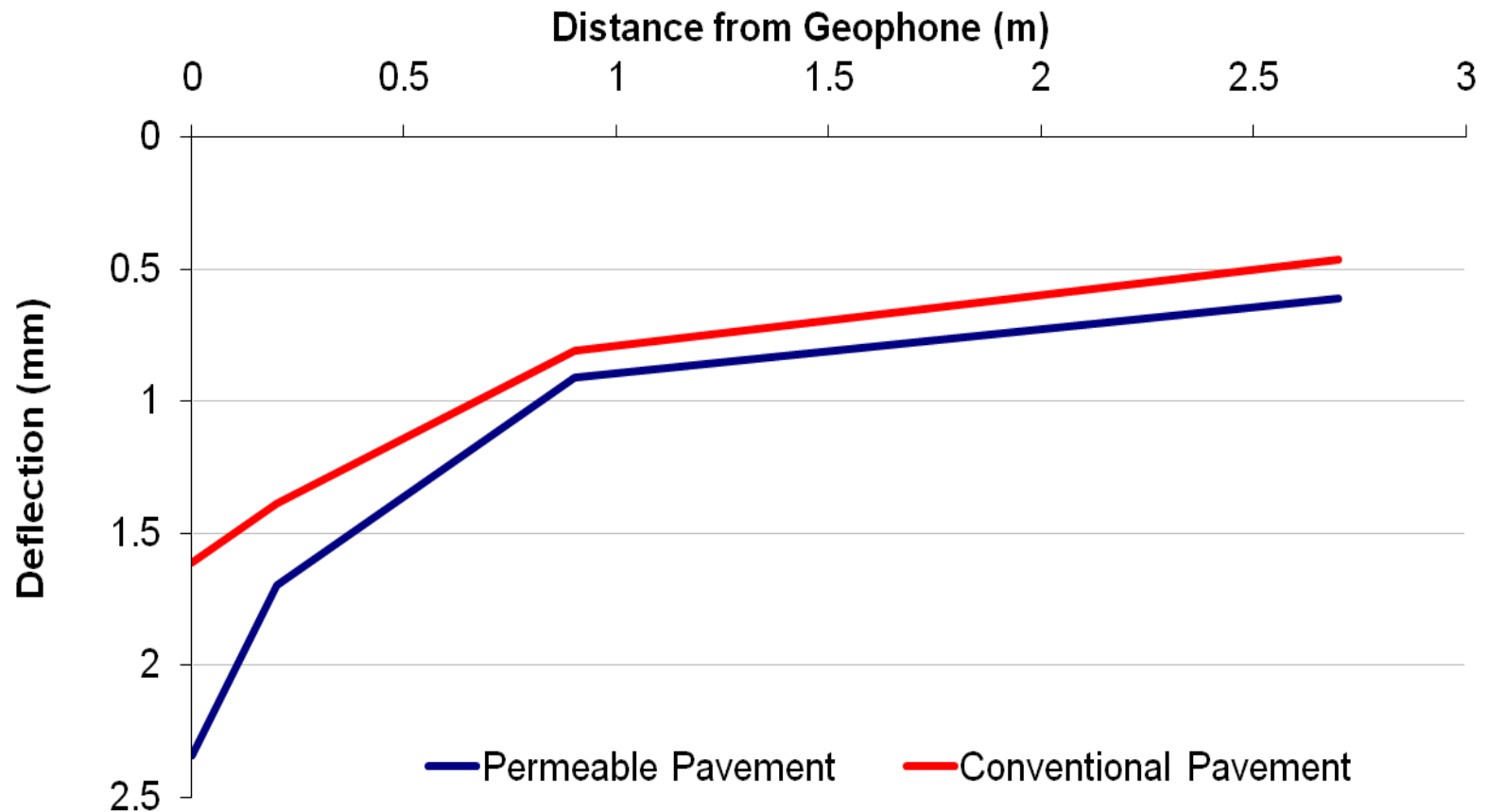
Deflection measurements gave expected results

Wheel Path Deflection

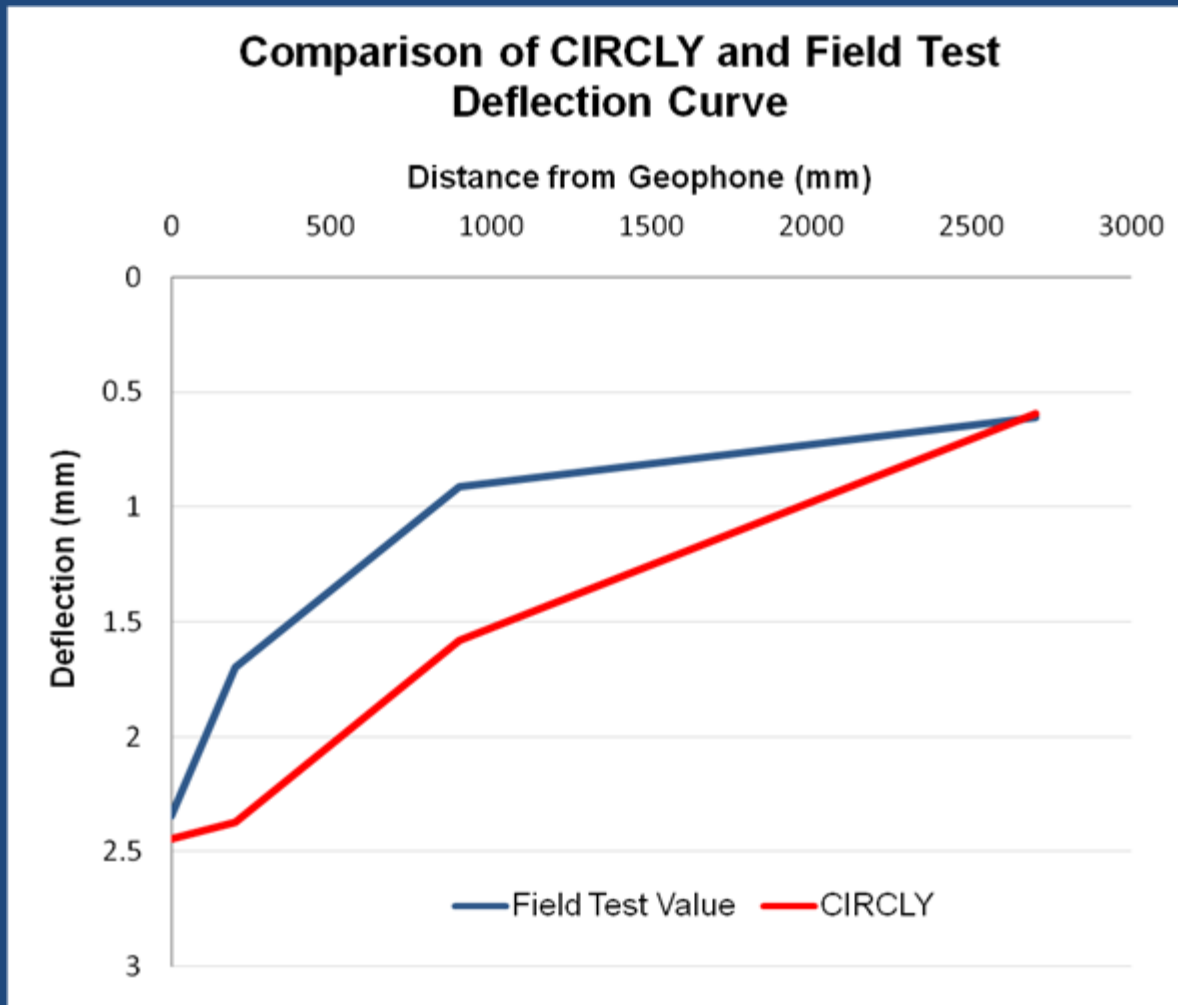


Conventional pavement vs permeable pavement

A Comparison of the Deflection Bowl between the Permeable Pavement and the Conventional Pavement



DO NOT use CIRCLY for analysing permeable pavement



Life Expectancy:

CIRCLY: 3.5 years
LOCKPAVE: 14 years.

Rut testing on the permeable pavement

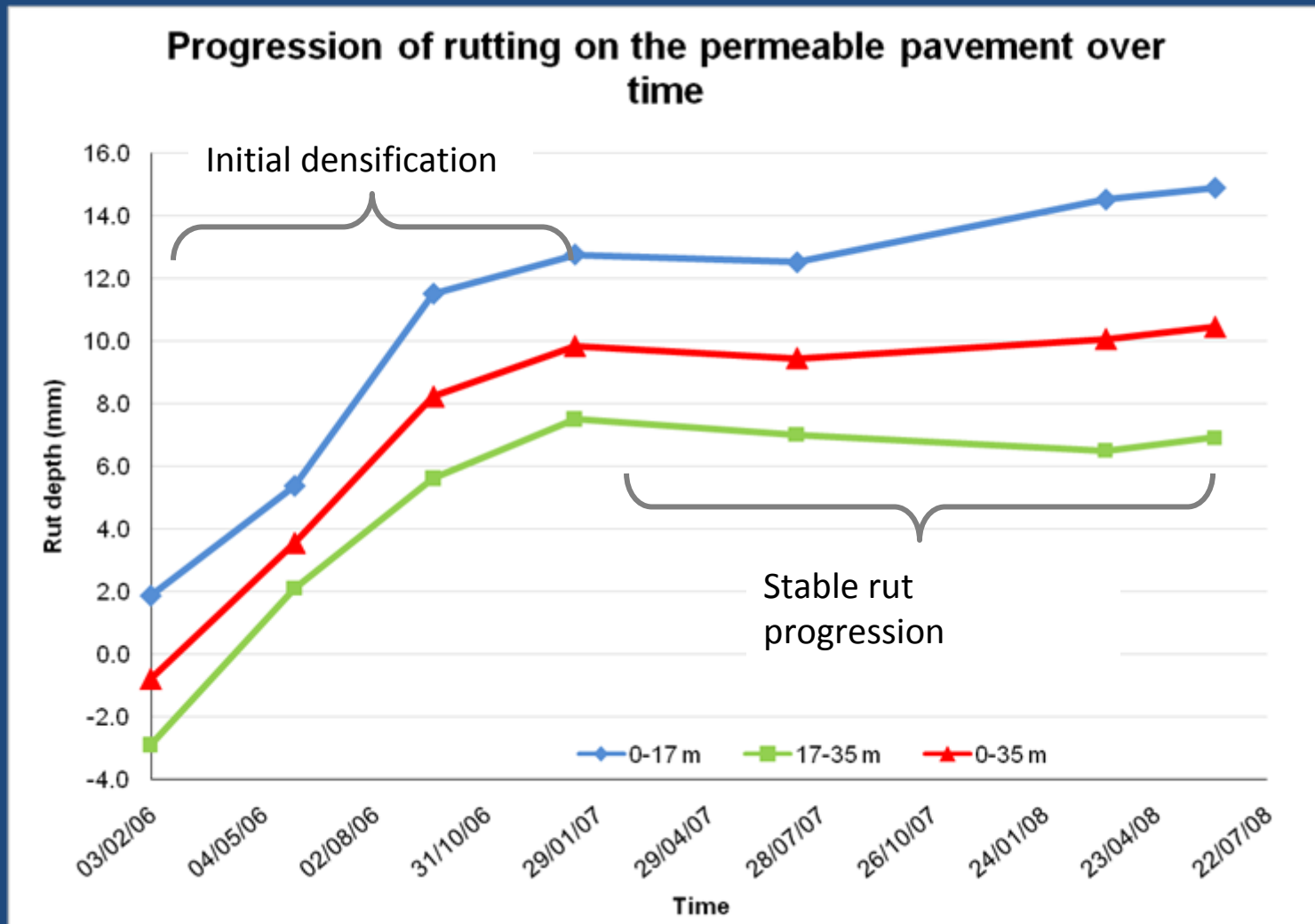


Figure 3: Pavement rutting measured with a 2-m straight edge

Figure 4: Rut measurements taken at 2-m intervals along the pavement



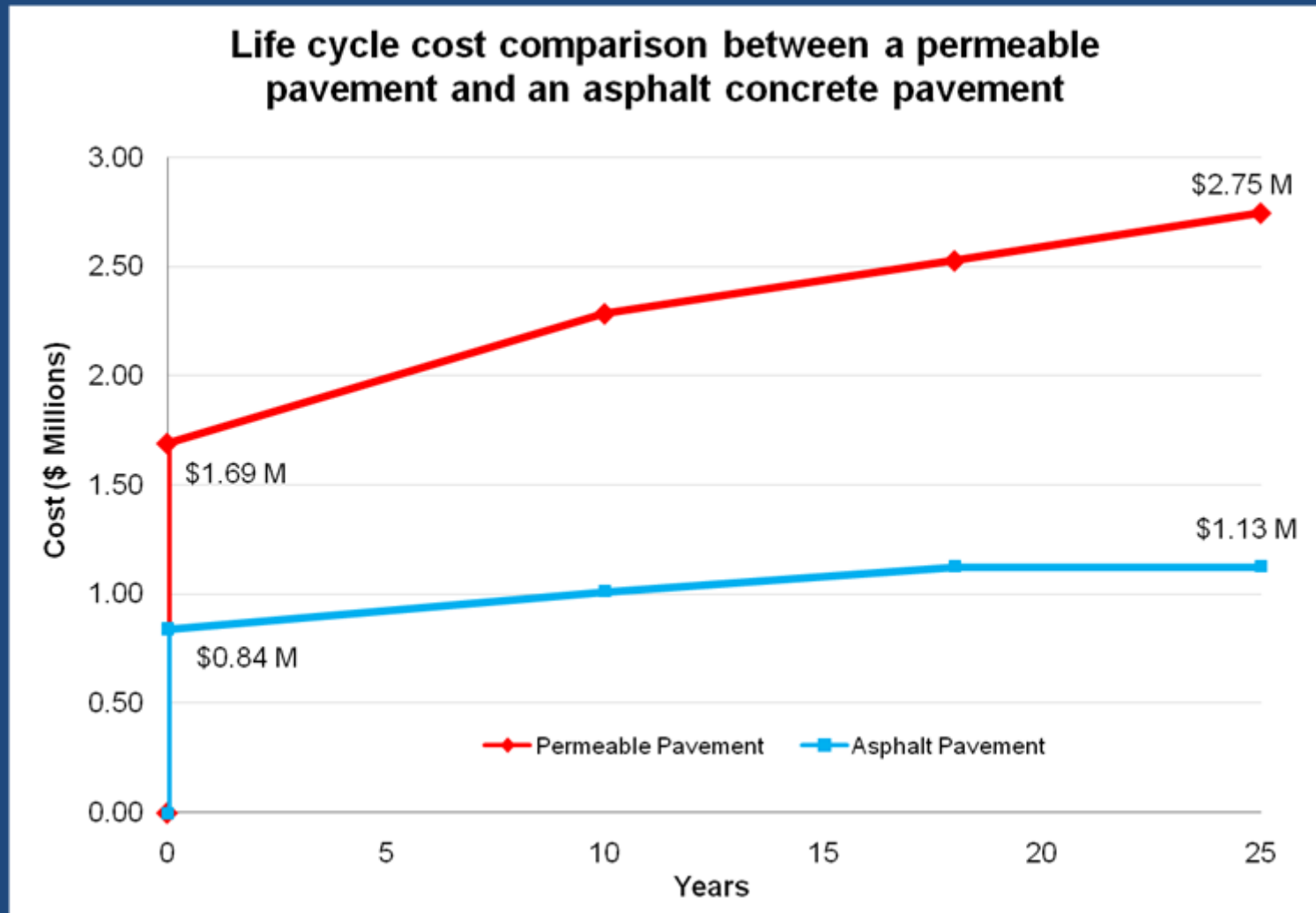
Progression of rutting on the permeable pavement



Higher rut depths and a longer design life can be expected

- Predicted life – 40 years
- Actual design life – 15 – 20 years
- Maximum acceptable rut depths:
 - 25 mm – Service limit
 - 35 mm – Structural limit

Permeable pavement ARE more expensive



But what are the benefits?

- Environmental benefits:
 - Reduced sediments
 - Reduced contaminants in the runoff – Zinc, Copper, Lead
- Economic benefits:
 - Lower need for stormwater pipe networks



Permeable pavement footpath
www.weneedsolutions.com

In summary

- Permeable pavement can be use as an alternative form of pavement
- The stiffness of the pavement increases with time
- This pavement can tolerate much higher deflection compare to the conventional pavement
- CIRCLY is not a suitable tool to analyse permeable pavements
- Actual pavement performance to date has been very well
- Overall life cycle costs of permeable pavements are significantly higher compared to asphalt pavements
- Expected environmental and economic benefits - unknown

Recommendations

- More analysis of the ground condition and the behaviour of the permeable pavement is still required
- Ongoing pavement monitoring is needed for more accurate pavement performance levels
- Economic and environmental benefits achieved in the long term are still to be quantified

Acknowledgements

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GHD Ltd

Stevensons

Geotechnics

Thank You

Questions?