



# Repair to Concrete with Polymer Based Soil Stabilisation

## Road Pavements Forum

TWENTY-EIGHTH MEETING  
CSIR International Conference Centre, Gauteng  
19 & 20 November 2014

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# Road Network Statistics

Concrete	77km
Block Paved	111km
Asphalt Surfaced	6,574km
<b>Total Network</b>	<b>6,762km</b>

# Network Maintenance

- Concrete pavements form part of the PMS assessments, optimisation and prioritisation process.
  - Manual Assessments
  - eThekwini Manual for Concrete Pavements is utilised
  - Assessment tools (assessor, assistant & TABLET)
- Output:
  - Rehabilitation priority list
  - VCI

# Solomon Mahlangu Drive

*(old Edwin Swales Drive)*

- eThekweni Municipality's *Freight Route*
  - Virtually all north bound freight from Durban Port uses Solomon Mahlangu Drive
  - In 2007 it was upgraded to 3-lane dual carriageway with new rehabilitated CRCP surface on the two existing lanes on each carriageway
  - Traffic loading at time of upgrade was estimated in excess of 90million E80s

# Solomon Mahlangu Drive



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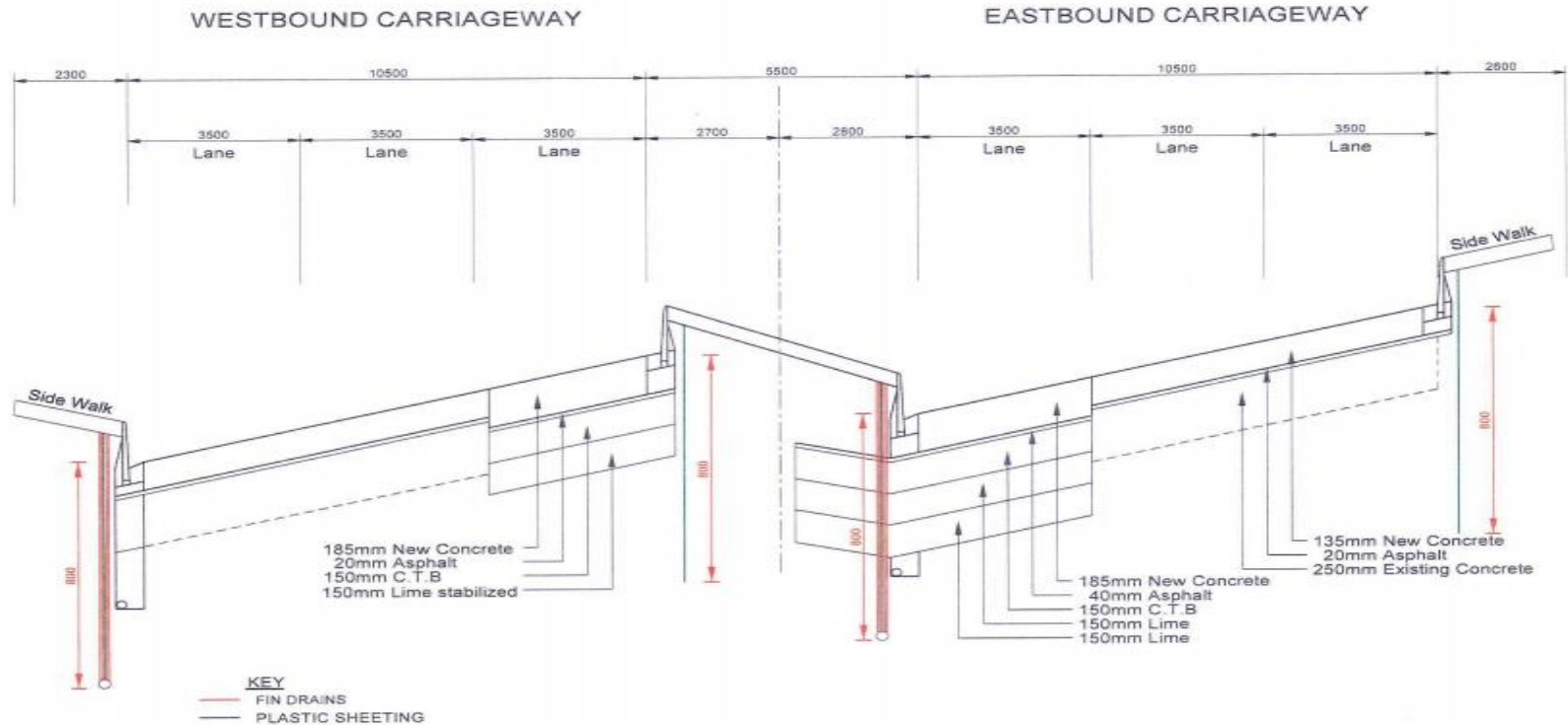
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# Traffic



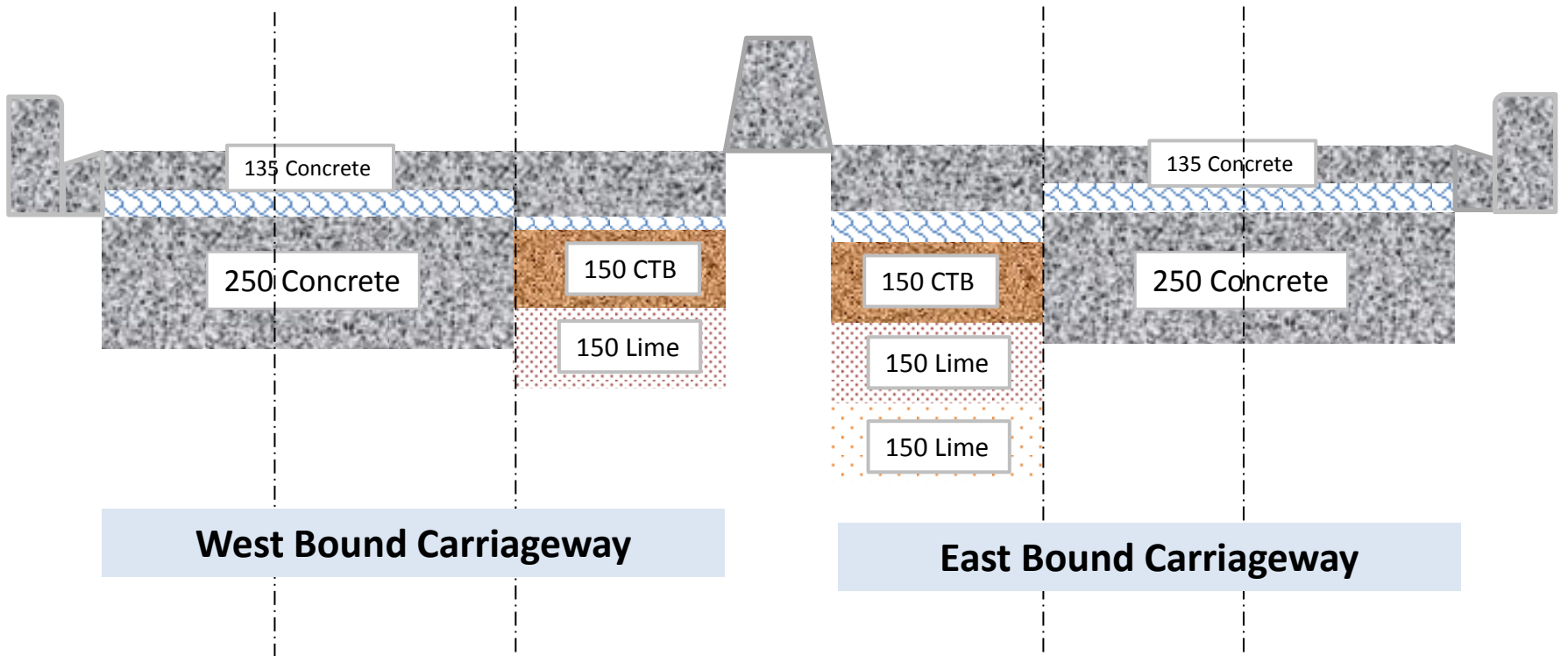
# Cross-section



TYPICAL CROSS SECTION - Km3+000 to Km4+100  
NTS



# Pavement Cross section



# Problem

- As early as 2008 sections of 135mm CRCP paved over the existing road exhibited multiple distresses:
  - Longitudinal cracks
  - Secondary block cracks
  - punch outs









# Possible causes...

- Excessive ground water in the pavement (even during DRY periods)
- Severe stripping of interlayer (*20mm – 50mm eThekwini Mix A asphalt*) thus weakening support for the CRCP
- Situation is aggravated by heavy traffic loading

# Failure analysis

- Visual
  - Physical logging of the distresses and positions
  - Assessing moisture conditions
- Intrusive failure investigations
  - Trial pits undertaken to verify pavement layer thickness and ground water situation
- Instrument testing
  - FWD measurements



# Trial Pit Information



WESTBOUND CARRIAGEWAY IN CANYON – TP1



WESTBOUND CARRIAGEWAY IN CANYON – TP1



**SOILCO MATERIALS INVESTIGATIONS (PTY) LTD**  
 CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1995/03565/07  
 25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATAL  
 TELEPHONE : 031 7004325 TELEFAX : 031 7001908 email : soilstab@maab.co.za

Client	Jeffares & Green
Project	Edwin Swales
Job Card No.	128218
Date of Test	2008-06-11
Field Technician	C.G. / L.M.
Position	Adjacent to Kerb
Test Pit Number	TP 1
Chainage	Opposite Light pole - 155
Diameter of TP	1m x 1m

**FIELD SOIL SURVEY TEST REPORT**

Water Table	Soil Legend	Depth (mm)	DESCRIPTION
			Moisture; Colour; Consistency; Structure; Soil Type; Origin; Sampling; Laboratory Testing abbreviations (I = Ind; M = MOD; C = CBR)
			Concrete
		150	Asphalt
		156	
			Concrete
		550	

The above test report is pertinent only to the area tested. This report shall not be reproduced, except in full, without the prior consent of SOILCO MATERIALS INVESTIGATIONS (PTY) LTD.

Remarks : Excavation stopped  
 Free moisture evident at interfaces of concrete and asphalt

For Soilco :

# Solution?..

1. Continue with repairs by our Roads Maintenance Department?





# Solution?..

2. Mill out CRCP and sort out interlayer and ground water problem?
  - EXTREME TRAFFIC DELAYS
  - DISRUPTIONS IN PORT OPERATIONS
  - CONSTRUCTION COST AND IMPACT ON THE ECONOMIC DUE DISRUPTION OF PORT ACTIVITIES

What other options?



D Rossmann: “Try mechanical soil stabilisation and void fill using Polymer product - URETEK”

# Solution

## **URETEK** - Foamed polymer injection

- Specially formulated resin: **Geoplus**
- Polyurethane family

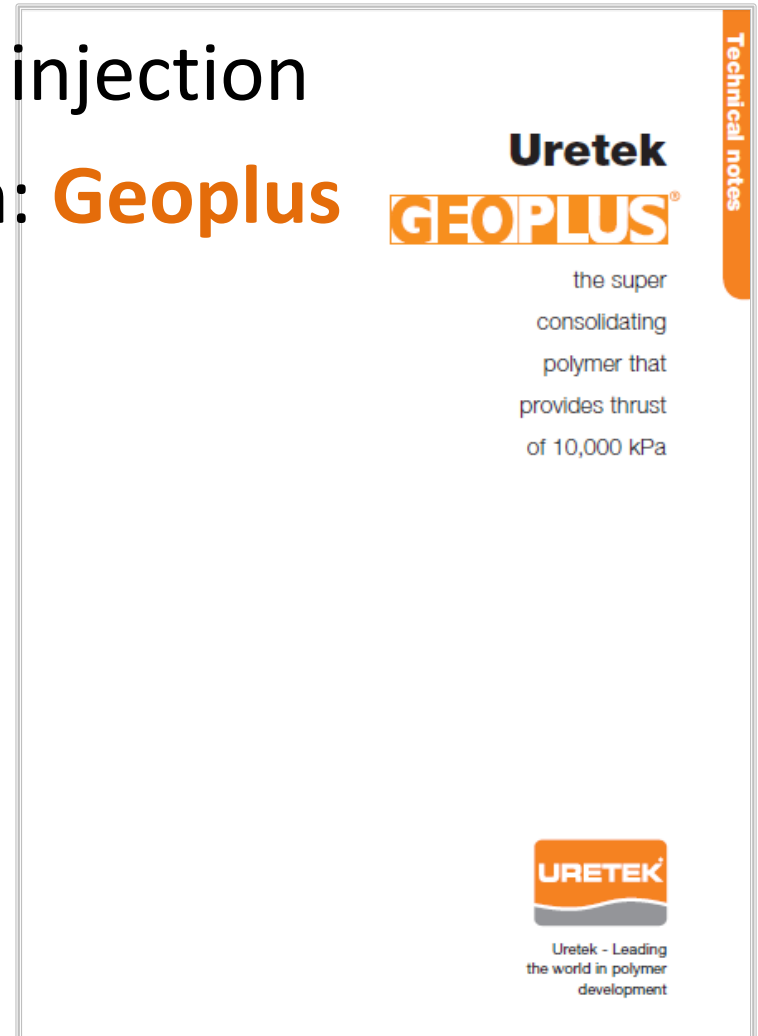
### **Product Information:**

Reaction time: 12 – 180 seconds

Pressure: 7 – 10 bar

Density: 70 – 300 kg/m<sup>3</sup>

**100% green**



Technical notes

**Uretek**  
**GEOPLUS**<sup>®</sup>

the super  
consolidating  
polymer that  
provides thrust  
of 10,000 kPa

**URETEK**

Uretek - Leading  
the world in polymer  
development

# EXPOSURE IN THE PRODUCT

- Details of experience with the product on the N3
- Trial at Griffiths Mxenge Highway rehabilitation with Smec
- Further experience at Inanda Road (concurrently undertaken with Solomon Mahlangu Drive)

# Project Statistics

Total Area Treated: 48 564.21 m<sup>2</sup>

Product Used: 125 082.25kg

Average production: 693.77m<sup>2</sup>/day

Project Start date: 24 February 2014

Project Completion date: 15 June 2014

# DRILLING

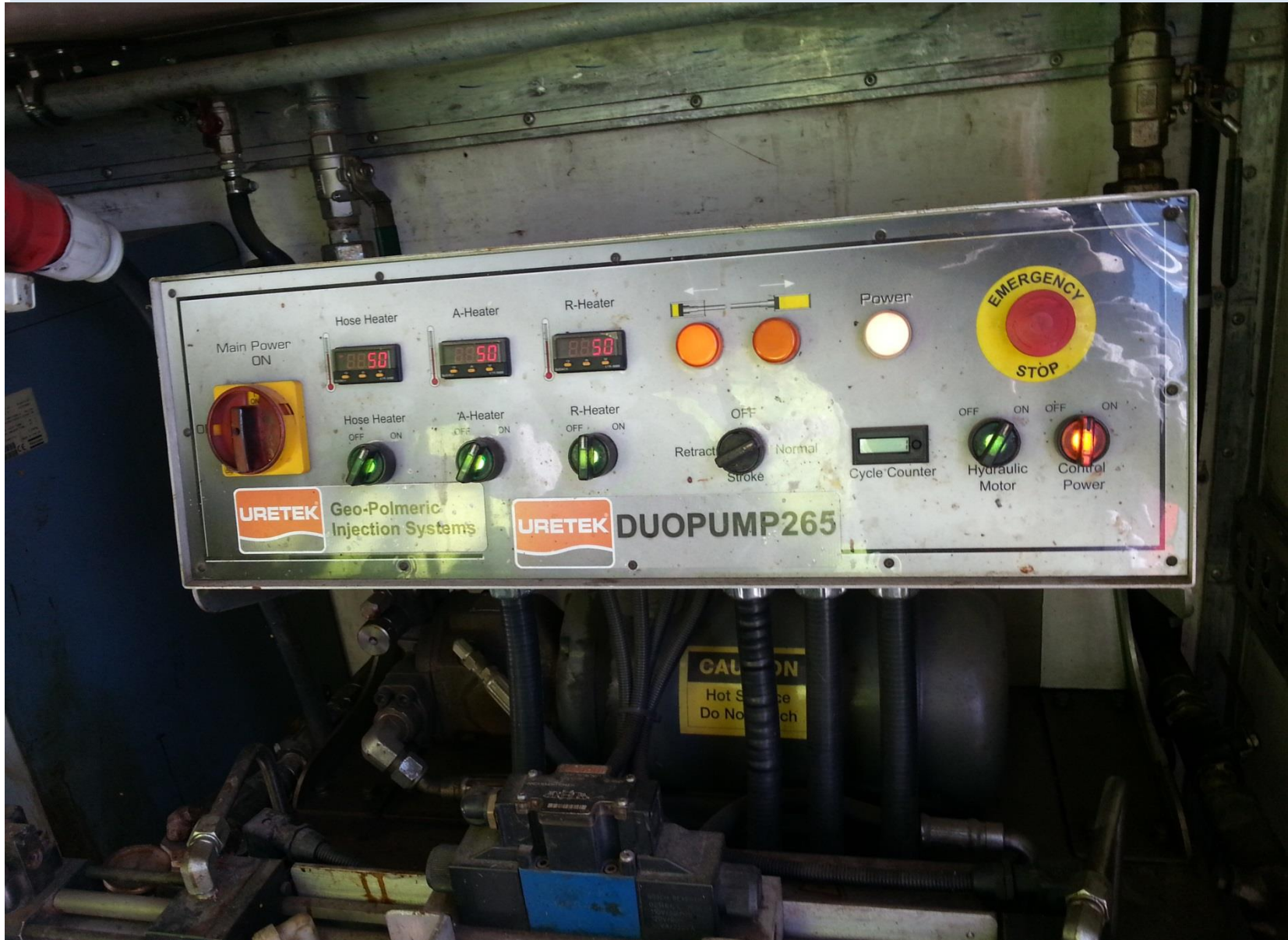




# DRILLING



# EQUIPMENT



# EQUIPMENT



# EQUIPMENT



# INJECTION PROCESS





# INJECTION PROCESS



## Quality Control System

- Electronic level to control pavement lift
- Product blend monitored
- Product Warranty

# INJECTION PROCESS





# INJECTION PROCESS

Chunk of asphalt interlayer picked up at punch-out repair.  
The grey is URETEK sandwiched between the interlayer



# INJECTION PROCESS



# INJECTION PROCESS



**Asphalt interlayer disintegrating easily by hand.  
Binder stripped in most aggregates of the broken  
pieces.**

# Long Term Monitoring Protocol

- Visual assessments – interval (*current*)
- Maintenance Stats and costs

## Planned for near future:

- GPR - (*to be explored*)
- Road Profiler - Instrument survey (*definite*)
- Thermal mapping – (*to be explored*)
- FWD – (*to be explored*)

A close-up photograph of a black and white French Bulldog and its puppy. The adult dog is on the left, looking towards the camera with large, expressive brown eyes. The puppy is on the right, leaning its head against the adult's face. The background is a solid, light blue color.

**THANK YOU**

**for  
Listening**