



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

Fakulteit Ingenieurswese, Bou-omgewing en
Inligtingtegnologie / Lefapha la Boetšenere,
Tikologo ya Kago le Theknolotši ya Tshedimošo

Engineering 4.0 Road Pavements Forum July 2019

Prof Wynand JvdM Steyn – HOD Civil
Engineering



3 July 2019

Background

- Discussions between SANRAL & UP started in 2014
- **MoU**
 - Signed on 28 June 2016
 - UP, SANRAL, CSIR
- **Final UP Council approval**
 - 15 November 2017
- **Site handover**
 - 31 July 2018
- **Construction started**
 - 17 October 2018
- **Contractual completion**
 - 28 February 2020



Engineering 4.0 Vision - Background



- Disruption, Evolution & Innovation in transportation
 - Autonomous & Electrical vehicles, Smart materials, IoT networks, Data analytics, Shared services
 - Need for
 - Smart Transportation within Smart Environments (including cities, towns, dwellings & rural)
 - Novel design, construction, maintenance
 - Sustainability & optimized environment

Engineering 4.0 Vision – Developing environment

- **Autonomous & Electrical vehicles**
 - Gravel & secondary road networks
 - Sustainable charging
 - Autonomous agricultural equipment
- **Smart materials**
 - Optimal use of marginal materials using nano-stabilizers
 - Responsive & intelligent materials
- **IoT networks**
 - Appropriate information for optimized systems
 - Data networks in rural areas
- **Shared services**
 - Equitable opportunities
- **Smart Transportation within Smart Environments (cities, towns, dwellings & rural)**
 - High-tech urban to informal settlements
 - Rural agricultural networks
- **Novel design, construction, maintenance**
 - Equitable employment
- **Sustainability & optimized environment**
 - Clean, safe, healthy living & working conditions



Engineering 4.0 Vision

Sustainable, Optimized, Smart, Equitable
transportation networks supporting social &
economic development in disruptive &
evolutionary society

UP Engineering 4.0

- Multi-phase planning
- **Phase 1**
 - National road materials reference laboratory
 - Duplicate sample testing
 - Proficiency Testing scheme
 - Limited specialised testing
 - Training & certification laboratory
 - Practical training
 - Certification of materials testers
 - Hands-on & virtual training
 - Concrete research laboratory
 - Accelerated Pavement Testing (APT) track
 - Active vehicle test track

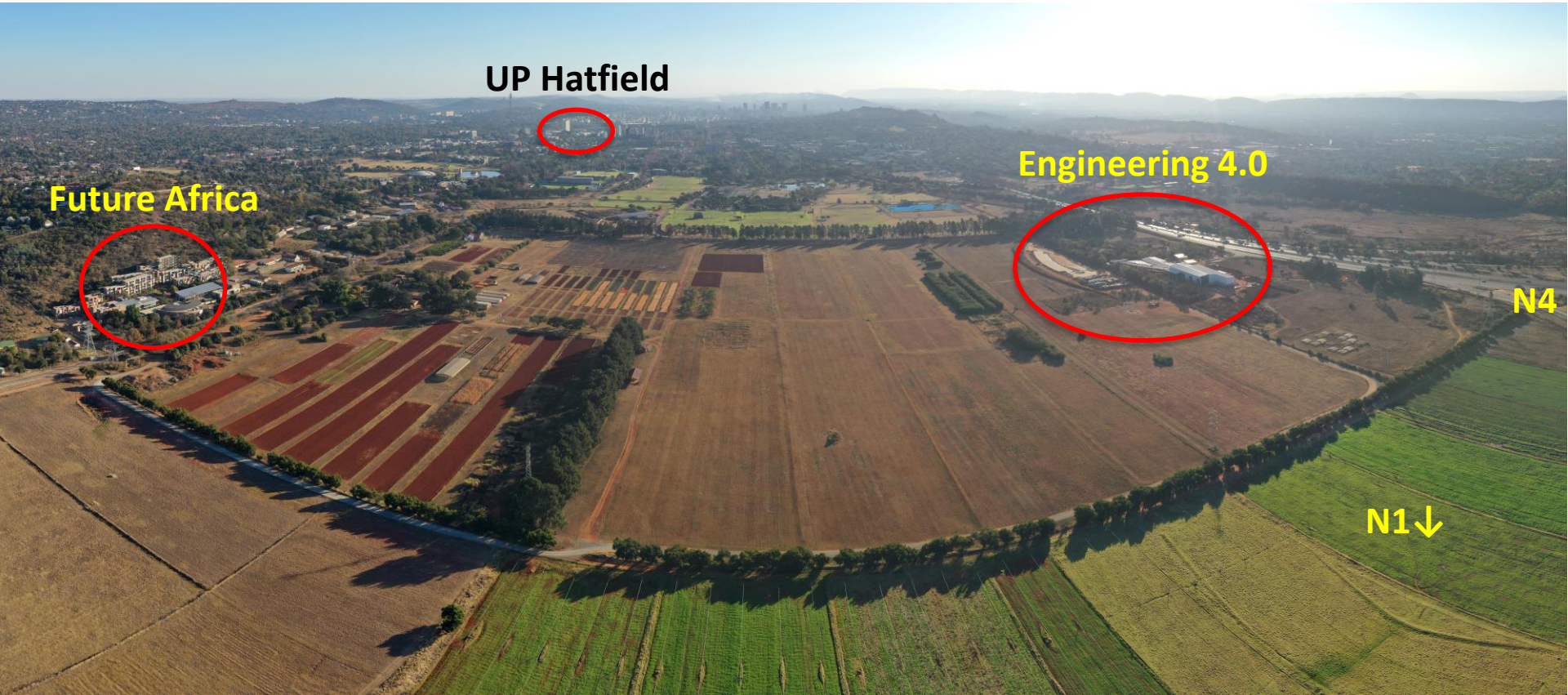




N1

N4

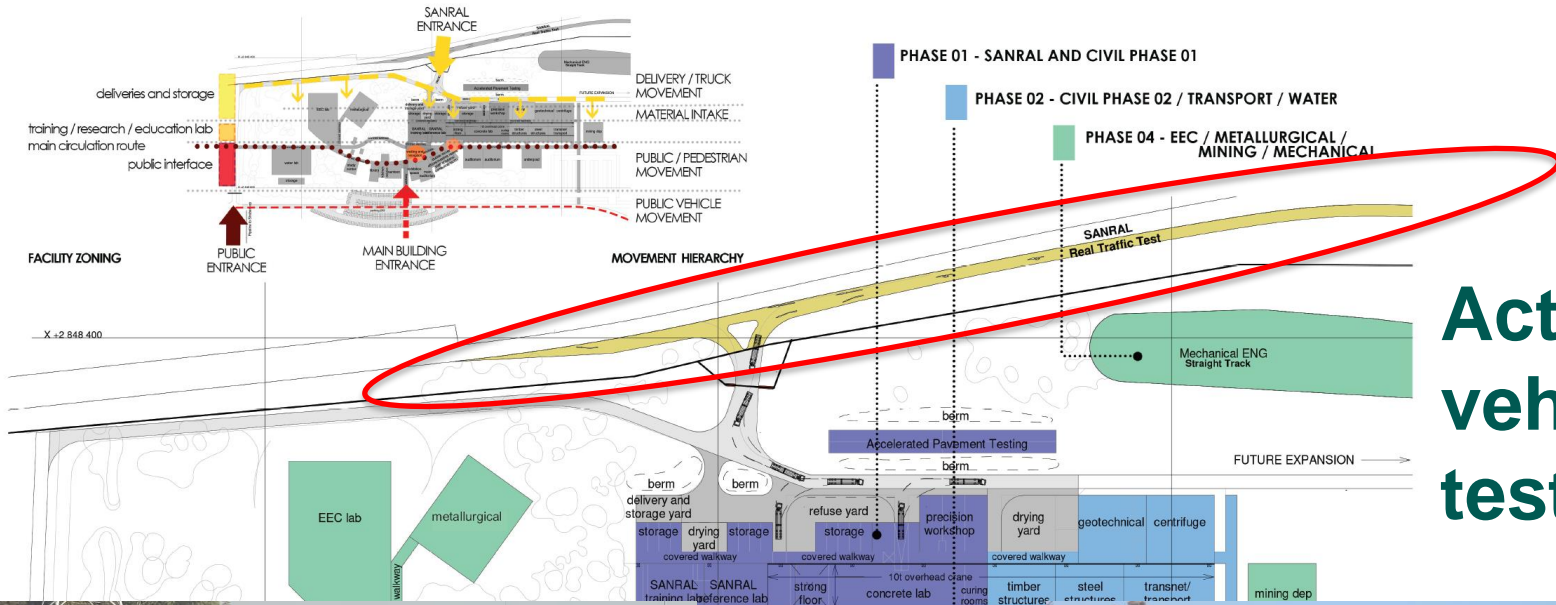
Hillcrest campus orientation



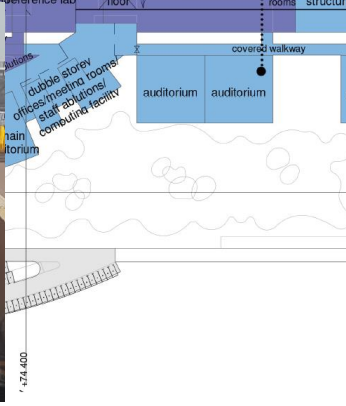




**5.05 Ha Protected
Grassland**



Active vehicle test track



APT facility

- Area designated for Accelerated Pavement Testing evaluations
- Accelerated evaluation of pavement performance
- Two options for mobile APT
- Both SA developed



















	Area [m ²]
Foyer	2,026
Training & Reference laboratories	1,340
Concrete laboratory	2,212
Storage	754
Total	6,332

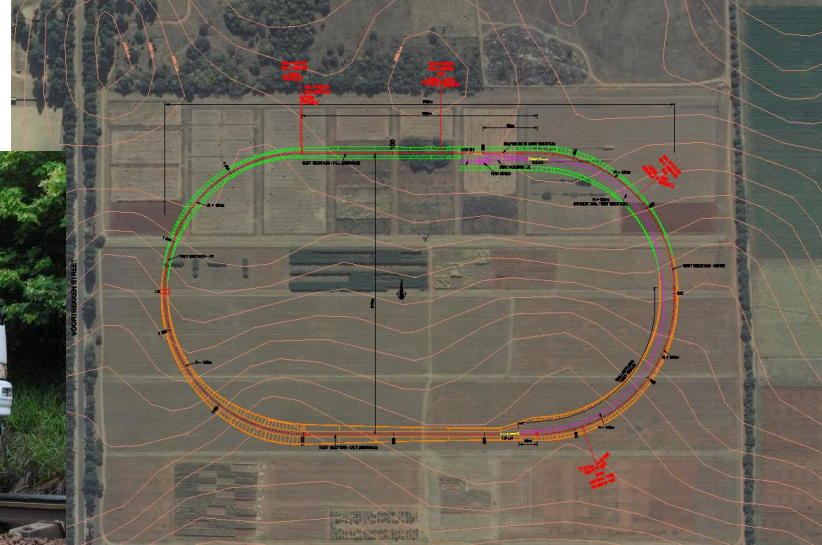
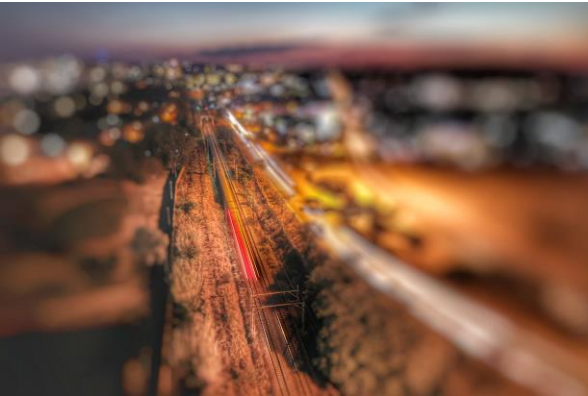
Future

- **Civil engineering**
 - Structural, water, geotechnical, rail, transportation laboratories
 - Offices & lecture spaces
- **Rail**
 - Rail oval
 - Laboratory
- **Mechanical**
 - Straight track
 - Autonomous track
 - Advanced agricultural equipment
- **Mining engineering laboratory**
- **Data analytics centre** (Big Agriculture / Transportation data)



Railway Research Laboratory

- Full-scale track trench in laboratory with multiple actuators
- 2.0 km test track with rolling stock, signalling & related infrastructure
- NRF-funded Road/Rail Infrastructure Monitoring System - custom-built road/rail vehicle

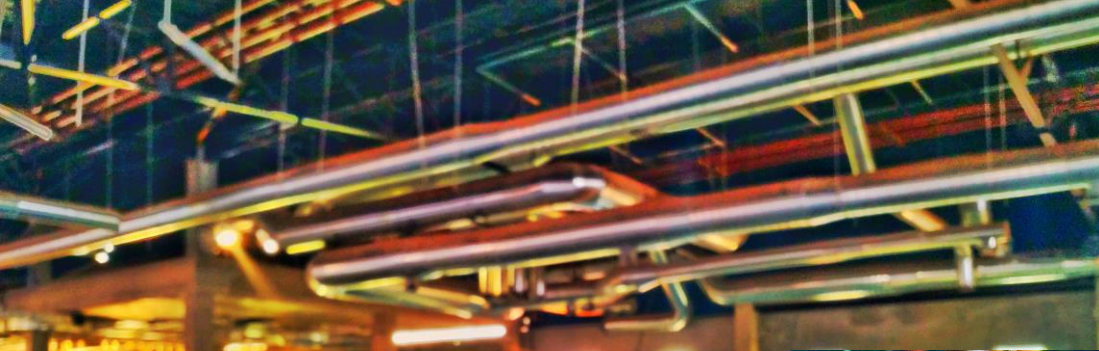










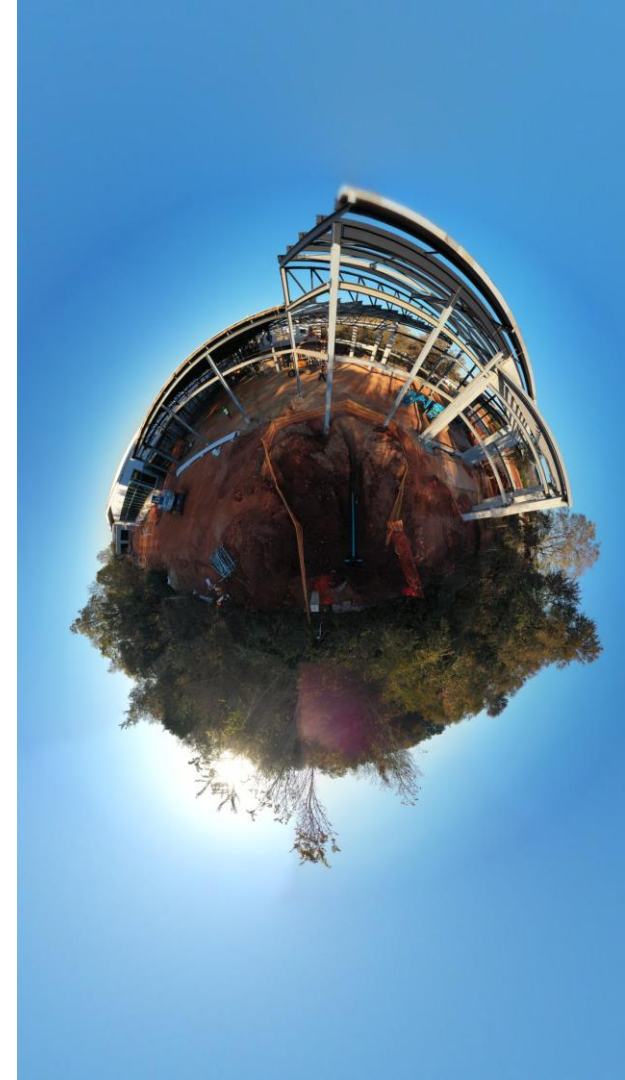






Summary

- Much to be thankful about in education & research environment
- Major investments on many campuses supporting education
 - ROI?



ENG 4

