Experience with Pavement Recycling on Volcanic Subgrades

Matthew Thrush
Opus International Consultants, Taupo

The Project

• Area Wide Treatments
• Design 2003
• Construction 2003/04
The Site

- 700m section SH5 Napier-Taupo
- Mode of Failure
  - Cracking
  - Flushing
  - Rutting
- Original 1950s construction (with repairs)
- Built on a fill

Investigations

- Testpits
  - Thick existing seal layers
  - 220mm greywacke AP65
  - Pumice sand subgrade
- FWD
  - Deflections average 2.1mm
  - 85%ile 2.5mm
  - Range 0.8mm to 3.2mm
Design

- APDG 1992 / NZ Supplement May 2000
- Precedent Method
- Subgrade Model
  - Vertical modulus 10CBR, horizontal 5CBR
- No sub-layering required
- 100mm overlay with TNZ M/4
- Cement modify 2%, recycle to 250mm

Construction

- Constructed in two 350m sections
- Direct water injection
- Dacite basecourse ex Tauhara
- Sealing soon after compaction
- Target densities not established
- Some density measurements not done
- Wet weather
Problems

- Within 6 months ruts noticed up to 20mm, in discrete areas
- Ruts now widespread, typically 20mm to 25mm
- Cracking and pumping of fines
- Several post-construction testpits dug
- Pavement in wheeltracks is not well cemented

Issues/Points for debate

- Enough protection for subgrade?
  - No clear evidence of subgrade deformation
- Design for subgrade strains?
  - Resulting pavement extremely thick
  - Upper limit for subgrade strain?
- Issue with materials?
  - Lack of “fine fines”
  - Material complied with TNZ M/4
- Was sufficient compaction possible?
  - Particularly for this material
Suggestions for Change

• Use of repeated load triaxial testing to determine durability (even for M/4)?
• Develop new relationships for sub-layer moduli on volcanic subgrades?
• Cap allowable subgrade strain (as % of Austroads strain criterion)?