

Auckland City Asphalt Performance Testing

- 9th November 2010



Objective of the Research

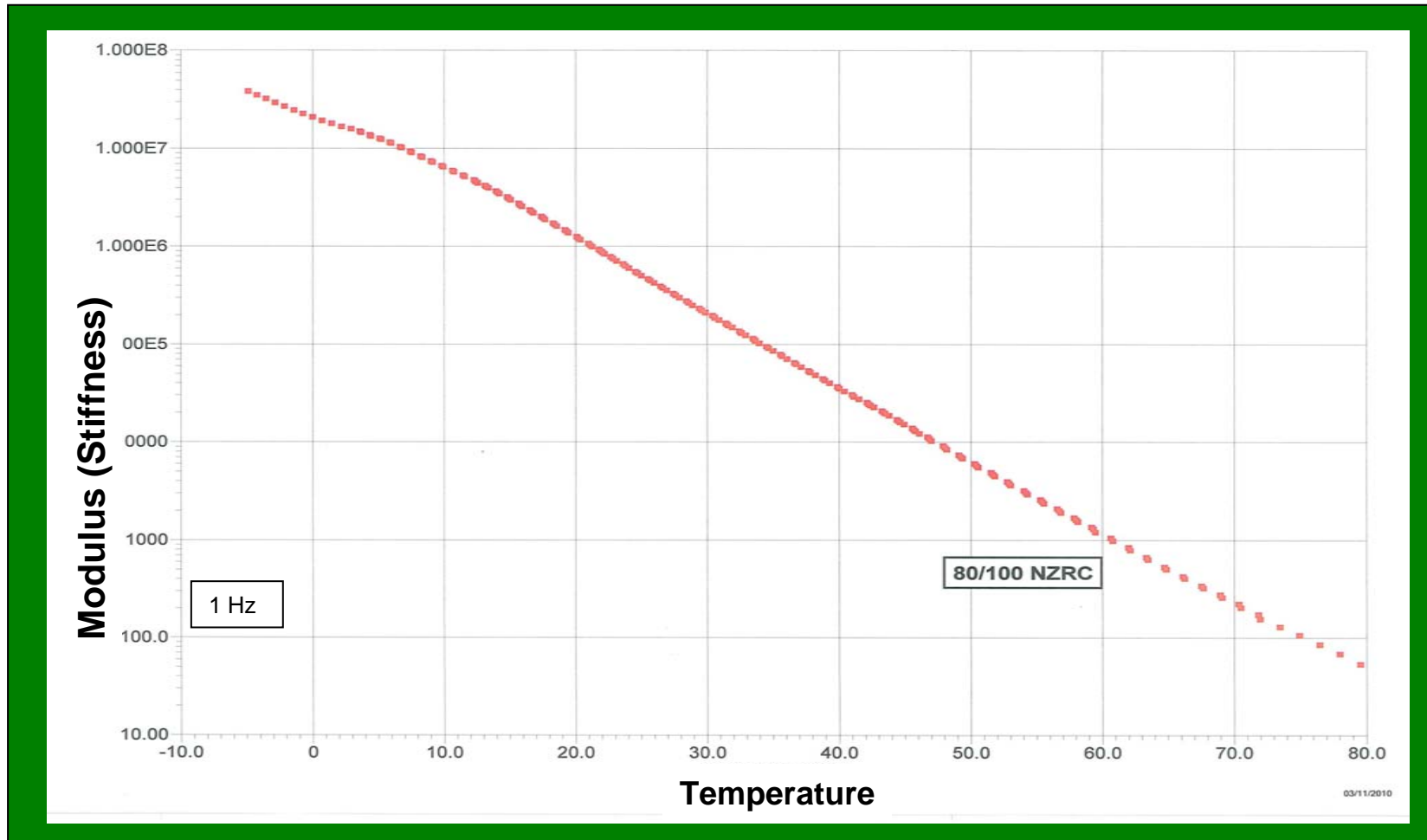
1. To test the two asphalts, selected for use in the Auckland City contract, for fatigue and wheeltracking performance
2. To compare the performance of the above two mixes with bitumen and polymer modified bitumen
3. To be able to recommend a long life asphalt solution for all Auckland City streets

Binder Test Results

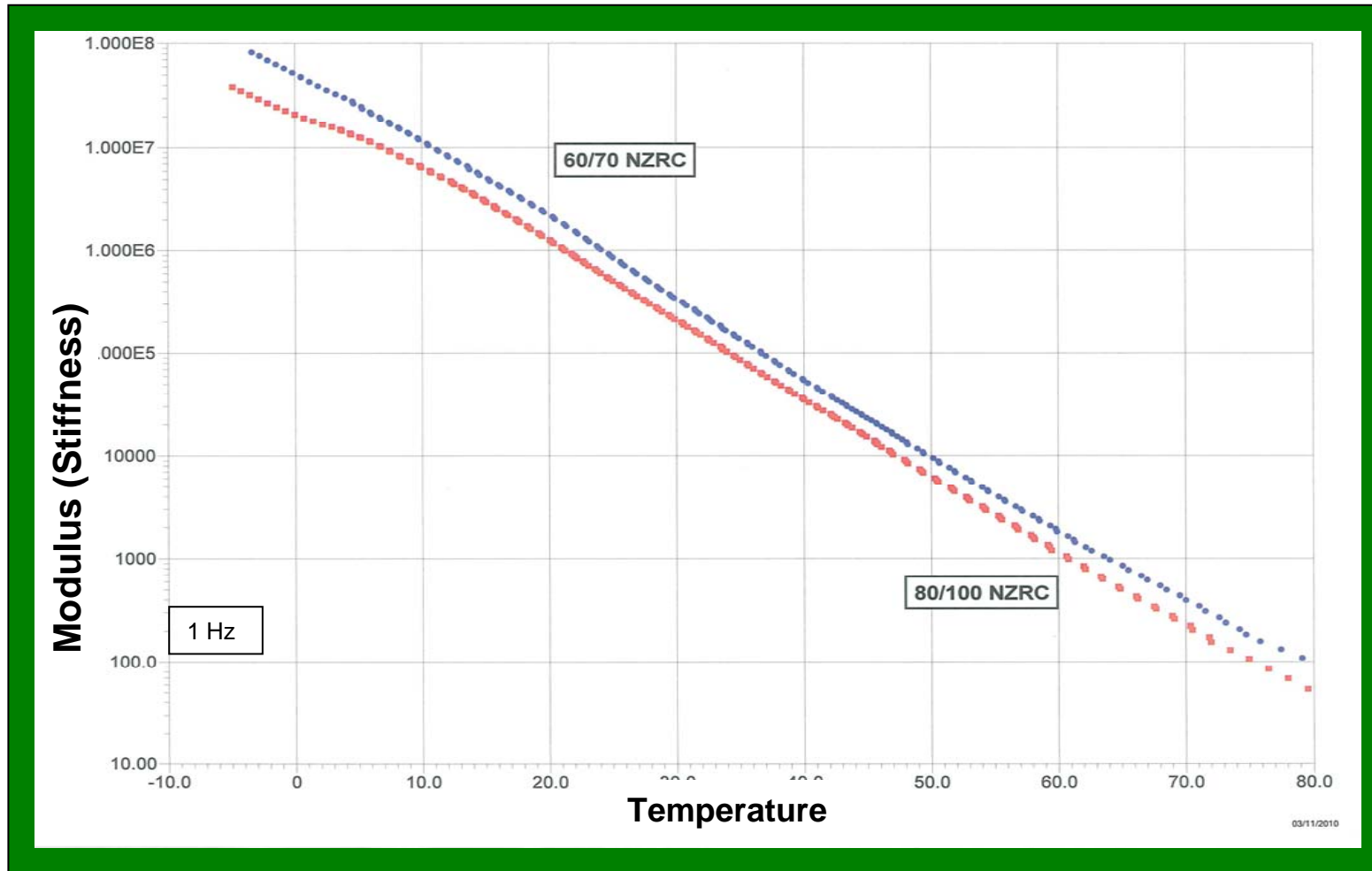
- Dynamic Shear Rheometer (DSR) can determine the performance of the binder used in the asphalt across a range of temperatures and frequencies (traffic speeds).
- The DSR can determine the Complex Modulus (Stiffness) & the Elastic/Viscous balance of a binder.



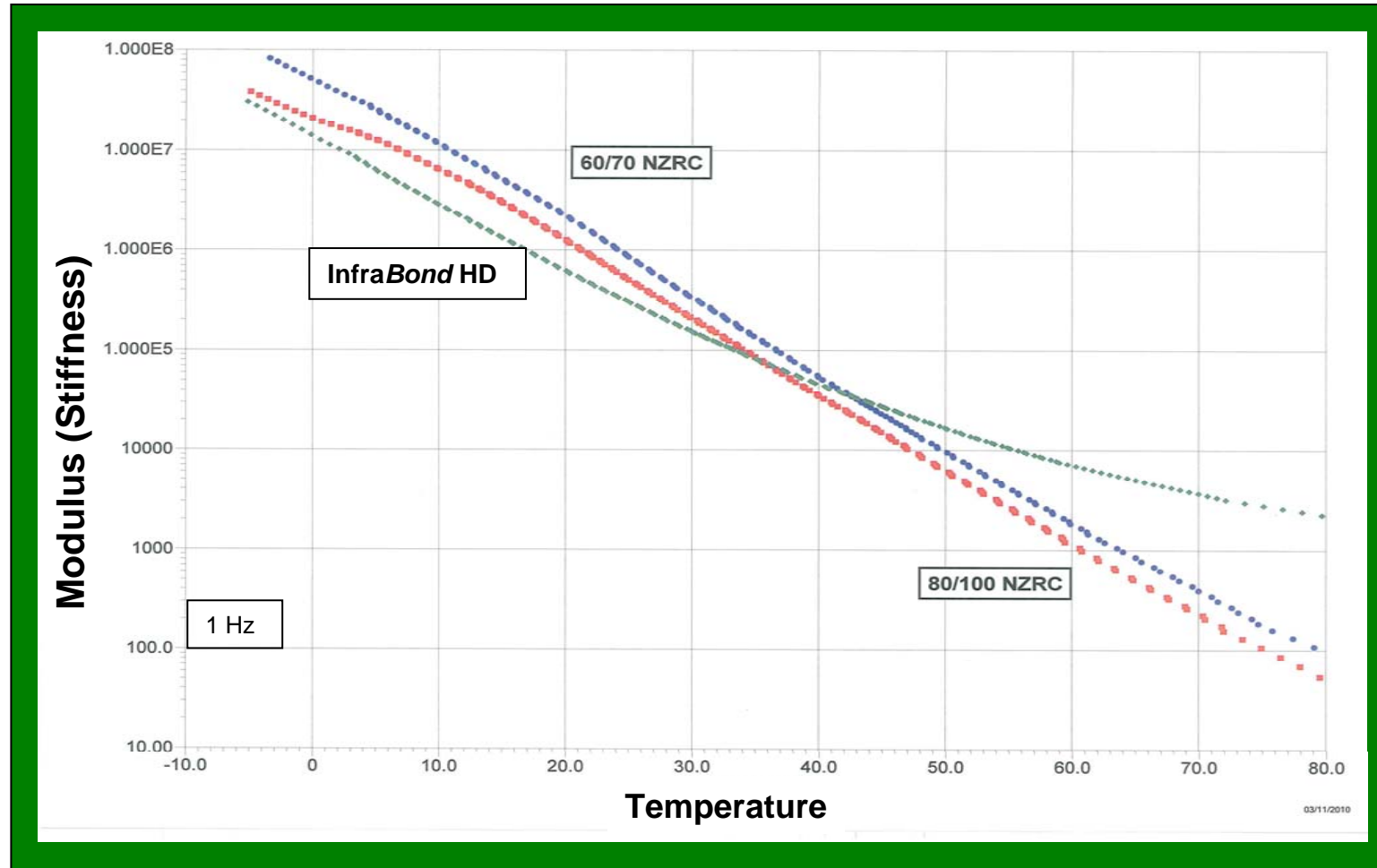
Binder Results - Stiffness



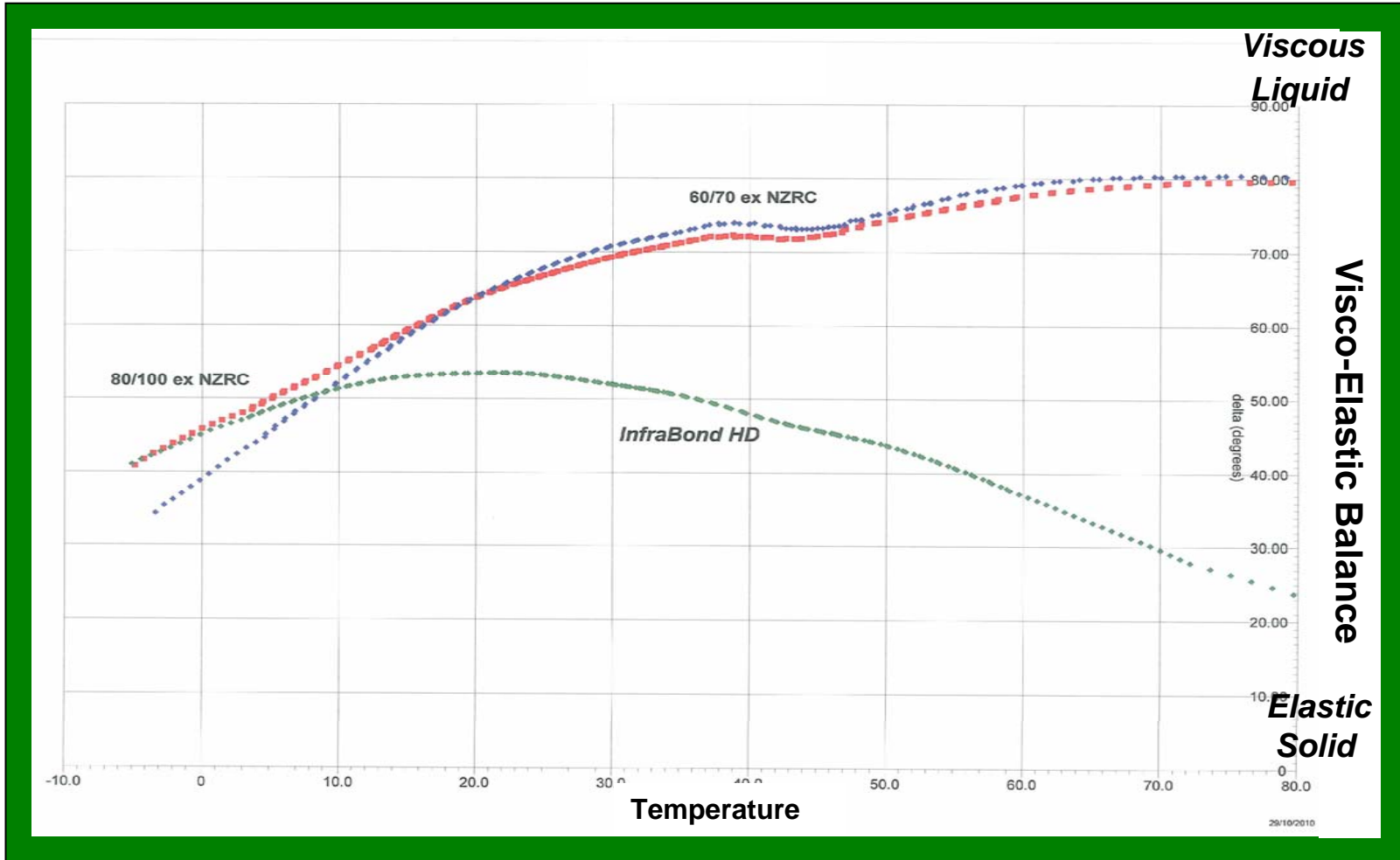
Binder Results - Stiffness



Binder Results - Stiffness



Binder Results – Visco-Elastic Balance



Asphalt Testing - Scope

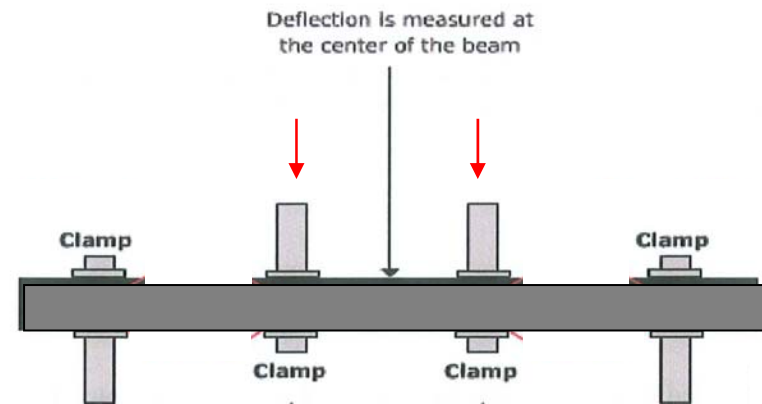
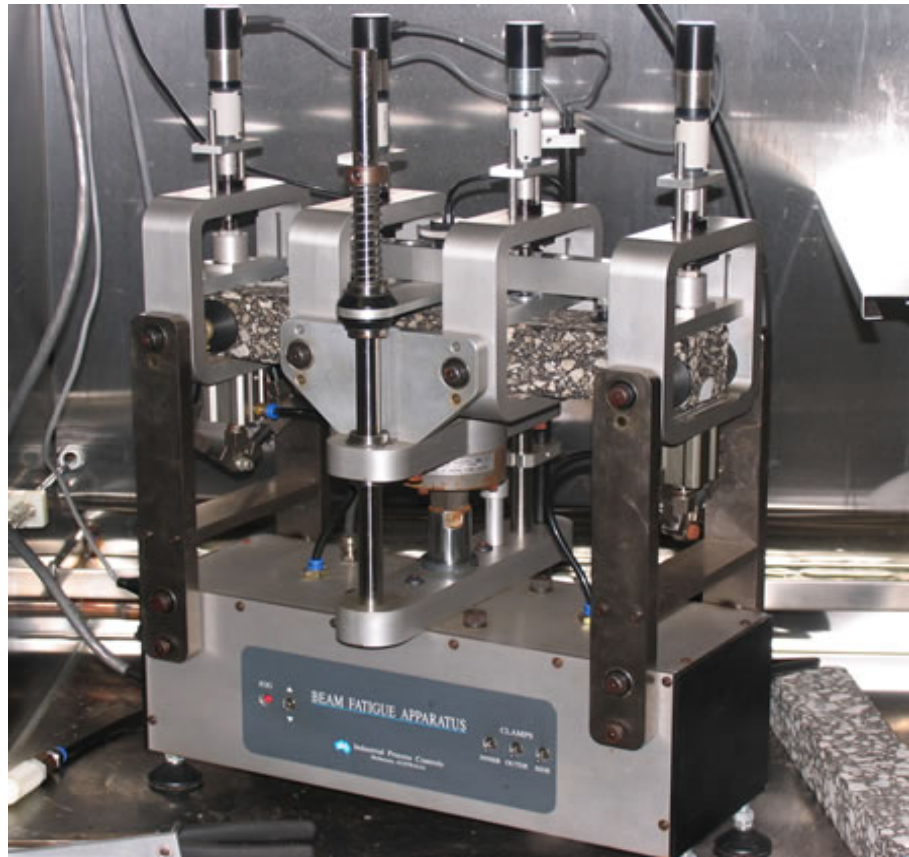
- Two asphalt mixes
 - TNZ15
 - AC14
- Three different binders
 - B80 (80/100) in TNZ15
 - B60 (60/70) in AC14
 - *InfraBond* HD polymer modified binder
- Tests
 - Fatigue @ 20°C
 - Wheeltracking @ 60°C

Asphalt Testing – Mix Control Envelope

- **TNZ15 B80 BB / TNZ15 HD BB**
 - JMF @ 5.8% design bitumen content.
 - Fine @ 6.1% maximum bitumen content.
 - Coarse @ 5.5% minimum bitumen content.

- **AC14 B60 BB / AC14 HD BB**
 - JMF @ 5.3% design bitumen content.
 - Fine @ 5.6% maximum bitumen content.
 - Coarse @ 5.0% minimum bitumen content.

Asphalt Testing Fatigue @ 20° C

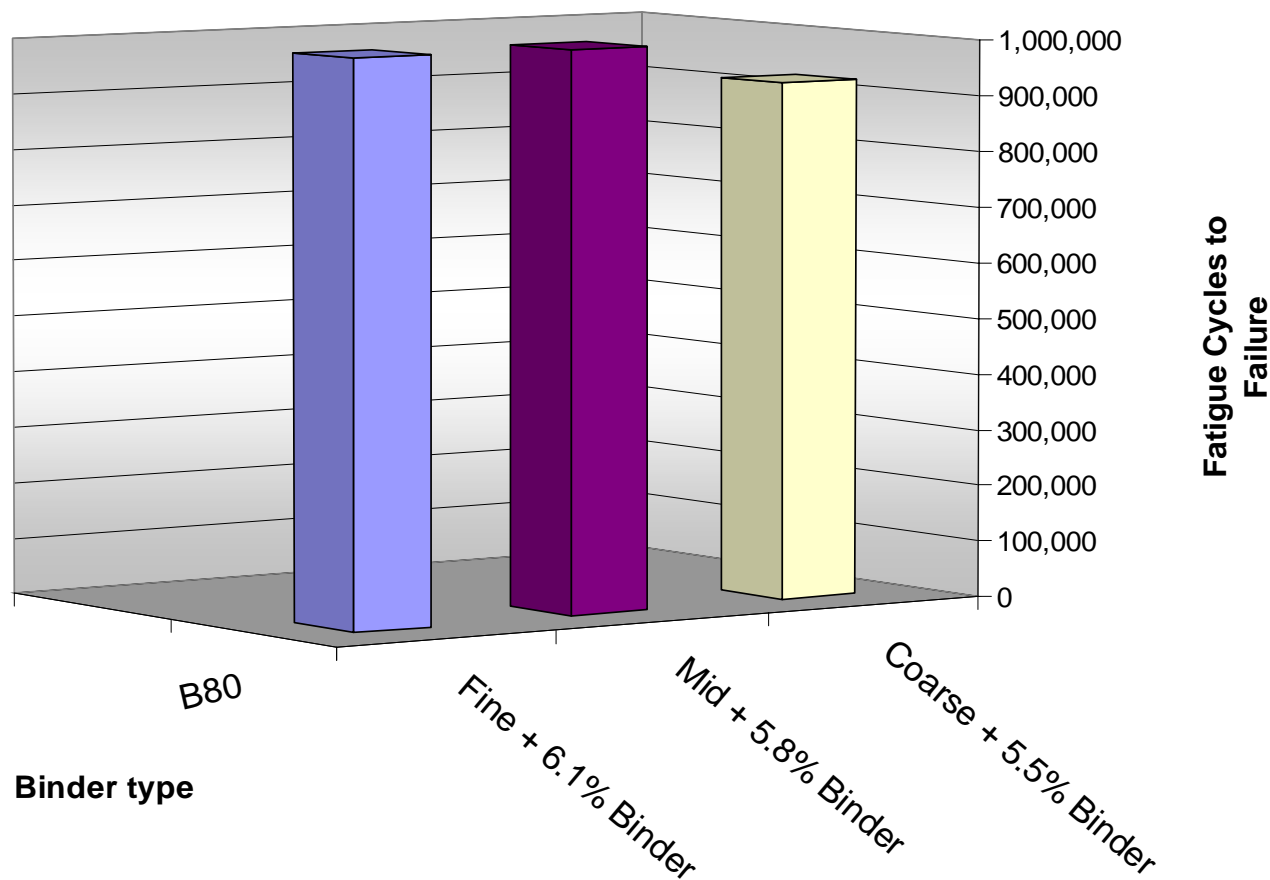


Test termination

- Stiffness reaches 50% initial value
- The beam cracks
- After 1 million cycles (record % loss in initial stiffness)

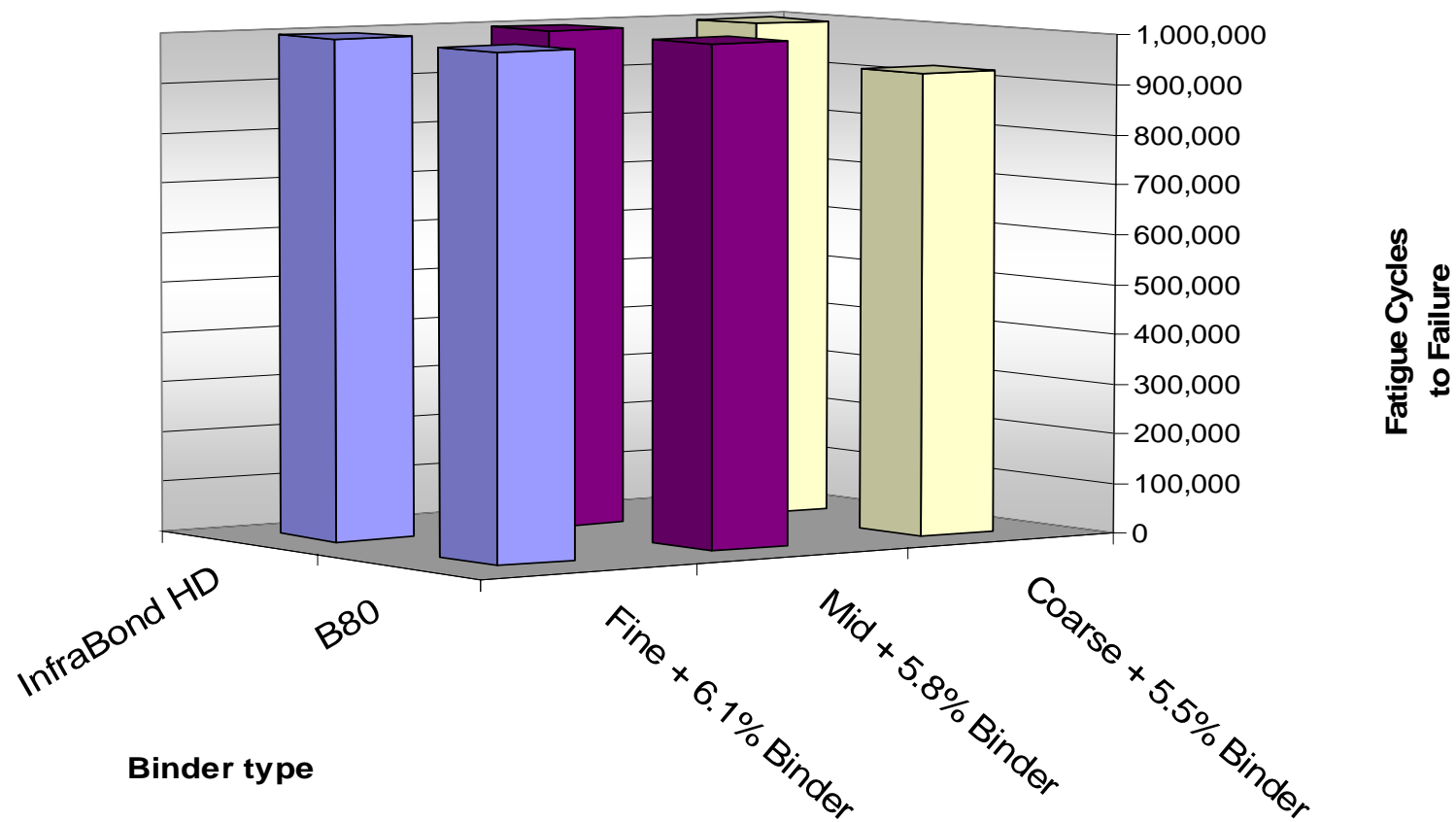
Asphalt Testing – TNZ15 B80 BB

Fatigue @ 20°C



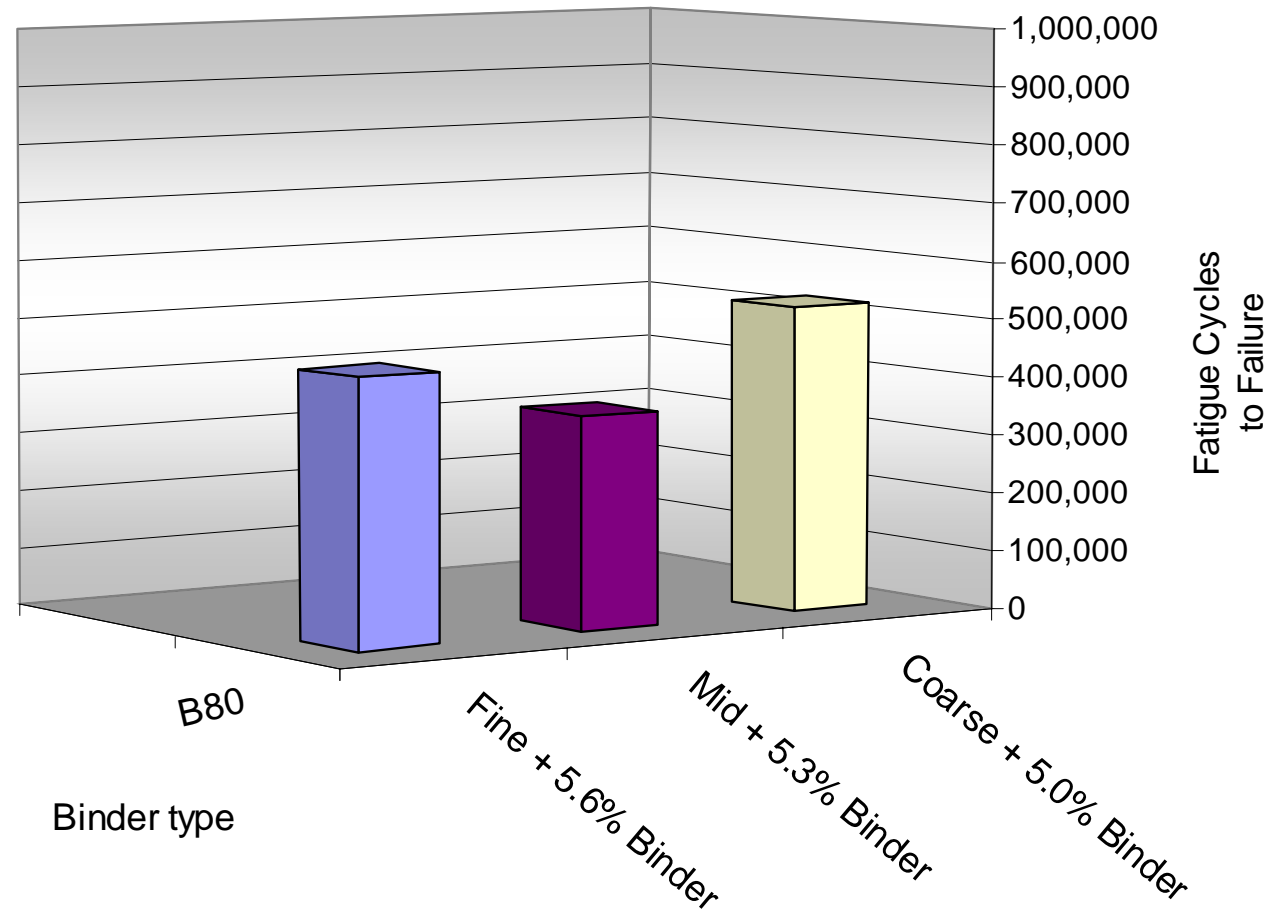
Asphalt Testing – TNZ15 B80 BB

Fatigue @ 20°C



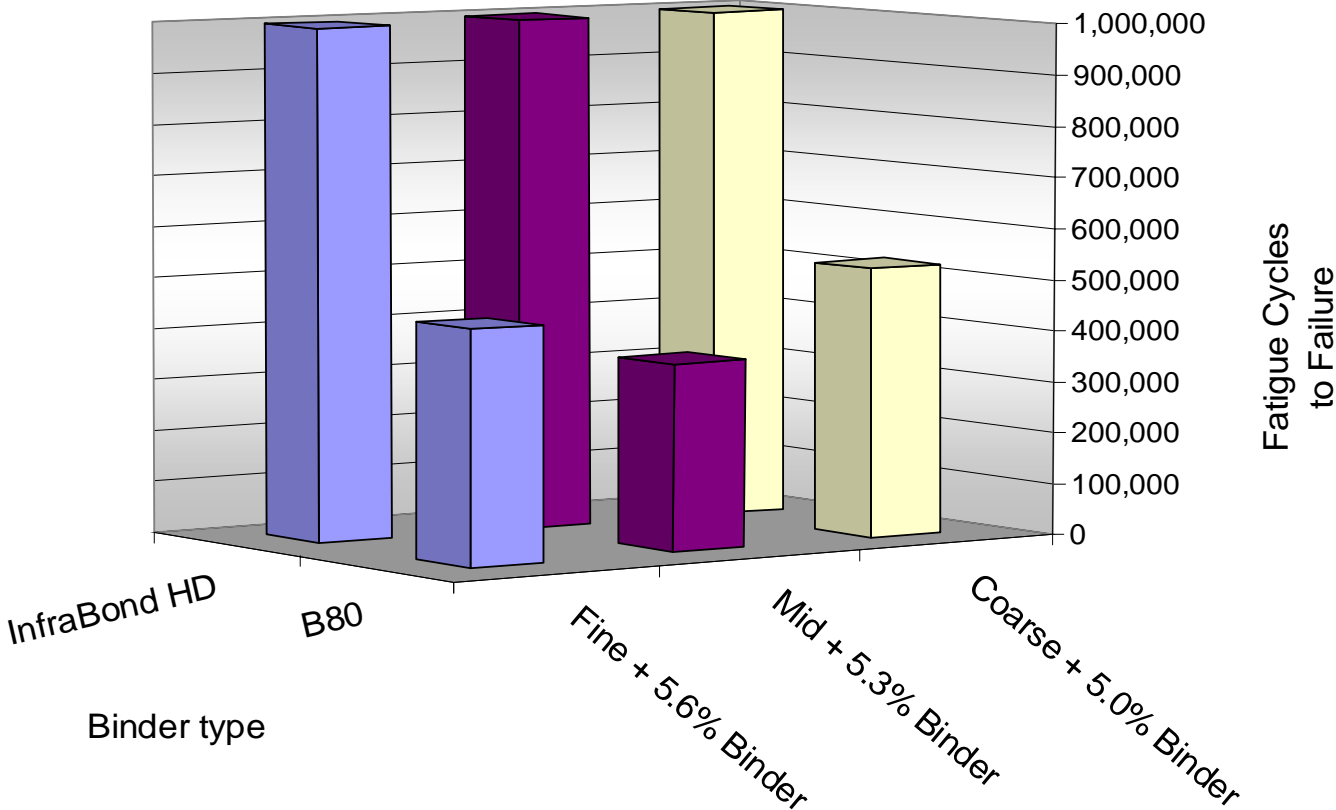
Asphalt Testing – AC14 B60 BB

Fatigue @ 20°C



Asphalt Testing – AC14 B60 BB

Fatigue @ 20°C



Summary of Results

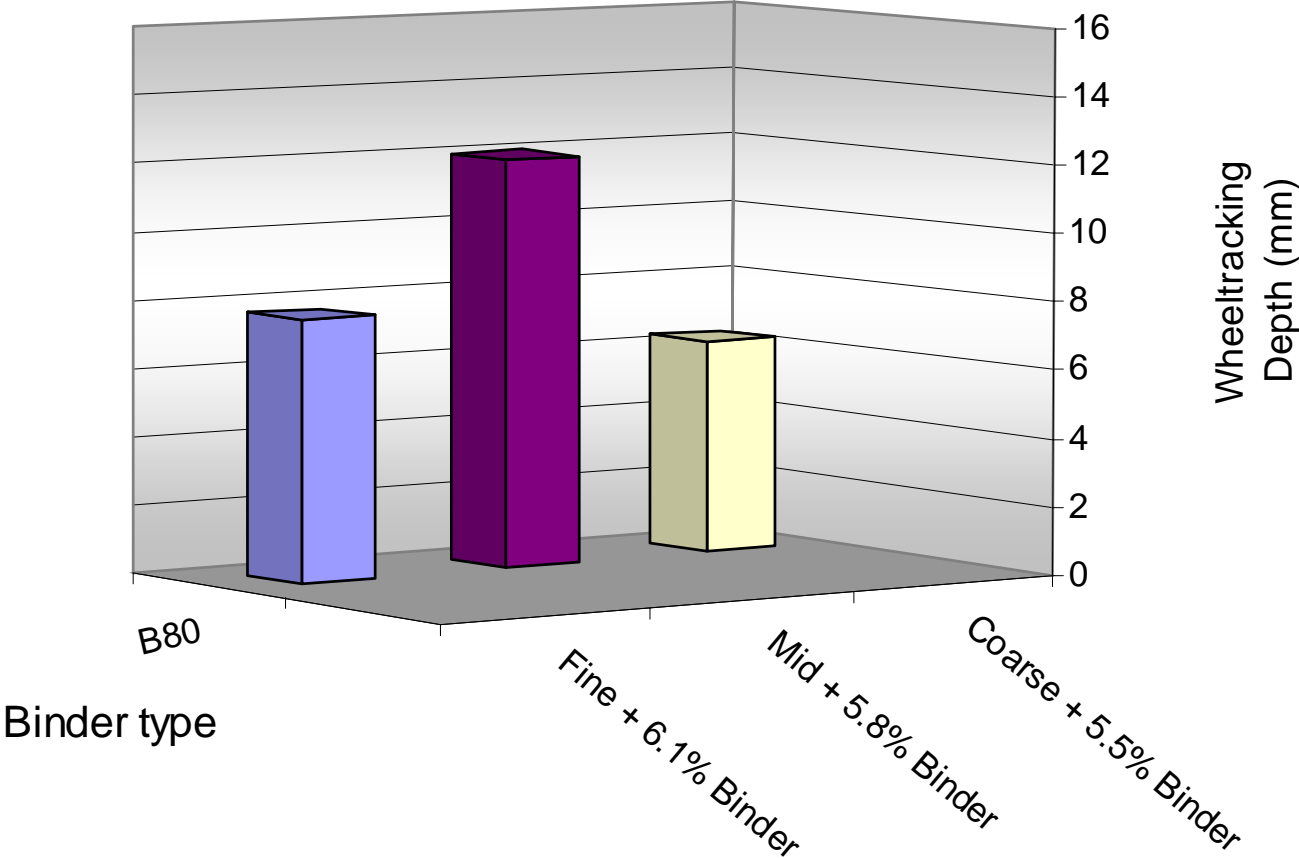
- **Fatigue @ 20°C**
 - TNZ15 B80 performed very well in fatigue, as was expected.
 - TNZ15 HD fatigue performance is exceptional, with all gradings exceeding the 1 million cycle limit with ease.
 - AC14 B60 was quite poor, with all gradings not exceeding 0.5 million cycles.
 - AC14 HD: the substitution of conventional bitumen with InfraBond HD PMB dramatically improved the fatigue performance of this mix.

Asphalt Testing: Wheeltracking @ 60°C after 10,000 passes



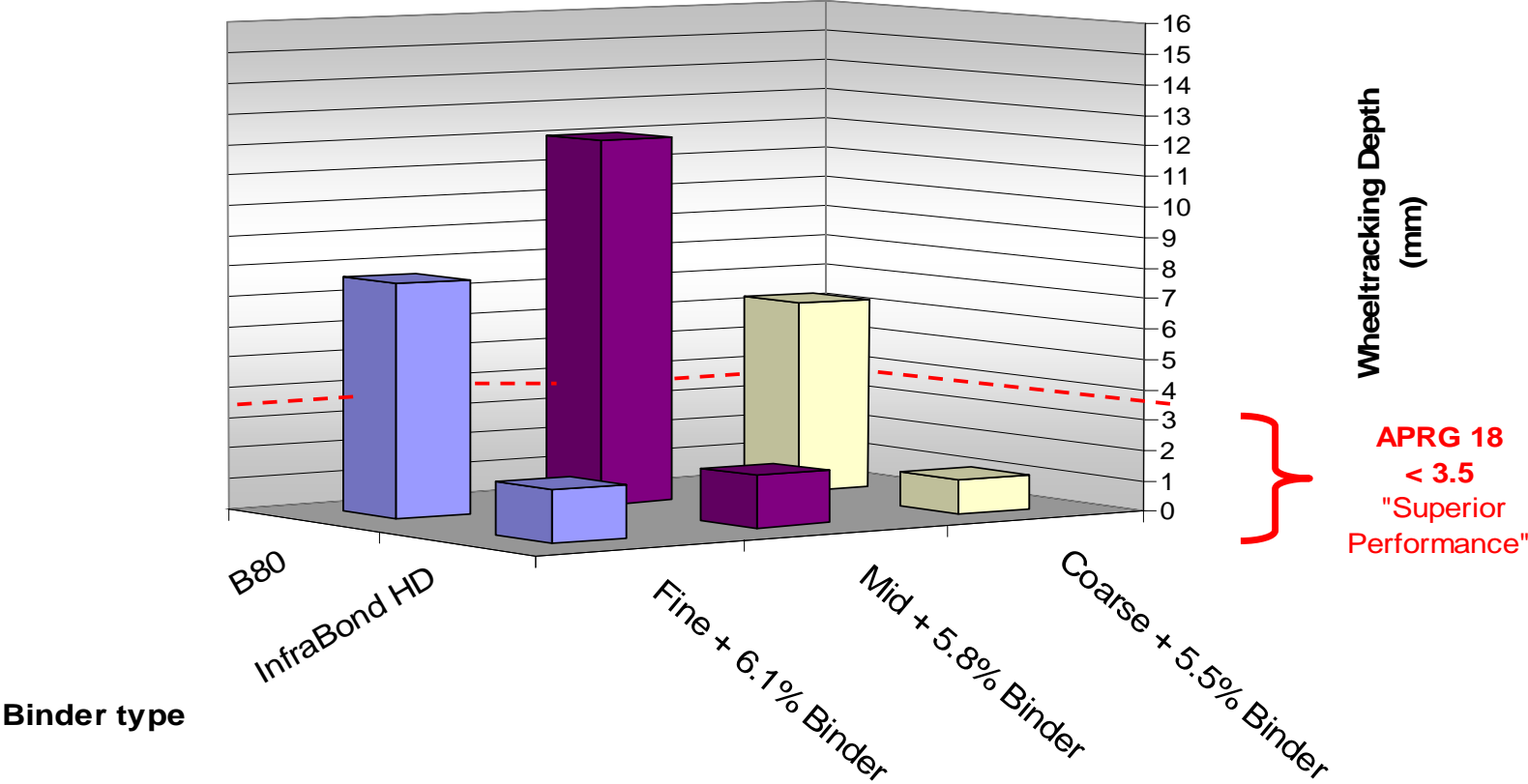
Asphalt Testing – TNZ15 B80BB

Wheeltracking @ 60 °C after 10,000 passes



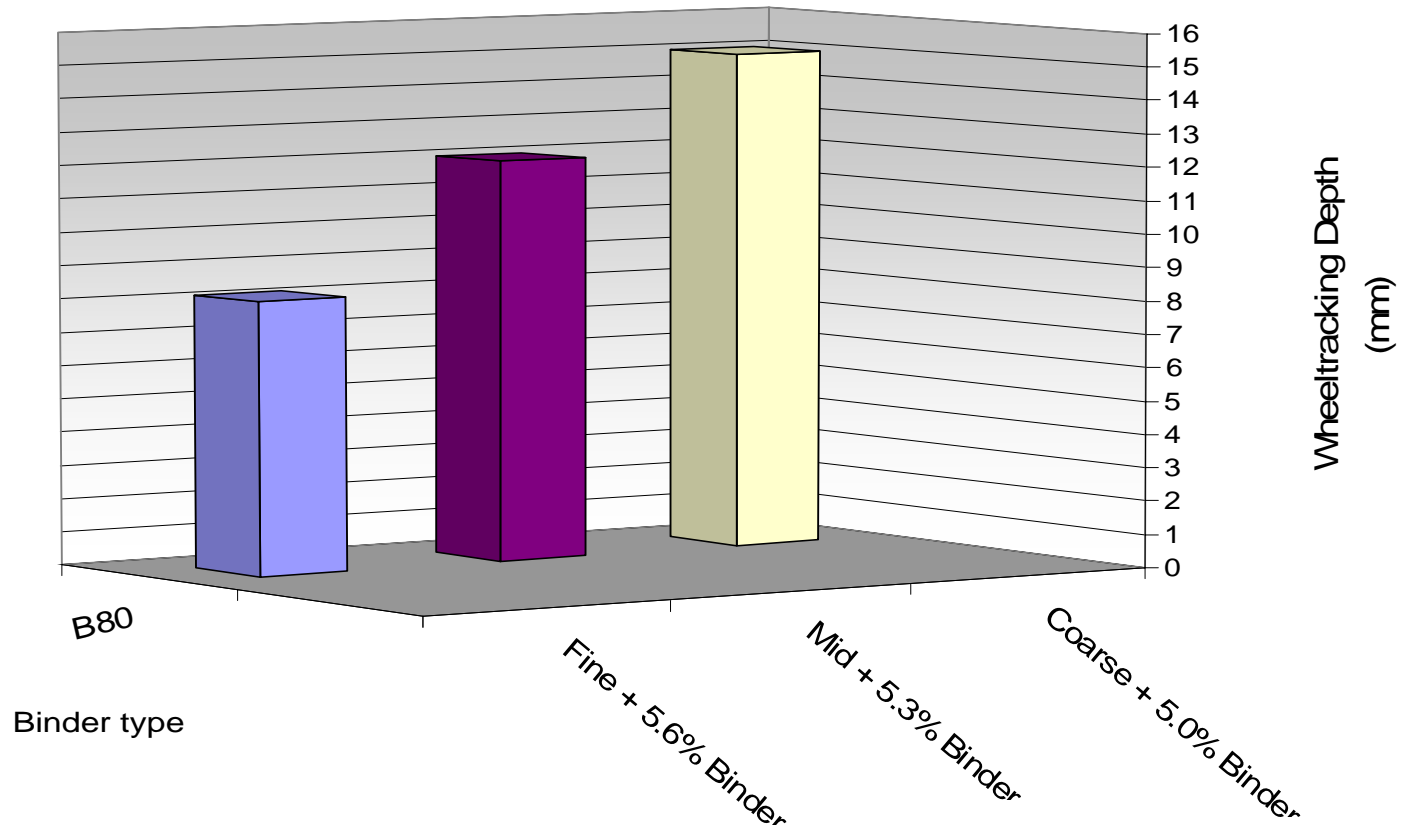
Asphalt Testing – TNZ15 B80 BB

Wheeltracking @ 60 °C after 10,000 passes



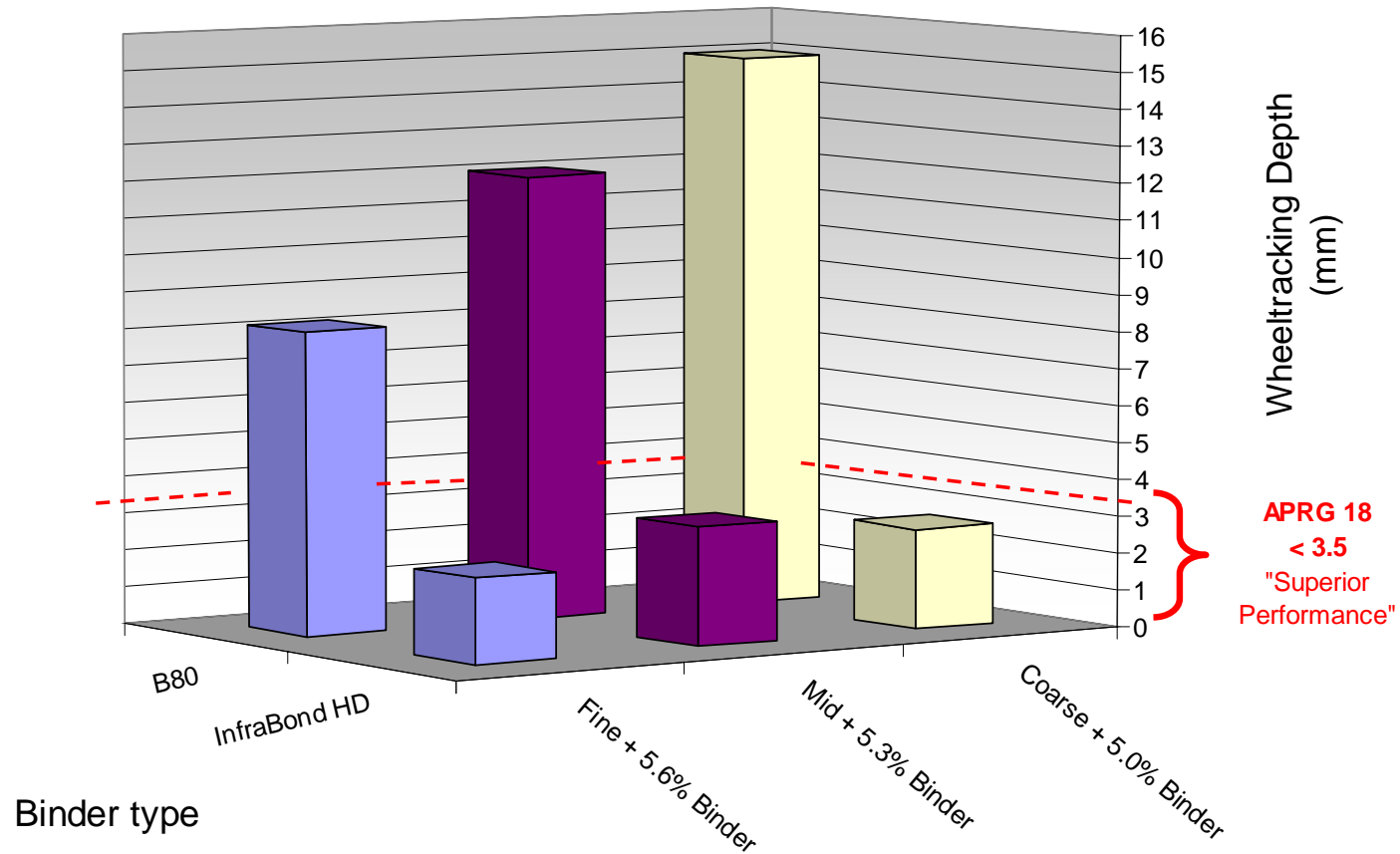
Asphalt Testing - AC14 B60 BB

Wheeltracking @ 60 °C after 10,000 passes



Asphalt Testing – AC14 B60 BB

Wheeltracking @ 60 °C after 10,000 passes



Summary of Results

- **Wheeltracking @ 60°C**
 - TNZ15 B80 is not a good rut resistant mix under repeated loading at 60°C.
 - TNZ15 HD: the substitution with the *InfraBond* HD PMB improved the rut resistance into the APRG18 “Superior” category.
 - AC14 B60 is a medium performing mix in terms of wheeltracking.
 - AC14 HD: the substitution with the *InfraBond* HD PMB improved the rut resistance of this mix into the APRG18 “Superior” category.

Conclusions

- Substituting conventional bitumen binders with *InfraBond HD* PMB dramatically improved the performance of both mixes with regard to fatigue and wheeltracking performance.
- The *InfraBond HD* also flatten the mix performance sensitivity to variations in the aggregate/binder grading across the MCE.
- The replacement of bitumen with *InfraBond HD* PMB improves the performance of Auckland City mixes dramatically.