Annual OBSI study to evaluate NHDOT asphalt pavements for District 5 Resurfacing Project

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New Hampshire DOT
Department of Transportation

Overview

- OBSI study for NHDOT District 5 Resurfacing Project
- 3-mile section of NH State Route 38 south of Pelham, NH
- Measurements conducted Summer 2011 (Rutgers Univ.) and Summers of 2012 through 2014 (HMMH)
- One test section Asphalt Rubber Gap Graded (ARGG) pavement
- Second control test section was Dense Graded Asphalt (DGA)
- Project Goal – measure OBSI levels for each pavement type on an annual basis and compare trends in these values over time

Background

- **3-mile section of NH State Route 38 south of Pelham, NH**
  - two 12-foot travel lanes
  - variable width shoulders
  - two signalized intersections
  - ADT of 12,000 vehicles per day
- **Original construction in late 1950s**
  - 16 to 24 inches of gravel base and 3 inches of a “road mix” pavement
- **Roadway rehabilitated in 2001**
  - full depth reclamation and repaved with 4 inches of new DGA pavement
- **District 5 Resurfacing Project in 2011**
  - existing pavement had started to show signs of weathering/oxidation
  - some longitudinal and thermal cracks had developed

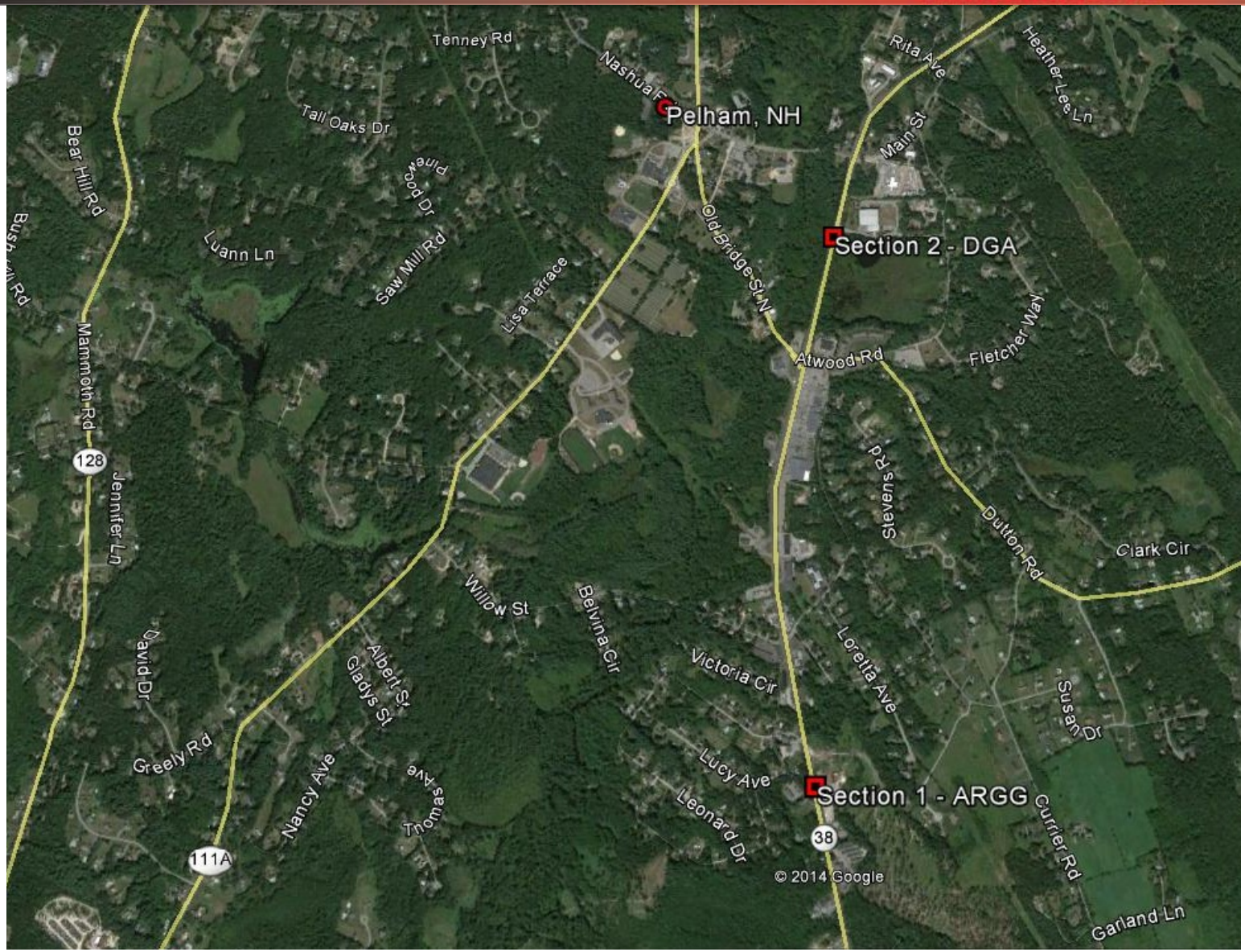
Background

- **NHDOT would typically pave 3/4-inch maintenance overlay**
  - additional service life of 6 to 8 years
- **For District 5 Resurfacing Project**
  - overlay thickness increased to 1-1/2 inches to add pavement structure
  - utilized an asphalt-rubber (AR) modified binder to increase service life
- **All States Materials Group**
  - ASMG has provided AR blending for other New England projects
  - developed gap graded HMA utilizing AR binder (ARGG) with MassDOT
  - used consistently since 2008 to resurface high volume Interstate highways
- **NHDOT decided to pave ARGG overlay, incorporating a 1/2-mile control section of conventional DGA**

Benefits of ARGG vs. Conventional DGA Pavements

- Longer service life
- Use of recycled tire rubber
- Increased resistance to cracking
- Reduced tire water splash/spray
- Reduced tire/pavement noise ?

Study Area – State Route 38, Pelham, New Hampshire



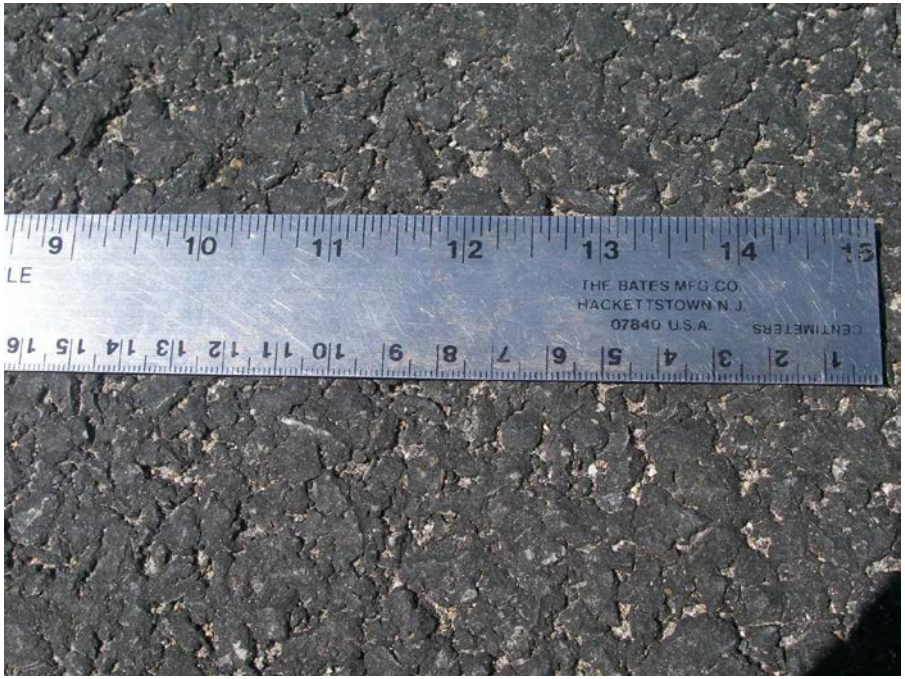
Section 1 Northbound - Asphalt Rubber Gap Graded

Section 1 Southbound - Asphalt Rubber Gap Graded

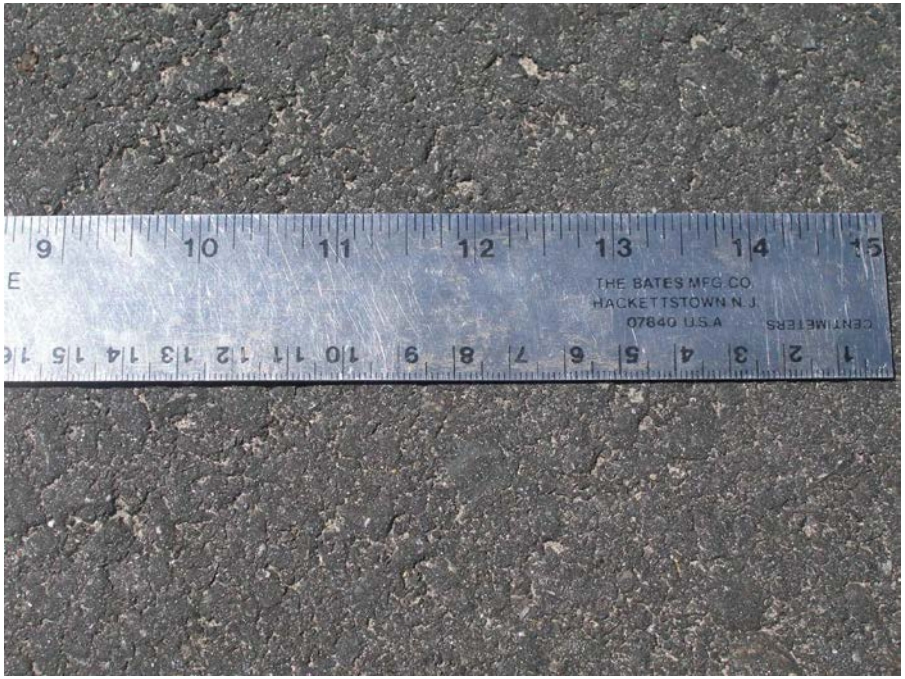
Section 2 Northbound – Dense Graded Asphalt

Section 2 Southbound – Dense Graded Asphalt

ARGG and DGA Pavement Close-ups



Asphalt Rubber Gap Graded



Dense Graded Asphalt

OBSI Test Vehicle

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OBSI Instrumentation

- Standard vehicle mounting rig
- Bruel & Kjaer PULSE real-time data acquisition / analysis system
- Two tire-mounted pairs of phase-matched sound intensity probes
- Meets ANSI Type I specifications
- System calibrated before, during, & after use
- Results accurate within 0.5 dB(A)

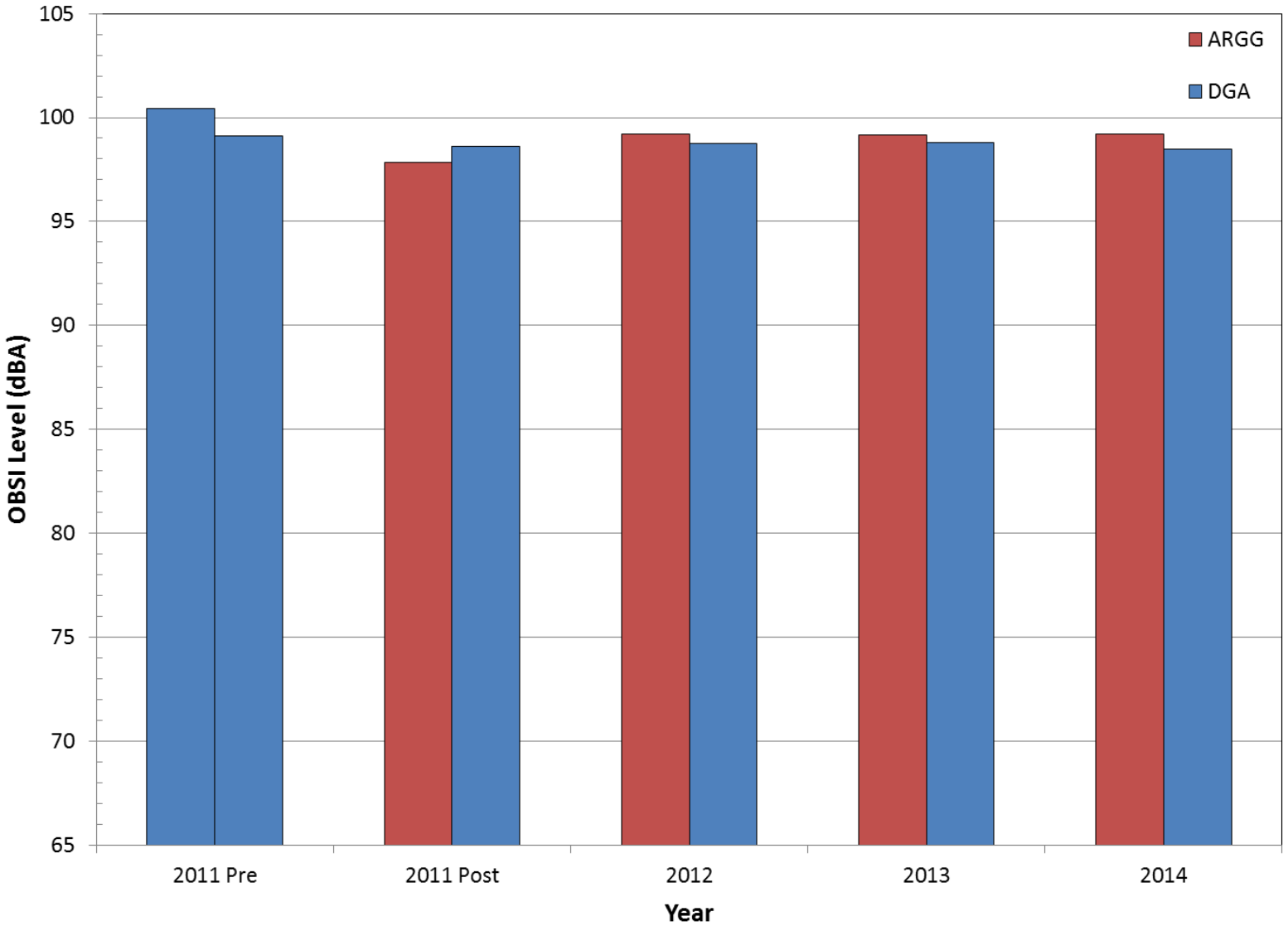
OBSI Measurement & Analysis Procedures

- Used Standard Reference Test Tire (SRTT)
- Tire pressure & hardness were checked
- Vehicle speedometer verified to within 1 mph – GPS unit
- Cruise control used for uniform **45 mph** test speed
- Verified suitable test conditions (roadway dry, free of debris, etc.)
- Accordance with AASHTO TP076 standard
- Conformance with NCHRP Report 630
- Averaged results for Northbound and Southbound directions
- All data were adjusted to account for temperature variations

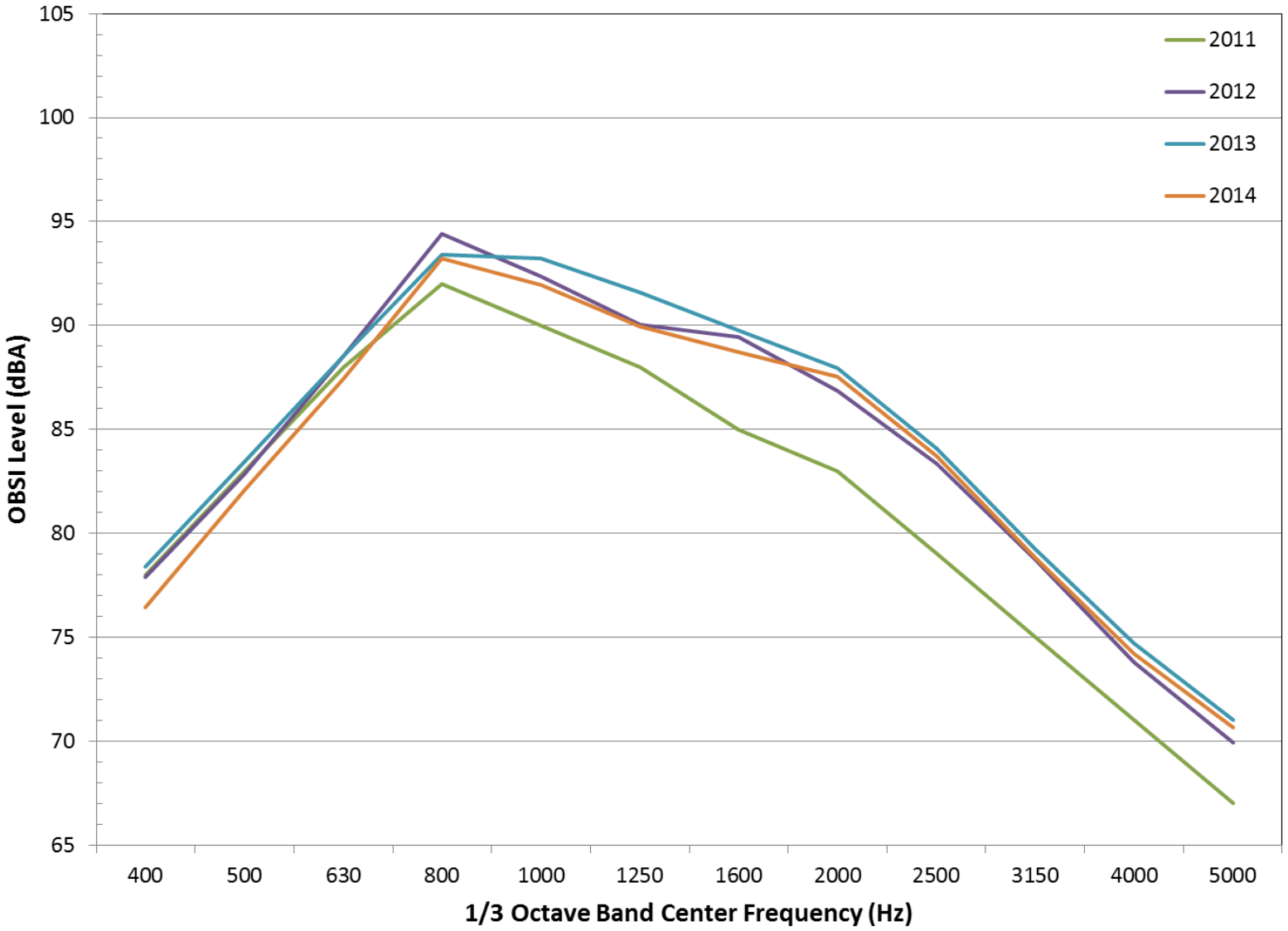
Temperature Correction

- All OBSI measurements conducted about same time of year (May – July)
- Air temperatures about 75 to 85 degrees Fahrenheit
- Pavement temperatures about 90 to 125 degrees Fahrenheit
- Pavement temps exceeded air temperatures by about 10 to 40 degrees
- Up to 30 degree variations in pavement temp at approx. the same air temps
- OBSI levels adjusted to normalized pavement temperature of 100 degrees

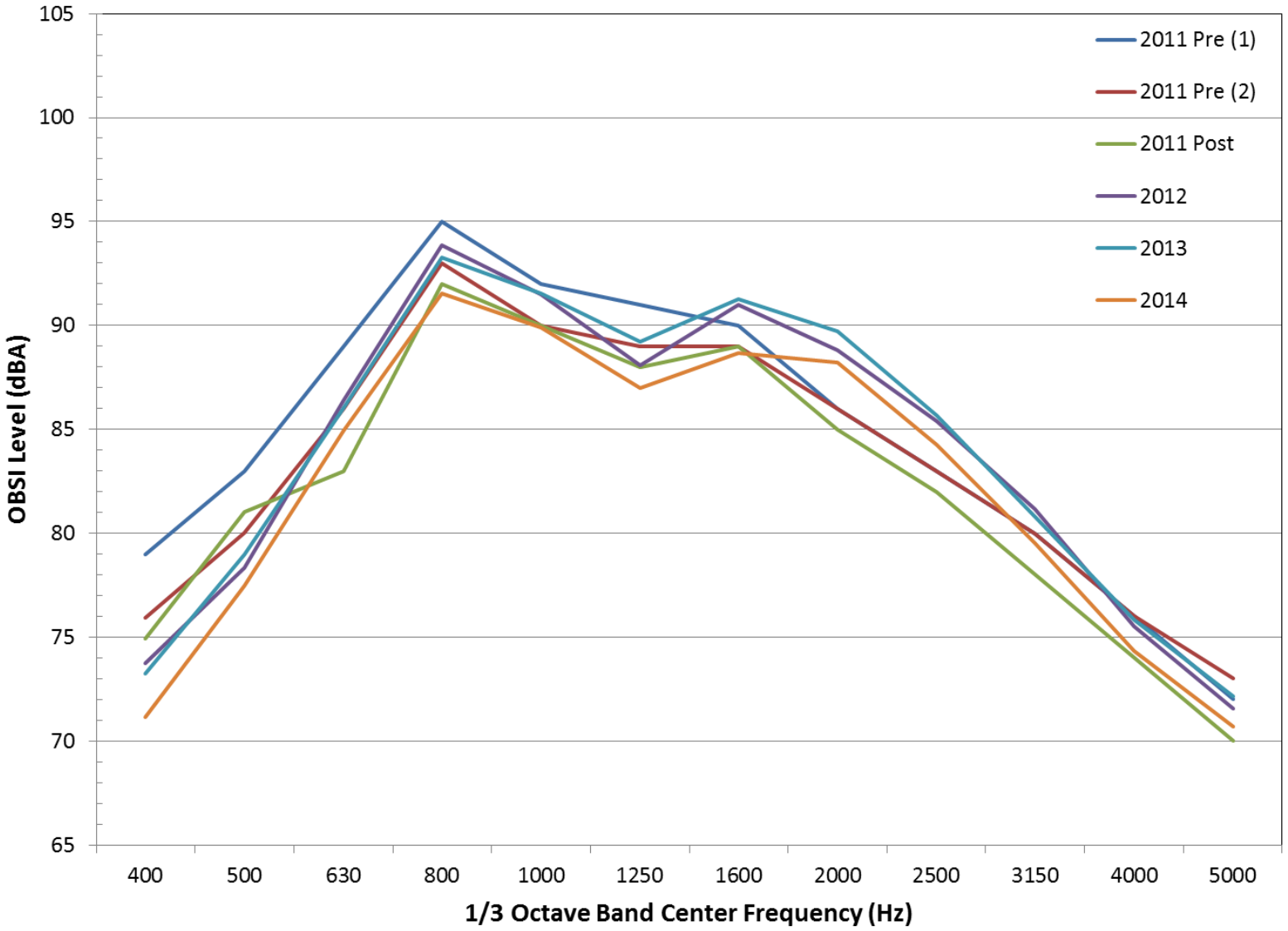
Results: Comparison of OBSI Levels



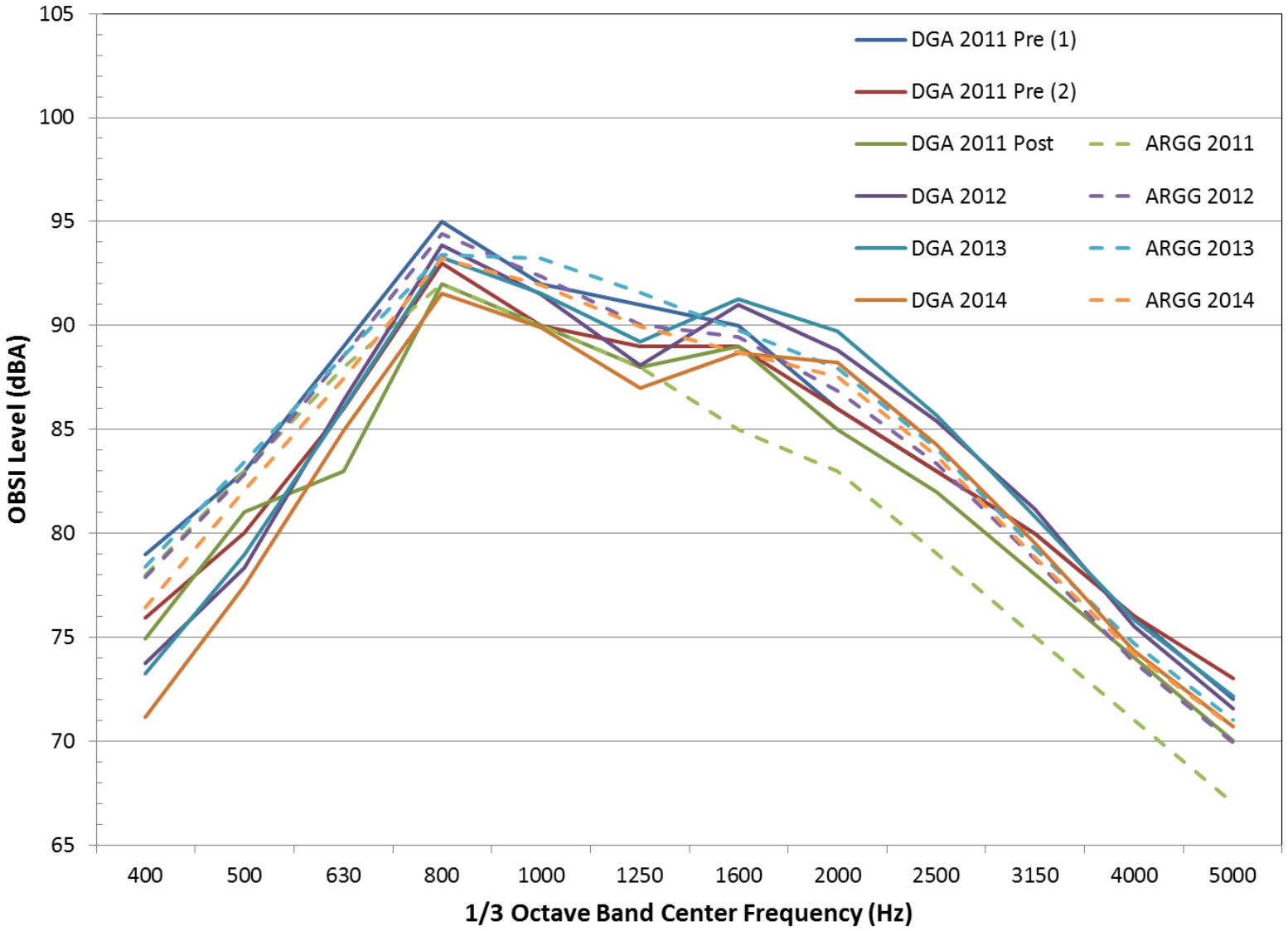
Results: Comparison of Spectral OBSI Levels - ARGG



Results: Comparison of Spectral OBSI Levels - DGA



Results: Overall Comparison of Spectral OBSI Levels



Summary of OBSI Results

- OBSI levels for old DGA pavement about 99 to 100.5 dB(A)
- OBSI level for new DGA pavement about 98.5 dB(A)
- New DGA approx. 0.5 to 2 dB(A) quieter than old DGA

- OBSI level for ARGG pavement initially about 98 dB(A)
- ARGG initially approx. 1 to 2.5 dB(A) quieter than old DGA
- ARGG initially about 0.5 dB(A) quieter than new DGA

- DGA pavement has not degraded over last 3 years
- ARGG pavement degraded approx. 1 dB(A) after 1st year to 99 dB(A)
- DGA now about 0.5 dB(A) quieter than ARGG

Conclusions

- ARGG initially slightly quieter than DGA
- After one year, DGA slightly quieter than ARGG
- OBSI levels about the same for ARGG and DGA pavements
- No significant noise reduction benefit observed for ARGG

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