



# Pavement Acoustics Mapping Demonstration

***Pavement is Dominant Vehicle Noise Source & Impacts Roadside Noise Levels***

**Quieter Pavements Can Lower Roadside Noise Levels**

## 1 - PROBLEM

Noise impacted roadside communities demand noise reducing action. DOTs under intense pressure to reduce transportation infrastructure noise with quieter design options & strategies.

### - FHWA Traffic Noise Model (TNM) -

Positions & distributes a large amount of acoustic energy in vehicle profiles at 5 and 12 ft above the pavement. **Underestimates pavement acoustic variation and it's impact on roadside noise levels.**

### TNM Distribution of Vehicle Sound Energy

#### Above the Pavement:

Motorcycles - **71% energy at 5 ft**

Heavy Trucks - **63% energy at 12 ft exhaust stack**

Passenger Cars - **39% energy at 5 ft \***

\*Avg. Passenger Car Design Vehicle Height = 4.3 ft, 2018 AASHTO Green Book

**TNM assumes pavement acoustics vary only 2.4 dBA for Heavy Trucks and 4.6 dBA for Passenger Cars.**

### Extensive recent acoustic research shows:

- 1) Pavement variation is much larger.
- 2) Most vehicle noise is tire/pavement related.
- 3) Pavement acoustics can significantly impact roadside noise levels.
- 4) Pavement acoustics varies little between 18-wheel Heavy Trucks & 4-wheel Passenger Cars (light vehicles).

## 2 - SOLUTION Hi-tech Precise Measurements

The National  
Academies of

SCIENCES  
ENGINEERING  
MEDICINE

### NAS / NCHRP Research Projects:



**On-Board SI (OBSI)**  
**Tire/Pavement**  
**Passenger Car (PC)**



**Beamforming Array**  
**(Acoustic Photography)**  
**Heavy Truck (HT)**

**NCHRP** NATIONAL  
COOPERATIVE  
HIGHWAY  
RESEARCH  
PROGRAM

## FINDINGS:

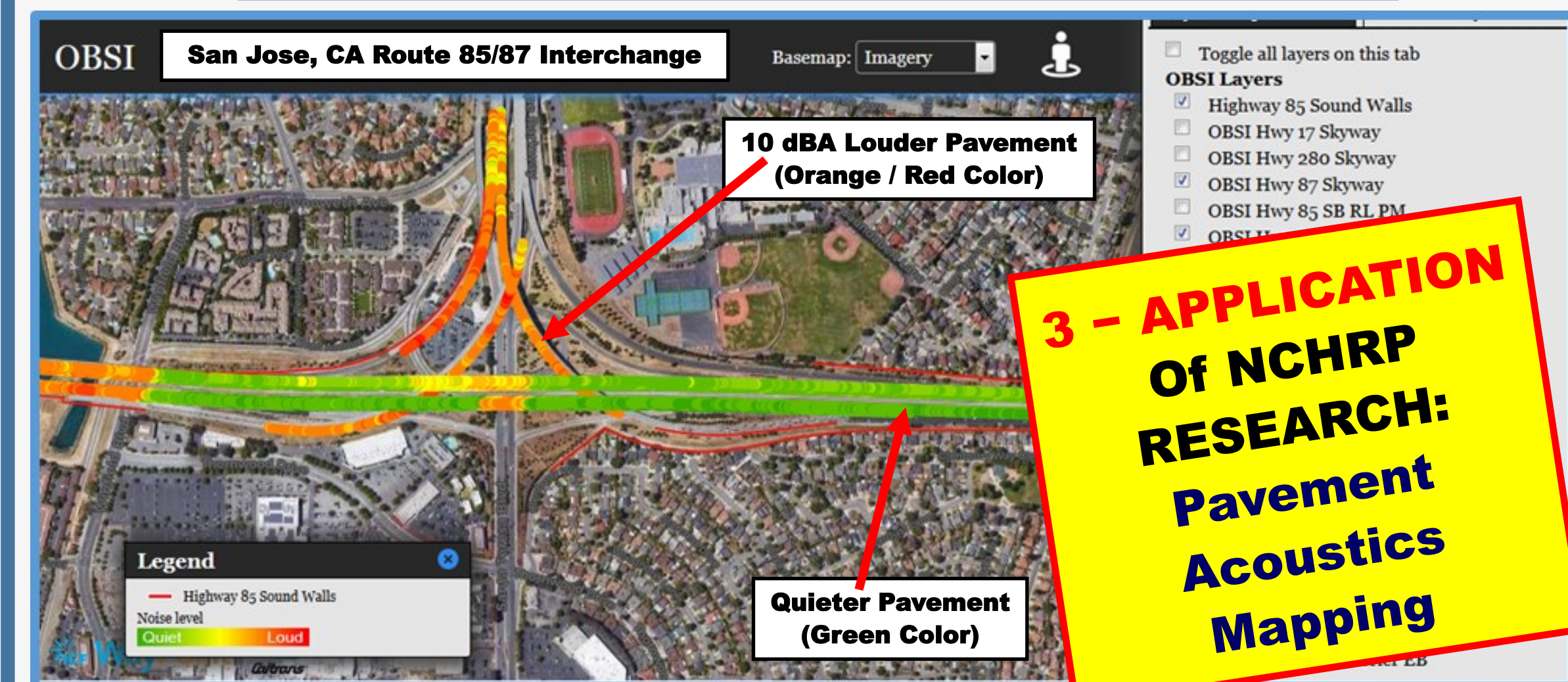
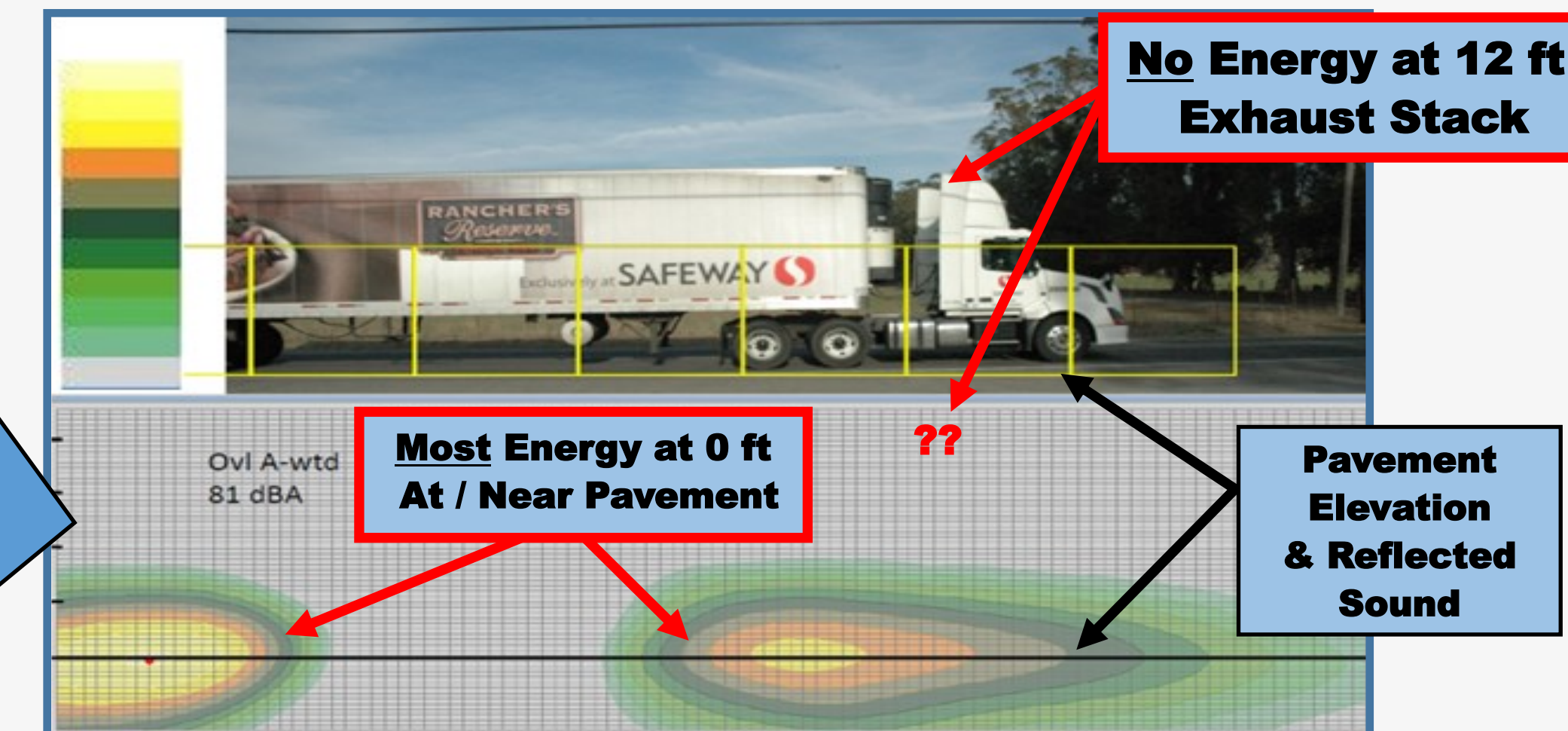
**PC** — at freeway speeds, **most light-vehicle noise is at 0 ft., the tire/pavement interface.**

**HT** — **most noise is tire/pavement dominated or between 0 to 3.3 ft above pavement.**

Pavement varies greatly & influences roadside noise levels 1:1. Example: reduce pavement noise by 6 dBA and the roadside noise levels are reduced by ~6 dBA. Reference: \$2M/mile sound walls reduce noise by 5 dBA.

## NAS / NCHRP Research

Heavy Truck and Passenger Car noise generators are primarily at/near the tire/pavement interface.



## 3 - APPLICATION OF NCHRP RESEARCH: Pavement Acoustics Mapping

Combines OBSI, GPS, & GIS to map quiet & loud pavement, identify loudest sections, and rank order quieter pavement strategies to lower roadside noise levels.

## INNOVATION

Reducing noise at the *Source* is more effective and efficient than altering the *Path* with an expensive wall w/ absorptive treatment. Works on **both** sides of freeway & keeps funds in pavement.

**Efficient, Effective, & Saves \$\$ MONEY \$\$**