

Environmental Training – Noise Abatement



Robert Schiavone

Region 1 Air Quality and Noise Specialist

- 7 years with ODOT
- FHWA's Traffic Noise Model (TNM) Certification
- FTA's Transit Noise and Vibration Impact Assessment Certification
- USDOT's Quarry Noise Model (QNM) Certification



Rob came to ODOT with roughly 20 years RF waveform analysis and computer modeling experience at Intel's Research and Development Labs working on next generation Wi-Fi and Bluetooth standards.

He currently evaluates air quality and noise effects of road construction to verify current and future construction will comply with federal, state, and local regulations. Estimates current and future noise using RCNM, QNM, TNM and other modeling programs.



Environmental Training – Noise Abatement Takeaways

1. Know when a Noise Study is required
2. The noise specialist needs to be engaged early in the process
3. Roadway, Traffic, and Right of Way need to be involved





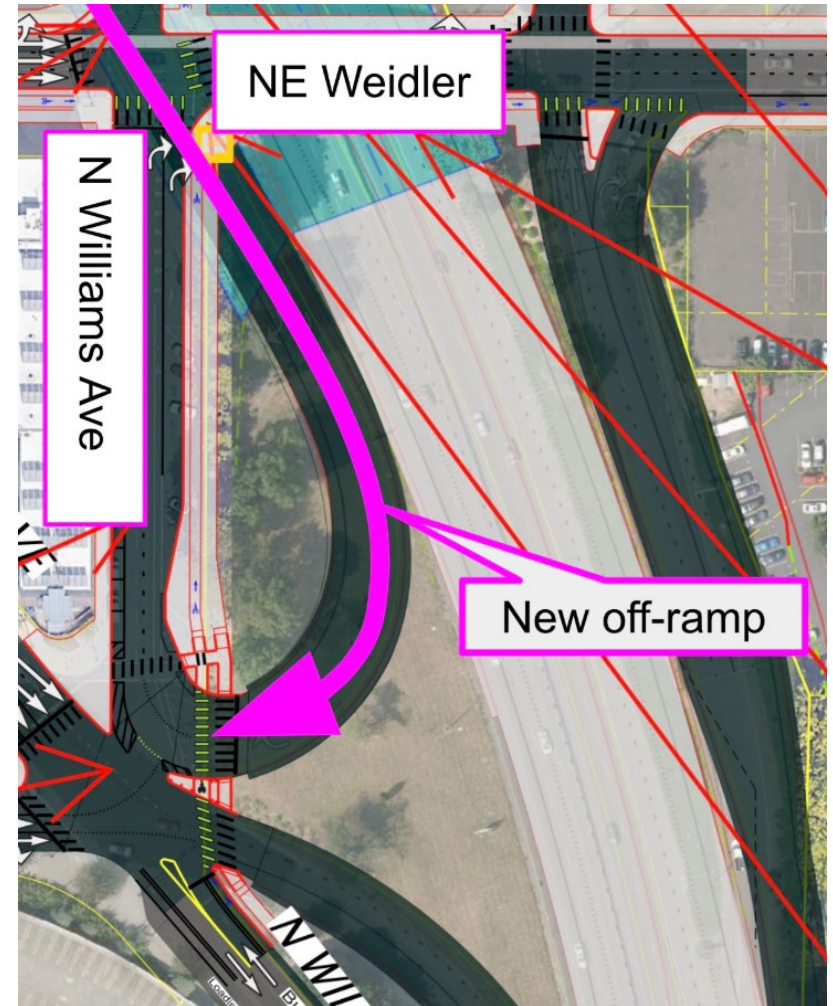
Why do we care about noise?

Federal-Aid Highway Act of 1970

- 23 CFR 772 FWHA highway traffic noise regulation
- *“To provide procedures for noise studies and noise abatement measures to help protect the public's health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to title 23 U.S.C.”*
- Must be a Type I (or Type II) project that will receive Federal funding or requires FHWA approval
- Provides noise analysis guidelines including:
 - noise sensitive receptor categories
 - defines maximum sound levels per category
 - allows states to define noise abatement (ex. walls or berms) requirement criteria with FWHA approval
 - provides feedback to local officials for future development noise impacts

What is a Type I project?

- *This is what triggers a noise analysis or noise screening*
- Roadway construction at a new location (including adding an interchange)
- Increases the number of through lanes (via construction or striping) or creates an auxiliary lane longer than 2500 feet
- *Significant* alteration of an existing highway
 - Horizontal change: Halves the distance to a noise sensitive location (receptor) horizontally
 - Vertical change: Changes the elevation, or removes a land feature, which then places a receptor in line-of-sight to the roadway



What is a Type II project?

An optional set of criteria that allows for abatement consideration which is developed by the state and approved by FWHA.

This allows for Federal funding for noise abatement when it would otherwise not be considered.

Oregon does not have a Type II program.

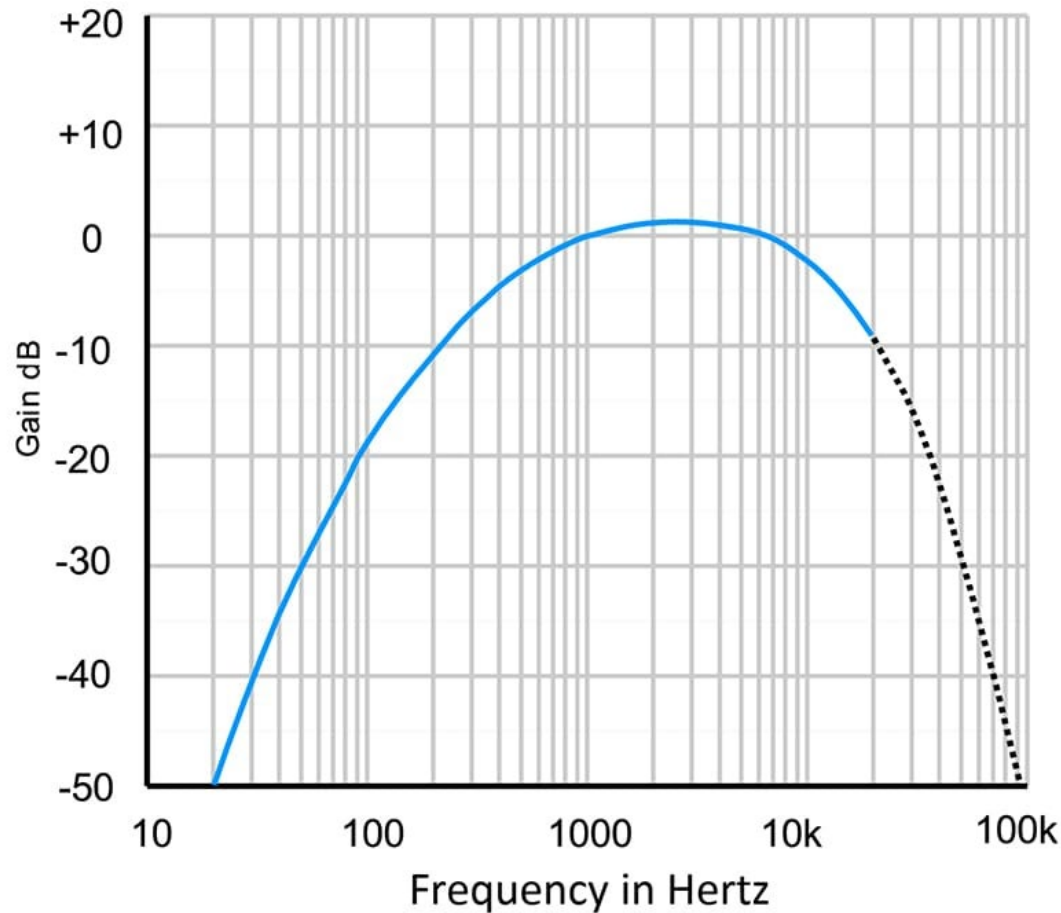


What is a NAAC?

- Noise Abatement Approach Criteria
- Oregon's interpretation of the Federal Noise Abatement Criteria (NAC)
- Measured in decibels in a logarithmic scale

Activity Category	Activity Criteria ^a		Evaluation Location	Land Use Activity Description
	Leq (h)			
	FHWA NAC ^b	ODOT NAAC ^c		
A	57	55	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where preserving those qualities is essential if the area is to continue to serve its intended purpose.
B ^c	67	65	Exterior	Residential
C ^c	67	65	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52	50	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E ^c	72	70	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A–D or F
F	—	—	—	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	—	—	—	Undeveloped lands that are not permitted

What is a decibel?

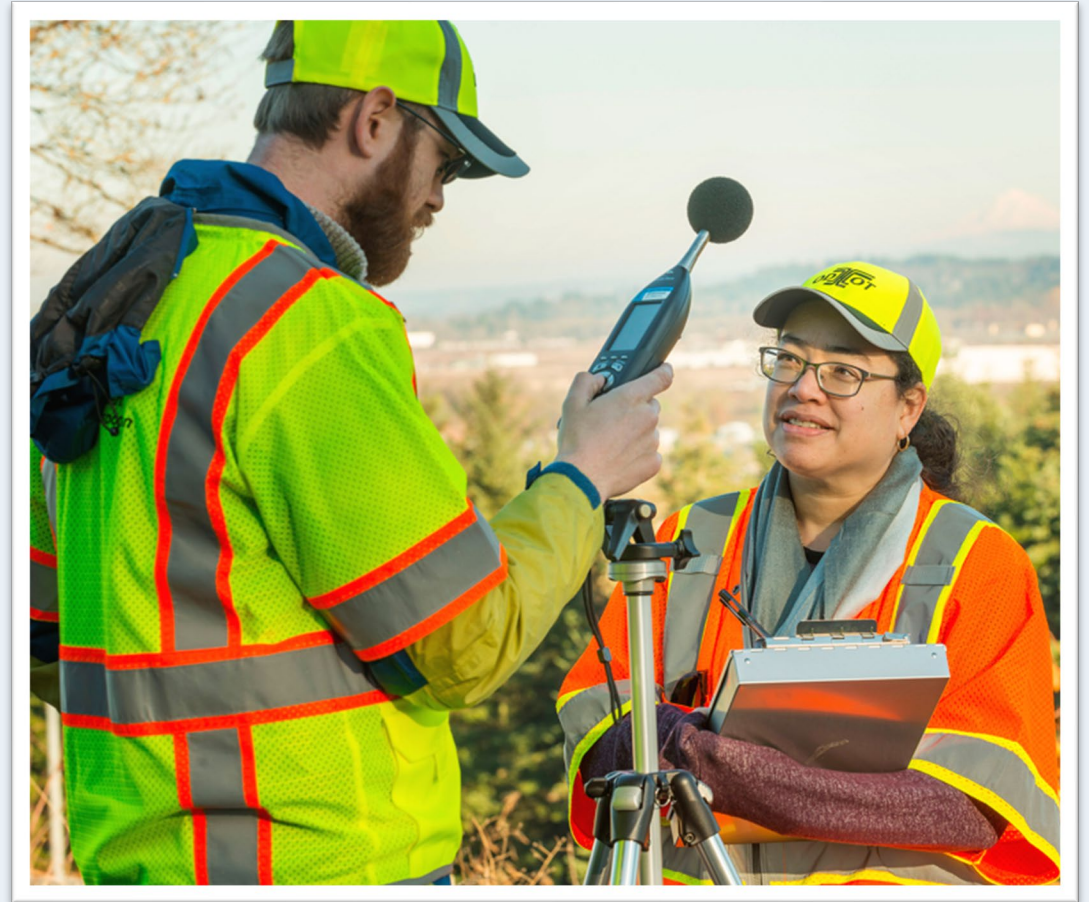


- Based upon a longitudinal pressure wave
- 3dB is the smallest perceivable difference (also the doubling of the *sound pressure*)
- 10dB is what humans perceive as a doubling of sound
- We use an “A weighted” scale for decibels (dBA)
- The Leq is the “average-ish” of the sound levels over a time period, usually 15 minutes
- I.e. 60 dBA + 70 dBA = 67.4 dBA

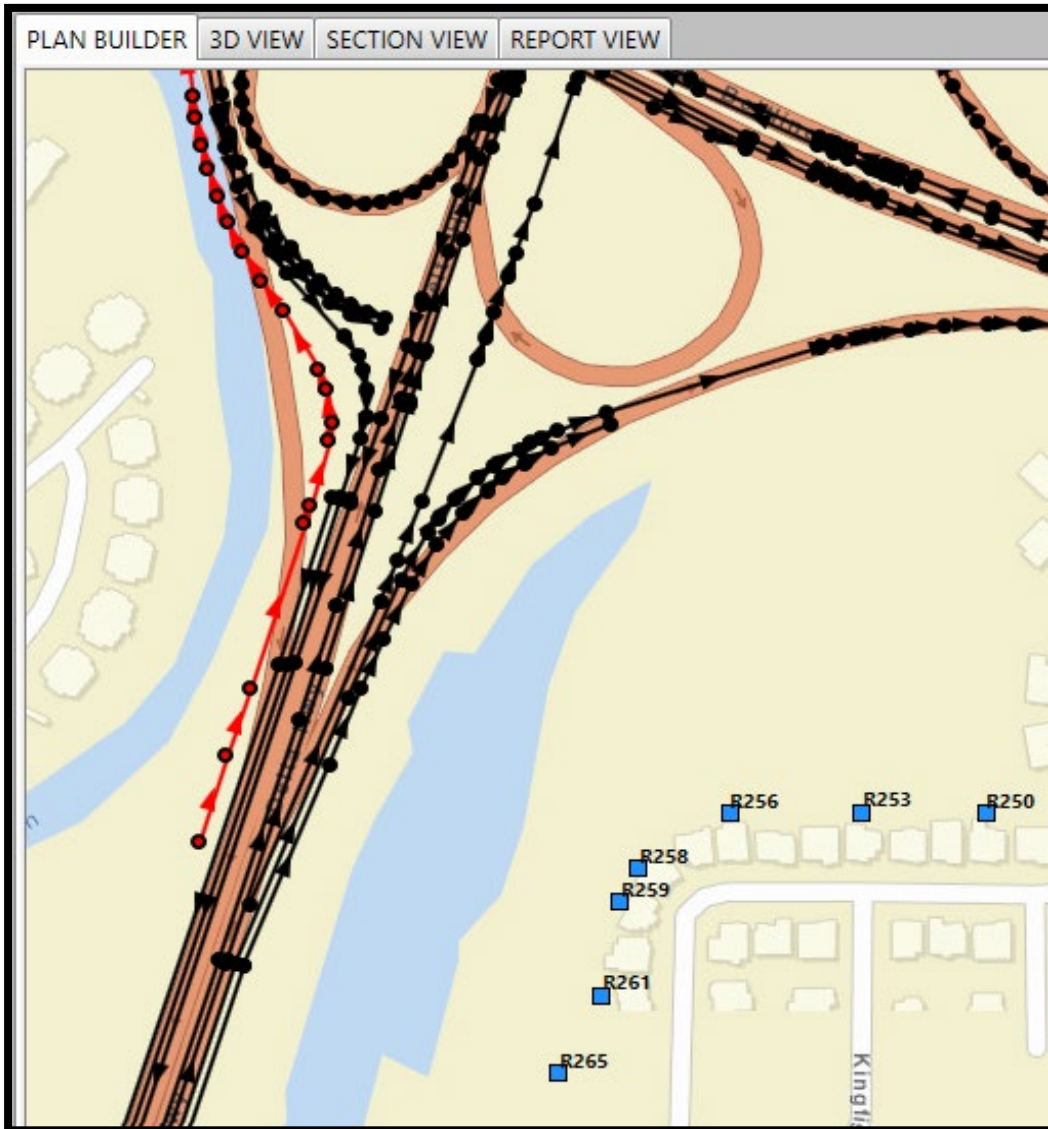
$$dB_{avg} = 10 \cdot \log_{10} \left(\frac{1}{n} \sum_{i=1}^n 10^{\frac{dB_i}{10}} \right)$$

What is a Noise Study? (Part 1)

- Noise specialist determines receivers based on land usage, specific noise sensitive locations (recording studios, hospitals, etc.), and existing noise complaints
- *Receivers are also based on development permits up to the date of public knowledge*
- Representative calibration sites are chosen to verify that the computer model will reasonably match reality
- The noise specialist will take sound measurements and count the traffic observed during the measurement
- The calibration traffic will be placed into the Existing geospatial model, and it must match within 3 dB of the measurement



What is a Noise Study? (Part 2)



- Models are run for Existing, No Build, Build, and Build Truck using data from Traffic
- If there are Impacted receivers then Barrier modeling is performed
 - Equal or greater than the NAAC
 - 10 dB between Existing and Build
- Undeveloped land is modeled every 50 feet to find where it passes the NAAC
- The Noise Technical Report (NTR) is written and given to the Project team
- A letter is sent to local officials with information on undeveloped land NAAC distance



Feasible and Reasonable

(when a noise wall is required)

Feasibility

- A simple majority must get a 5 dB reduction
- Engineering concerns (barrier height, utilities, access, safety, etc.)

Reasonability

- The residents want a wall (a majority votes for it)
- At least one property gets a 7dB reduction
- Cost must be equal or less than \$37,500 per benefitted receptor
 - Based on \$30 per square foot up to 16 foot high, \$37.5 for 17 to 25 feet high

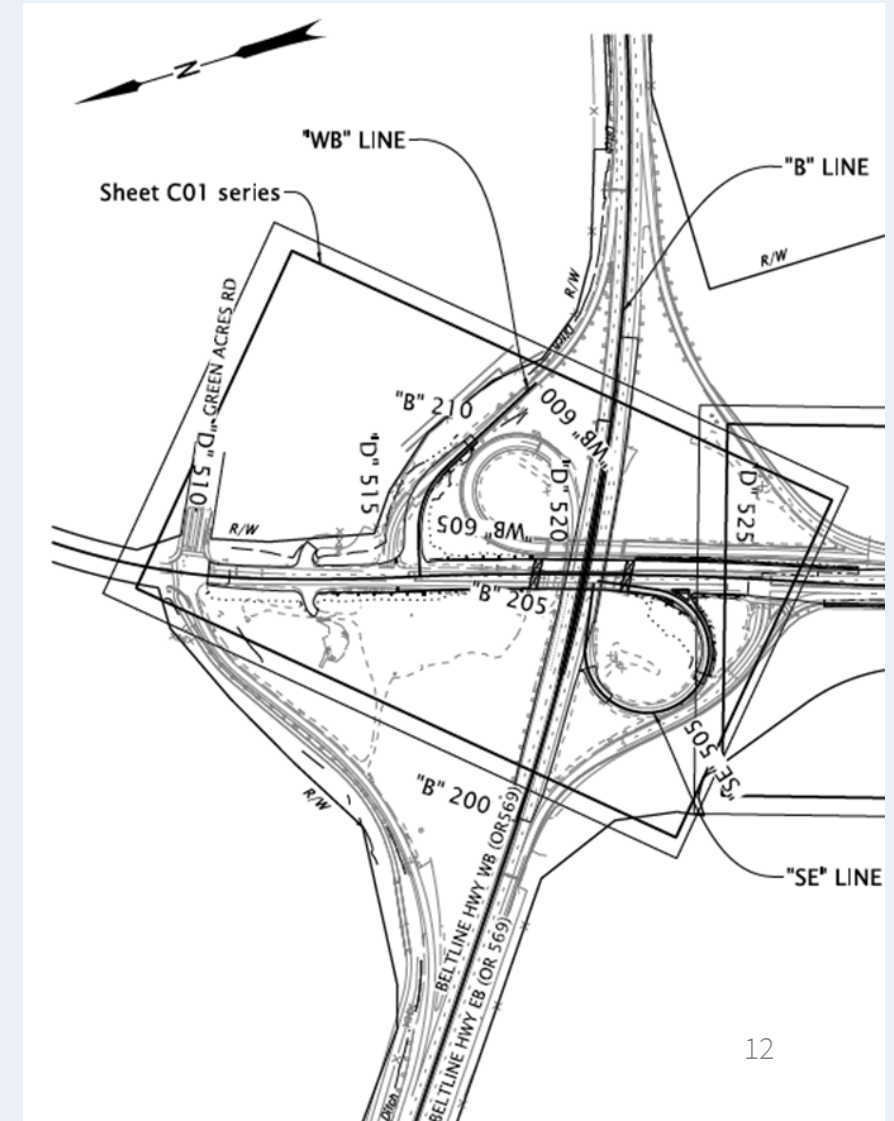
Optional reasonableness criteria increases it to \$52,500 per benefitted receptor

- Exposure to higher absolute highway noise levels (70 dBA)
- Large noise increases between Existing and Build conditions

What the Noise Specialist Needs from You

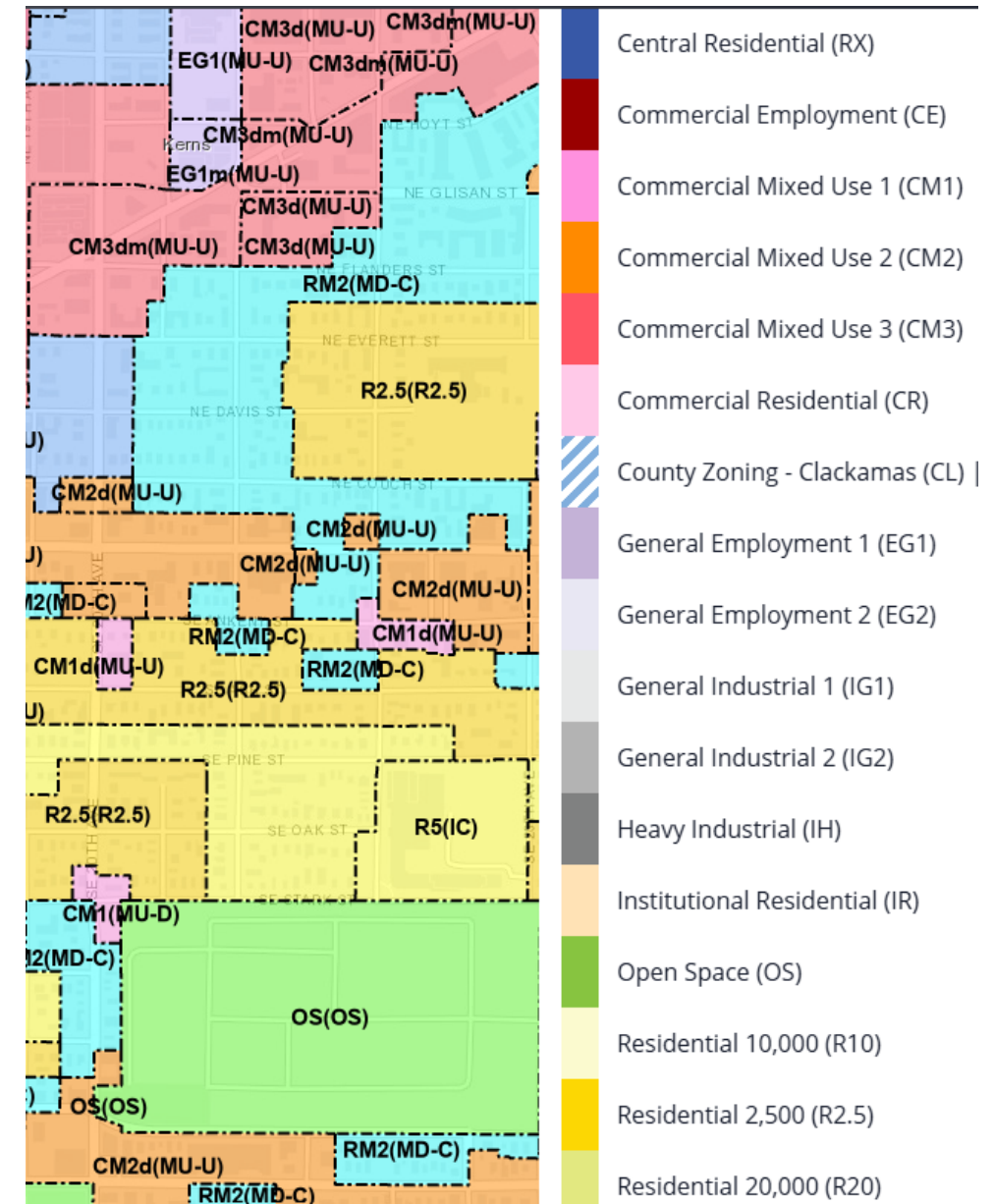
(Part 1)

- ***The earlier the better!***
- The plans need to be given to the noise specialist as soon as possible as they need to get modeled
- IF a noise wall is warranted, the details need to be given to structural and geohydro engineers for their consideration *ASAP (noise modeling only determines height and location)*
- Financial needs to add in the cost (from the above engineers)
- The noise barrier needs to be added into the plans for consideration by the rest of the project team



What the Noise Specialist Needs from You (Part 2)

- Right of Way needs to be contacted to get access to properties to perform Calibration noise measurements
- Information on the purposes of property and buildings are needed to determine the Activity Category (NAAC)
- Traffic needs to be engaged early to provide the data for the models
- Roadway needs to be engaged to get elevations and roadway centerlines





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Recommended Websites:

<https://www.oregon.gov/odot/GeoEnvironmental/Pages/Acoustics.aspx>

<https://www.fhwa.dot.gov/environment/noise/>

<https://www.ecfr.gov/current/title-23/chapter-I/subchapter-H/part-772>

$$L = L' + 10 \lg \left(1 - 10^{-0.1(L' - L_{\text{res}})} \right) \text{ dB} + \delta_{\text{sou}} + \delta_{\text{met}} + \delta_{\text{loc}}$$

Questions?

