Noise Levels in Dundee for the OR18: Newberg-Dundee Bypass Project

Community Meeting
6:00 – 8:00 p.m.  April 24, 2018
Dundee Fire Station

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Carole Newvine, ODOT

Aerial photos courtesy of ODOT Photo-Video Services
Bypass Project Info

- February data showed 12,000 vehicles are using the Bypass (24 hour count)
- Each of those vehicles makes Noise. A truck in general creates the same sound energy as 25 cars.
- Since the Bypass opened in January, ODOT has received a number of calls and emails about the Noise generated by the traffic on the Bypass.
Bypass Noise: Concerned Neighborhoods
Sound and Noise

• Sound is an energy wave that passes through the air to reach a receiver.

• Noise is any unwanted sound.

• A particular version of unwanted noise is trucks using compression braking (also known as engine braking or jake braking).

• Numerous complaints ODOT received are about engine braking noise.
Truck Noise

• National standards allow for engine braking.
• No national laws or Oregon state laws prohibit engine braking for legal trucks with a muffler system on the truck.
• Oregon has a law against un-muffled trucks using engine braking. If a police office stops a truck with particularly loud engine braking and the truck does not have a muffler, then a citation can be issued.
• If the stopped truck has a muffler, no law has been violated.
Discussion of How Sound Travels

Sound travels through the air as a wave. Below is a classic ripple pattern in water that is much easier to see than sound waves in the air.
How Sound Travels

The vibration of the air molecules is how the wave energy is transmitted from the source to the receiver. Below is drawing of sound waves produced by a roadway and the sound is shown as curved waves.
How can you reduce noise?

Distance: Noise decreases the further you are from the roadway.

Future residential areas are zoned away from major noise sources.

Abatement: Sound walls are often installed to block some of the noise.

The area with less noise behind the wall is sometimes called a Shadow Zone.
Noise decreases based on distance

Typical noise level for roads based on distance from the road from a federal highway web site.

<table>
<thead>
<tr>
<th>Distance (ft)</th>
<th>Noise Level (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>63</td>
</tr>
<tr>
<td>400</td>
<td>55</td>
</tr>
</tbody>
</table>

Bypass is 2 lanes

The Green Line

Typical noise levels

- 200 ft: 63 dBA
- 400 ft: 55 dBA

Drawing modified to remove 6 and 8 lane noise curves
Sound energy decreases with distance. Each doubling of the distance drops the reading by 3-4.5 dBA.
Distance From Bypass

Homes within 400 ft = 11
On the left is several manufactured home parks. Over 40 homes (within 400 ft.) for each block of wall.

On the right is Springbrook Ridge apartments with 8 buildings with 8 units each for 64 total.

Both parks voted yes for a wall.

Springbrook Ridge voted “no” on a wall.
Barriers reduces noise by shielding

A home in the shadow zone may be quieter than one that is further away if the distant house has a direct line of sight.
Sound bends over and around walls. A short wall lowers the noise level for a small distance.
Taller Wall Shadow Zone

Taller wall = bigger shadow. Sound walls effectively lowers noise for 200 ft., after that the benefit drops off. After 300 ft. the reduction is only 1-2 dBA.
Most of us know what noise is, how does ODOT measure it?

Different Noise Measurements
What do they mean?

$L_{\text{max}}$ is the peak noise measured

$L_{10}$ is the noise level that is exceeded 10% of the time

$L_{\text{eq}}$ is the noise level that at a continuous rate will equal the energy of the entire event (gold line)
Noise always changes, how do you measure it?

Highway traffic noise is never constant. Traffic noise variations can be plotted. In the model, we convert the noise data to a single representative number.

The two most common statistical descriptors used for traffic noise are \( L_{\text{eq}} \) and \( L_{10} \) (the sound level exceeded 10 percent of the time).

Measured noise is louder than \( L_{10} \) for 6 minutes (which is 10% of an hour).
Explain how you get the Leq number.

L_{eq} for typical traffic conditions is usually about 3 dBA less than the L_{10} for the same conditions.

The Federal Highway Administration sets noise impact criteria close to highways. The numbers below are for residential property.

<table>
<thead>
<tr>
<th></th>
<th>L_{10}</th>
<th>L_{eq}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Highway</td>
<td>70 dBA</td>
<td>67 dBA</td>
</tr>
<tr>
<td>ODOT Levels</td>
<td>xxxxxx</td>
<td>65 dBA</td>
</tr>
</tbody>
</table>

The other noise impact is the difference between the existing noise level and the noise level after the roadway is built. That criteria is 10 dBA.
Noise Leq formula

\[ \text{Leq} = \text{Lae} - 10 \times \log_{10} (\text{Time}) \text{ (dB)} \]

\( \text{Leq} \) is a composite descriptor that represents both the intensity of a sound and its duration, and provides a measure of the net impact of an entire acoustic event.

In most instances, \( \text{Leq} \) is approximately 3 dBA less than \( \text{L}_{10} \).

The Noise Model calculates \( \text{Leq} \) using the top formula instead of the subtracting 3 dBA approximation.
Measured Noise versus Modeled Noise

With very few exceptions, the sound wall decisions are based on the predicted noise levels in the Model instead of the noise measurements.

ODOT is measuring noise levels at selected places in Dundee and Newberg. We are taking the measurements to either validate the modeling that was done or find places where the modeling was wrong.

We are checking in communities that did not get a sound wall and in places where a sound wall was built to see if the wall provided the benefit the model predicted would occur.
Impacted Receiver: In Oregon, a receiver is considered to be impacted when the noise level is 65 dBA for Residential Properties.

Substantial Noise Increase: An increase of at least 10 dBA designed vs existing.

Impacted: Benefited
Distance From Bypass

Homes within 400 ft = 11
Feasible: Reasonable: Community Support
**Feasible:** Reasonable: Community Support

**Benefited Receptor:** A home that receives a noise reduction of at least 5 dBA, regardless of whether or not the receptor is impacted. In Oregon, **one benefited receptor must achieve** the noise reduction of 7 dBA.

**Feasible Abatement:** For an abatement measure to be feasible, ODOT requires that a simple majority of impacted receptors receive a minimum reduction of 5 dBA in noise levels.

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**Feasible: Reasonable: Community Support**

**Reasonable Abatement:** An abatement measure that has been determined to be (1) **cost effective**, (2) approved by a simple majority (over 50%) of property owners and residents, and (3) achieve ODOT’s noise reduction design goal 7 dBA for at least one receptor. All three criteria must be met.

All benefited residences must be considered in calculating a noise barrier’s cost per residence. A benefited residence is any that receives a noise reduction of 5 dBA or more. A reasonable cost is considered to be a maximum of $25,000 per benefited residence. Wall Construction Cost Only.

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**Feasible: Reasonable: Community Support**

If you clear the Feasible and Reasonable Hurdles, then the wall issue is put to a vote. All of the benefited receptors (homes) that get a benefit of 5 dBA get the opportunity to vote. You do not have to be on the impacted list to vote.

If over 50% of the benefited votes are yes build a wall, then a wall is built. If over 50% of the votes are no, then the process stops and a wall will not be built.
### Feasibility

<table>
<thead>
<tr>
<th>FEASIBILITY</th>
<th>Yes</th>
<th>No</th>
<th>If no, abatement evaluation stops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Impacted Receptors:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Impacted Receptors Receiving 5 dBA Noise Reduction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Constructability Issues (if any):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposed Barrier Meets Feasibility Criteria</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

How many homes in the neighborhood are impacted?

Looking at wall sizes, will one or more wall reduce the $L_{eq}$ by 5 dBA for over 50% of the Impacted Receptors?

### Reasonableness

<table>
<thead>
<tr>
<th>REASONABLENESS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. NOISE REDUCTION DESIGN GOAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Benefited Receptors Meeting Noise Reduction Design Goal of 7 dBA:</td>
<td>(if not at least one, evaluation stops here)</td>
<td></td>
</tr>
<tr>
<td>2. COST BENEFIT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cost of Barrier:</td>
<td>Cost per Benefited Receptor:</td>
<td></td>
</tr>
</tbody>
</table>

(Cannot be greater than $25k/receptor or if one of the optional reasonableness criteria is met, cannot be greater than $35k/receptor) (if not, evaluation stops here)

Optional Reasonableness Criteria – used only to justify cost/benefited Receptor between $25K and $35K (Section 7.4.4 of the Noise Manual)

<table>
<thead>
<tr>
<th>Absolute Highway Traffic Noise Levels for Build Condition (from modeling)</th>
<th>Current Use:</th>
<th>Future Use:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in Noise Levels Between Existing and Future Build Conditions</td>
<td>Existing Noise Level:</td>
<td>Future Noise Level:</td>
</tr>
<tr>
<td>Date of Development (for Retrofit Abatement Projects only)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is there wall that benefits over 50% of the homes reasonable?
Impacted Receiver: In Oregon, a receiver is considered to be impacted when the noise level is 65 dBA for Residential Properties.

Substantial Noise Increase: an increase of at least 10 dBA designed vs existing.

Impacted: Benefited
If a wall is Feasible and Reasonable, it goes out for a vote. If the community says yes, the wall is funded to be built. If the community says no, then a wall will not be built.
24 hour Monitoring Sites

PC3 is in Newberg.
24 hour Noise Reading (PC1)

Max hour Leq is 58 dBA.
Max hour Leq is 68 dBA.
Max hour Leq is just over 70dBA.
Max hour Leq is 63 dBA.
Dundee is a thriving community that will grow over the next 20 years. The City growth will mostly be to the east between the Bypass and the River.
Dundee in the future

Dundee expects to add approximately 600 households between 2012 and 2035
Dundee Master Plan

Figure 1 - Riverside District Land Uses

Note: Locations of river access/recreation areas, a potential future golf course, future neighborhood parks, and pocket parks should be considered approximate and conceptual. Locations of these elements will be further defined through subsequent development application processes.
Definitions for Noise Program

dBA: A unit of measurement for traffic noise, “dB” refers to decibel and “A” refers to the frequency scale. The “A-scale” is a frequency weighing system that closely represents the average human hearing response.

Impacted Receiver: In Oregon, a receiver is considered to be impacted when the future build alternative noise level is 65 dBA for Residential Properties. The FHWA noise abatement criteria is 2 dBA higher at 67dBA.

Substantial Noise Increase: One of two types of highway traffic noise impact. In Oregon, a substantial increase impact is an increase of at least 10 dBA in the design year over the existing noise level and is independent of the absolute noise level.

Benefited Receptor: The recipient of an abatement measure that receives a noise reduction of at least 5 dBA, regardless of whether or not the receptor is impacted. In Oregon, one benefited receptor must achieve the noise reduction of 7 dBA.

Feasible Abatement: Abatement that has been judged to be effective at lowering noise levels and is possible to construct based on acoustical and engineering factors. For an abatement measure to be feasible, ODOT requires that a simple majority of impacted receptors receive a minimum reduction of 5 dBA in noise levels. Feasibility or constructability of an abatement measure includes acoustical and engineering factors.

Reasonable Abatement: An abatement measure that has been determined to be cost effective, approved by a simple majority (over 50%) of property owners and residents, and is able to achieve ODOT’s noise reduction design goal is 7 dBA for at least one receptor. In assessing reasonable noise abatement ODOT must consider the viewpoints of the residents and property owners that benefit from the proposed abatement, the cost-effectiveness of the abatement measure, and the ODOT noise reduction design goal for abatement. All three criteria must be met to satisfy the reasonableness requirement. Assessing reasonable criteria will be done only after the proposed abatement has been determined to be feasible.
Definitions and Rules for Noise Program

Model Validation: To test the accuracy of TNM in the project area, the model output is compared to field measurements at the same locations. The noise analyst should use the concurrent traffic counts and vehicle mix data gathered during field measurement as inputs to the model. The modeling results must agree with the measured data within ±3 dBA.

Noise Reduction Design Goal: The optimum desired dBA noise reduction determined from calculating the difference between future build noise levels with abatement to future build noise levels without abatement. In Oregon, one benefited receptor must achieve the noise reduction design goal of 7 dBA.

Traffic Noise Model: the FHWA Traffic Noise Model (TNM) (currently version 2.5)

Truck Restrictions can effectively mitigate traffic noise for some locations. Such restrictions are not recommended where they conflict with the designated use of the roadway or create unreasonable delays or hardship to the motoring public. ODOT’s policy is to not restrict trucks on a State highway.

Speed restrictions may be evaluated to mitigate traffic noise where they do not conflict with the roadway's designated use or create unreasonable delays or hardship to the motoring public.

Architectural Mitigation (Noise Insulation): Architectural treatment for noise mitigation may be used for public or nonprofit institutional buildings such as schools, places of worship, libraries, and some commercial activities (see land use activities under Activity Category D in Table 1). ODOT will not pay for sound proofing residential property.

Locating noise barriers within a public ROW may not be reasonable or feasible. If so, consideration can be given to locating the noise barriers on private property. Such noise barriers must meet the same requirement of reasonableness and feasibility as mitigation located along an existing public ROW. When barriers are located on private property, a permanent easement is necessary for wall maintenance.
Viewpoints of the Property Owners and Residents  If the sound wall has met all other criteria for Feasibility and Reasonableness, then Benefitted Residences and Property Owners are sent a letter asking them for their vote. The Letter is the Noise Abatement Survey. If a simple majority (51% or higher) vote yes to the wall, the wall will be built. If over 51% of the benefitted residences, vote no, then the process is over and the wall will not be built.

Votes from those responding to the noise abatement survey will be counted according to the following manner:

- Each property owner gets one vote.
- Benefited residents in multi-unit complexes (such as apartments) get one collective vote after those individual votes are tallied. A collective vote results in one yes vote or one no vote.
- The property owner of the multi-unit complex gets one vote.
- In the case of condominium complexes where some of the units are owner-occupied and some are rented, the owner-occupied unit gets one unique vote, the renters get a collective vote, and the offsite owners get one vote each.
- For mobile home and trailer parks, each resident gets a unique vote and the property owner gets one vote.
- A renter of a single-family property gets one vote and the owner gets one vote.
Links to manuals and web sites

- Unmuffled Engine Braking Law: [https://www.oregonlaws.org/ors/811.492](https://www.oregonlaws.org/ors/811.492)

Dundee Transportation System Plan

Dundee Master Plan
QUESTIONS?

Contact Info

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