Proposed Thoroughfare Noise Stipulation Study

for

Manatee County Planning Department

prepared by:

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Consultants in Architectural and Environmental Acoustics
Manatee County I-75 Corridor Noise Stipulation

Residential development permitted on sites with LDN ≤ 65 dBA

If sound levels on site are > 65 dBA, noise mitigation must be employed to reach the 65 dBA criterion

Mitigation to include barriers or berms to protect both the site and the homes

Living areas, bedrooms, lanais and Florida rooms located away from the noise source

Maximize distance between homes and I-75 to the extent practicable
County Noise Ordinance

Noise Ordinances usually do not apply to transportation noise sources

- Acoustical measurements not required to demonstrate that noise disturbance exists

- Acoustical measurements required to demonstrate maximum permissible sound levels are exceeded

- 55 dBA (day) and 50 dBA (night)

- Sound level limits reduced by 5 dBA for tonal sounds; increased by 10 dBA during day for short duration sounds

- Examples of Exempt Sound Sources:
  - Lawn care
  - Maintenance of trees, hedges, gardens
  - Sweepers
  - Lawn mowers
  - Limb chipping
  - Tree trimming
  - Solid waste and recycling equipment (6:00 am to 6:00 pm)
The Day Night Average Sound Level (LDN) is the average sound level taken over a 24 hour time period with a 10 dB penalty added to sounds that occur during night time hours.

The Equivalent Continuous Sound Level (Leq) is the continuous or average sound level in a period of time.
Sound Reduction with Distance

- Sound is reduced approximately 4.5 to 6 dB per doubling of distance from an individual car or truck.

- Sound is reduced approximately 3 dB per doubling of distance for a continuous line of traffic.
Traffic Barrier Wall

- 6 to 10 ft. tall wall for cars
- 10 to 20 ft. tall wall for trucks and cars
- Approximately 4 to 12 dBA sound reduction possible

Acoustic "shadow" zone gives maximum noise reductions for first 1 to 3 rows of homes nearest barrier wall

Barrier located 35 to 50 ft. from edge of road

Height of wall near the eave line of homes
Traffic Barrier Wall Wrapping Sides of Site

Wrap walls or berm to block
180° line of sight to road

Use increased distance
and vegetation for
increased noise reduction

Locate walls or berm close to
homes and yards to be protected
METHOD

1. Conduct site visits and project meetings to select measurement sites, develop analysis protocols and obtain traffic counts.

2. Review existing County Noise Stipulation for I-75 corridor as well as various acoustical standards from Federal agencies.

3. Take acoustical measurements of traffic noise and ambient sounds at the 12 selected sites.

4. Iterative computer models of noise mitigation alternatives.

5. Data analysis, recommendations and report.
R1 Moccasin Wallow West
66 dBA LDN
2 lane undivided urban collector
6 lane divided collector

R2 Moccasin Wallow East
63 dBA LDN
2 lane undivided urban collector
6 lane divided collector

R3 Lockwood Ridge and 70th Drive
72 dBA LDN
4 lane divided minor collector
4 lane divided collector
R4 Lorraine Road/Sienna Loop
65 dBA LDN
4 lane divided urban collector
4 lane divided arterial

R5 Lakewood Ranch North of SR 70
70 dBA LDN
2 lane divided minor arterial
6 lane divided principal arterial

R6 SR 70 East of Braden Run
70 dBA LDN
6 lane divided principal arterial
6 lane divided principal arterial
R7 63rd Avenue at Cascades
57 dBA LDN
4 lane unclassified divided road
4 lane divided arterial

R8 Honore at Mote Ranch
58 dBA LDN
2 lane divided urban collector
4 lane divided arterial

R9 Ellenton Gillette Road by Cemetery
64 dBA LDN
2 lane undivided busy urban collector
2 lane arterial
R10 US 301 by Colony Cove/Victory Road
73 dBA LDN
6 lane divided principal arterial
6 lane divided principal arterial

R11 SR 62 ½ mile East of US 301
65 dBA LDN
2 lane undivided minor rural arterial
6 lane arterial

R12 Rye Road by Entry to Country Creek
61 dBA LDN
2 lane undivided urban collector
4 lane arterial
Data sorted into 4 groups of sites based on LDN
Data normalized to a 100 ft distance from the edge of the road to the nearest part of a residential property

GROUP 1
LDN 70-74 dBA  Major arterials, 6 lane divided highways
               Traffic moving at higher speeds
               Large numbers of cars and trucks
               US 301

GROUP 2
LDN 65-69 dBA  2 lane rural and 6 lane arterials
               High truck counts, high speed travel
               SR 70, SR 62 and Moccasin Wallow East

GROUP 3
LDN 60-64 dBA  4 lane divided connectors and 2 lane roads
               Sub group 1 – primarily auto traffic
               Lockwood Ridge, Lorraine Road and Ellenton Gillette Road
               Sub group 2 – trucks
               Moccasin Wallow West

GROUP 4
LDN 55-59 dBA  Lightly traveled roads with cars at moderate speeds
               63rd Avenue at Cascades, Honore, Rye Road
Manatee County Thoroughfare Noise Stipulation
Location: R10A US-301
January 14, 2008 (Monday) to January 15, 2008 (Tuesday)

LDN = 73 dB
Manatee County Thoroughfare Noise Stipulation
Location: R6 SR-70 at Braden Woods
November 19, 2007 (Monday) to November 20, 2007 (Tuesday)

LDN = 69 dBA.
Manatee County Thoroughfare Noise Stipulation
Location: R9 Ellenton Gillette Road
November 27, 2007 (Tuesday) to November 28, 2008 (Wednesday)

LDN = 64 dBA
Manatee County Thoroughfare Noise Stipulation
Location: R8 Honore at Mote Ranch
December 5, 2007 (Wednesday) to December 6, 2007 (Thursday)

LDN = 59 dBA.
COMPUTER MODELS

Computer model based on HUD *Noise Assessment Guidelines* developed for each site and calibrated with field data (1-2 dB generally agreement between field measured average LDN’s and calculated)

Computer models account for traffic only sounds. They do not include construction in the vicinity, insects, air conditioners at homes, birds, wind and other non-traffic sources.

Traffic data used in the models were obtained from monitoring of current traffic flows at each site for 48 hours each by the County
Iterative models developed for each site to determine sound reduction achieved by various noise mitigation strategies

1. Increasing distance

2. Adding densely planted tree buffers

3. Constructing walls, berms and berm/wall combinations of various heights

4. Alternative planning strategies
WHO, US EPA and HUD generally recommend 55 dBA as the maximum exterior sound level for residential communities.

FICUN, HUD and other federal agencies generally recommend outside noise levels in residential areas of 55 dBA LDN. However, they allow residential construction in areas with sound levels up to 65 dBA LDN when economic, social and other specific needs of a community justify using lands with higher sound levels.

All Federal agencies recommend 45 dBA LDN as maximum allowable interior sound level.
Group 1 - Ldn 70-74 dBA at 100 feet.

- LDN 65
- LDN 55

Distance Only  | Distance and >100' vegetation buffer | Distance and >12' Barrier
<table>
<thead>
<tr>
<th>Group-Distance</th>
<th>LDN (dBA)</th>
<th>Distance only</th>
<th>Dense Vegetative Buffer</th>
<th>Wall, berm or berm/wall combination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1 LDN 70-74 dBA at 100 ft</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>25 ft</td>
<td>80-82</td>
<td>Exceed</td>
<td>Exceed</td>
<td>Special acoustical design required</td>
</tr>
<tr>
<td>50 ft</td>
<td>75-76</td>
<td>Exceed</td>
<td>Exceed</td>
<td>Special acoustical design required</td>
</tr>
<tr>
<td>100 ft</td>
<td>71-70</td>
<td>Exceed</td>
<td>Exceed</td>
<td>15-20' + meets 65 dBA</td>
</tr>
<tr>
<td>200 ft</td>
<td>66-63</td>
<td>Exceed</td>
<td>Meets 65 dBA with 100' buffer</td>
<td>12-16' meets 55 dBA</td>
</tr>
<tr>
<td>400 ft</td>
<td>62-57</td>
<td>Meets 65</td>
<td>Exceeds 55 dBA with 100' buffer</td>
<td>12-18' meets 55 dBA</td>
</tr>
<tr>
<td>800 ft</td>
<td>57-49</td>
<td>Meets 65</td>
<td>Meets 55 dBA with 100' buffer</td>
<td>NA</td>
</tr>
</tbody>
</table>
Group 2 - Ldn 65-69 dBA at 100 feet.

Ldn (dBA)

Distance Only | Distance and >100' vegetation buffer | Distance and >12' Barrier

25 feet | 50 feet | 100 feet | 200 feet | 400 feet | 800 feet

LDN 65 | LDN 55
<table>
<thead>
<tr>
<th>Group-Distance</th>
<th>LDN (dBA)</th>
<th>Distance only</th>
<th>Dense Vegetative Buffer</th>
<th>Wall, berm or berm/wall combination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 2 - LDN 65-69 dBA at 100 ft</strong></td>
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<td></td>
</tr>
<tr>
<td>25 ft</td>
<td>78-79</td>
<td>Exceed</td>
<td>Exceed</td>
<td>Special acoustical design required</td>
</tr>
<tr>
<td>50 ft</td>
<td>69-72</td>
<td>Exceed</td>
<td>Exceed</td>
<td>12-20' + meets 65 dBA</td>
</tr>
<tr>
<td>100 ft</td>
<td>64-66</td>
<td>Barely Meets 65 dBA</td>
<td>Meets 65 dBA with 100' buffer</td>
<td>16 - 20' meets 55 dBA</td>
</tr>
<tr>
<td>200</td>
<td>60</td>
<td>Meets 65 dBA</td>
<td>Almost meets 55 dBA with 100' buffer</td>
<td>12-16' meets 55dBA</td>
</tr>
<tr>
<td>400 ft</td>
<td>53-55</td>
<td>Meets 55 dBA</td>
<td>Meets 55 dBA</td>
<td>N/A</td>
</tr>
<tr>
<td>800 ft</td>
<td>45-51</td>
<td>Meets 55 dBA</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Group 3 - Ldn 60-64 dBA at 100 feet.

- Distance Only
- Distance and >100' vegetation buffer
- Distance and >12' Barrier

Levels:
- LDN 55
- LDN 65

Distance:
- 25 feet
- 50 feet
- 100 feet
- 200 feet
- 400 feet
- 800 feet

Ldn (dBA)
<table>
<thead>
<tr>
<th>Group-Distance</th>
<th>LDN (dBA)</th>
<th>Distance only</th>
<th>Dense Vegetative Buffer</th>
<th>Wall, berm or berm/wall combination</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Group 3 - LDN 60-64 dBA at 100 ft</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>25 ft</td>
<td>70-79</td>
<td>Exceed</td>
<td>Exceed</td>
<td>16-20' + meets 65dBA</td>
</tr>
<tr>
<td>50 ft</td>
<td>66-72</td>
<td>Exceed</td>
<td>Exceed</td>
<td>12-20' + meets 65 dBA</td>
</tr>
<tr>
<td>100 ft</td>
<td>60-66</td>
<td>Meets 65 dBA</td>
<td>Meets 65 dBA with 100' buffer</td>
<td>12-18' meets 55 dBA</td>
</tr>
<tr>
<td>200 ft</td>
<td>57-60</td>
<td>Meets 65 dBA</td>
<td>Meets 55 dBA with 100' buffer</td>
<td>6-12' meets 55 dBA</td>
</tr>
<tr>
<td>400 ft</td>
<td>51-53</td>
<td>Meets 55 dBA</td>
<td>N/A</td>
<td>NA</td>
</tr>
<tr>
<td>800 ft</td>
<td>47-49</td>
<td>Meets 55 dBA</td>
<td>N/A</td>
<td>NA</td>
</tr>
</tbody>
</table>
Group 4 - Ldn 55-59 dBA at 100 feet.

- 25 feet
- 50 feet
- 100 feet
- 200 feet
- 400 feet
- 800 feet

LDN 65
LDN 55

Distance Only
Distance and >100' vegetation buffer
Distance and >12' Barrier
<table>
<thead>
<tr>
<th>Group-Distance</th>
<th>LDN (dBA)</th>
<th>Distance only</th>
<th>Dense Vegetative Buffer</th>
<th>Wall, berm or berm/wall combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 4 - LDN 55-59 dBA at 100 ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 ft</td>
<td>65-69</td>
<td>Exceeds</td>
<td>Almost Meets 65 dBA with 100' buffer</td>
<td>10-14' meets 55 dBA</td>
</tr>
<tr>
<td>50 ft</td>
<td>60-63</td>
<td>Meets 65 dBA</td>
<td>Meets 65 dBA with 100' buffer</td>
<td>8-12' meets 55 dBA</td>
</tr>
<tr>
<td>100 ft</td>
<td>56-59</td>
<td>Meets 65 dBA</td>
<td>Meets 55 dBA with 100' buffer</td>
<td>6-12' meets 55 dBA</td>
</tr>
<tr>
<td>200 ft</td>
<td>50-54</td>
<td>Meets 55 dBA</td>
<td>N/A</td>
<td>NA</td>
</tr>
<tr>
<td>400 ft</td>
<td>43-50</td>
<td>Meets 55 dBA</td>
<td>N/A</td>
<td>NA</td>
</tr>
<tr>
<td>800 ft</td>
<td>37-45</td>
<td>Meets 55 dBA</td>
<td>N/A</td>
<td>NA</td>
</tr>
</tbody>
</table>
Recommendations

1. Noise stipulation for secondary roads should consider future location, status and traffic counts

2. Using a goal of 55 dBA LDN for exterior areas would be consistent with WHO, EPA and other agency recommendations

3. County could consider raising this level to 65 dBA LDN if economic, social or other goals supercede the sonic environment of the community as many Federal agencies do

4. Homes built in areas with higher LDN’s than allowed should have noise mitigation required for outdoor areas of the site and for the building envelope to reach 45 dBA maximum LDN inside

5. Second floor balconies and outdoor living areas or building facades built where elevation changes put them above or below the roadway will require special consideration
Noise mitigation strategies to include:

1. Increased distance from the road
2. Dense vegetative buffers – 100 ft depth gives 3-4 dBA sound reduction
3. 6-12 ft tall walls, berms or berm/wall combinations for car noise
4. 12-20+ walls, berms or berm/wall combinations for car and truck noise
5. Develop alternative mitigation strategies

6. In urban areas consider requiring interior sound levels to be $\leq 45$ dBA LDN
Alternative approaches

a. Locate open space, drainage retention and other natural areas between homes and the roads to increase distance

b. Develop commercial, retail, office, hotel and other less critical and uses and the associated parking between homes and busy roads to increase distance and serve as barriers to road noise

c. Develop long range plans for alternative transportation modalities to reduce the need to expand roadways

d. Develop alternative zoning strategies to provide mixed use centers, live/work/shop/school communities to reduce future needs for road way expansion

e. Develop incentives for renewal of downtown and close-in suburban infill projects to attract development
Sound Reduction with Distance

- Sound is reduced approximately 4.5 to 6 dB per doubling of distance from an individual car or truck.

- Sound is reduced approximately 3 dB per doubling of distance for a continuous line of traffic.
Vegetated Barrier

- A 100 ft. depth of densely planted trees with complete upper story, mid story and understory will reduce sounds by 3 to 4 dB.
Traffic Barrier Wall

- 6 to 10 ft. tall wall cars
- 10 to 20 ft. tall wall for trucks and cars
- Approximately 4 to 12 dBA sound reduction possible

Acoustic “shadow” zone gives maximum noise reductions for first 1 to 3 rows of homes nearest barrier wall.

Barrier located 35 to 50 ft. from edge of road

Height of wall near the eave line of homes
Traffic Barrier Wall / Berm

- 6 to 10 ft. tall wall / berm combination or berm for cars

- 10 to 20 ft. tall wall / berm combination or berm for trucks and cars

- Approximately 4 to 12 dBA sound reduction possible
Traffic Barrier Wall Wrapping Sides of Site

Wrap walls or berm to block 180° line of sight to road

Use increased distance and vegetation for increased noise reduction

Locate walls or berm close to homes and yards to be protected
QUIET COMMUNITIES

Meet standards

Plan for and design community soundscape

Provide for a better tomorrow

. . . “Always the wish that you find patience enough in yourself to endure, and simplicity enough to believe, that you may acquire more and more confidence in that which is difficult, and in your solitude among others” . . .

Rainier Maria Rilke Letters to a Young Poet 1954