APPENDIX C. DETERMINING EXISTING NOISE

This appendix provides additional detail in determining existing noise by: (1) full measurement, (2) computation from partial measurements, and (3) tabular look-up. Note that the words "existing noise" and "ambient noise" are often used interchangeably.

Continuing with the example from Figure B-1, the ambient noise at the selected receivers of interest, labeled "REC 1,2,3...," can be determined according to the following methods.

- Existing noise at REC 1 is due to the highway at the side of this church. L_{eq} during a typical church hour was measured in full. – OPTION 1 below
- Existing noise at REC 2, a residence, is due to a combination of the highway and local streets. L_{dn} was measured in full. – OPTION 2 below
- Existing noise at REC 3 is due to the street in front of this residence. L_{dn} was computed from three hourly L_{eq} measurements. – OPTION 3 below
- Existing noise at REC 4, a residence, is due to the highway. Since the highway has a predictable diurnal pattern, L_{dn} was computed from one hourly L_{eq} measurement. – OPTION 4 below
- Existing noise at REC 5, a residence, is due to Kee Street. L_{dn} was computed from L_{dn} at the comparable REC 3, which is also affected by local street traffic and is a comparable distance from the highway. – OPTION 5 below
- Existing noise at REC 6, a residence, is due to local traffic. L_{dn} was estimated by table look-up, based upon population density along this corridor. – OPTION 6 below

The full set of options for determining existing noise at receivers of interest is as follows:

- For non-residential land uses, measure a full hour's L_{eq} at the receiver of interest, during a typical hour of use on two non-successive days. The hour chosen should be the one in which maximum project activity will occur. The L_{eq} will be accurately represented.-- OPTION 1
- The three option for residential land uses are
  - Measure a full day's L_{dn}. The L_{dn} will be accurately represented. – OPTION 2
  - Masure the hourly L_{eq} for three typical hours: peak traffic, midday and late night. Then compute the L_{dn} from these three hourly L_{eq}'s. The computed L_{dn} will be slightly underestimated. – OPTION 3
  - Masure the hourly L_{eq} for one hour of the day only, preferably during midday. Then compute the L_{dn} from this hourly L_{eq}. The computed L_{dn} will be moderately underestimated. – OPTION 4
- For all land uses, compute either the L_{eq} or the L_{dn} from a measured value at a nearby receiver – one where the ambient noise is dominated by the same noise source. The computed value will be represented with only moderate precision. – OPTION 5
- For all land uses, estimate either the L_{eq} or the L_{dn} from a table of typical values, depending upon distance from major roadways or upon population density. The resulting values will be significantly underestimated. – OPTION 6

Option 1: For non-residential land uses, measure the hourly L_{eq} for the hour of interest

Full one-hour measurements are the most precise way to determine existing noise for non-residential receivers of interest. Such full-duration measurements are preferred over all other options. The following procedures apply to full-duration measurements:

- Measure a full hour's L_{eq} at the receiver of interest on at least two non-successive days during a typical hour of use. This would generally be between noon Monday and noon Friday, but weekend days may be appropriate for places of worship. On both days, the measured hour must be the same as that for which project noise is computed: the loudest facility hour that overlaps hours of noise-sensitive activity at the receiver.
- At all sites, locate the measurement microphone as shown in Figure 6-8, depending upon the relative orientation of project and ambient sources. Desired is a microphone location that is shielded somewhat from the ambient source. At such locations, ambient noise will be measured at the quietest location on the property for purposes of noise impact assessment so that noise impact will be assessed most critically.
- Undertake all measurements in accordance with good engineering practice (see References 1 and 2 of Chapter 6).

Option 2: For residential land uses, measure the L_{dn} for a full 24 hours

Full 24-hour measurements are the most precise way to determine ambient noise for residential receivers of interest. Such full-duration measurements are preferred over all other options. The following procedures apply to full-duration measurements:

- Measure a full 24-hour's L_{dn} at the receiver of interest, for a single weekday (generally between noon Monday and noon Friday).
- At all sites, locate the measurement microphone as shown in Figure 6-8, depending upon the relative orientation of project and ambient sources. Desired is a microphone location that is shielded somewhat from the ambient source. At such locations, ambient noise will be measured at the quietest location on the property for purposes of noise impact assessment so that noise impact will be assessed most critically.
- Undertake all measurements in accordance with good engineering practice (see References 1 and 2 of Chapter 6).

Option 3: For residential land uses, measure the hourly L_{eq} for three hours and then compute L_{dn}

An alternative way to determine L_{dn}, less precise than its full-duration measurement, is to measure hourly L_{eq}'s for three typical hours of the day and then to compute the L_{dn} from these three hourly L_{eq}'s. The following procedures apply to this partial-duration measurement option for L_{dn}:

- Measure the one-hour L_{eq} during each of the following time periods: once during peak-hour roadway traffic, once midday between the morning and afternoon roadway-traffic peak hours, and once during late night between midnight and 5 am.
- Compute L_{dn} with the following equation:

$$L_{dn} \approx 10\log\left[(3)\cdot 10^{\frac{L_{eq}(\text{peakhour})-2}{10}} + (12)\cdot 10^{\frac{L_{eq}(\text{midday})-2}{10}} + (9)\cdot 10^{\frac{L_{eq}(\text{latenight})+8}{10}}\right] - 13.8$$

  This value of L_{dn} will be slightly underestimated, due to the subtraction of 2 decibels from each of the measured levels before their combination. As explained previously, this underestimate is intended to compensate for the reduced precision of the computed L_{dn} here, compared to its full-duration measurement.

- At all sites, locate the measurement microphone as shown in Figure 6-8, depending upon the relative orientation of project and ambient sources. Desired is a microphone location that is shielded somewhat from the ambient source. At such locations, ambient noise will be measured at the quietest location on

the property for purposes of noise impact assessment so that noise impact will be assessed most critically.

- Undertake all measurements in accordance with good engineering practice (see References 1 and 2 of Chapter 6).

Option 4: For residential land uses, measure the hourly L_{eq} for one hour and then compute L_{dn}

The next level down in precision is to determine L_{dn} by measuring the hourly L_{eq} for one hour of the day and then to compute L_{dn} from this hourly L_{eq}. This method is useful when there are many sites in a General Assessment, or when checking whether a particular receiver of interest represents a cluster in a Detailed Analysis. The following procedures apply to this partial-duration measurement option for L_{dn}:

- Measure the one-hour L_{eq} during any hour of the day. The loudest hour during the daytime period is preferable. If this hour is not selected, then other hours may be used with less precision.
- Convert the measured hourly L_{eq} to L_{dn} with the applicable equation:

For measurements between 7am and 7pm:	L_{dn}	$\approx$	$L_{eq} - 2$
For measurements between 7pm and 10pm:	L_{dn}	$\approx$	$L_{eq} + 3$
For measurements between 10pm and 7am:	L_{dn}	$\approx$	$L_{eq} + 8$

The resulting value of L_{dn} will be moderately underestimated, due to the use of the adjustment constants in these equations. As explained previously, this underestimate is intended to compensate for the reduced precision of the computed L_{dn} here, compared to the more precise methods of determining L_{dn}.

- At all sites, locate the measurement microphone as shown in Figure 6-8, depending upon the relative orientation of project and existing sources. Desired is a microphone location that is shielded somewhat from the ambient source. At such locations, ambient noise will be measured at the quietest location on the property for purposes of noise impact assessment so that noise impact will be assessed most critically.
- Undertake all measurements in accordance with good engineering practice (see References 1 and 2 of Chapter 6).

Option 5: For all land uses, compute either L_{eq} or L_{dn} from a nearby measured value

A computation method comparable in precision to Option 4 is to determine the ambient noise, either $L_{eq}(h)$ or $L_{dn,}$ from a *measured* value at a nearby receiver – one where the ambient noise is dominated by the same noise source. This method is used to characterize noise in several neighborhoods by using a single representative receiver. Care must be taken to ensure that the measurement site has a similar noise environment to all areas represented. If measurements made by others are available, and the sites are

equivalent, they can be used to reduce the amount of project noise monitoring. The following procedures apply to this computation of ambient noise at the receiver of interest:

- Choose another receiver of interest, called the "comparable receiver," at which:
  - The same source of ambient noise dominates.
  - The ambient $L_{CompRec}$ was **measured** with either OPTION 1 or OPTION 2 above.
  - The ambient measurement at the comparable receiver was made in direct view of the major source of ambient noise, unshielded from it by noise barriers, terrain, rows of buildings, or dense tree zones.
- From a plan or aerial photograph, determine: (1) the distance $D_{CompRec}$ from the comparable receiver to the near edge of the ambient source, and (2) the distance $D_{ThisRec}$ from this receiver of interest to the near edge of the ambient source.
- Also determine N, the number of rows of buildings that intervene between the receiver of interest and the ambient source.
- Compute the ambient at this receiver of interest with the applicable equation:

If roadway sources dominate: $$L_{This\,Rec} \approx L_{Comp\,Rec} - 15\log\left(\frac{D_{This\,Rec}}{D_{Comp\,Rec}}\right) - 3N$$

If other sources dominate: $$L_{This\,Rec} \approx L_{Comp\,Rec} - 25\log\left(\frac{D_{This\,Rec}}{D_{Comp\,Rec}}\right) - 3N$$

The resulting value of $L_{ThisRec}$ will be moderately underestimated. As explained previously, this underestimate is intended to compensate for the reduced precision of the computed L_{dn} here, compared to the more precise methods of determining ambient noise levels.

Option 6: For all land uses, estimate either $L_{eq}(h)$ or L_{dn} from a table of typical values

The least precise way to determine the ambient noise is to estimate it from a table. A tabular look-up can be used to establish baseline conditions for a General Noise Assessment if a noise measurement can not be made. It should not be used for a Detailed Noise Analysis. For this estimate of ambient noise:

- Read the ambient noise estimate from the relevant portion of Table 5-7. These tabulated estimates depend upon distance from major roadways, rail lines or upon population densities. In general, these tabulated values are significant underestimates. As explained previously, underestimates here are intended to compensate for the reduced precision of the estimated ambients, compared to the options that incorporate some degree of measurements.