see Chapter 23, *Noise*). Construction activities were classified into five construction activity types that each were assumed to have a typical noise level. Categories of noise sources at construction sites (measured at 50 feet distance) are listed below.

- Impact pile driving: 101 dBA.
- Multiple source construction activities: 96 dBA.
- Conveyor belt return/load/booster drive (Alternative 4 only): 85 dBA.
- Conveyor belt mid-segment (Alternative 4 only): 75 dBA.
- Heavy trucks: 85 dBA.

Pile driving was analyzed separately due to the unique characteristics of noise produced from this noise source (intermittent impact noise). Multiple source construction noise was characterized by calculating the noise levels that would be produced when the loudest six pieces of construction equipment were operating simultaneously, and noise from heavy trucks was calculated assuming three heavy trucks operating in the same general area simultaneously.

To assess the potential effect of noise on sandhill cranes the noise level expected was calculated for known roosting habitat (at temporary and permanent roosts), and in modeled foraging habitat. Calculations assumed direct line-of-sight (no intervening barriers) with an atmospheric noise attenuation rate of approximately 6 dBA with each doubling of distance plus an additional attenuation of 1.5 dBA noise absorption due to propagation over soft ground (e.g., agricultural land, open natural habitat). Therefore, total noise attenuation was calculated as 7.5 dBA per doubling of distance from the source. For construction noise, distance to noise level contours were calculated from the edge of each identified construction area, giving a conservative worst-case estimate of noise levels because most of the construction activity would not take place on the perimeter of each site.

Overlay of the noise contours on the modeled foraging and known temporary and permanent roost sites was used to calculate the areas affected by expected worst-case noise levels above 60 dBA and 50 dBA. When the noise levels from different noise categories overlapped, the category with the highest noise level was assumed to be operating. More detail on the methods for determining the construction noise effects on greater sandhill crane habitat can be found in Section 11F.5.1 of Appendix 11F, *Substantive BDCP Revisions*.

Using global position system receivers, the DHCCP surveys also mapped locations of elderberry shrubs (which are used by valley elderberry longhorn beetle to complete its lifecycle) in the DHCCP Conveyance Planning Area, where accessible. The spatial data collected consisted of point and line data and was attributed with size class, habitat found in, an estimate of the number of stems, and in some cases the estimate of the number of shrubs associated with a spatial feature (i.e., some lines represented as many as 160 shrubs). To determine the number of elderberry shrubs potentially impacted by CM1 for each alternative, ICF GIS staff intersected the conveyance alignment alternatives with the elderberry shrub line and point data. Where an individual line represented multiple shrubs along a channel, an estimate of the number of shrubs impacted by a particular conveyance alignment was generated by multiplying the number of shrubs represented by the line by the proportion of the line intersected by the conveyance alignment. For example, if a 1,000-foot-long line representing 100 shrubs had 500 feet of its length intersected by one of the conveyance alignment alternatives, then the 100 shrub total was multiplied by 0.50 (500/1,000) to come up with an estimate of 50 shrubs impacted.