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APPENDIX F  
NOISE STUDY

To: SDDOT	
From: HDR	Project: SD100 Noise Study
Date: May 23, 2011 (revised December 6, 2011)	Job No: 32194

## RE: SD100 Noise Study

An advocate of noise-compatible land use planning, the South Dakota Department of Transportation (SDDOT) has requested that HDR Engineering, Inc. (HDR) determine the distance to specific noise contour levels and plot those noise contours on aerial photos of the SD100 corridor.

In previous technical memos prepared by HDR for the South Dakota Department of Transportation (SDDOT) regarding the SD100 corridor preservation project, HDR determined the distance to specific noise levels (66 and 71 dBA), and plotted those noise contours on aerial photos of the SD100 corridor. The distance to these contours was determined using the Federal Highway Administration's (FHWA) Traffic Noise Model (TNM, Version 2.5). The 66 dBA contour represents the threshold for traffic noise impacts on residential land uses. The 71 dBA contour represents the threshold for traffic noise impacts on commercial and institutional land uses. SDDOT also asked HDR to determine noise levels at the following fixed distances from the roadway centerline: 25, 50, 75, 100, 125, 150, 200, 225, 250, 275, 300, 325, 350, 375, 400, 450, 500, and 600 feet.

HDR has been requested to update the noise analysis with year 2035 traffic volumes, replacing the year 2025 volumes previously modeled. This update will be for the southern project area only (I-29 to 26<sup>th</sup> Street).

## Traffic Data

This analysis used peak hour traffic volumes for the year 2035. Attachment A shows the traffic volumes used for each roadway segment remodeled in TNM.

## Analysis Results

Table 1 shows the distance to these predicted contour lines for each segment of SD100 (I-29 to 26<sup>th</sup> Street) that has unique traffic volumes. It is important to note that noise contours are an approximation that takes into account traffic, speed, ground elevation, etc. and can vary depending on a variety of conditions.

**Table 1  
Predicted Traffic Noise Levels at Fixed Distances from the Right of Way (dBA)**

Roadway Section	Predicted Traffic Noise Levels at Fixed Distances from Roadway Centerline (dBA)																
	25 feet	50 feet	75 feet	100 feet	125 feet	150 feet	200 feet	225 feet	250 feet	275 feet	300 feet	350 feet	375 feet	400 feet	450 feet	500 feet	600 feet
I-29 TO TALLGRASS	74	71	69	68	67	66	65	64	64	63	63	62	62	62	61	61	60
TALLGRASS TO LOUISE	74	71	69	68	67	66	65	64	64	63	63	62	62	62	61	61	60
LOUISE TO WESTERN	74	71	69	68	67	66	65	65	64	64	63	63	62	62	62	61	60
WESTERN TO MINNESOTA	74	71	69	68	67	66	65	64	64	63	63	62	62	62	61	61	60
MINNESOTA TO CLIFF	74	71	69	68	67	66	65	65	64	64	63	63	62	62	62	61	60
CLIFF TO SOUTHEASTERN	74	71	70	68	67	67	65	65	64	64	64	63	63	62	62	62	61
SOUTHEASTERN TO SYCAMORE	74	71	69	68	67	66	65	64	64	63	63	62	62	62	61	61	60
SYCAMORE TO 69TH	74	71	69	68	67	66	65	65	64	64	63	63	62	62	62	61	60
69TH TO 57TH	74	71	69	68	67	66	65	64	64	63	63	62	62	62	61	61	60
57TH TO 41ST	74	71	69	68	67	66	65	64	64	63	63	62	62	62	61	61	60
41ST TO 33RD	74	71	69	68	67	66	65	64	64	63	63	62	62	62	61	61	60
33RD TO 26TH	74	71	69	68	67	66	65	65	64	64	63	63	62	62	62	61	60

The following information pertains to specific locations within the SD100 corridor that have potential noise impacts identified and required further analysis.

**Noise Impacts – 41st Street**

The noise analysis conducted in this area indicated the potential for noise impacts to the residential area in the northwest quadrant of the intersection of 41<sup>st</sup> Street and SD100. This determination was based on the predicted location of the 66 dBA noise contour generated by this study. Additional analysis is provided to determine the benefit to cost ratio of possible noise mitigation measures. HDR modeled the impacted area using TNM 2.5 and determined that a total of three residences were predicted to be impacted by traffic noise levels in excess of the noise abatement criteria (66 dBA).

In the attempt to mitigate these noise impacts, HDR modeled a noise barrier along the ROW between SD100 and the residences (see Figure F-1 for location). The modeled barrier was 767 feet long and averaged 15.19 feet in height, with a total cost of \$512,632, at \$44 per square foot. Of the ten residences located in the area, five received a benefit (a 5dBA or greater noise reduction) from the barrier. The calculated benefit to cost ratio for this barrier is \$102,526 per benefited receptor, which is greater than the SDDOT limit of \$21,000 per benefited receptor.

The predicted 66 and 71 dBA noise contour lines for the new alignment of SD100 are presented in Figures 3-3a thru 3-3g of Chapter 3.

**Harmodon Park**

HDR evaluated potential noise impacts to the softball and baseball fields at Harmodon Park using TNM 2.5. HDR also evaluated discrete modeling points within the park and vicinity. Existing traffic volumes from 2006 were utilized to determine the existing traffic noise levels in the park. These were compared to the 2035 future build scenario noise levels. Figure F-2 in Attachment B shows the modeling locations and the predicted change in noise levels from 2006 to 2025. Analysis results indicate that traffic noise levels are not predicted to occur. Predicted traffic noise increases are less than 15 dBA, which is defined by the SDDOT as the threshold where a noise level increase substantially exceeds the existing conditions.

**SD100 and 57th Street**

HDR modeled the redesigned interchange at SD100 and 57<sup>th</sup> Street, and determined predicted noise levels at set distances from the ROW (Table 2). Analysis results indicate that no traffic noise impacts are expected outside of the ROW and the traffic noise level at the nearest residence (approximately 350 feet from the ROW) is predicted to be 60 dBA.

**Table 2**  
**Predicted Traffic Noise Levels at Fixed Distances from the Right of Way (dBA)**  
**SD100 and 57<sup>th</sup> Street**

25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	450	500	600
feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet	feet
65	64	63	63	63	62	62	62	61	61	61	61	60	60	60	60	59	59	58

# Attachment A

## Traffic Volumes

**SD 100 PEAK HOUR VOLUMES  
2035 FORECASTS**

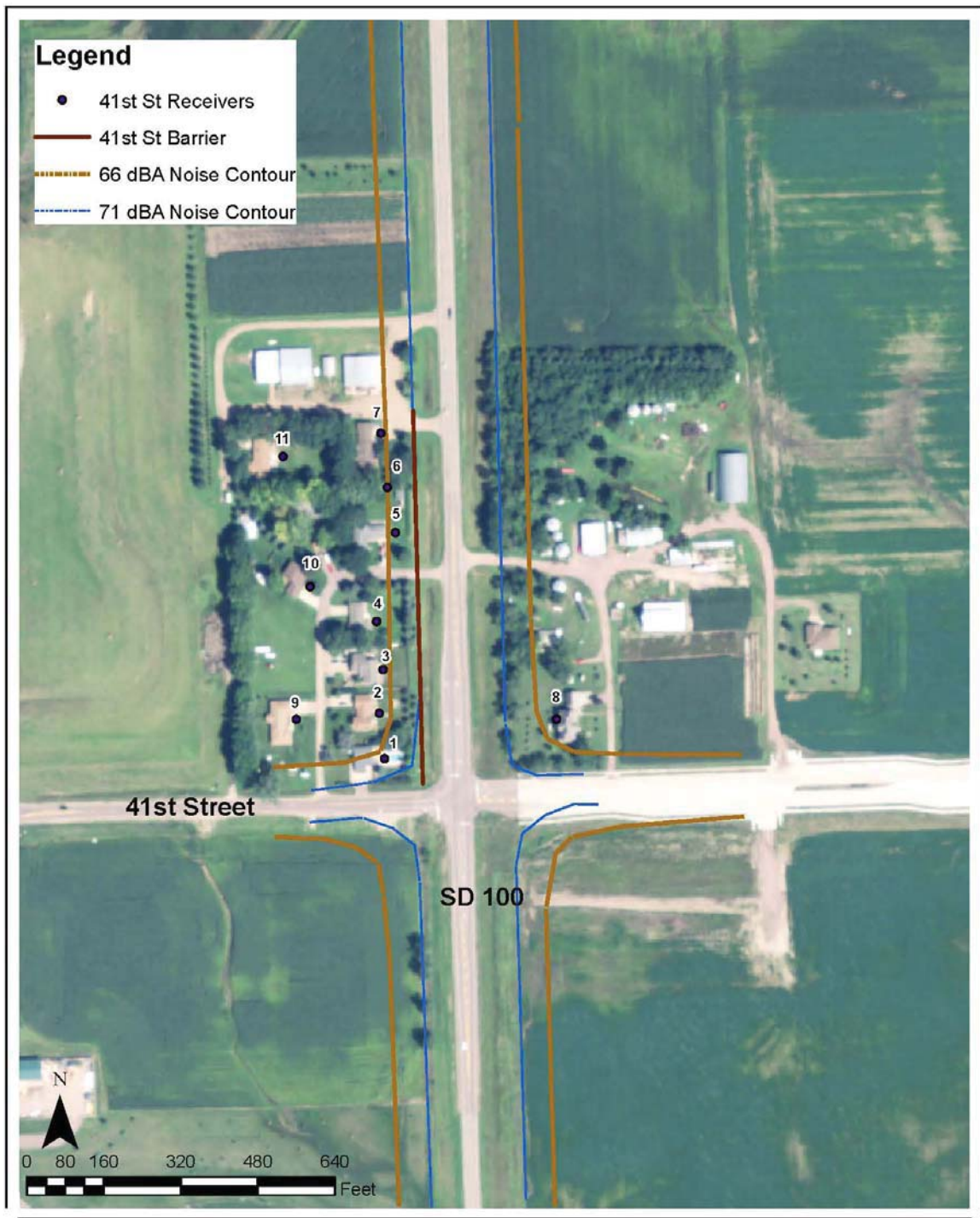
ROADWAY SECTION	PEAK HOUR		PM VOLUMES	AUTO	MEDIUM TRUCK	HEAVY TRUCK	BUS	MOTORCYCLE
	AM	PM						
I-29 TO TALLGRASS	2660	3110	WB	1410	65	51	11	17
			EB	1410	65	51	11	17
TALLGRASS TO LOUISE	2830	3140	WB	1424	66	52	11	17
			EB	1424	66	52	11	17
LOUISE TO WESTERN	2860	3210	WB	1456	67	53	11	18
			EB	1456	67	53	11	18
WESTERN TO MINNESOTA	2620	3020	WB	1370	63	50	11	17
			EB	1370	63	50	11	17
MINNESOTA TO CLIFF	2820	3200	WB	1451	67	53	11	18
			EB	1451	67	53	11	18
CLIFF TO SOUTHEASTERN	2940	3250	WB	1474	68	54	11	18
			EB	1474	68	54	11	18
SOUTHEASTERN TO SYCAMORE	2710	3030	WB	1374	64	50	11	17
			EB	1374	64	50	11	17
SYCAMORE TO 69TH	2790	3080	SB	1397	65	51	11	17
			NB	1397	65	51	11	17
69TH TO 57TH	3450	3740	SB	1696	79	62	13	21
			NB	1696	79	62	13	21
57TH TO 41ST	3520	3940	SB	1787	83	65	14	22
			NB	1787	83	65	14	22
41ST TO 33RD	3580	3950	SB	1791	83	65	14	22
			NB	1791	83	65	14	22
33RD TO 26TH	3730	4220	SB	1914	89	70	15	23
			NB	1914	89	70	15	23

**VEHICLE CLASSIFICATION**

VEHICLE	PERCENT
AUTO	90.7%
MEDIUM TRUCK	4.2%
HEAVY TRUCK	3.3%
BUS	0.7%
MOTORCYCLE	1.1%

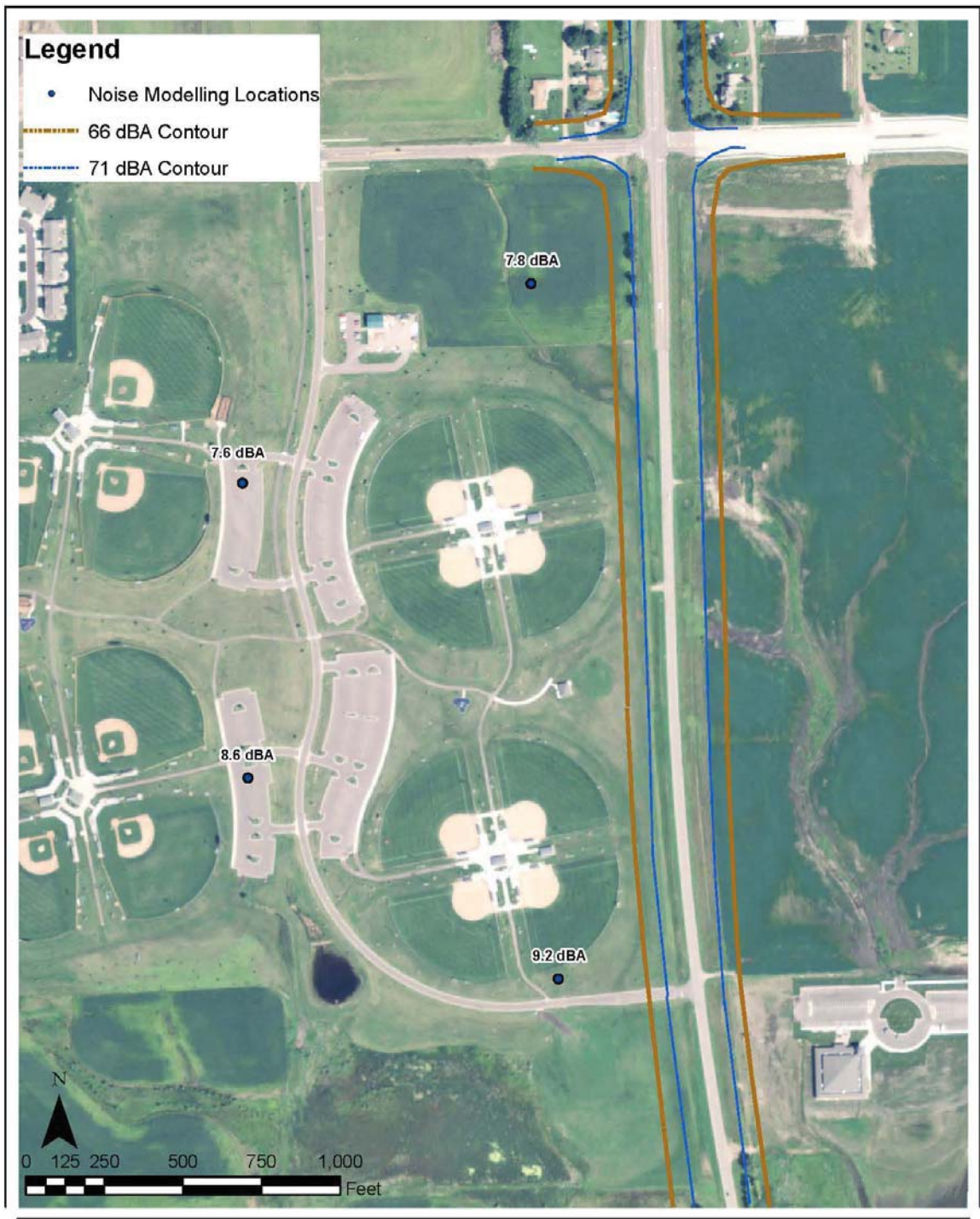
# Attachment B

## Figures



**Figure F-1**  
**Noise Impacts- 41<sup>st</sup> Street**





**Figure F-2**  
**Noise Impacts- Harmodon Park**