Appendix D

Noise Memo

TRAFFIC NOISE EVALUATION MEMORANDUM

SD 44 Platte-Winner Bridge
Corridor Study and Environmental Assessment

CHARLES MIX AND GREGORY COUNTIES, SOUTH DAKOTA

January 2022

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South Dakota DOT Environmental Office

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1. INTRODUCTION

The South Dakota Department of Transportation (SDDOT) is proposing to replace the existing Highway 44 Bridge (Bridge No. 12-085-080), also known as the Platte-Winner Bridge, connecting Gregory and Charles Mix Counties over the Missouri River. This Traffic Noise Evaluation Memorandum has been prepared to assess the need for a full traffic noise analysis based on a review of the Federal Highway Administration (FHWA) regulations and the South Dakota Department of Transportation (SDDOT) noise policy as it applies to the proposed improvements. Additionally, the project will impact Section 4(f) property and will require consideration of constructive use due to traffic noise.

Project Description

The project is in south-central South Dakota as shown on the project location map. The Platte-Winner Bridge crosses the Missouri River, which at this location is also known as Lake Francis Case, a reservoir created by the Fort Randall Dam at Pickstown, South Dakota. The west end of the bridge is in Gregory County and the east end of the bridge is in Charles Mix County. The nearest towns to the bridge include Winner located approximately 40 miles west, Gregory (25 miles southwest), and Platte, located approximately 15 miles east.

The purpose of the project is to replace the existing SD44 Platte-Winner Bridge over the Missouri River. The SDDOT's *Major Bridge Investment Study* and the *SD44 Platte-Winner Bridge Corridor Study,* identified the following issues with the existing bridge that combined threatened the long-term viability of the bridge.

- Overall aging infrastructure of the bridge and long-term maintenance costs
- Risk of future ice jams damaging the bridge piers and foundation
- Narrow bridge width that does not meet current geometric design standards.

Alternative bridge alignments were evaluated, including alignments both north and south of the existing bridge. Based on the review of alternatives, which is detailed in the *SD44 Platte-Winner Bridge Corridor Study*, the Refined North Skew alignment was retained for further consideration. This alignment is shown in Figure 2. In addition to the horizontal realignment, the bridge will be raised 10-feet. The proposed improvement will remain a two-lane cross-section (one lane in each direction). as the project purpose and need did not include capacity needs.

Surrounding Land Use

A scenic overlook parking area and boat launch are immediately southwest of the western bridge approach while surrounding lands are predominately grasslands featuring significant changes in elevation. Snake Creek Recreation Area, which includes rental cabins and supporting facilities such as a welcome center, campground, and restaurant, is located both north and south of SD44 on the east bank of the river. The state established Snake Creek Recreation Area following the construction of the bridge to expand the recreational use of the area. Agricultural production fields and grasslands, including SDGFP-managed Game Production Areas (GPAs), are located beyond the 695-acre recreational area.

2. NOISE BACKGROUND AND REGULATIONS

Noise Background[1]

Noise is generally defined as unwanted sound and is measured in terms of sound pressure level expressed in decibels (dB). The human ear is less sensitive to higher and lower frequencies than mid-range frequencies; therefore, sound level meters used to measure environmental noise generally incorporate a filtering system that discriminates against higher and lower frequencies in a manner like the human ear. This produces noise measurements that approximate the normal human perception of sound. Measurements made using this filtering system are termed "A-weighted decibels (dB(A))." Noise levels referred to in this report are stated as hourly-equivalent sound pressure levels ($L_{eq}(h)$) in terms of dB(A). Noise levels decrease with distance from a noise source. The $L_{eq}(h)$ noise level from a line source, such as moving traffic on a road, will decrease between 3 to 4.5 dB(A) from every doubling of distance. Subjectively, a 10 dB(A) increase in noise level is perceived by most observers to be approximately a doubling of loudness (e.g., an increase from 50 dB(A) to 60 dB(A) causes the perceived loudness to double). Generally, 3 dB(A) is the minimum change in outdoor sound levels that can be perceived by a person with normal hearing.

Federal and State Regulations

Applicability

The Federal Highway Administration (FHWA) developed procedural guidelines and regulations for traffic noise as required by the Federal-Aid Highway Act of 1970 (Public Law 91-605, 84 Stat. 1713). This regulation, 23 CFR 772 *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, applies to highway construction projects where a state Department of Transportation has requested Federal funding for participation in the project. A traffic noise analysis is required when projects meet the definition of a Type I project:

Type I Project:

1. The construction of a highway on new location; or,
2. The physical alteration of an existing highway where there is either:
    a. *Substantial Horizontal Alteration*. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
    b. *Substantial Vertical Alteration*. A project that removes shielding (vegetation does not constitute shielding as it typically does not provide substantial noise reduction), as it thereby exposes the line-of-sight between the receptor and the traffic noise source (maintenance and resurfacing projects are not Type I projects). This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,
3. The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a High Occupancy Vehicle (HOV) lane, High Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,
4. The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,

[1] Federal Highway Administration. Highway Traffic Noise: Analysis and Abatement Guidance (FHWA-HEP-10-025). December 2011.

5. The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,
6. Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,
7. The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

If any portion of a project evaluated under NEPA is determined to be Type I per 23 CFR 772.5, then the entire project area as defined in the environmental document is a Type I project. Based on the definitions presented above, the proposed actions qualify this project as a Type I project due most notably to the new roadway realignment. Therefore, a traffic noise analysis is required.

Noise Abatement Criteria and State Policy

The FHWA regulations establish noise abatement criteria (NAC) based upon land use activity to assess potential traffic noise impacts (see Table 1). A traffic noise impact occurs when noise levels approach or exceed the NAC values, or if there is a substantial increase in traffic noise.

In determining the applicable noise category for the project, the existing land use was reviewed. The applicable NAC is 67 dB(A) for residences (Activity Category B), and campgrounds, recreation areas and Section 4(f) lands (Activity Category C). Therefore, the exterior NACs of 67 $L_{eq}(h)$ would be utilized in evaluating future build noise levels in different parts of the project area.

SDDOT is the agency responsible for implementing the FHWA traffic noise regulations in South Dakota and has developed a policy on highway traffic noise which has been approved by FHWA. SDDOT policy guidelines would be used to define noise impacts as follows:

- Design-year traffic noise levels approach or exceed the NAC, with approach defined as within 1 dB(A) of the NAC (e.g., 66 dB(A) for the Activity Category B NAC of 67 dB(A)). Results are not rounded up (e.g., 65.6 dB(A) is not rounded up to 66 dB(A)).

- Design-year traffic noise levels are a substantial increase over existing traffic-generated noise levels, defined as a 15 dB(A) or greater increase.

Table 1: Noise Abatement Criteria – Hourly Weighted Sound Level

Activity Category	Activity Criteria dB(A)		Activity Description
	Noise Abatement Criteria (NAC)	Approaching NAC	
A	57	56	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67	66	Residential
C	67	66	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings

D	52	51	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72	71	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing
G	-	-	Undeveloped lands that are not permitted for development

Source: Table 5: 23 CFR, Part 772, Table 1 Noise Abatement Criteria (NAC)

3. APPLICATION OF REGULATIONS TO PROPOSED IMPROVEMENTS

FHWA regulations require a traffic noise evaluation for projects meeting the definition of a Type I project. A project is defined as a Type I project if it meets any of the seven (7) listed project types as presented in Section 2. The first definition is construction of a highway on new location. The proposed improvement is to an existing facility and therefore does meet the definition of a "highway on new location". The project does meet the second definition of a physical alteration of an existing highway, both for the horizontal and vertical alterations. However, to be defined as a Type I project, there needs to be a substantial alteration.

A substantial horizontal alteration is considered when the distance between the traffic noise source and the closest receptor is reduced by 50 percent or more (the realignment halves the distance). The sensitive receptors in the project area are associated with the Snake Creek Recreation Area, which is on both sides of SD44. Figure 2 identifies the potentially sensitive receptor locations within the recreation area. The recommended alternative realigns SD44 up to 270 feet north of the existing alignment. This will necessitate the relocation of the residence and some maintenance facilities. The following shows a comparison of the separation distance between the identified receptors and the existing and proposed alignments.

Table 2: Receptor Distance Evaluation

Receptor Description	Distance to Existing Centerline	Distance to Proposed Centerline	Distance Change
Traveler's Chapel	150 ft.	95 ft.	-36%
Campsites/Campground	190 ft.	465 ft.	+245%
Scenic Overlook (to be redeveloped)	320 ft.	195 ft.	-39%
Residence to be Relocated	330 ft.	To be Relocated	TBD*

* Relocation of the residence should be considered in the context of traffic noise and not placing it close to SD44. It would not be considered a "substantial alteration" provided the house is more than 165 feet from the proposed realignment.

The comparison shows that the separation distance from the identified sensitive receptors will not decrease by more than half (more than 50%) for any of the locations. The horizontal alignment alteration would therefore not be considered "substantial". The SD 44 alignment will be shifted away from the campground, more than doubling the distance to the most sensitive part of the recreation area main campground area.

The vertical alignment will mainly occur along the bridge and is limited to 10 feet. As there are no sensitive receptors immediately along the bridge, this vertical shift would not be anticipated to substantially affect the line of sight from the sensitive receptor locations.

The remaining five (5) definitions of a Type I project do not apply to the SD 44 proposed improvement. Based on this review, the project would not be considered a Type I project due to the horizontal or vertical alignment shift, as there are no substantial alterations. Consequently, a full traffic noise analysis is not required.

4. NOISE MONITORING RESULTS and CONSTRUCTIVE USE

Noise monitoring was conducted June 11, 2018, given the project might be defined as a Type I project due to the shift in the SD 44 alignment. However, it was not known if the alignment shift would be considered a "substantial alteration" per the Type I definition (23 CFR Part 772), as the recommended alignment had not been determined. As presented in Section 3, the recommended alignment (which includes the relocation of the residence) would not be considered a substantial alteration. Therefore, a full noise analysis is not required per 23 CFR Part 772.

Noise monitoring was also conducted to address traffic noise for the Snake Creek Recreation Area. The noise evaluation for a Section 4(f) property considers constructive use that varies from the noise regulations in 23 CFR Part 772 described in Section 2. FWHA regulations for Section 4(f) define noise impacts for constructive use in 23 CFR Part 774.15. Generally, constructive use does not occur when projected noise levels:

1. Do not exceed the FHWA noise abatement criteria (NAC) as contained in Table 1 of 23 CFR Part 772; or,
2. The increase in the projected noise levels if the proposed project is constructed, when compared to the projected noise levels if the project is not built, is barely perceptible (3 dB(A) or less).

Noise Monitoring Results

Noise monitoring was conducted in four locations within the Salt Creek Recreation Area. This includes two locations on the north side of SD44 and two locations within the campground on the south side of SD44. Each site was monitored for two sessions of 15 minutes each. The noise monitoring logs and photos are included the appendix. The following summarizes the noise monitoring results.

Table 3 – Noise Monitoring Data

Monitoring Site	Monitor Dist. to SD 44*	Start Time	Leq, dB(A)	Vehicles, 15 mins	Vehicles, 60 mins
Campsite 39E	250	3:56 pm	48.0	16	64
		5:23 pm	48.8	19	76
Campsite 68E	320	3:31 pm	48.4	24	96
		5:02 pm	49.3	14	56
Traveler's Chapel	130	3:02 pm	54.7	17	68
		4:37 pm	53.5	14	56

Residence	330	2:34 pm	50.0	14	56
		4:17 pm	53.4	20	80

* Note: Noise meter is not placed directly at building location.

The traffic volumes observed during the monitoring sessions are consistent with the traffic volumes anticipated on SD 44. The average daily traffic based on 2017 traffic data is 835 vehicles per day. The noise levels are therefore representative of the traffic conditions. Based on the traffic noise monitoring data, the existing noise levels do not exceed the FHWA NAC. The highest noise level (54.7 dB(A)) was monitored at the closest receptor (Traveler's Chapel), approximately 130 feet from the SD 44 centerline. The Traveler's Chapel also has the most direct line of sight to SD 44 as it is not shielded by vegetation or topography.

The recommended alternative will be realigned approximately 95 feet north of the Traveler's Chapel. This will still be the closest receptor location to the recommended alignment. The noise level from the new alignment can be projected based on the noise monitoring data collected. Traffic noise levels increase as the distance decreases between the noise source and receiver. Generally, every time the distance is reduced by half, the noise level will increase three (3) decibels over hard ground (e.g. pavement, dirt or water) and will increase 4.5 decibels over soft ground (e.g. grass or vegetation). The following demonstrates this relationship based on the noise levels monitored at the Traveler's Chapel. Both ground types are provided as the existing condition is a combination of both.

Table 4 – Project Traffic Noise Levels at Traveler's Chapel

Distance Between SD 44 and Chapel	Hard Ground Noise Level (3 dB(A) Increase)	Soft Ground Noise Level (4.5 dB(A) Increase)
130 Feet – Actual Reading	55.0	55.0
65 Feet – Projected	58.0	59.5
32.5 - Projected	61.0	64.0

Using the above evaluation, the projected traffic noise level at the Traveler's Chapel will be less than 59.5 dB(A) under a worst-case condition. This is less than the applicable FHWA NAC level of 67 dB(A) and therefore would not be considered a constructive use based on the Section 4(f) guidance. The proposed improvement will be moving SD 44 away from the campground area, increasing the distance from approximately 200 feet to 465 feet, thereby reducing the noise level by 3 to 4.5 dB(A) or more. This will vary depending on the location within the campground, but a reduction in traffic noise will be achieved. Based on this evaluation, a constructive use will not occur due to the proposed project.

5. CONCLUSION

Based on a review of the recommended alignment and the comparison to the 23 CFR Part 772 definitions of a Type I project, the proposed project would not be considered a Type I project, as there is no substantial alignment alteration. Therefore, a full traffic noise analysis would not be required.

Based on the noise monitoring data collected, the noise levels within the Section 4(f) property, the Snake River Recreation Area, would not exceed the FHWA NAC. This is based on both the existing and proposed

alignments. As the noise level are not projected to exceed the FHWA NAC, constructive use would not occur.

FIGURES

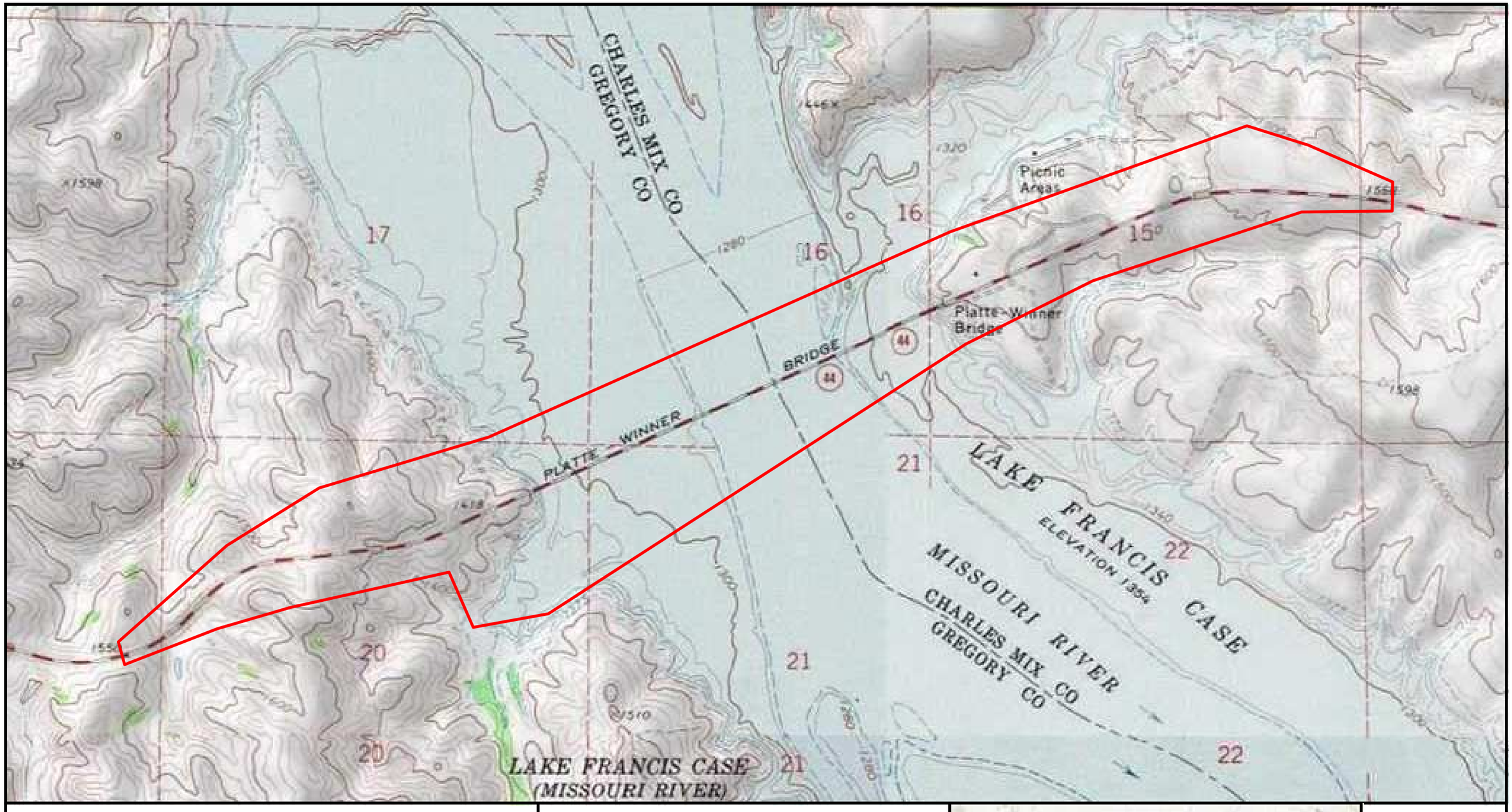


FIGURE 1

USGS QUAD / LOCATION MAP

SD44 / Platte-Winner Bridge Corridor Study Wetland Delineation

Wetland Delineation Report

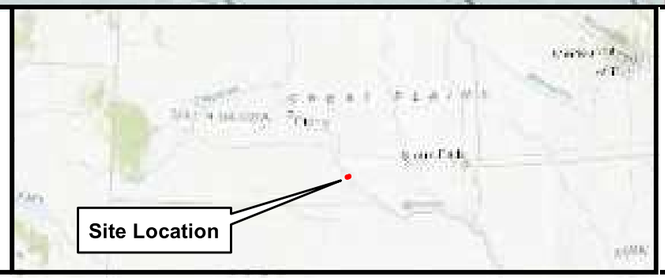
Legend - Main Map

Wetland Study Area

N

0 600 1,200 Feet

1 inch = 1,200 feet



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South Dakota DOT
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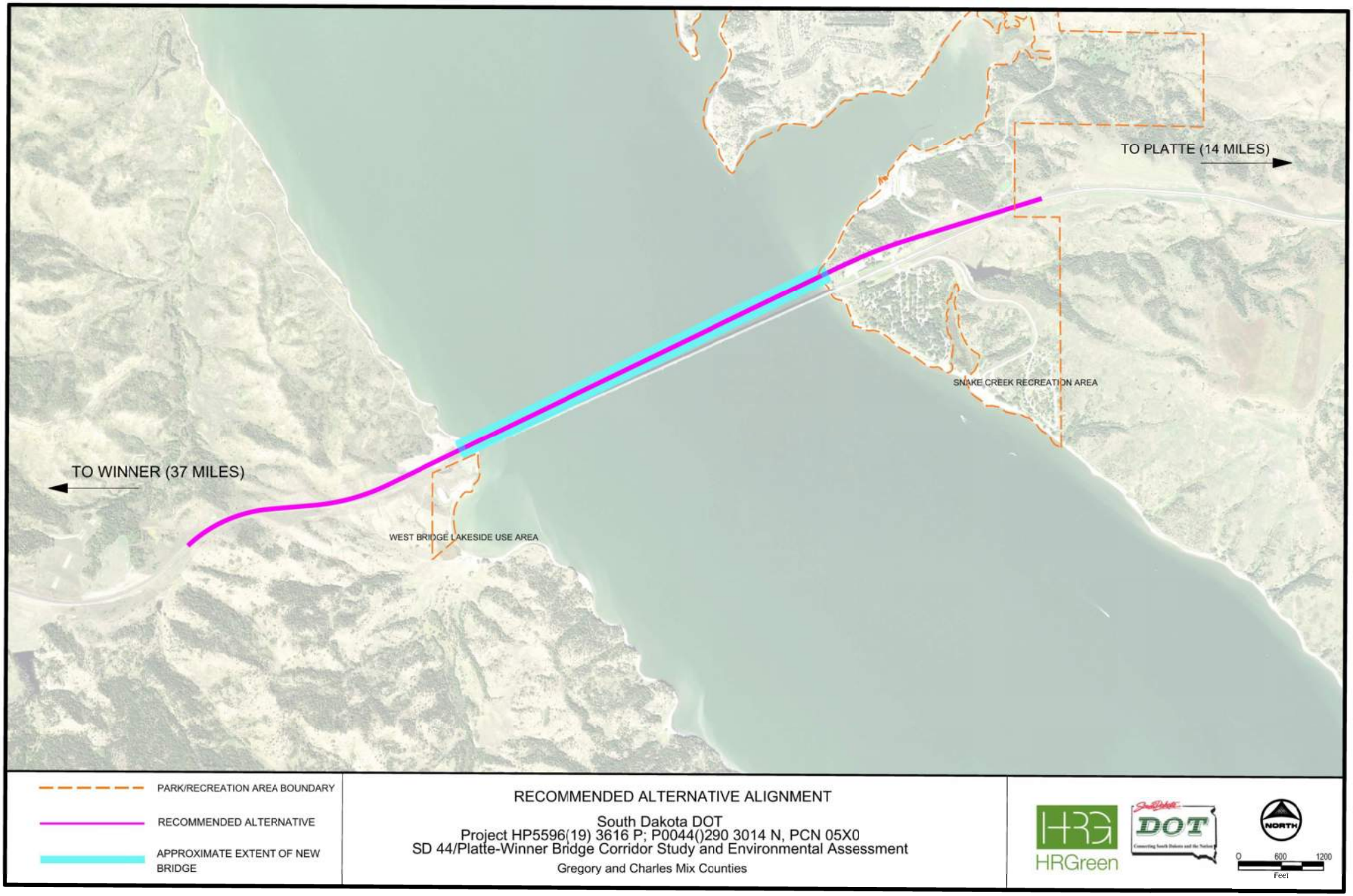
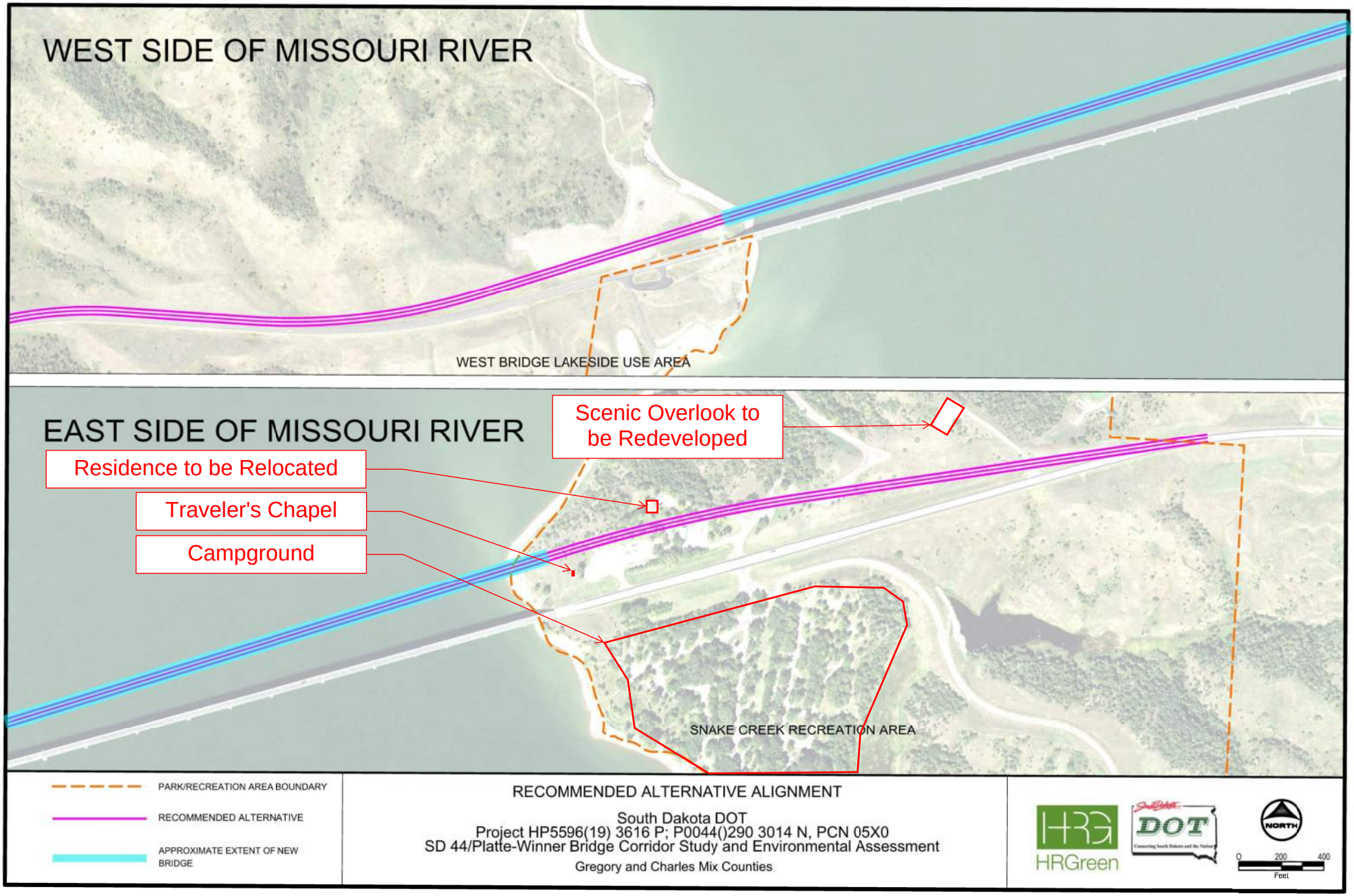
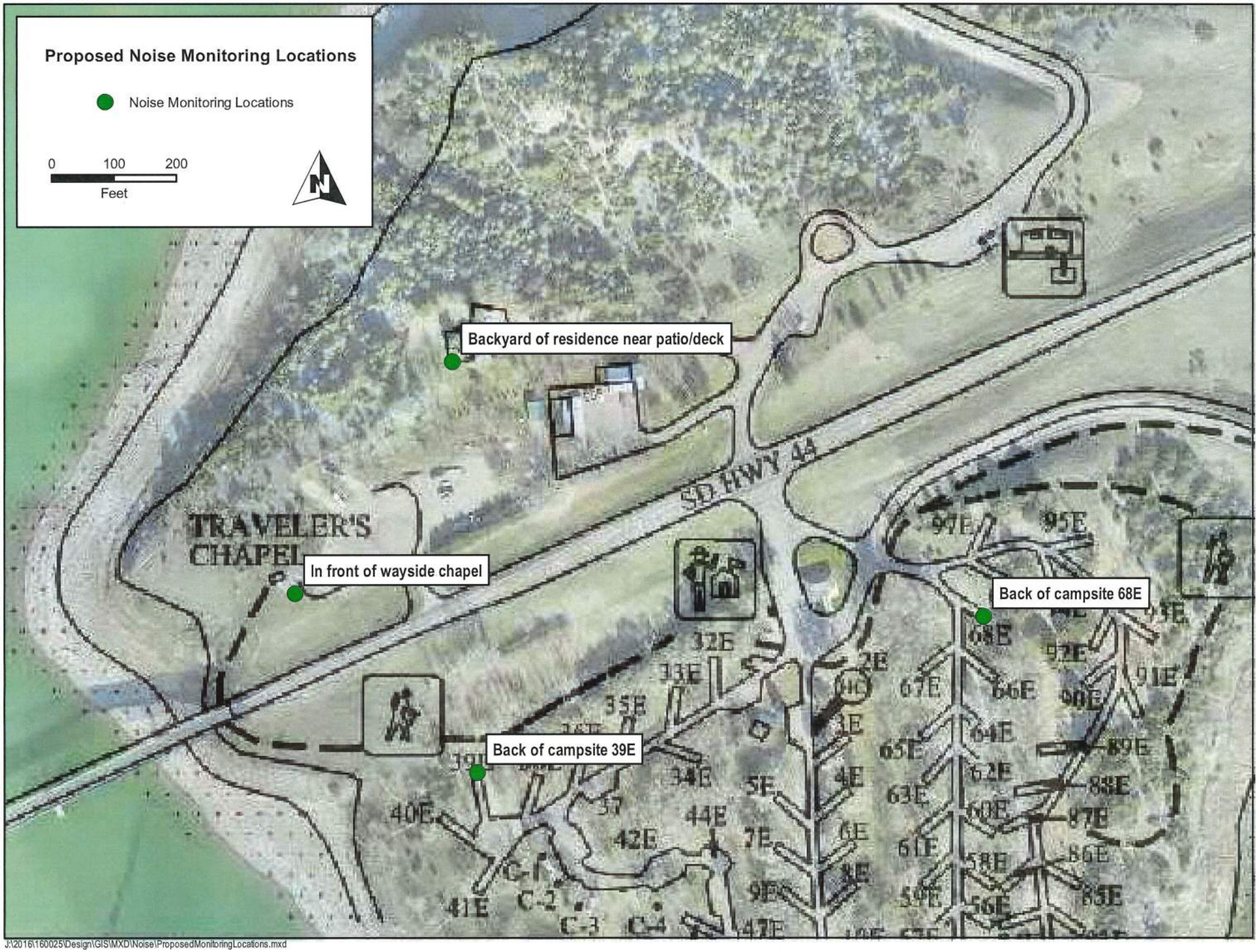

TO PLATTE (14 MILES)
SNAKE CREEK RECREATION AREA
TO WINNER (37 MILES)
WEST BRIDGE LAKESIDE USE AREA
PARK/RECREATION AREA BOUNDARY
RECOMMENDED ALTERNATIVE
APPROXIMATE EXTENT OF NEW BRIDGE
RECOMMENDED ALTERNATIVE ALIGNMENT
South Dakota DOT
Project HP5596(19) 3616 P; P0044()290 3014 N, PCN 05X0
SD 44/Platte-Winner Bridge Corridor Study and Environmental Assessment
Gregory and Charles Mix Counties
HRGreen
DOT
NORTH
0 600 1200
Feet


WEST SIDE OF MISSOURI RIVER
WEST BRIDGE LAKESIDE USE AREA
EAST SIDE OF MISSOURI RIVER
Scenic Overlook to be Redeveloped
Residence to be Relocated
Traveler's Chapel
Campground
SNAKE CREEK RECREATION AREA
PARK/RECREATION AREA BOUNDARY
RECOMMENDED ALTERNATIVE
APPROXIMATE EXTENT OF NEW BRIDGE
RECOMMENDED ALTERNATIVE ALIGNMENT
South Dakota DOT
Project HP5596(19) 3616 P; P0044()290 3014 N, PCN 05X0
SD 44/Platte-Winner Bridge Corridor Study and Environmental Assessment
Gregory and Charles Mix Counties
HRGreen
DOT
NORTH
0 200 400
Feet


Proposed Noise Monitoring Locations
Noise Monitoring Locations
0
100
200
Feet
N
Backyard of residence near patio/deck
SD HWY 44
TRAVELER'S CHAPEL
In front of wayside chapel
Back of campsite 68E
Back of campsite 39E
J:\2016\160025\Design\GIS\MXD\Noise\ProposedMonitoringLocations.mxd

NOISE MONITORING REPORT LOG

HRGreen

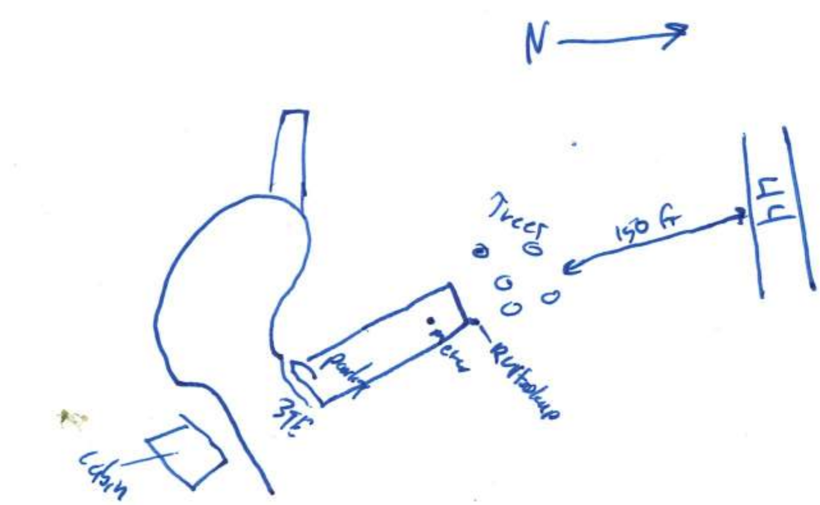
SITE INFORMATION		
Project Name:	44 Bridge	
Date:	6/12/18	
Site Number:	39E	
Address/Description:	Campsite	
MONITORING DATA		
Start Time:	3:56	5:23
End Time:	4:11	5:38
Duration:	0:15	0:15
Leq (dBA):	48.0	48.8
MaxL (dBA):	63.6	61.8
Record No.:	059	063

WEATHER INFORMATION		
Temperature:	79 °F°	80 F°
Wind Speed:	6 mph	9 mph
Wind Direction:	NNW	NWE
Humidity:	48%	45%
Pavement Conditions:		

TRAFFIC INFORMATION

Roadway	Direction	Autos	Trucks	Speed	Duration
44	W	|||			
44	E	卌 卌	|||		
44	W	卌 ||	||		
44	E	卌 ||	|||		

MONITORING SITE DIAGRAM



OTHER NOISE SOURCES OBSERVED

Hand tools work at cabin; camper conversation, dumpster closed, bobcat at cabin 4:09
boats [boats, sneeze]

METER INFORMATION

Manufacturer:

Model No:

Calibrated Before Reading:

Calibrated After Reading:

Operater Name:

NOISE MONITORING REPORT LOG

HRGreen

SITE INFORMATION	
Project Name:	44 Bridge
Date:	6/12/18
Site Number:	68E
Address/Description:	Campsite

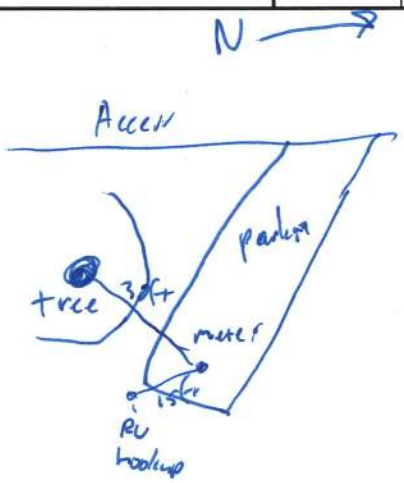
MONITORING DATA		
Start Time:	3:31	5:02
End Time:	3:36	5:17
Duration:	0:15	0:15
Leq (dBA):	48.4	49.3
MaxL (dBA):	64.3	68.3
Record No.:	057	062

WEATHER INFORMATION		
Temperature:	78°F°	79 F°
Wind Speed:	5 mph	5 mph
Wind Direction:	NW	NNW
Humidity:	48%	45%
Pavement Conditions:		

TRAFFIC INFORMATION

Roadway	Direction	Autos	Trucks	Speed	Duration
44	W	𝍸	II		
44	E	𝍸	II		
44	W	III			
44	E	𝍸 III	II		

MONITORING SITE DIAGRAM



OTHER NOISE SOURCES OBSERVED

None

car on unpaved road, boats, birds

METER INFORMATION

Manufacturer:

Model No:

Calibrated Before Reading:

Calibrated After Reading:

Operater Name:

NOISE MONITORING REPORT LOG

HRGreen

SITE INFORMATION		
Project Name:	44 Bridge	
Date:	6/11/18	
Site Number:	Chapel	
Address/Description:		

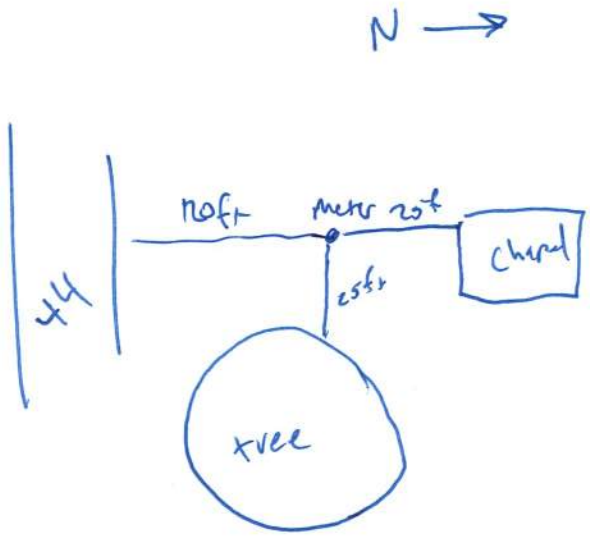
MONITORING DATA		
Start Time:	3:02	4:37
End Time:	3:17	4:52
Duration:	00:15	00:15
Leq (dBA):	54.7	63.5
MaxL (dBA):	77.4	76.4
Record No.:	056	061

WEATHER INFORMATION		
Temperature:	76 F°	80 F°
Wind Speed:	5 mph	8 mph
Wind Direction:	WNW	NNW ~~WSW~~
Humidity:	50%	44%
Pavement Conditions:		

TRAFFIC INFORMATION

Roadway	Direction	Autos	Trucks	Speed	Duration
44	W	~~HH~~ ||	||		
44	E	~~HH~~ |	||		
44	W	~~HH~~ |	|		
44	E	||||	|||		

MONITORING SITE DIAGRAM



OTHER NOISE SOURCES OBSERVED

None

boats

METER INFORMATION

Manufacturer:

Model No:

Calibrated Before Reading:

Calibrated After Reading:

Operater Name:

NOISE MONITORING REPORT LOG

HRGreen

SITE INFORMATION		
Project Name:	44 Bridge	
Date:	6/12/19	
Site Number:	residence	
Address/Description:	pole residence	

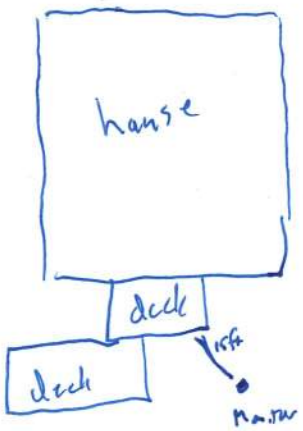
MONITORING DATA		
Start Time:	2:34	4:17
End Time:	2:49	4:32
Duration:	~~00:15~~ 00:15	00:15
Leq (dBA):	50.0	53.4
MaxL (dBA):	68.1	69.0
Record No.:	055	060

WEATHER INFORMATION		
Temperature:	77 F°	79F°
Wind Speed:	4 ~~[illegible]~~ mph	2mph
Wind Direction:	NNE	WNW
Humidity:	50%	47%
Pavement Conditions:	~~[illegible]~~	

TRAFFIC INFORMATION

Roadway	Direction	Autos	Trucks	Speed	Duration
44	W	IIII	I		
44	E	III	HH		
44	W	~~IIII~~ ~~HH~~	~~I~~		
44	E	~~HH~~ I	II		

MONITORING SITE DIAGRAM



OTHER NOISE SOURCES OBSERVED

ambulance at start, boats + 2:45

boats, birds, vehicles leaving shop

METER INFORMATION

Manufacturer:

Model No:

Calibrated Before Reading:

Calibrated After Reading:

Operater Name: