Final Evaluation of Designated Roads (Transmission Line Phase)

Prepared for:

Codington County Highway Department
Codington County, SD

FEBRUARY 2021

Prepared by:

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Final Evaluation of Designated Roads (Transmission Line Phase)

Codington County Highway Department
Codington County, SD

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I hereby certify that this Report was prepared by me or under my direct supervision.

TABLE OF CONTENTS

SECTION I: INTRODUCTION

NextEra Energy Resources LLC (Developer) has completed construction on the wind farm project referred to as Crowned Ridge Wind LLC. The construction was understood to be completed in two phases known as Crowned Ridge Wind I and Crowned Ridge Wind II, respectively, and each with preliminary transmission line phases. Portions of this wind farm project are located in Codington County, SD, where the Developer entered an agreement (Agreement for Road Use, Repair, and Improvements dated April 2nd, 2019) with the Codington County Highway Department (Owner) to utilize county roads as haul routes. The owner has consulted with Banner Associates, Inc. (Engineer) to perform two roadway evaluations of all proposed haul routes, once at a time prior to construction and once construction has ceased. The roadways used in this phase of the construction were presented to the Owner for post-construction evaluation on October 8, 2020. This report presents the Engineer's findings for the post-construction roadway evaluation of the Transmission Line phase of Crowned Ridge Wind I.

It is our understanding the Transmission Line travels from a Substation in Codington County, through Grant County, to a Capacitor station near Big Stone City, SD. There are seven (7) miles of asphalt surfaced Codington County highway roads that were used as haul roads for the transmission line. The roads are identified in further detail in Figure 1 below. Banner contacted a representative of the SDDOT in regard to truck percentages of the ADT. The SDDOT stated that truck counts were not available for these two particular roads; however, the statewide average for Rural Collectors of this type is 13% of the ADT. The roads are in northeastern Codington County, near South Shore, SD. A project area map is provided in APPENDIX A.

The main project control center and laydown yard, a material mining pit, as well as a substation are located within the footprint of this phase of the project. The main project control center and laydown yard were located in Section 11 – Township 118 N – Range 51 W in Waverly Township, with access coming off of CCR No 3. The material mining pit is located in Section 26 – Township 119 N – Range 51 W in Leola Township, with access coming off of CCR No 3. The substation is located in Section 11 – Township 118 N – Range 51 W in Waverly Township, with access coming off of CCR No 3. These facilities generated substantial traffic both in frequency and loading on the roads evaluated as part of this phase. These roads were also utilized for subsequent phases of both Crowned Ridge Wind I and Crowned Ridge Wind II as well.

Figure 1 – Roadway Inventory

Roadway	Segment	Length (miles)	Surfacing	ADT	ADT-T
CCR No 4 – 162nd Street	464th Ave. – 466th Ave.	2	Asphalt	110	14
CCR No 3 – 464th Avenue	157th St. – 162nd St.	5	Asphalt	185	24
	Total Miles	7			

*CCR – Codington County Road
*ADT – Average Daily Traffic counts
*ADT-T – Average Daily Truck Traffic

SECTION II: ROADWAY EVALUATION PROCESS

Banner compiled input from internal transportation engineers, clients of previous roadway inspection projects, and the Owner's particular preferences in order to formulate an effective roadway evaluation process. Banner determined the most practical way to evaluate the roadway condition was to utilize three major categories of evaluation to include geotechnical investigation, manual roadway data collection, and visual inspection and observation. Further details are provided below.

Geotechnical Investigation

Banner obtained the professional services of GeoTek Engineering & Testing Services, Inc. in Sioux Falls, SD to perform standard penetration test (SPT) soil borings at a frequency of three per mile. The borings provide a representative sample of each segment of roadway in regard to the existing asphalt and base course sections, as well as the type and condition of subgrade and underlying soils to a depth of six feet. The following paragraph is an excerpt from the pre-construction evaluation regarding the geotechnical exploration efforts.

GeoTek reported that the average asphalt pavement and clean gravel base course thickness on CCR No 4 is 3.8 inches and 6.9 inches, respectively. This section sits on a subgrade that is described as in fair condition. GeoTek reported that the average asphalt pavement and clean gravel base course thickness on CCR No 3 is 4.2 inches and 7.8 inches, respectively. Banner particularly requested reporting of clean and contaminated base course material, as contamination can contribute to a weaker pavement section. All base course material was reported as clean.

Manual Roadway Data Collection

Banner performed manual field measurements of pavement widths and rut depths, as well as additional depth measurements to document any pavement deformations. These measurements were taken at a frequency of five per mile. The field measurements consisted of Banner staff using a magnesium screed to provide a straight edge plane from the crown of the roadway to the shoulder. Banner then determined offsets from centerline and measured depths departing from the straight edge to 1/16" precision. These measurements were taken at the same locations as the pre-construction manual field measurements to provide a better understanding of potential roadway damages.

Banner reported that on average the rutting within the wheel paths on both CCR No 4 and CCR No 3 fell between 1/8" and 3/8" as a departure from the straight edge, with the deepest rut measuring 1/2". The full data set for manual roadway measurements can be found in APPENDIX B.

Visual Inspection and Observation

Banner collected video of each section of roadway from a vehicle mounted Go-Pro camera. Upon reviewing the video, Banner drove the roadway segments, making frequent stops to document and assess pavement deterioration, crack widths, and to record any other notable observations. Banner utilized notes from the inspection as well as pictures, video, and measurements to provide ratings for each roadway segment. Roadway rating criteria and results are provided in the Roadway Rating section of this report. During the pre-construction evaluation, Banner noted areas of additional observation that served as locations that Banner felt were most susceptible to damage from construction activities. Those same locations were observed during the post-

construction evaluation, and a comparison to the pre-construction status was noted. A map and comparison notes can be found in APPENDIX C.

Culvert Inspection

During the visual inspection, Banner also assessed all drainage pipes crossing beneath the highways. During the assessment, Banner took pictures of each end of the culverts, as well as any deficiencies noticed. Banner also recorded the shape, size, and material of each culvert, as well as the aforementioned deficiencies that were photographed. This work was completed during the pre-construction evaluation and then the culverts were re-assessed during the post-construction evaluation, with any changes noted. A map and detailed assessment notes can be found in APPENDIX D.

SECTION III: ASPHALT ROADWAY RATING

In an effort to give Codington County a basis for the condition of the prospective haul roads prior to construction and a comparison condition post-construction, Banner produced a rating for each one mile stretch of roadway evaluated. The rating system chosen by Banner is derived from the Pavement Surface Evaluation and Rating (PASER) Asphalt Roads Manual produced by the Transportation Information Center at the University of Wisconsin-Madison. The PASER Manual addresses four major categories of common asphalt pavement distress, to include: Surface defects, Surface deformation, Cracks, and Patches and potholes. Roadways are rated on a scale of 1, being failed, to 10, being excellent. The Distress Identification Manual for the Long-Term Pavement Performance Program produced by the Federal Highway Administration was also used as an additional resource for identifying severity levels of the pavement distress. An excerpt from the PASER Manual regarding a general description of each surface rating is provided in APPENDIX E.

The four major categories of distress can be broken down further to provide a more comprehensive evaluation tool. Surface defects are represented by raveling, flushing, and polishing. Surface deformation is represented by rutting, distortion, rippling and shoving, settling, and heaving. Cracks can be represented by transverse, reflective, longitudinal, block, alligator, and slippage. These distresses, as well as patches and potholes present on the roadway, were evaluated by Banner Engineers as being of low, medium, or high severity. The severity and frequency of the distresses were taken into account when formulating an overall rating reflective of the entire mile stretch of roadway.

Banner utilized visual inspection as well as manual field measuring to determine severity levels of the pavement distress. What follows is a general synopsis of the information collected and used to determine the PASER ratings. The PASER rating for each one-mile segment of roadway is shown in Figure 2 on page 9.

Mile No. 1 - CCR No. 4 from 466th Ave – 465th Ave

- Moderate amount of longitudinal and transverse cracks throughout, with many longitudinal cracks in outside wheel paths and roadway shoulders.
- Moderate severity block and alligator cracking present along outside ¼ of lanes for approximately 35% of the segment length
- Asphalt settlement was noted in a couple locations, particularly above culvert crossings

- Moderate severity of aggregates worn away in the wheel paths coupled with oil migrating to the surface, creating a slick traveling surface.
- Rutting measured between 1/16th and 5/16th of an inch.
- Three new patches were noted along this segment of roadway replacing areas of pavement that were compromised during construction.

Mile No. 2 - CCR No. 4 from 465th Ave – 464th Ave

- Moderate amount of longitudinal and transverse cracks of medium severity throughout, with many longitudinal cracks in wheel paths
- Moderate severity block and alligator cracking present along outside ¼ of lanes for approximately 35% of the segment length
- Asphalt settlement was noted in a couple locations, particularly above culvert crossings
- Moderate severity of aggregates worn away in the wheel paths coupled with oil migrating to the surface, creating a slick traveling surface.
- Seven new patches were noted along this segment of roadway replacing areas of pavement that were compromised during construction.
- Rutting measured between 1/16th and 3/8th of an inch.

Mile No. 3 - CCR No. 3 from 161st St – 162nd St

- Moderate amount of longitudinal and transverse cracks throughout, with longitudinal cracks of medium severity mostly prevalent in wheel paths
- Moderate severity of block and alligator cracking present along outside ¼ of lanes for approximately 35% of the segment length
- Asphalt settlement was noted in a couple locations, particularly above culvert crossings
- High severity of aggregates worn away in the wheel paths coupled with oil migrating to the surface, creating a slick traveling surface.
- One new patch was noted along this segment of roadway replacing an area of pavement that was compromised during construction.
- Rutting measured between 1/16th and 5/16th of an inch.

Mile No. 4 - CCR No. 3 from 160th St – 161st St

- Moderate amount of longitudinal and transverse cracks throughout, with longitudinal cracks of medium severity mostly prevalent in wheel paths
- High severity of block and alligator cracking present along outside 1/2 of lanes for approximately 95% of the segment length
- Asphalt settlement was noted in a couple locations, particularly above culvert crossings
- High severity of aggregates worn away in the wheel paths coupled with oil migrating to the surface, creating a slick traveling surface.
- One new patch was noted along this segment of roadway replacing an area of pavement that was compromised during construction.
- Rutting measured between 1/16th and 3/8th of an inch.

Mile No. 5 - CCR No. 3 from 159th St – 160th St

- Moderate amount of longitudinal and transverse cracks throughout, with longitudinal cracks mostly prevalent in wheel paths
- High severity of block and alligator cracking present along outside 1/3 of lanes for approximately 35% of the segment length
- Asphalt settlement was noted in a couple locations, particularly above culvert crossings
- High severity of aggregates worn away in the wheel paths coupled with oil migrating to the surface, creating a slick traveling surface.
- No new patches observed
- Rutting measured between 1/16th and 3/16th of an inch.

Mile No. 6 - CCR No. 3 from 158th St – 159th St

- Moderate amount of longitudinal and transverse cracks throughout, with longitudinal mostly prevalent in wheel paths and along centerline. Transverse cracks at a fairly consistent frequency of approximately 25’ intervals, tightening to 15’ intervals near south end of segment.
- High severity of block and alligator cracking present along outside 1/3 of lanes for approximately 70% of the segment length, and especially prevalent in southbound lane
- Asphalt settlement and movement noted in some areas, particularly near the ½ mile line
- Moderate severity of aggregates worn away in the wheel paths coupled with oil migrating to the surface, creating a slick traveling surface.
- One new patch was noted along this segment of roadway replacing an area of pavement that was compromised during construction.
- Rutting measured between 1/16th and 3/8th of an inch.

Mile No. 7 - CCR No. 3 from 157th St - 158th St

- Moderate amount of longitudinal and transverse cracks throughout, with longitudinal cracks mostly prevalent in wheel paths and along centerline. Transverse cracks at a fairly consistent frequency of approximately 25’ intervals.
- Moderate severity of block and alligator cracking present along outside ¼ of lanes for approximately 35% of the segment length
- High severity of aggregates worn away in the wheel paths coupled with oil migrating to the surface, creating a slick traveling surface.
- No new patches observed
- Rutting measured between 1/16th and 7/16th of an inch.

Figure 2 – PASER Rating

Roadway	Segment	Mile Reference	PASER Rating
CCR No 4 - 162nd St	466th Ave – 465th Ave	1	4
CCR No 4 - 162nd St	465th Ave – 464th Ave	2	4
CCR No 3 - 464th Ave	162nd St – 161st St	3	4
CCR No 3 - 464th Ave	161st St – 160th St	4	3
CCR No 3 - 464th Ave	160th St – 159th St	5	5
CCR No 3 - 464th Ave	159th St – 158th St	6	4
CCR No 3 - 464th Ave	158th St – 157th St	7	5

SECTION IV: HAUL ROUTE MAINTENANCE

Representatives of Codington County and Banner Associates frequently traveled the haul routes to gauge the maintenance effort of the Developer during construction. The maintenance of the roads was the responsibility of the Developer for the duration of the construction period. Initial observations showed that the Developer did not take any pre-construction steps to improve the roadways and strengthen their ability to handle the proposed loadings anticipated with the project. Subsequent observations showed that the stretches of roadway evaluated in this phase of the project continued to deteriorate until much of the roadway experienced excessive damages that at many times created a compromised and unsafe roadway.

At times, the public traveling these roads contacted the Codington County Highway Department regarding potholes and roadway breakups creating safety concerns, particularly during night driving. The maintenance effort of the Developer to address these concerns was minimal throughout the duration of construction, as it was noted that many areas of break-up were not maintained for a period of months. The developer did place temporary maintenance asphalt patches over areas of complete failure and break-up at the completion of construction. These patches are intended for short term maintenance only, and do not provide a long-term solution to the damages experienced. The Codington County Highway Department did not perform any routine maintenance on these stretches of roadway during the construction timeframe.

SECTION V: SUMMARY

Banner would consider the segments of CCR No 4 and CCR No 3 to be in poor condition overall. Manual roadway measurements show that the roadways have experienced minor to moderate rutting in the wheel paths. Additional visual observations have shown substantial damage and deficiencies across all aspects of pavement evaluation, including cracking, flushing, polishing, and patching. Assessment of the roadways using the PASER system provided an average rating of four (4).

A lack of pre-construction efforts to enhance the roadway carrying capabilities, as well as a lack of ongoing maintenance during construction has brought nearly the entire stretch of roadway into a state of failure. Many locations have exhibited complete failure by means of excessive cracking, potholing, and complete break-up of the surface material. With the amount of damage that can be seen from the surface, it can be concluded that the remaining roadway section has been severely compromised as well. With the roads having been in service

for many years to this point and no significant damage noted on the pre-construction roadway evaluation, it is clear that the damages sustained by the haul routes from the construction activities are far beyond that in which typical traffic loadings over the course of sixteen months would have produced.

The Codington County Highway Department practices a preventative maintenance program for their roadways comprised largely of chip seals and overlays to ensure an extension of the roadway life cycle multiple times over before reaching a state of failure. This is a common practice in this area, particularly on rural roadways where low ADT counts result in a substantial increase in the longevity of quality constructed and maintained roadways. What has transpired on the haul routes in this phase of the project would fall under the practice of reactive maintenance, in which the roadway is allowed to reach a point of failure and extensive restoration is necessary to return the roadway to a state in which future preventative maintenance can again be practiced.

Restoration expectations for the haul routes were echoed at the South Dakota Public Utilities Commission meetings held on October 13th and again on October 28th, where commissioners made clear statements that the expectation for the roadway restoration efforts are for the roads to be returned in "perfect condition." The commission reaction was particular to a letter received from the project's public liaison, as well as comments made by the Codington County Highway Superintendent as well as photos that a local resident sent to the Public Utilities Commission. The damages were acknowledged by a representative of NextEra Energy and were quoted as being "typical" for a wind project site.

SECTION VI: EVALUATION COMPARRISON

Banner has compared the pre-construction roadway evaluation data with the post-construction roadway evaluation data and this section summarizes our findings.

In this phase of the project, there are seven (7) miles of asphalt roadway, totaling 35 manual roadway measurement locations. Of the 35 locations, 17 showed an increase in rut depth for at least one measurement at that location. The severity of the increased rut depths ranged from 1/16th of an inch to 5/16ths of an inch, with an average of approximately 1/8th of an inch. Another four (4) locations were temporarily patched due to damages sustained during construction and therefore a comparison could not be made. Manual roadway measurements for lane width also showed that the roadway shoulder pushed out anywhere from 1/2" up to 2" in some areas.

Banner completed a visual inspection and assigned a PASER roadway rating to each one mile stretch of designated haul route. The post-construction visual inspection showed an increase in both frequency and severity of the common asphalt pavement distresses. Cracking was much more prevalent on the post-construction inspection, particularly longitudinal and block cracking along each outer quarter of the roadway. The aggregate in the wheel paths has been worn to a point where there is no angularity left on the aggregates at the surface, creating a very slick and friction-free surface. Flushing and polishing increased significantly, with it being very evident that oil had migrated to the surface of the asphalt in a large portion of the wheel paths due to heavy and consistent loading. Lastly, the roadway experienced areas of potholing and asphalt break-up, which resulted in the need for temporary maintenance patches to be placed. Figure 3 on the next page shows a comparison of PASER ratings for each mile stretch of roadway.

Figure 3 – PASER Rating Comparison

Roadway	Segment	PASER Rating	
		Pre-Construction	Post-Construction
CCR No 4 - 162nd St	466th Ave – 465th Ave	7	4
CCR No 4 - 162nd St	465th Ave – 464th Ave	7	4
CCR No 3 - 464th Ave	162nd St – 161st St	7	4
CCR No 3 - 464th Ave	161st St – 160th St	7	3
CCR No 3 - 464th Ave	160th St – 159th St	7	5
CCR No 3 - 464th Ave	159th St – 158th St	7	4
CCR No 3 - 464th Ave	158th St – 157th St	7	5

During construction, many intersections were widened to accommodate construction traffic, which required the contractor to remove and temporarily place traffic signs at intersections. It was noted that the most common temporary placement effort was by placing the signposts in PVC standpipes that were anchored into the ground. During the post construction evaluation, it was noted that many signs remained in the temporary PVC standpipes and/or were reinstalled but incorrectly whether it be absent square placement to the corresponding intersection and roadways, at an inappropriate offset to the corresponding roadways, or on inappropriate mounting posts. The maintenance and reinstallation of these signs is of extreme importance.

Many areas of highway right of way that were vegetated prior to construction currently sit barren. The areas exhibiting a lack of vegetation were commonly observed in locations where existing intersections were widened for construction and the widening was removed at the conclusion of construction, and locations where turbine access roads are installed off of the county highway. The lack of vegetation in these areas creates a concern for erosion and sediment transfer.

Banner did not note any additional deficiencies during the post-construction evaluation of the culverts beneath the roadway.

APPENDIX G contains pre- and post-construction frozen frames from video of the haul routes collected by Banner. Each sheet shows a side-by-side comparison of the same location from each evaluation period. The damages shown are intended to depict the typical damage experienced by that segment of roadway. Please note that some haul routes were driven in opposite direction pre- and post-construction, so a red arrow is used to point out an identifier in each photo to verify it is the same location in both frozen frames. Banner has also included a sheet of photos taken during construction of areas of roadway that were completely compromised.

SECTION VII: RESTORATION RECOMMENDATIONS

In accordance with Section 3.2 *Repair of Designated Roads* of the *Agreement for Road Use, Repair, and Improvements*, the Developer is responsible for the restoration of all Designated Roads as specified in this Final Evaluation of Designated Roads Report. Restoration may include, but is not limited to, to following: 1) services of civil, structural and geotechnical consultant(s), 2) Design, plans, bidding, staking, testing, observation, etc., 3) repair of damaged roadway areas, additional gravel, asphalt overlays, etc., 4) replacement of roadway base

and surfacing, 5) repair and/or replacement of bridges and/or culverts. All costs associated with the restoration of the roadways, bridges, and culverts along the designated roads shall be paid for by the Developer.

Banner has determined that there is no feasible rehabilitation effort that could return these roadways to the condition as outlined in the Pre-Construction Evaluation Report. The structural integrity and life span of these roadways has been damaged beyond rehabilitation. Banner recommends full reconstruction of the asphalt roadway surfacing section for the seven (7) miles of CCR No 3 and CCR No 4 as identified in this report. Full reconstruction will include, but is not limited to, traffic control, shoulder preparation, reclamation of the in-place surfacing material, incorporation of virgin base course, roadway shaping, installation of 4" of asphalt concrete pavement surfacing, and restoring the shoulders of the roadway, and striping. This is the most reasonable way to return the road at least back to pre-construction condition.

Banner recommends that all intersections within the project footprint are to be evaluated and all signs are to be re-installed, as necessary, in accordance with the Codington County Highway Department standards for placement in relation to the corresponding roadway and on proper sign posts using Codington County Highway Department approved hardware. This effort is required to be coordinated with the Codington County Highway Department prior to commencement of the effort. Banner also recommends that all areas of highway right-of-way in need of vegetative restoration are to be cleared of all rock and gravel debris and seeded using a Codington County Highway Department approved seed mix and method.

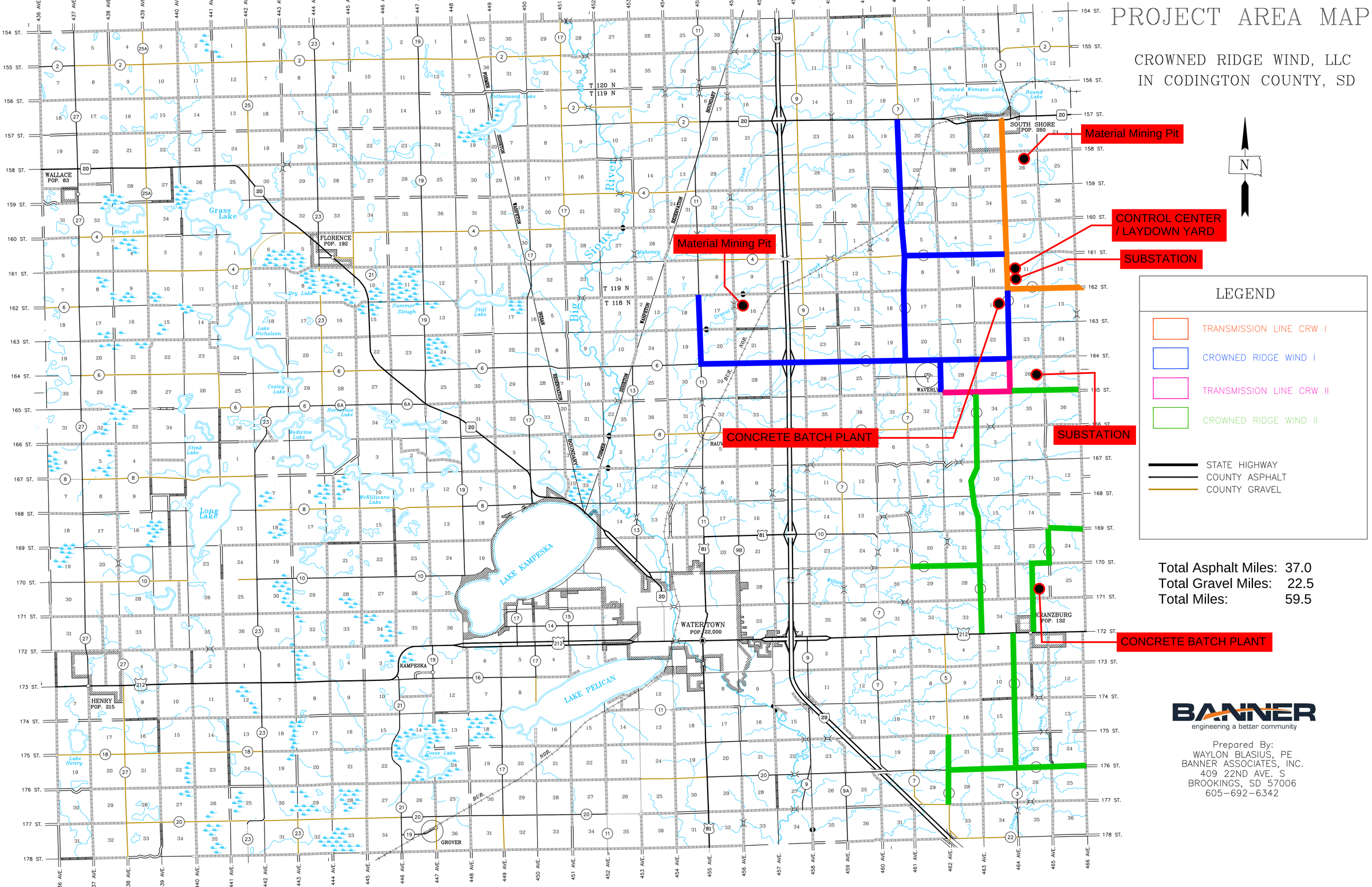
Banner recommends that a consultant be hired to produce construction documents and provide bidding and construction observation services appropriate for the effort necessary to complete the roadway restoration. All restoration plans and specifications are required to be approved by the Codington County Highway Department prior to any restoration efforts taking place. Banner also recommends that a testing agency be hired to complete quality control testing for the roadway restoration efforts.

An opinion of probable restoration cost can be found in Appendix F. Please note this cost estimate is meant for a ballpark cost for informational purposes only, the Developer is responsible for all actual costs incurred to completely satisfy the restoration recommendations. In accordance with Section 3.2 *Repair of Designated Roads* of the *Agreement for Road Use, Repair, and Improvements*, the restoration of the Designated Roads shall be completed within 12 months of the Final Evaluation of Designated Roads report being issued to the Developer.

APPENDIX A

PROJECT AREA MAP

PROJECT AREA MAP



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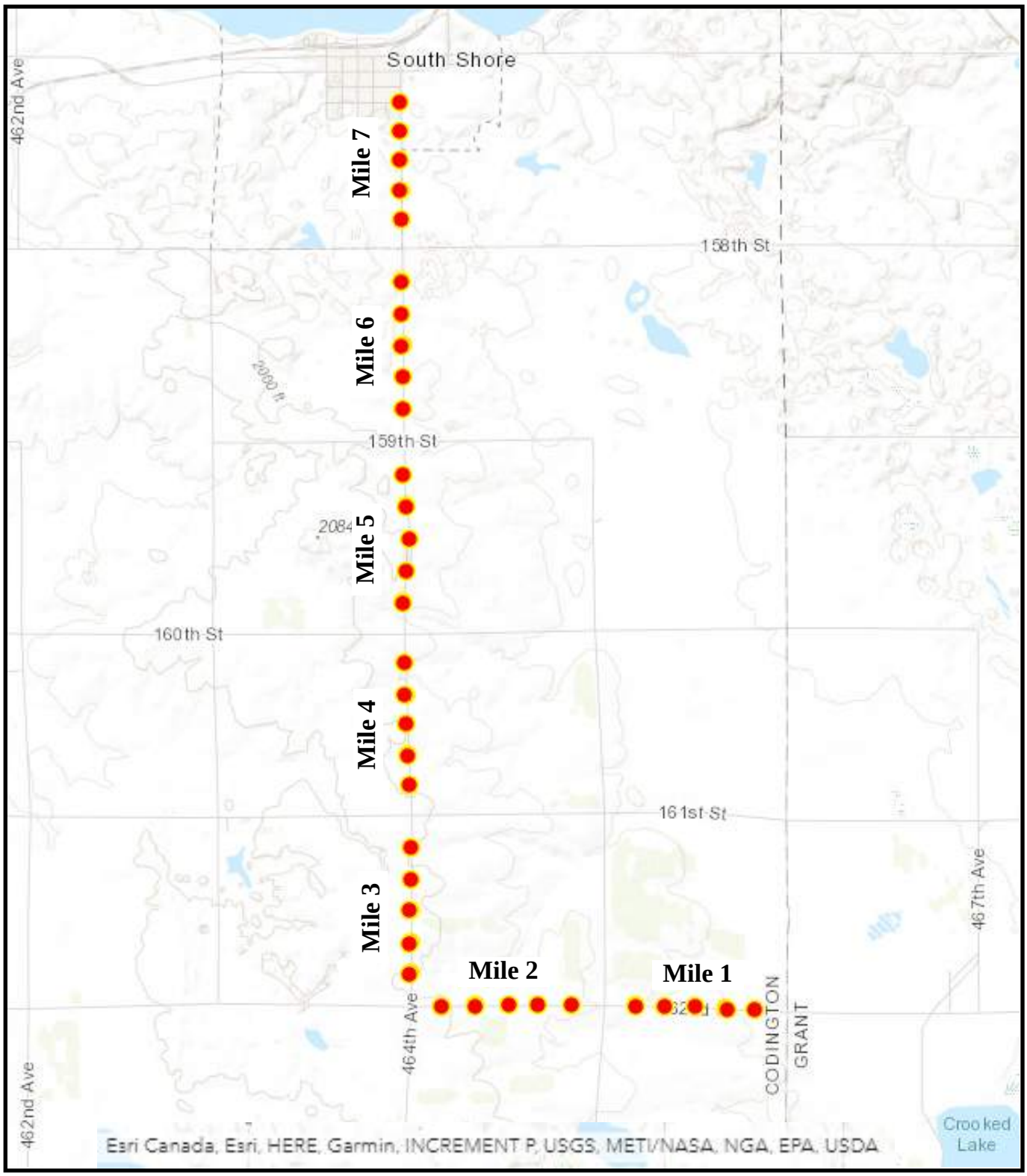
APPENDIX B

MANUAL ROADWAY MEASUREMENTS



Roadway Measurements Map

MILE 1

Location ID	Lane	Lane Width 1	Lane Width 2
M1	North	148 1/2	148 1/2

Offset	Depth 1	Depth 2	Difference
11	1/8		
31	3/16		
42 1/2	1/16	Patch	
56 1/2	1/8		
93	7/16		
119	1/16		

Location ID	Lane	Lane Width 1	Lane Width 2
M2	North	146 1/4	146 1/4

Offset	Depth 1	Depth 2	Difference
16	1/8	1/8	0
32	3/16	3/16	0
63	1/8	1/8	0
74	1/16	1/16	0
95	5/16	5/16	0
119	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M3	North	146 1/4	146 1/4

Offset	Depth 1	Depth 2	Difference
14	1/8	1/8	0
26	3/16	3/16	0
73	0	1/8	1/8
89	3/16	3/16	0
106	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M4	North	144	144

Offset	Depth 1	Depth 2	Difference
14	1/8	1/8	0
26	3/16	3/16	0
44	1/8	1/8	0
70	1/8	1/8	0
90	5/16	5/16	0
112	1/8	1/8	0

Location ID	Lane	Lane Width 1	Lane Width 2
M5	North	150	150

Offset	Depth 1	Depth 2	Difference
10	1/16	1/16	0
20	1/8	1/8	0
47	1/16	1/16	0
72	1/16	1/16	0
96	5/16	5/16	0
114	3/16	3/16	0
119	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M70	South	150	150

Offset	Depth 1	Depth 2	Difference
6	0	0	0
22	1/16	1/16	0
40	0	0	0
64	1/16	1/16	0
78	0	0	0
95	1/8	1/8	0
117	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M69	South	150 1/2	150 1/2

Offset	Depth 1	Depth 2	Difference
6	0	0	0
23	1/16	1/16	0
49	0	0	0
69	0	0	0
90	1/4	1/4	0
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M68	South	143 1/2	143 1/2

Offset	Depth 1	Depth 2	Difference
12	1/16	1/16	0
35	1/16	1/16	0
53	0	0	0
76	0	0	0
97	1/8	1/8	0
117	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M67	South	151	151

Offset	Depth 1	Depth 2	Difference
8	0	0	0
24	1/8	3/16	1/16
48	1/8	1/8	0
76	0	0	0
92	1/4	5/16	1/16
110	5/16	5/16	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M66	South	145	145

Offset	Depth 1	Depth 2	Difference
12	1/16	3/16	1/8
31	1/8	1/8	0
50	0	1/8	1/8
72	1/16	1/8	1/16
94	1/4	1/4	0
116	0	0	0

MILE 2

Location ID	Lane	Lane Width 1	Lane Width 2
M6	North	145	145

Offset	Depth 1	Depth 2	Difference
6	1/16	1/16	0
25	3/16	1/4	1/16
55	1/8	1/8	0
72	1/16	1/16	0
92	3/16	3/16	0
114	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M65	South	156	156

Offset	Depth 1	Depth 2	Difference
16	1/16	1/8	1/16
28	1/16	3/16	1/8
51	1/16	1/16	0
75	1/16	1/16	0
96	1/4	1/4	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M7	North	153	153

Offset	Depth 1	Depth 2	Difference
6	0	0	0
19	3/16	3/16	0
30	3/16	3/16	0
44	1/16	1/16	0
72	0	0	0
95	3/16	1/4	1/16
118	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M64	South	148	148

Offset	Depth 1	Depth 2	Difference
5	3/16	3/16	0
14	1/4	5/16	1/16
31	1/8	1/4	1/8
55	1/16	1/8	1/16
75	1/16	1/16	0
92	5/16	3/8	1/16
117	0	1/8	1/8

Location ID	Lane	Lane Width 1	Lane Width 2
M8	North	154	154

Offset	Depth 1	Depth 2	Difference
16	1/16	1/16	0
25	1/16	1/16	0
35	1/16	3/16	1/8
45	1/8	1/8	0
79	1/8	1/8	0
92	1/4	1/4	0
115	1/8	1/8	0

Location ID	Lane	Lane Width 1	Lane Width 2
M63	South	148 1/2	148 1/2

Offset	Depth 1	Depth 2	Difference
10	0	0	0
24	1/16	1/16	0
38	0	0	0
60	1/4	1/4	0
67	1/8	1/8	0
88	3/16	3/16	0
114	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M9	North	153	153

Offset	Depth 1	Depth 2	Difference
7	1/8	1/8	0
22	3/16	3/16	0
47	0	0	0
74	0	0	0
93	1/4	3/8	1/8
115	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M62	South	153	153

Offset	Depth 1	Depth 2	Difference
17	1/16	1/8	1/16
34	1/8	3/16	1/16
54	1/16	1/16	0
74	0	0	0
100	3/16	3/8	3/16
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M10	North	155	155

Offset	Depth 1	Depth 2	Difference
6	1/16	1/16	0
26	3/16	3/16	0
56	1/16	1/16	0
72	1/16	1/16	0
99	3/8	3/8	0
120	1/8	1/8	0

Location ID	Lane	Lane Width 1	Lane Width 2
M61	South	151	151

Offset	Depth 1	Depth 2	Difference
10	1/16	1/16	0
35	1/16	1/16	0
55	0	0	0
68	0	0	0
94	1/4	1/2	1/4
117	0	0	0

MILE 3

Location ID	Lane	Lane Width 1	Lane Width 2
M11	East	152	

Offset	Depth 1	Depth 2	Difference
9	1/16		
0	3/16		
0	1/16	Patch	
0	0		
88	1/16		
115	0		

Location ID	Lane	Lane Width 1	Lane Width 2
M60	West	153	

Offset	Depth 1	Depth 2	Difference
10	1/16		
30	0		
48	1/16		
55	1/8	Patch	
71	0		
86	1/16		
119	0		

Location ID	Lane	Lane Width 1	Lane Width 2
M12	East	150	150

Offset	Depth 1	Depth 2	Difference
13	1/16	1/16	0
28	1/8	1/8	0
66	1/16	1/16	0
74	1/8	1/8	0
97	3/16	3/16	0
112	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M59	West	152	152

Offset	Depth 1	Depth 2	Difference
17	1/8	1/8	0
27	1/16	1/16	0
52	0	0	0
73	0	0	0
90	1/8	1/8	0
110	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M13	East	150	150

Offset	Depth 1	Depth 2	Difference
9	1/8	1/8	0
18	3/16	3/16	0
44	5/16	5/16	0
60	1/8	1/8	0
68	1/16	1/16	0
104	1/8	1/8	0
119	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M58	West	148	148

Offset	Depth 1	Depth 2	Difference
17	1/8	1/8	0
38	1/16	1/16	0
53	0	0	0
81	0	0	0
102	1/16	1/16	0
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M14	East	143	144

Offset	Depth 1	Depth 2	Difference
2	1/8	1/8	0
8	3/16	3/16	0
30	1/16	1/16	0
44	1/16	1/16	0
74	1/16	1/16	0
87	1/8	1/8	0
107	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M57	West	155	155

Offset	Depth 1	Depth 2	Difference
13	1/16	1/16	0
20	1/8	1/8	0
35	1/16	1/16	0
60	1/16	1/16	0
68	0	0	0
91	1/16	1/16	0
117	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M15	East	148	148

Offset	Depth 1	Depth 2	Difference
2	1/16	1/16	0
16	1/8	1/8	0
32	1/8	1/8	0
54	1/16	1/16	0
71	1/16	1/16	0
88	1/8	1/8	0
111	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M56	West	153	155

Offset	Depth 1	Depth 2	Difference
10	1/8	1/8	0
30	1/16	1/16	0
48	1/8	1/8	0
71	1/8	1/8	0
94	1/8	1/8	0
119	0	0	0

MILE 4

Location ID	Lane	Lane Width 1	Lane Width 2
M16	East	154	154

Offset	Depth 1	Depth 2	Difference
9	1/16	1/16	0
23	1/8	1/8	0
42	1/16	1/16	0
73	0	0	0
96	5/16	5/16	0
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M17	East	151	151

Offset	Depth 1	Depth 2	Difference
8	1/16	1/16	0
31	3/8	3/8	0
64	1/16	1/16	0
72	1/16	1/16	0
94	1/4	1/4	0
115	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M18	East	162	162

Offset	Depth 1	Depth 2	Difference
10	0	0	0
17	1/8	1/8	0
36	1/16	1/16	0
62	1/16	1/16	0
94	1/8	1/8	0
105	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M19	East	152	152

Offset	Depth 1	Depth 2	Difference
3	1/16	1/16	0
16	5/16	5/16	0
38	1/4	1/4	0
58	1/16	1/16	0
64	1/16	1/16	0
93	1/8	1/8	0
117	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M20	East	152	152

Offset	Depth 1	Depth 2	Difference
19	1/8	1/8	0
30	1/8	1/8	0
47	3/16	3/16	0
65	0	0	0
73	1/16	1/16	0
95	3/16	3/16	0
115	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M55	West	147 1/2	147

Offset	Depth 1	Depth 2	Difference
10	1/16	1/16	0
28	1/16	1/16	0
44	1/16	1/16	0
76	1/16	1/16	0
93	3/16	3/16	0
118	1/8	1/8	0

Location ID	Lane	Lane Width 1	Lane Width 2
M54	West	147	147

Offset	Depth 1	Depth 2	Difference
7	1/8	1/8	0
17	3/16	3/16	0
32	3/16	3/16	0
53	0	0	0
84	1/16	1/16	0
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M53	West	143	143

Offset	Depth 1	Depth 2	Difference
10	1/16	1/16	0
34	1/8	1/8	0
49	1/8	1/8	0
82	1/16	1/16	0
104	1/16	1/8	1/16
119	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M52	West	147 1/2	148

Offset	Depth 1	Depth 2	Difference
5	3/16	3/16	0
11	5/16	5/16	0
30	1/8	1/8	0
52	0	0	0
73	0	0	0
94	3/16	3/16	0
117	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M51	West	150	150

Offset	Depth 1	Depth 2	Difference
6	1/16	1/16	0
16	3/16	3/16	0
25	0	1/8	1/8
79	1/16	1/16	0
93	1/8	1/8	0
115	0	0	0

MILE 5

Location ID	Lane	Lane Width 1	Lane Width 2
M21	East	155 1/2	157

Offset	Depth 1	Depth 2	Difference
10	1/16	1/16	0
28	1/8	1/4	1/8
42	1/16	1/4	3/16
75	0	0	0
90	1/16	1/16	0
12	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M50	West	149	149

Offset	Depth 1	Depth 2	Difference
6	1/16	1/16	0
23	0	0	0
42	0	0	0
77	0	0	0
92	1/16	3/16	1/8
117	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M21	East	155	157

Offset	Depth 1	Depth 2	Difference
8	1/16	1/16	0
22	3/8	3/8	0
33	1/4	1/4	0
50	3/16	3/16	0
77	1/16	1/16	0
91	1/8	1/8	0
114	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M49	West	141	141

Offset	Depth 1	Depth 2	Difference
11	1/16	1/16	0
30	0	0	0
52	1/16	1/16	0
66	0	0	0
71	1/16	1/16	0
98	1/16	1/16	0
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M23	East	160 1/2	160 1/2

Offset	Depth 1	Depth 2	Difference
10	1/8	1/8	0
27	3/16	3/16	0
48	1/8	1/8	0
72	1/8	1/8	0
92	3/16	3/16	0
116	1/16	1/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M48	West	143	143

Offset	Depth 1	Depth 2	Difference
7	1/8	1/8	0
18	1/4	1/4	0
35	0	0	0
48	1/8	1/8	0
68	1/16	1/16	0
84	1/16	1/16	0
100	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M24	East	154	154

Offset	Depth 1	Depth 2	Difference
8	3/16	3/16	0
26	1/4	1/4	0
48	1/4	1/4	0
65	1/16	1/16	0
72	1/16	1/16	0
96	3/16	3/16	0
117	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M47	West	146	146

Offset	Depth 1	Depth 2	Difference
6	1/4	1/4	0
26	0	0	0
53	0	0	0
80	1/8	1/8	0
97	1/16	1/16	0
116	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M25	East	149 1/2	150

Offset	Depth 1	Depth 2	Difference
6	1/16	1/16	0
24	3/16	3/16	0
38	1/8	1/8	0
52	1/16	1/16	0
70	0	0	0
88	1/16	1/16	0
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M46	West	149	149

Offset	Depth 1	Depth 2	Difference
10	3/16	3/16	0
27	1/16	3/16	1/8
50	1/16	3/16	1/8
71	1/16	1/16	0
93	1/8	1/8	0
119	1/16	1/16	0

MILE 6

Location ID	Lane	Lane Width 1	Lane Width 2
M26	East	153	153

Offset	Depth 1	Depth 2	Difference
12	1/16	1/16	0
32	1/8	1/8	0
51	3/16	3/16	0
60	1/16	1/16	0
94	0	0	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M45	West	145	145

Offset	Depth 1	Depth 2	Difference
6	5/16	5/16	0
32	0	0	0
55	1/16	1/16	0
70	1/16	1/16	0
90	1/8	1/8	0
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M27	East	156 1/2	157

Offset	Depth 1	Depth 2	Difference
16	1/8	1/8	0
36	1/8	1/8	0
52	1/16	1/16	0
68	0	0	0
90	1/8	1/8	0
116	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M44	West	147	148

Offset	Depth 1	Depth 2	Difference
8	1/8	1/8	0
30	1/16	1/16	0
56	3/16	3/16	0
74	3/16	3/16	0
89	1/8	1/8	0
116	3/16	3/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M28	East	148 1/2	149

Offset	Depth 1	Depth 2	Difference
6	1/16	1/16	0
17	1/8	1/4	1/8
32	1/16	1/4	3/16
46	0	1/8	1/8
70	0	0	0
92	0	1/8	1/8
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M43	West	151	151

Offset	Depth 1	Depth 2	Difference
6	1/16	1/16	0
15	3/16	3/16	0
52	1/8	1/8	0
68	1/8	1/8	0
90	1/4	1/4	0
117	1/8	1/8	0

Location ID	Lane	Lane Width 1	Lane Width 2
M29	East	149	149

Offset	Depth 1	Depth 2	Difference
12	1/16	1/16	0
29	1/8	1/8	0
50	1/16	1/8	1/16
68	0	0	0
92	1/16	1/16	0
117	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M42	West	142	142

Offset	Depth 1	Depth 2	Difference
8	3/16	3/16	0
34	1/16	1/16	0
55	1/16	1/16	0
72	1/8	1/8	0
96	3/16	3/16	0
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M30	East	151 1/2	151 1/2

Offset	Depth 1	Depth 2	Difference
8	0	0	0
23	1/8	1/8	0
34	1/8	1/8	0
74	0	0	0
98	1/8	1/8	0
115	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M41	West	147	147

Offset	Depth 1	Depth 2	Difference
6	1/4	1/4	0
23	1/8	1/8	0
50	1/16	1/8	1/16
80	0	0	0
106	3/16	3/8	3/16
113	0	1/4	1/4

MILE 7

Location ID	Lane	Lane Width 1	Lane Width 2
M31	East	150 1/2	150 1/2

Offset	Depth 1	Depth 2	Difference
6	0	0	0
18	1/4	1/4	0
35	1/8	1/8	0
49	1/16	1/16	0
75	0	0	0
93	3/16	3/16	0
117	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M32	East	144 1/2	144 1/2

Offset	Depth 1	Depth 2	Difference
11	1/8	1/8	0
22	3/16	3/16	0
40	1/8	1/8	0
58	1/16	1/16	0
75	1/16	1/16	0
92	1/8	3/16	1/16
117	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M33	East	152 1/2	152 1/2

Offset	Depth 1	Depth 2	Difference
12	0	3/16	3/16
23	5/16	7/16	1/8
44	1/8	3/16	1/16
72	0	0	0
86	1/16	1/16	0
18	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M34	East	151	151

Offset	Depth 1	Depth 2	Difference
9	0	0	0
21	5/16	5/16	0
41	1/8	1/8	0
74	1/16	1/16	0
98	3/16	3/16	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M35	East	153	153

Offset	Depth 1	Depth 2	Difference
9	0	0	0
21	1/4	1/4	0
38	3/16	3/16	0
59	1/8	1/8	0
69	1/16	1/16	0
92	1/8	1/8	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M40	West	143	143

Offset	Depth 1	Depth 2	Difference
7	3/16	3/16	0
25	1/8	1/8	0
50	1/16	1/16	0
70	0	0	0
86	1/16	1/16	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M39	West	147	147

Offset	Depth 1	Depth 2	Difference
11	3/16	3/16	0
30	1/8	3/16	1/16
56	1/16	1/16	0
80	0	0	0
103	1/16	3/16	1/8
118	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M38	West	138	138

Offset	Depth 1	Depth 2	Difference
7	1/8	3/16	1/16
27	1/16	3/8	5/16
54	1/16	1/16	0
68	0	0	0
96	0	0	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M37	West	140	140

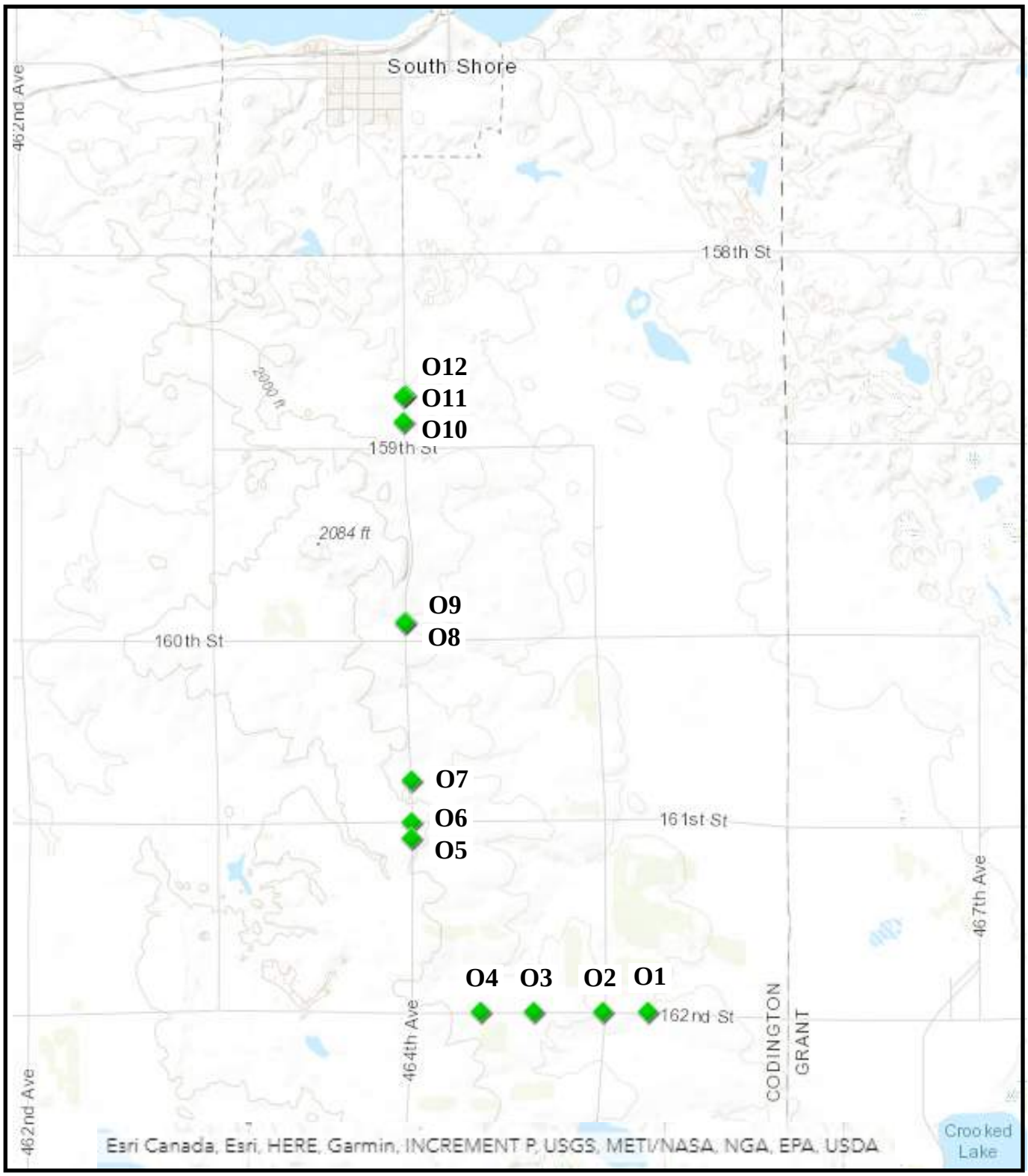
Offset	Depth 1	Depth 2	Difference
6	1/4	1/4	0
22	3/16	3/16	0
44	1/4	1/4	0
70	0	0	0
80	1/16	1/16	0
98	0	0	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M36	West	147	147

Offset	Depth 1	Depth 2	Difference
6	1/8	1/8	0
30	0	0	0
68	1/8	1/8	0
80	1/16	1/16	0
97	1/16	1/16	0
118	1/16	1/16	0

APPENDIX C

ADDITIONAL AREAS OF OBSERVATION



Additional Areas of Observation Map

ADDITIONAL AREAS OF OBSERVATION

ID	Street	Observation	Pre-Construction Comments	Post-Construction Comparison
O1	162nd St.	Settlement over Culvert	road settlement above culvert, 25' long x full road width. 2 transverse cracks roughly 6' apart. asphalt above east side of culvert depressed 1/2" at fog lines and 3/4" at centerline	Roadway settlement depressed to 3/4" at fog line and centerline, some additional cracking noted
O2	162nd St.	Break-up and patch	north lane shoulder broken up. looks to have been patched or double chipped 6'x20'. asphalt depressed 1" at fog line	Maintenance Patch due to breakup during construction
O3	162nd St.	Heaving in center of lane	center of north lane heaving causing 1" rutting in outside wheel path. 25' long	Maintenance Patch due to breakup during construction
O4	162nd St.	Settlement above culvert	road settlement above culvert. road depressed 3/8" at centerline and 1" at fog lines. 18" diameter patch in south lane depressed 1.33"	Roadway settlement depressed 1.5" in lane
O5	464th Ave	Shoulder Wear	west shoulder showing additional wear and potential break-up	Similar condition with additional cracking/wear noted
O6	464th Ave.	Intersection Fatigue	intersection showing more fatigue cracking than others on roadway	Similar condition with additional cracking/wear noted as well as pavement scarring possible from equipment tracks
O7	464th Ave.	Transverse cracking with settlement	very noticeable transverse crack across entire roadway with settlement. settlement up to 3/4 in lanes and at fog lines. 1/2" at centerline	Similar condition with additional wear noted
O8	464th Ave.	Longitudinal cracking	60' long longitudinal crack in west lane. notable due to lack of longitudinal cracks elsewhere	Similar condition with additional wear noted
O9	464th Ave.	Settlement over culvert	asphalt settlement over culvert at west fog line of 3/8". 1/4" at centerline and east fog line	similar condition with additional wear noted
O10	464th Ave.	Settlement over culvert	asphalt settlement over top of culvert. depressed 1" at west fog line and 1/2" at east fog line. none at centerline	similar condition with additional wear noted
O11	464th Ave.	Cracking	multiple longitudinal and transverse cracks, notable due to amount of cracks in one area compared to rest of roadway	Additional cracking as well as block cracking starting, cracks seem pounded down
O12	464th Ave.	Cracking	excessive cracking in a short span of approx 15'. notable due to lack of excessive cracking elsewhere on roadway	Similar condition with addititional cracking and wear noted

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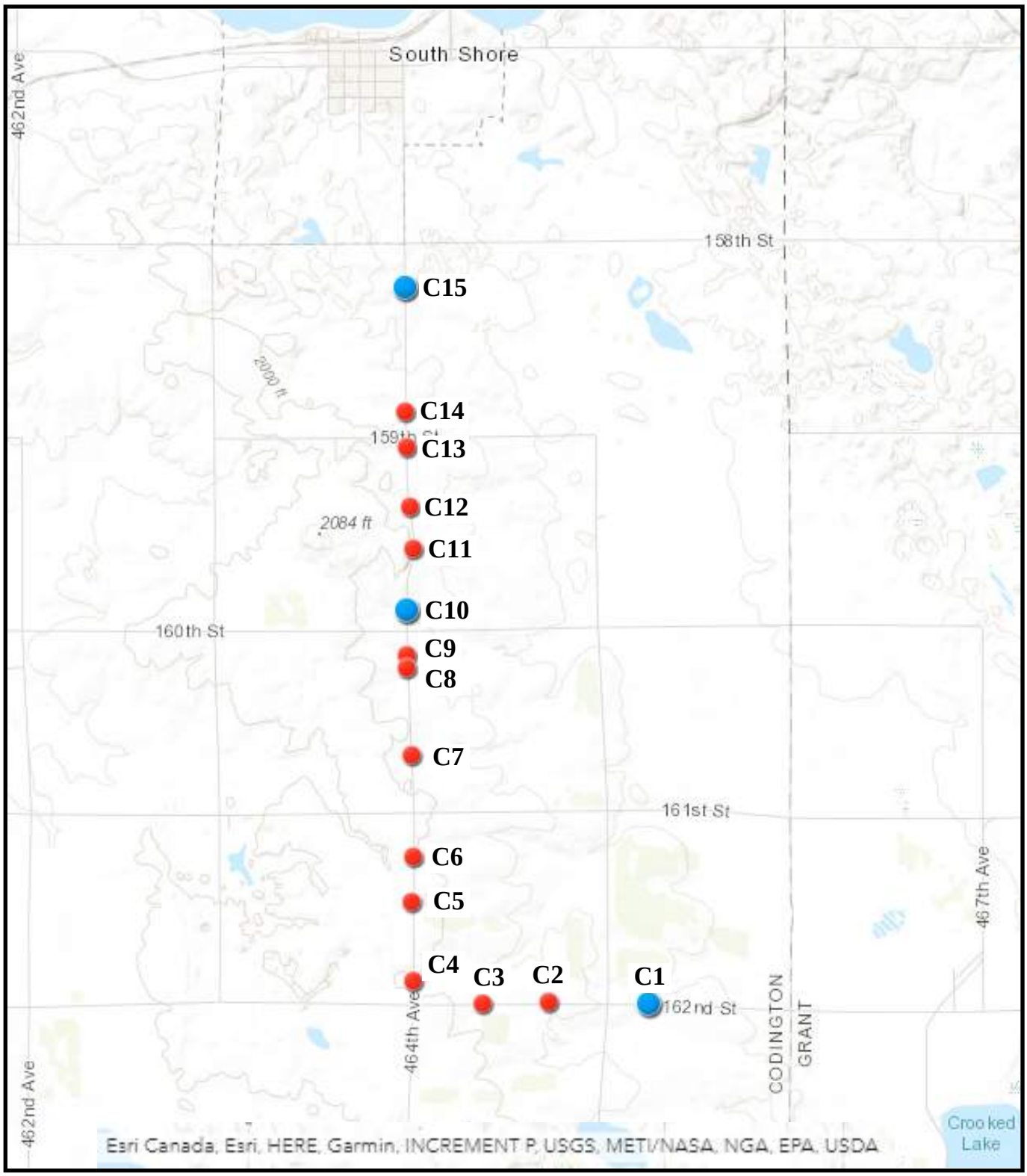
APPENDIX D

CULVERT INSPECTIONS



Culvert Map

N

0 1 2

Miles

PRE-CONSTRUCTION CULVERT OBSERVATIONS

ID	Shape	Size	Material	End	Note	End	Note
C1	Round	72"	CMP	North	pipe under centerline of road deformed to a shape of 82" wide x 57" high	South	pipe under centerline of road deformed to a shape of 82" wide x 57" high
C2	Round	18"	RCP	North	no end section, joint between 1st and 2nd pipe separated, hole in foreslope above separated joint	South	no end section, no joint separation
C3	Round	24"	RCP	North	No end section, joint between 1st and 2nd pipe separated	South	no end section, joint between 1st and 2nd pipe separated
C4	Round	36"	RCP	West	End section joint starting to pull apart, not completely separated yet	East	End section joint separated w/ sediment depositing in pipe through separation
C5	Round	18"	RCP	West	hard to see into pipe but seemed to be okay	East	hard to see into pipe but seemed to be okay
C6	Round	18"	RCP	West	End section joint separated along bottom of pipe	East	joints together and in good condition
C7	Round	42"	RCP	West	End section joint separation, hole in foreslope above pipe	East	End section joint and 2nd joint separated
C8	Round	36"	RCP	West	End Section joint separated on bottom	East	End Section joint separated, water flowing through joint separation and under pipe
C9	Round	30"	RCP	West	End Section joint separation	East	End Section Joint Separation
C10	Round	48"	RCP	West	End Section and 2nd joint completely separated	East	End Section and 2nd joint completely separated
C11	Round	18"	RCP	West	No deficiencies noted	East	End section joint separated
C12	Round	36"	RCP	West	End Section joint separated	East	End section joint separated
C13	Round	42"	RCP	West	End section joint separated	East	End Section Joint Separated
C14	Round	36"	RCP	West	No deficiencies noted	East	No deficiencies noted
C15	Round	60"	RCP	West	some gravel otherwise in good condition	East	Some gravel in culvert, otherwise in good condition

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POST-CONSTRUCTION COMPARISON NOTES

ID	Shape	Size	Material	End	Note	End	Note
C1	Round	72"	CMP	North	No Change Noted	South	No Change Noted
C2	Round	18"	RCP	North	No Change Noted	South	No Change Noted
C3	Round	24"	RCP	North	No Change Noted	South	No Change Noted
C4	Round	36"	RCP	West	No Change Noted	East	No Change Noted
C5	Round	18"	RCP	West	No Change Noted	East	No Change Noted
C6	Round	18"	RCP	West	No Change Noted	East	No Change Noted
C7	Round	42"	RCP	West	No Change Noted	East	No Change Noted
C8	Round	36"	RCP	West	No Change Noted	East	No Change Noted
C9	Round	30"	RCP	West	No Change Noted	East	No Change Noted
C10	Round	48"	RCP	West	No Change Noted	East	No Change Noted
C11	Round	18"	RCP	West	No Change Noted	East	No Change Noted
C12	Round	36"	RCP	West	No Change Noted	East	No Change Noted
C13	Round	42"	RCP	West	No Change Noted	East	No Change Noted
C14	Round	36"	RCP	West	No Change Noted	East	No Change Noted
C15	Round	60"	RCP	West	No Change Noted	East	No Change Noted

BANNER
engineering a better community

APPENDIX E

PASER MANUAL RATING SHEET

Rating system

Surface rating	*Visible distress**	*General condition/ treatment measures*
10 Excellent	None.	New construction.
9 Excellent	None.	Recent overlay. Like new.
8 Very Good	No longitudinal cracks except reflection of paving joints. Occasional transverse cracks, widely spaced (40′ or greater). All cracks sealed or tight (open less than ¼″).	Recent sealcoat or new cold mix. Little or no maintenance required.
7 Good	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks (open ¼″) due to reflection or paving joints. Transverse cracks (open ¼″) spaced 10′ or more apart, little or slight crack raveling. No patching or very few patches in excellent condition.	First signs of aging. Maintain with routine crack filling.
6 Good	Slight raveling (loss of fines) and traffic wear. Longitudinal cracks (open ¼″–½″), some spaced less than 10′. First sign of block cracking. Sight to moderate flushing or polishing. Occasional patching in good condition.	Shows signs of aging. Sound structural condition. Could extend life with sealcoat.
5 Fair	Moderate to severe raveling (loss of fine and coarse aggregate). Longitudinal and transverse cracks (open ½″) show first signs of slight raveling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Some patching or edge wedging in good condition.	Surface aging. Sound structural condition. Needs sealcoat or thin non-structural overlay (less than 2″)
4 Fair	Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (½″ deep or less).	Significant aging and first signs of need for strengthening. Would benefit from a structural overlay (2″ or more).
3 Poor	Closely spaced longitudinal and transverse cracks often showing raveling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate rutting or distortion (1″ or 2″ deep). Occasional potholes.	Needs patching and repair prior to major overlay. Milling and removal of deterioration extends the life of overlay.
2 Very Poor	Alligator cracking (over 25% of surface). Severe distortions (over 2″ deep) Extensive patching in poor condition. Potholes.	Severe deterioration. Needs reconstruction with extensive base repair. Pulverization of old pavement is effective.
1 Failed	Severe distress with extensive loss of surface integrity.	Failed. Needs total reconstruction.

** Individual pavements will not have all of the types of distress listed for any particular rating. They may have only one or two types.*

APPENDIX F

OPINION OF PROBABLE RESTORATION COSTS

Banner Associates, Inc.
409 22nd Avenue South
Brookings, SD 57006
Tel 605.692.6342
Toll Free 855.323.6342
www.bannerassociates.com

OPINION OF PROBABLE RESTORATION COST

Seven Miles of CCR No. 3 and CCR No. 4

PROJECT Crowned Ridge Wind I Transmission Line Phase **BAI NO 22913.00**

LOCATION Codington County, SD

DATE February 1, 2021

ITEM NO.	DESCRIPTION OF WORK AND MATERIALS	QTY	UNIT	UNIT PRICE	TOTAL
1	Traffic Control and Detour signing	7	Mile	$1,500.00	$10,500.00
2	Preparation of Roadway - Shoulder Removal	7	Mile	$2,500.00	$17,500.00
3	Reclamation of Existing Surfacing Section	7	Mile	$20,000.00	$140,000.00
4	Incorporation of Virgin Base Course and Roadway Shaping	7	Mile	$35,000.00	$245,000.00
5	Installation of Asphalt Surfacing Material (4" Thick)	7	Mile	$290,000.00	$2,030,000.00
6	Shoulder Restoration	7	Mile	$2,500.00	$17,500.00
7	Roadway Striping	7	Mile	$7,500.00	$52,500.00
8	Sign Restoration	1	Lump Sum	$3,500.00	$3,500.00
9	Seeding Restoration	1	Lump Sum	$14,000.00	$14,000.00
				Construction Contingencies (10%) =	$253,050.00
				Opinion of Probable Construction Costs =	**$2,783,550**
				Design, Bidding and Construction Services =	$28,000
				Quality Control Testing Services =	$7,000
				Opinion of Probable Restoration Cost =	**$2,818,550**

APPENDIX G

HAUL ROUTE COMPARISON PICTURES

Pre CCR 4 from 464th Ave. to 465th Ave. 0:24 video time

Post CCR 4 from 464th Ave. to 465th Ave. 0:22 video time

Pre CCR 4 from 465th Ave. to 466th Ave. 2:21 video time

Post CCR 4 from 465th Ave. to 466th Ave. 1:30 video time

Pre CCR 3 from 157th St. to 158th St. 0:41 video time

Pre CCR 3 from 157th St. to 158th St. 0:28 video time

Pre CCR 3 from 158th St. to 159th St. 3:09 video time

Post CCR 3 from 158th St. to 159th St. 6:55 video time

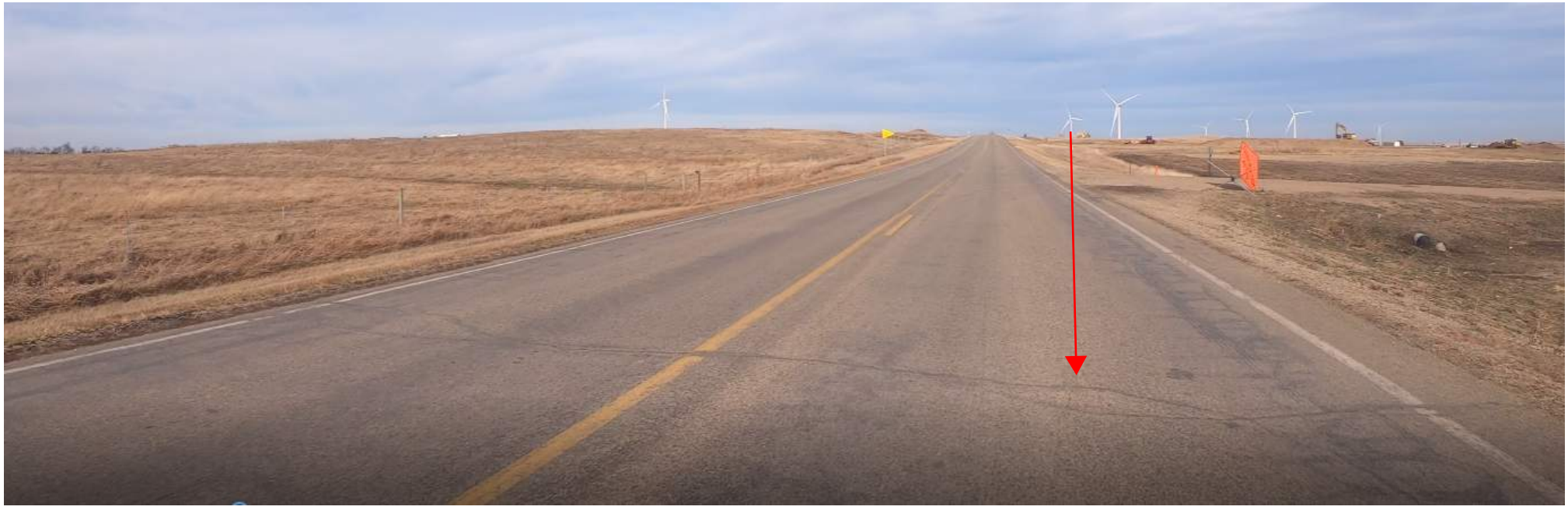
Pre CCR 3 from 159th St. to 160th St. 5:56 video time

Post CCR 3 from 159th St. to 160th St. 4:13 video time

Pre CCR 3 from 160th St. to 161st St. 6:23 video time

Post CCR 3 from 160th St. to 161st St. 3:47 video time

Pre CCR 3 from 161st St. to 162nd St. 8:40 video time



Post CCR 3 from 161st St. to 162nd St. 1:33 video time

CROWNED RIDGE WIND I TRANSMISSION LINE PHASE MID-CONSTRUCTION PHOTOS