

Final Evaluation of Designated Roads (Crowned Ridge Wind II Transmission Line Phase)

Prepared for:
Codington County Highway Department
Codington County, SD

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Prepared by:

BANNER

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Final Evaluation of Designated Roads (Crowned Ridge Wind II Transmission Line Phase)

Codington County Highway Department Codington County, SD

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Certification:



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

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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 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 asphalt roadways used in this phase of the construction were presented to the Owner for post-construction evaluation on October 8, 2020. The gravel roadways used in this phase of construction were presented to the Owner for post-construction evaluation in November 2020. This report presents the Engineer’s findings for the post-construction roadway evaluation of the Crowned Ridge Wind II Transmission Line Phase.

It is our understanding that the Crowned Ridge Wind II Transmission Line phase consisted of the construction of a substation that will transmit energy through Codington and Grant Counties, to a Capacitor station near Big Stone City, SD. More specifically, the substation is located in the SE 1/4 of Section 27 – Township 118 N – Range 51 W of Waverly Township, with access coming off of Codington County Road No 6. There is one (1) mile of asphalt surfaced and two (2) miles of gravel surfaced Codington County highway roads that were used as haul roads for the Crowned Ridge Wind II Transmission Line phase. The roads are identified in detail in Table 1 below. Banner contacted the SDDOT regarding truck percentages of the ADT. The SDDOT stated that truck counts were not available for these roads; however, the statewide average for Rural Collectors of this type is 13% of the ADT. A Project Area Map is provided in APPENDIX A.

Table 1 – Roadway Inventory

Roadway	Segment	Length (miles)	Surfacing	ADT	ADT-T
CCR No 6 – 165 th Street	462 nd Ave. – 463 rd Ave.	1	Asphalt	137	18
CCR No 6 – 165 th Street	463 rd St. – 464 th St.	1	Gravel	N/A	N/A
CCR No 3 – 464 th Avenue	165 th St. – 164 th St.	1	Gravel	N/A	N/A
Total Miles		3			

*CCR – Codington County Road

*ADT – Average Daily Traffic

*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 surfacing sections, as well as the type and condition of subgrade and underlying soils to a depth of six feet. These efforts were performed pre-construction. The following paragraph and Figure 2 are excerpts from the pre-construction evaluation regarding the geotechnical exploration efforts.

GeoTek reported an asphalt pavement and clean gravel base course thickness for the asphalt surfaced haul roads, and a clean gravel surfacing thickness for the gravel surfaced haul roads. The average material thickness for each haul road is broken down in Table 2 on this page. 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.

Table 2 – Average Surfacing Thicknesses

Road	Average Asphalt Pavement Thickness (in)	Average Gravel Base Thickness (in)	Average Gravel Surfacing Thickness (in)
CCR No 6 – 165 th Street	5.5	4.0	N/A
CCR No 6 – 165 th Street	N/A	N/A	3.3
CCR No 3 – 464 th Avenue	N/A	N/A	4.0
Overall – All Roads	5.5	4.0	3.8

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. The locations of these measurements were collected during the pre-construction evaluation and those same locations were measured during the post-construction evaluation to allow for comparison to be made. These measurements were only taken on asphalt surfaced roadways, as the variability of gravel surfacing would make it too difficult to reproduce comparative results.

Banner reported that on average the rutting within the wheel paths on the one mile stretch of CCR No 6 fell between 1/16” and 3/4” as a departure from the straight edge. The full data set for manual roadway measurements can be found in APPENDIX B.

Gravel Roadway Crown and Shoulder Topography

During the pre-construction evaluation, Banner used ATV mounted Trimble surveying equipment to collect horizontal and vertical data representing the crown and shoulder points of all Codington County gravel roadways proposed to be used as haul roads. This effort was not repeated in for the post-construction evaluation in this phase of the project.

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 the frequency and severity of the different forms of distresses, defects, and deterioration related to both asphalt and gravel surfacing. 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 asphalt surfaced haul roads prior to construction, Banner has 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. Asphalt roadways are rated on a scale of 1 to 10; 1 - failed, 10 – 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 F.

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, along with 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 and manual field measurements 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 Table 4 below.

CCR No 6 from 462nd Ave. to 463rd Ave.

- Moderate amount of longitudinal and transverse cracks throughout, with longitudinal cracks most prevalent in wheel paths and along roadway edges. Transverse cracks feel pounded down into base material while driving.
- Minor severity of block and alligator cracking present along outer 1/4 of lanes for approximately 10% of the segment length
- Asphalt settlement /movement was noted in some areas, particularly above culvert crossings.
- Moderate severity of aggregates worn away in the wheel paths coupled with oil migrating to the surface, creating a slick travel surface.
- No new patches observed
- Rutting measured between 1/16th and 3/4th of an inch.

Table 4 – Asphalt PASER Rating

Roadway	Segment	Mile Reference	PASER Rating
CCR No 6 – 165 th Street	462 nd Ave. – 463 rd Ave.	20	6

SECTION IV: GRAVEL ROADWAY RATING

In an effort to give Codington County a basis for the condition of the prospective gravel haul roads prior to 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) Gravel Roads Manual produced by the Transportation Information Center at the University of Wisconsin-Madison. The PASER Manual addresses five major conditions and defects common to gravel roadways, to include: Crown, Drainage, Gravel Layer, Surface deformation, and Surface defects. Gravel roadways are rated on a scale of 1 to 5; 1 - failed, 5 – excellent. An excerpt from the PASER Manual with a general description of each surface rating is provided in APPENDIX E. Banner performed a similar visual inspection during the post-construction roadway evaluation but did not produce a corresponding PASER rating for each segment of roadway, as by the time the roadways were turned over for evaluation, the ground was frozen and not all aspects of the evaluation could be completed.

The five major conditions and defects can be broken down further to provide a more comprehensive evaluation tool. Crown not only refers to the height and condition of the crown at the centerline of the roadway, but also the entire cross-slope of the roadway through the shoulders and to the ditch. Drainage assessment reflects the adequacy of the roadway corridor to convey water without having areas of standing water soaking into the roadway subgrade for long periods of time, through the use of roadside ditches and pass-through culverts. Gravel layer is a more tangible condition where the thickness and quality of the gravel can be measured and identified. Surface deformations are represented by conditions that create an unsafe roadway such as washboarding, potholes, and ruts. Surface defects are represented by dust and loose aggregate on the roadway. Banner evaluated the conditions and defects as being of low, medium, or high severity. The severity and

frequency of the conditions were considered when formulating an overall rating reflecting the entire mile stretch of roadway. Something that must be understood is that many of the visual observations that are considered when rating these roadways can change significantly as a result of recent large weather events causing surface defects, or recent maintenance efforts repairing surface defects.

Banner utilized visual inspection to determine severity levels of the gravel conditions and defects to the extent possible with frozen ground. What follows is a general synopsis of the information collected for each stretch of gravel surfaced roadway.

CCR No 3 from 164th St to 165th St.

- Visually the crown slopes appear to be fair with good roadside drainage.
- A very notable false edge/extension of the roadway is present where the Developer had utilized a scraper to cut down the long stretches of curb and gutter on the roadway created by Developer maintenance practices during construction. Some of the areas of false edge have an abrupt change in cross-slope from the real edge of roadway to the ditch foreslope. May be dangerous to the travelling public if they do not realize that this is not part of the actual roadway.
- Many areas were noted where clay/subgrade material can be seen contaminating the surface gravel, particularly at the centerline. These are likely soft areas that began to expose themselves but may have frozen before completely blowing out.
- Substantial loss of surface gravel noted along the entire segment
- Minimal other surface defects such as rutting, washboarding, or potholing were noted. This is likely due to recent maintenance efforts and frozen ground.

CCR No 6 from 463rd Ave. to 464th Ave.

- Visually the crown slopes appear to be fair with good roadside drainage.
- A very notable false edge/extension of the roadway is present where the Developer had utilized a scraper to cut down the long stretches of curb and gutter on the roadway created by Developer maintenance practices during construction. Some of the areas of false edge have an abrupt change in cross-slope from the real edge of roadway to the ditch foreslope. May be dangerous to the travelling public if they do not realize that this is not part of the actual roadway.
- Some areas were noted where clay/subgrade material can be seen contaminating the surface gravel, particularly at the centerline. These are likely soft areas that began to expose themselves but may have frozen before completely blowing out.
- Moderate amount of loss of surface gravel noted along the segment
- Minimal other surface defects such as rutting, washboarding, or potholing were noted. This is likely due to recent maintenance efforts and frozen ground.

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 at a rapid pace.

Maintenance efforts on the gravel roadways during construction consisted largely of the Developer digging out areas where their equipment could not pass and filling those areas with material to bridge the subgrade, as well as routine blading of the gravel surface. The Developer noted to Codington County that the project did need to haul additional gravel material to the haul routes to facilitate the movement of construction vehicles throughout the course of the project. In addition to the gravel material provided for construction purposes, it appears that during construction gravel material was pulled from the outer $\frac{1}{4}$ of the roadway on each side, into the middle to provide a more stable single path for construction traffic. This assumption is made based on the condition of the gravel roads near the end of construction, as many of the gravel roadways showed crown slopes of 1.5 to 2.0 times as steep as pre-construction conditions. The steep crown slopes coupled with the roadway edges being dug down below the adjacent shoulder, created a curb and gutter appearance on the roadway which trapped water on the roadway and left little to no gravel surfacing on the roadway edges.

Banner was informed in August 2020 that the Developer had completed their use of the gravel haul roads associated with the wind farm construction. Banner performed an initial abbreviated evaluation of the gravel roads within the Crowned Ridge Wind I phase of the project. During this evaluation Banner identified many deficiencies with the gravel haul roads as presented by the Developer. These deficiencies placed the gravel haul roads in a far worse condition than that which they were prior to construction. Banner, the Owner, and the Developer met on site in September 2020 at which time Banner presented the unacceptable findings of the abbreviated evaluation. At that time, the Developer agreed to address all concerns as noted prior to returning the haul roads to the Owner for a post-construction evaluation to be administered. The items of concern noted during this meeting were also to be addressed on the gravel surfaced haul routes within this phase of the project.

The Developer hired a contractor to perform some of the roadway restoration efforts noted in the aforementioned September 2020 site meeting. Representatives of Codington County and Banner Associates made site visits to assess the efforts and ensure care was being taken to restore the roadways appropriately. Both parties noted that substantial effort was made to dig out soft areas and clean up the roadway edges, as well as blade the existing gravel surfacing in a manner to more evenly distribute the surface material across the full width of the roadway creating a more consistent gravel surfacing depth and a more manageable crown slope. It was also noted that the center of the roadway had far thicker sections of gravel surfacing than the roadway edges prior to re-distribution efforts, likely being a direct result of the blading maintenance approach assumed earlier in this report. This substantial effort was consistent for approximately three (3) miles of the gravel surfaced roadway CCR No. 7 from 164th St. to 161st St. in the Crowned Ridge Wind I Phase. The gravel surfaced haul routes in this phase of the project did not receive the same restoration efforts, as it appears that there were no soft areas dug out and replaced on these segments. The Developer did continue the efforts of removing the curb and gutter effect for these segments of gravel roadway. There was a snow storm in mid-October that impacted the project area and restoration efforts, and it is not known whether the impending winter weather and associated ground freeze played a factor in the decision to suspend the dig out operations.

SECTION V: SUMMARY

Banner would consider the one-mile stretch of CCR No 6 from 462nd Ave. to 463rd Ave. to be in good condition overall. Manual roadway measurements show that the roadway has experienced moderate rutting in the wheel paths. Visual observations have shown minor to moderate damage and deficiencies across all aspects of pavement evaluation, particularly related to cracking of all types at minor to moderate severities and surface and wheel path wear. An assessment of this segment of roadway using the PASER system provided a rating of six (6).

The lack of pre-construction efforts to enhance the roadway carrying capabilities, as well as a lack of ongoing maintenance during construction has resulted in the existing roadway experiencing additional cracking and wearing. By failing to take pre-construction measures to protect the roadway, the Developer will need to take corrective action measures post-construction to provide a roadway back to Codington County that is absent the newly experienced cracking and wearing. Taking into consideration the additional damages that can be seen from the surface, it is fair to conclude that the remaining roadway section has been compromised some as well.

Banner would consider the one-mile stretch of CCR No 3 from 164th St. to 165th St to be in poor condition overall. Crown slopes appeared to be poor to fair with some areas of minimal grade from centerline to shoulder as well as a substantial absence of surface gravel and many areas of clay material at the surface, contaminating the surfacing gravel. A full post-construction evaluation was not able to be completed due to frozen ground conditions, and therefore Banner could not report on all aspects of the evaluation process and chose not to give the roadway a post-construction PASER rating. Having knowledge of the effort and process the Developer put forth for digging out soft areas on other stretches of gravel roadway in the Crowned Ridge Wind I Phase but having suspended that effort prior to addressing this stretch of roadway, it is likely that there are soft areas that were exposed during construction that will show up again once the ground thaws. The number and size of these areas cannot be quantified at this time, and the only true way to find them will be to perform a follow-up inspection once ground conditions are favorable. Non-contaminated gravel surfacing depths were not investigated during the post-construction evaluation due to frozen ground conditions.

Banner would consider the one-mile stretch of CCR No 6 from 463rd Ave. to 464th Ave. to be in fair condition overall. Crown slopes appeared to be adequate with some areas of absence of surface gravel and some areas of clay material at the surface, contaminating the surfacing gravel. As mentioned in this report, A full post-construction evaluation was not able to be completed due to frozen ground conditions and the same considerations regarding potential soft areas presented in the previous paragraph holds true for this mile as well.

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. A red arrow is used to point out an identifier in each photo to verify it is the same location in both frozen frames.

SECTION VI: EVALUATION COMPARRISON

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

CCR No 6 from 462nd Ave. to 463rd Ave.

This segment of roadway covers one (1) mile of asphalt roadway, totaling five (5) manual roadway measurement locations. Of the five locations, two (2) showed an increase in rut depth for at least one measurement at that location. The severity of the increased rut depths ranged from 1/8th of an inch to 3/16th of an inch. Banner also completed a visual inspection and assigned a PASER roadway rating to this 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 more prevalent on the post construction inspection, particularly additional longitudinal cracks or existing cracks that now are at a higher severity. Flushing and polishing also increased, with it being very evident that heavy loadings has caused oil to migrate to the surface of the asphalt in the wheel paths. This also couples with the aggregate in the wheel paths being worn to a point where there is no angularity left on the aggregates at the surface, creating a very slick and friction-free surface. The post-construction PASER rating assigned to this segment is six (6), which is a decline from the pre-construction PASER rating of seven (7).

CCR No 3 from 164th St. to 165th St.

The post-construction visual inspection showed a substantial loss of surface gravel as well as many areas of contaminated surface gravel where it appears that what was existing for surface gravel was pounded into the subgrade and mixed to create a clay/gravel surface. The post-construction visual inspection also showed some areas lacking grade from the centerline to the shoulder, creating potential ponding issues on the roadway. Other aspects of the post-construction evaluation could not be completed due to frozen ground conditions. One large change noted in the post-construction evaluation is a very notable false edge/extension of the roadway is present where the Developer had utilized a scraper to cut down the long stretches of curb and gutter effect on the shoulders of the roadway. Some of the areas of false edge have an abrupt change in cross-slope from the real edge of roadway to the ditch foreslope. This may be dangerous to the travelling public if they do not realize that this is not part of the actual roadway.

CCR No 6 from 463rd Ave. to 464th Ave.

The post-construction visual inspection showed moderate loss of surface gravel as well as some areas of contaminated surface gravel where it appears that what was existing for surface gravel was pounded into the subgrade and mixed to create a clay/gravel surface. Other aspects of the post-construction evaluation could not be completed due to frozen ground conditions. One large change noted in the post-construction evaluation is a very notable false edge/extension of the roadway is present where the Developer had utilized a scraper to cut down the long stretches of curb and gutter effect on the roadway. Some of the areas of false edge have an abrupt change in cross-slope from the real edge of roadway to the ditch foreslope. This may be dangerous to the travelling public if they do not realize that this is not part of the actual roadway.

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.

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, the 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 provides the following recommendations for restoration of the haul routes, broken down into various segments of roadway each corresponding to a different restoration effort.

CCR No 6 from 462nd Ave. to 463rd Ave.

Banner has determined that the roadway segment has experienced damages to the extent that the structural integrity of the roadway section has been compromised, including additional and expanded cracking of both longitudinal and transverse types, as well as general roadway wear. Banner is recommending that this segment of roadway be assessed for any specific locations where damages require a full dig out and patching effort, followed by milling 1.5" of the wearing course of asphalt and relaying a 2" wearing course. Any restoration effort short of milling and overlaying would leave Codington County with a roadway that is less structurally sound than what was existing prior to construction.

CCR No 3 from 164th St. to 165th St. and CCR No 6 from 463rd Ave. to 464th Ave.

As was noted previously in this report, although the Developer continued to clean up the roadway edges, the same post-construction restoration effort to repair soft areas and appropriately re-distribute the existing gravel surfacing material to create a more uniform surface and manageable crown that arose during

construction was not maintained for this segment of roadway. Banner does not feel it is reasonable to believe that this effort was abruptly determined to be no longer necessary by the Developer and therefore recommends that once the roadway is thawed in the Spring, the Developer perform the same assessment and digout effort that they felt was necessary for the initial three-mile stretch of full rehabilitation before frozen conditions set in. The Developer will be expected to shape the roadway to re-establish an acceptable crown slope. Banner also recommends that the Developer seed the false roadway edges to provide a clear differentiation between the gravel roadway and the vegetated shoulders, for the safety of the travelling public. This will also help reduce the chance that the now barren roadway shoulders will erode, causing future damage. Once repairs are made, in accordance with the Agreement for Road Use, Repair, and Improvements, the Developer shall place 3" of SDDOT state spec. "gravel surface" material as defined in section 882 of the SDDOT specification book on gravel roads defined in the haul road agreement. It shall be noted that this effort has not yet been performed.

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.



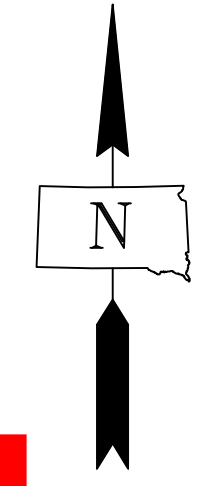
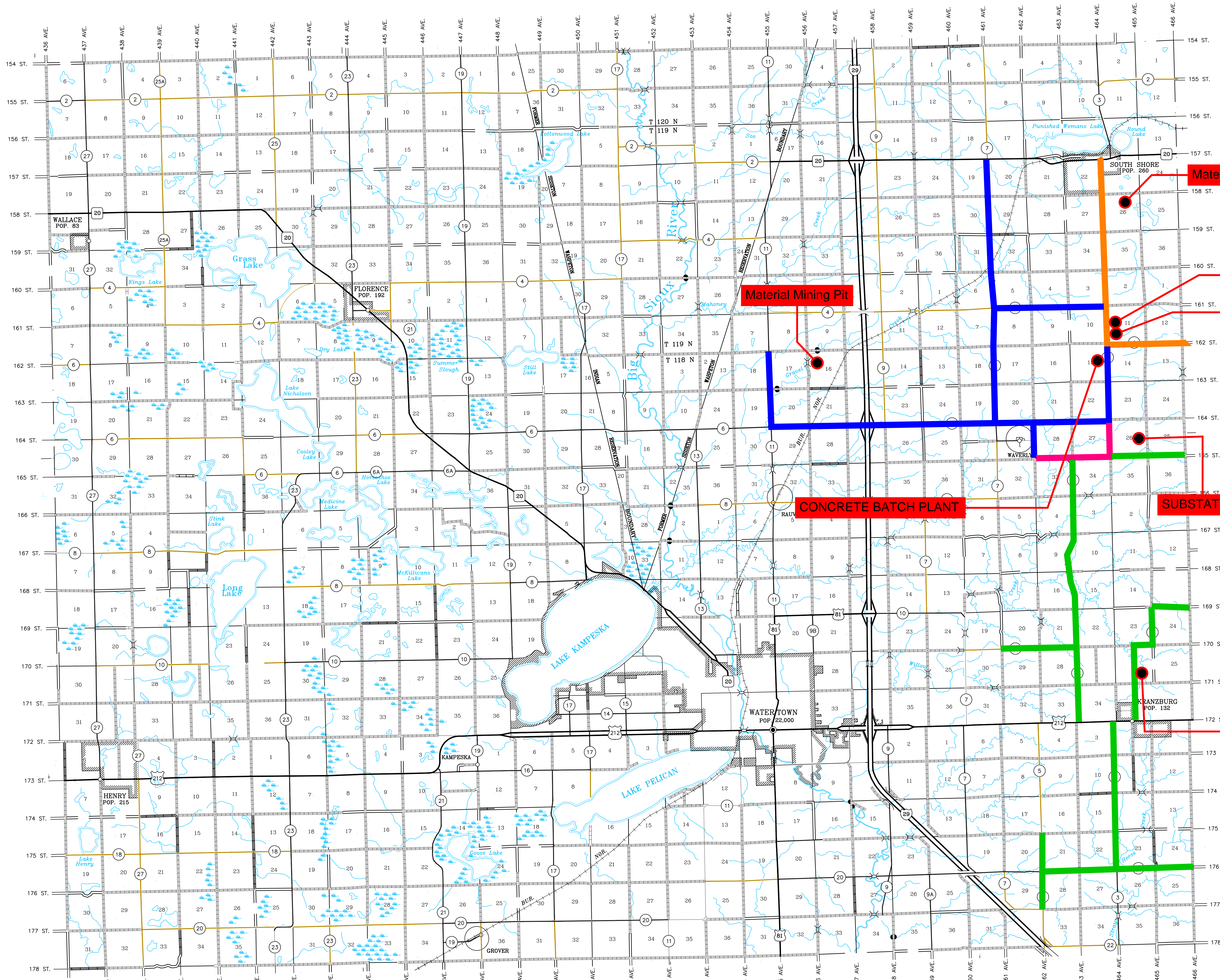
APPENDIX A

PROJECT AREA MAP

PROJECT AREA MAP

PROJECT AREA MAP

CROWNED RIDGE WIND, LLC
IN CODINGTON COUNTY, SD



LEGEND

- TRANSMISSION LINE CRW I
- CROWNED RIDGE WIND I
- TRANSMISSION LINE CRW II
- CROWNED RIDGE WIND II
- STATE HIGHWAY
- COUNTY ASPHALT
- COUNTY GRAVEL

Total Asphalt Miles: 37.0
Total Gravel Miles: 22.5
Total Miles: 59.5

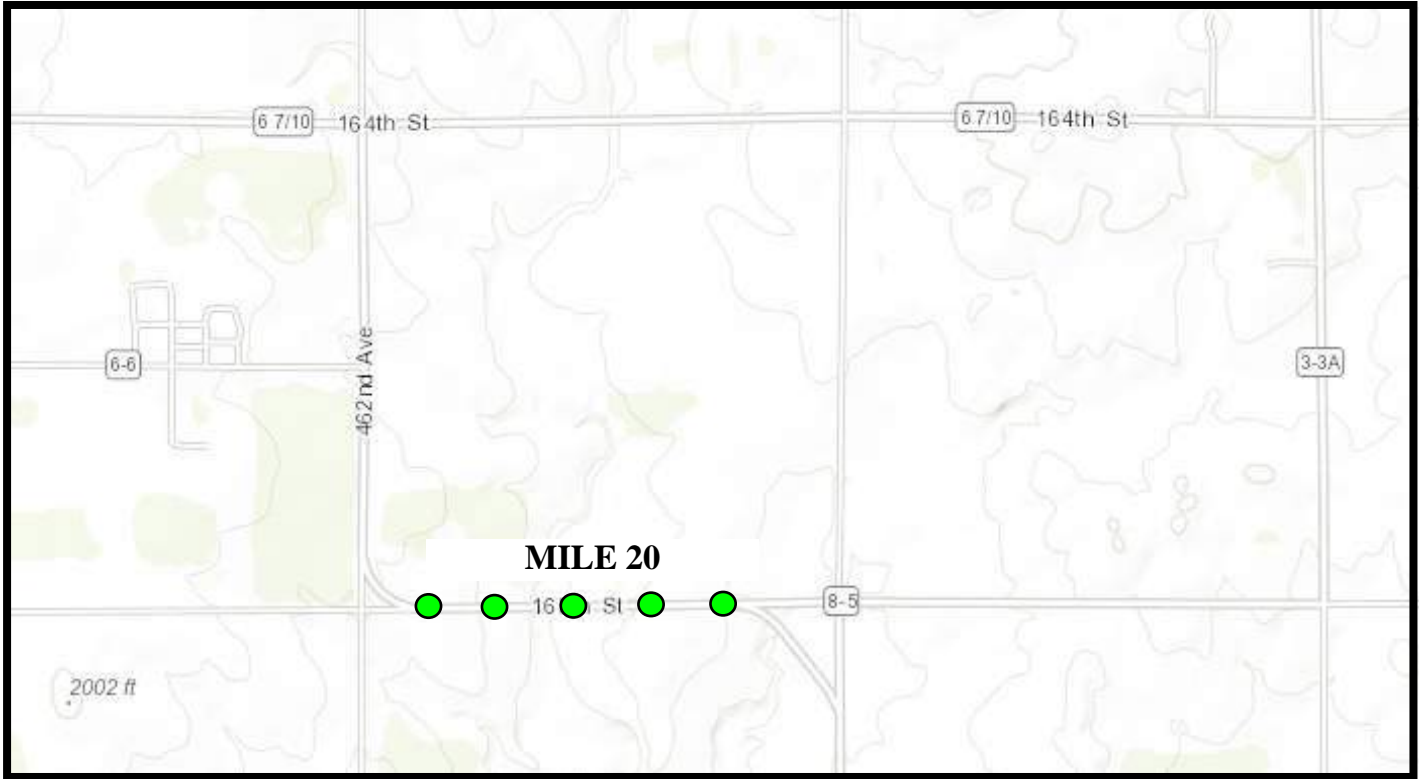


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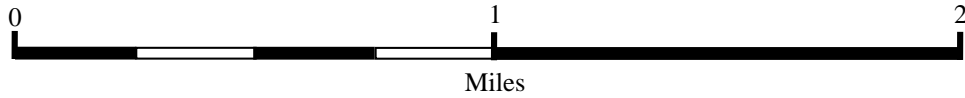


APPENDIX B

MANUAL ROADWAY MEASUREMENTS



Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA | Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA



ROADWAY MEASUREMENTS MAP

MILE 20

Location ID	Lane	Lane Width 1	Lane Width 2
M191	South	160	
Offset	Depth 1	Depth 2	Difference
7	5/8	3/4	1/8
22	1/8	1/4	1/8
39	0	0	0
50	1/4	3/8	1/8
71	0	0	0
106	1/8	1/4	1/8
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M200	North	156	
Offset	Depth 1	Depth 2	Difference
5	0	0	0
13	0	0	0
27	0	0	0
40	1/16	1/16	0
48	0	0	0
56	0	0	0
89	3/16	3/16	0

Location ID	Lane	Lane Width 1	Lane Width 2
M192	South	160	160
Offset	Depth 1	Depth 2	Difference
10	1/4	1/4	0
32	0	0	0
54	0	0	0
70	1/8	1/8	0
93	0	0	0
112	1/16	1/16	0
119	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M199	North	158	158
Offset	Depth 1	Depth 2	Difference
2	0	0	0
7	1/8	1/8	0
38	0	0	0
60	1/16	1/16	0
68	1/16	1/16	0
94	0	0	0
112	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M193	South	156	156
Offset	Depth 1	Depth 2	Difference
9	1/8	1/8	0
33	0	0	0
49	0	0	0
80	0	0	0
94	1/16	1/16	0
112	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M198	North	158	158
Offset	Depth 1	Depth 2	Difference
6	1/4	1/4	0
32	0	0	0
51	0	0	0
67	1/16	1/16	0
87	1/16	1/16	0
112	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M194	South	157	157
Offset	Depth 1	Depth 2	Difference
10	0	0	0
24	3/8	9/16	3/16
48	0	1/16	1/16
70	3/16	3/16	0
86	1/8	1/8	0
101	3/16	5/16	1/8
114	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M197	North	158	158
Offset	Depth 1	Depth 2	Difference
8	0	0	0
37	3/16	1/2	5/16
64	0	0	0
72	0	0	0
87	1/8	1/8	0
116	0	0	0

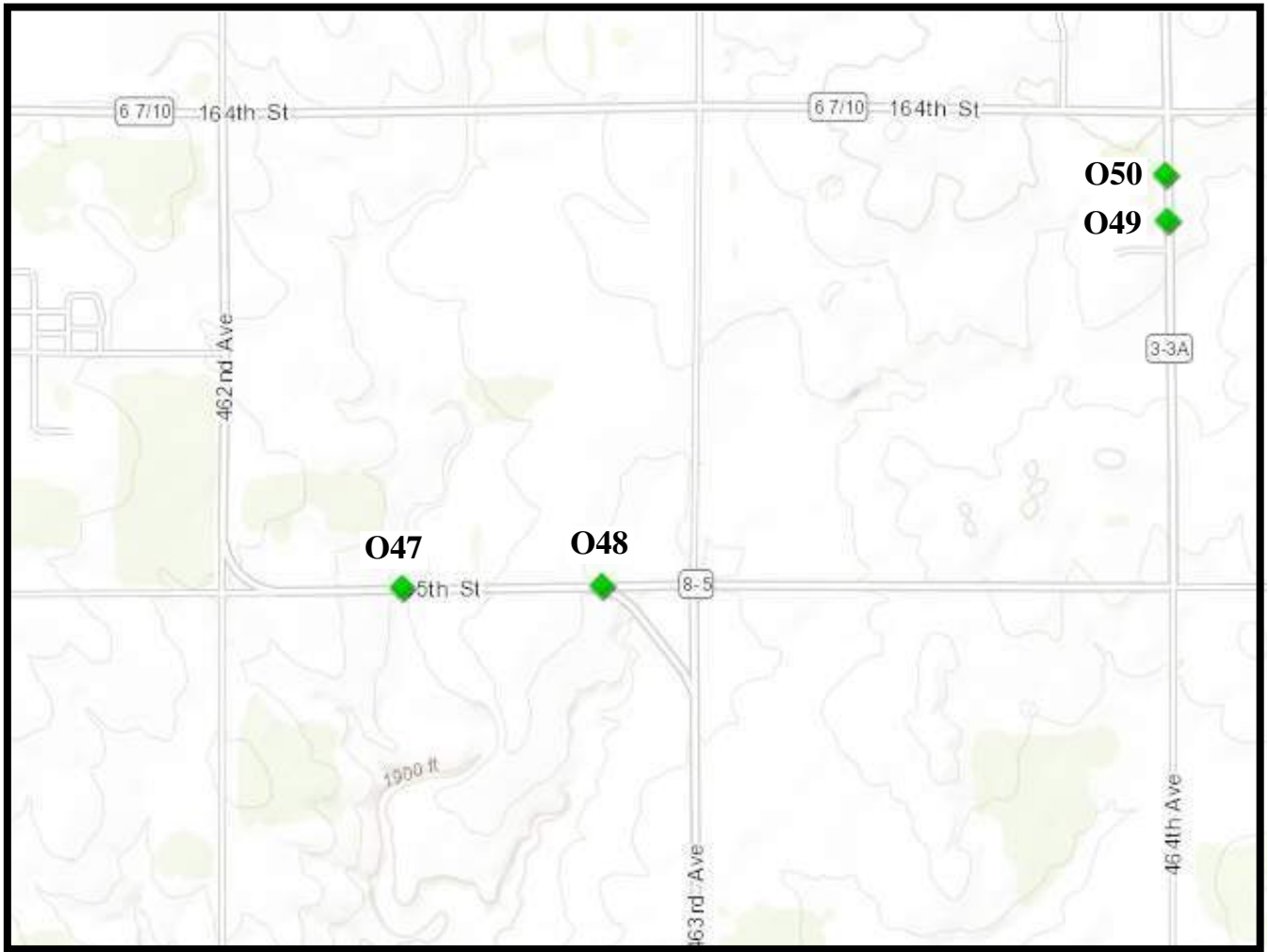
Location ID	Lane	Lane Width 1	Lane Width 2
M195	South	163	163
Offset	Depth 1	Depth 2	Difference
10	0	0	0
30	1/16	1/16	0
65	0	0	0
74	0	0	0
92	1/16	1/16	0
112	0	0	0

Location ID	Lane	Lane Width 1	Lane Width 2
M196	North	153	153
Offset	Depth 1	Depth 2	Difference
17	0	0	0
32	1/16	1/16	0
49	0	0	0
51	0	0	0
72	1/8	1/8	0
109	0	0	0

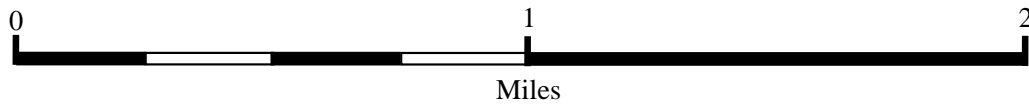


APPENDIX C

ADDITIONAL AREAS OF OBSERVATION



Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA | Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA



ADDITIONAL AREAS OF OBSERVATION MAP

ADDITIONAL AREAS OF OBSERVATION

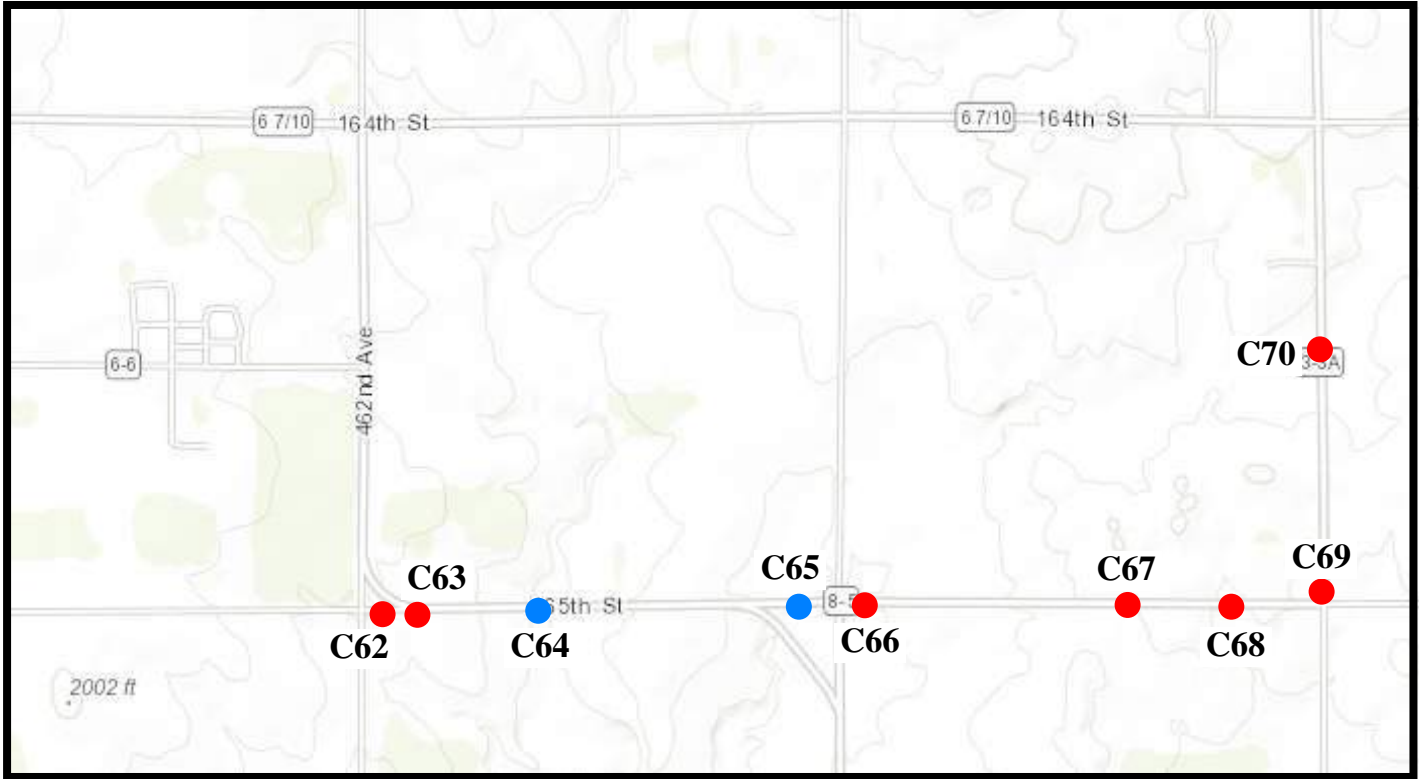
ID	Street	Observation	Pre-Construction Comments	Post-Construction Comparison
O47	165th St.	Roadway Settlement	Roadway showing some settlement on West side of furthest West culvert, approximately 1/2" at fog lines	Similar condition
O48	165th St.	Surfacing Transition Deterioration	Asphalt surfacing is cracking and breaking up at transition from gravel to asphalt	Similar condition with additional cracking noted
O49	464th Ave.	Soft Shoulder	West 10' of roadway showing signs of soft area, approximately 100' long	No post-construction comparison due to gravel road variability and frozen conditions
O50	464th Ave.	Soft Area	Full roadway width showing signs of soft area, approximately 25' long	No post-construction comparison due to gravel road variability and frozen conditions





APPENDIX D

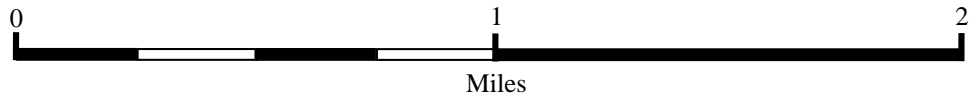
CULVERT INSPECTIONS



Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA | Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

Legend:

- Culverts Under 48" Diameter
- Culverts of 48" Diameter and Larger



CROWNED RIDGE WIND II TRANSMISSION LINE PHASE CULVERT MAP

PRE-CONSTRUCTION CULVERT OBSERVATIONS

ID	Shape	Size	Material	End	Note	End	Note
C62	Round	24"	RCP	North	No End sections, first joint separated, cannot tell beyond that, concrete pipe end in rough condition	South	No End sections, first joint separated, cannot tell beyond that, concrete pipe end in rough condition
C63	Round	18"	RCP	North	No End Sections, joints starting to show some separation, concrete pipe end in rough condition	South	No End Sections, joints starting to show some separation, concrete pipe end in rough condition
C64	Round	84"	RCP	North	3-84" Pipes, End section separated on all 3 pipes with embankment falling through the separation on the center pipe, pipe themselves in good condition with exception of spalling and visible rebar on east pipe end section	South	3-84" Pipes @ 12' CL to CL, End section showing separation on all 3 pipes, East culvert has been patched
C65	Round	80"	CMP	North	Good condition, minimal rusting on bottom 1' of pipe	South	Good condition, minimal rusting on bottom 1' of pipe
C66	Round	24"	RCP	North	End section separated at first joint, debris coming through joint separation	South	End section separated 4" at first joint, Looks as though many joints are separated, debris coming through joint separation, End section also cracked and spalling
C67	Round	20"	RCP	North	Hard to see but debris at first joint suggesting separation at that location	South	Hard to see but debris at first joint suggesting separation at that location
C68	Round	20"	RCP	North	No end sections, first joint separated, looks as though other joints are separated also, debris coming through all separated joints, concrete pipe end in rough condition	South	No end sections, first joint separated, looks as though other joints are separated also, debris coming through all separated joints, concrete pipe end in rough condition
C69	Round	18"	RCP	West	End section separated at first joint with some debris starting to collect at that joint	East	Very hard to see, plenty of debris in end section of pipe
C70	Round	36"	CMP	West	Pipe rusting up beyond the springline	East	Pipe rusting up beyond the springline, small deformation in top of pipe



POST-CONSTRUCTION COMPARISON NOTES

ID	Shape	Size	Material	End	Note	End	Note
C62	Round	24"	RCP	North	No change noted	South	No change noted
C63	Round	18"	RCP	North	No change noted	South	No change noted
C64	Round	84"	RCP	North	No change noted	South	No change noted
C65	Round	80"	CMP	North	No change noted	South	No change noted
C66	Round	24"	RCP	North	No change noted	South	No change noted
C67	Round	20"	RCP	North	No change noted	South	No change noted
C68	Round	20"	RCP	North	No change noted	South	No change noted
C69	Round	18"	RCP	West	No change noted	East	No change noted
C70	Round	36"	CMP	West	No change noted	East	No change noted





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 1/4").	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 1/4") due to reflection or paving joints. Transverse cracks (open 1/4"– 1/2") 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 1/4"– 1/2"). Transverse cracks (open 1/4"– 1/2"), some spaced less than 10'. First sign of block cracking. Slight 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 1/2" or more) 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 (1/2" 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 (greater than 1/2" but less than 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 rutting or distortions (2" or more 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.

Rating road surface condition

A simplified rating system has been developed to help manage gravel roads. It uses a scale of 1 to 5—5 is **excellent** condition and 1 is **failed**. In a normal progression the road will start out in excellent condition and gradually deteriorate under the effects of traffic and weather. Routine grading and minor patching may be sufficient to restore the road to excellent condition. As conditions worsen, more extensive maintenance

may be required; complete rebuilding may eventually be necessary.

To select a rating first assess the crown, drainage, and gravel layer. Then review the individual defects and select the type of maintenance or rehabilitation necessary. The rating should reflect the condition and type of maintenance or repairs required. Look at the photographs in this section to become more familiar with the ratings and conditions.

Ratings are related to needed maintenance or repair

- Rating 5** Newly constructed road. Excellent crown and drainage. No maintenance required.
- Rating 4** Good crown and drainage. Routine maintenance.
- Rating 3** Roadway shows traffic effects. Needs regrading, minor ditch maintenance, and spot gravel application.
- Rating 2** Road needs additional aggregate layer, major drainage improvements.
- Rating 1** Travel is difficult. Complete rebuilding required.

Surface rating	Visible distress*	General condition/treatment measures
5 Excellent	No distress. Dust controlled. Excellent surface condition and ride.	New construction—or total reconstruction. Excellent drainage. Little or no maintenance needed.
4 Good	Dust under dry conditions. Moderate loose aggregate. Slight washboarding.	Recently regraded. Good crown and drainage throughout. Adequate gravel for traffic. Routine grading and dust control may be needed.
3 Fair	Good crown (3"-6"). Adequate ditches on more than 50% of roadway. Gravel layer mostly adequate but additional aggregate may be needed in some locations to correct washboarding or isolated potholes and ruts. Some culvert cleaning needed. Moderate washboarding (1"-2" deep) over 10%-25% of the area. Moderate dust, partial obstruction of vision. None or slight rutting (less than 1" deep). An occasional small pothole (less than 2" deep). Some loose aggregate (2" deep).	Shows traffic effects. Regrading (reworking) necessary to maintain. Needs some ditch improvement and culvert maintenance. Some areas may need additional gravel.
2 Poor	Little or no roadway crown (less than 3"). Adequate ditches on less than 50% of roadway. Portions of the ditches may be filled, overgrown and/or show erosion. Some areas (25%) with little or no aggregate. Culverts partially full of debris. Moderate to severe washboarding (over 3" deep) over 25% of area. Moderate rutting (1"-3"), over 10%-25% of area. Moderate potholes (2"-4") over 10%-25% of area. Severe loose aggregate (over 4").	Travel at slow speeds (less than 25 mph) is required. Needs additional new aggregate. Major ditch construction and culvert maintenance also required.
1 Failed	No roadway crown or road is bowl shaped with extensive ponding. Little if any ditching. Filled or damaged culverts. Severe rutting (over 3" deep), over 25% of the area. Severe potholes (over 4" deep), over 25% of area. Many areas (over 25%) with little or no aggregate.	Travel is difficult and road may be closed at times. Needs complete rebuilding and/or new culverts.

* Individual road sections 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

3 Miles of CCR No. 3 and CCR No. 6

PROJECT Crowned Ridge Wind II 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	3	Mile	\$1,500.00	\$4,500.00
2	Digouts (Reclaim, Remove 2", and Compact)	1	Mile	\$7,500.00	\$7,500.00
3	Patching Digout areas (2" Asphalt)	1	Mile	\$20,000.00	\$20,000.00
4	Milling 1.5" Wearing Course	1	Mile	\$12,000.00	\$12,000.00
5	2" Wearing Course Asphalt Surfacing Overlay	1	Mile	\$145,000.00	\$145,000.00
6	Roadway Striping	1	Mile	\$5,000.00	\$5,000.00
G1	Gravel Roadway Soft Area Repairs	2	Mile	\$13,000.00	\$26,000.00
G2	3" Gravel Surfacing Installation	2	Mile	\$50,000.00	\$100,000.00
G3	Sign Restoration	1	Lump Sum	\$1,000.00	\$1,000.00
G4	Seeding Restoration	1	Lump Sum	\$4,000.00	\$4,000.00
Asphalt Roadway Restoration Subtotal =					\$194,000
Gravel Roadway Restoration Subtotal =					\$131,000
Construction Contingencies (10%) =					\$32,500
Opinion of Probable Construction Costs =					\$357,500
Design, Bidding and Construction Services =					\$12,000
Quality Control Testing Services =					\$3,000
Opinion of Probable Restoration Cost =					\$372,500



APPENDIX G

HAUL ROUTE COMPARISON PICTURES



Pre CCR 6 from 462nd to 463rd 0:12 video time



Post CCR 6 from 462nd to 463rd 0:17 video time