



July 15, 2021

Patrick Fahn  
Director, Public Utilities Division  
North Dakota Public Service Commission  
600 East Boulevard; Department 408  
Bismarck, ND 58505-0480

Re: PU-14-813 - Basin Electric Power Cooperative - North Killdeer Loop Phase I 345-kV  
Transmission Line - Notice of Noncompliance

Dear Mr. Fahn:

This letter is in response to your letter dated June 15, 2021 enumerating two items of apparent noncompliance regarding order provisions in the above-captioned case. Basin Electric Power Cooperative's (**Basin Electric's**) explanation and proposed corrective action for each item is presented below.

Item 1.

Response: According to our records, the required information was submitted to the North Dakota Public Service Commission (**Commission or NDPSC**) by Basin Electric employee Mr. Cris Miller on February 16, 2018. A copy of the submittal is attached for your reference. Basin Electric believes this meets the requirements to Order Provision paragraph 33. While Basin Electric does not have a copy of the CD that was sent in 2018, for your convenience, we have included the electronic files on the enclosed USB flash drive that were likely included on that CD.

Item 2.

Response: On August 16, 2017, Mr. Cris Miller submitted an "Initial" (or Partial) Tree/Shrub Mitigation Plan (**Plan**) which is docketed as item 109 in the above-captioned case. The Plan indicated that the total number of trees/shrubs removed was estimated at 1,129 (requiring 2,258 replacements) on nineteen landowner parcels, and that ten of the nineteen landowners had requested replacements totaling 1,534. The Plan also provided that the replacements were to be combined with the replacement efforts required under NDPSC Case PU-11-696 (AVS to Neseet 345-kV transmission line) because this Project and the AVS to Neseet 345-kV Transmission Project were occurring simultaneously in some of the same areas. A copy of the August 16, 2017 correspondence is also attached for your convenience. It appears that report was never approved by the Commission.

120 PU-14-813 Filed 07/15/2021 Pages: 66  
Response to 15 June 2021 Notice of Noncompliance  
Basin Electric Power Cooperative  
Kevin Solie, P.E.

On February 21, 2018, Mr. Miller submitted an update on tree and shrub planting in PU-11-696 detailing Basin Electric's efforts to identify planting opportunities with local and state entities.

Further, on October 20, 2020, I submitted a report in docket PU-11-696, detailing a summary of Basin Electric's replacement efforts in western North Dakota:

**Table 1. Tree and shrub summary.**

County	Public Plantings	Landowner Plantings	Planting Dates (Year)	Notes
McKenzie	0	7,117	2017, 2018, 2019	1,606 replants 2018/2019
Mercer	4,529	2,129	2016, 2018	
Mountrail	622	0	2018	
Stark	16,540	0	2019	1,000 replants 2020
Williams	5,097	1,513	2017, 2018, 2019	1,750 replants planned for 2021
<b>Totals</b>	<b>26,788</b>	<b>10,759</b>		

While the report didn't specifically include reference to docket PU-14-813, the table did include total tree plantings for replacement trees in both the North Killdeer Loop Project and the AVS-Neset Project. Between the two projects, a total of 37,078 replacements would need to be accounted for. Basin Electric has planted approximately 37,547 trees in western North Dakota (with 7,117 planted in McKenzie County, the location of the North Killdeer Loop Phase I Project), as well as spent hundreds of thousands of dollars on tree/shrub mitigation efforts to date.

As detailed in the filings to the NDPSC on this issue, tree/shrub mitigation efforts under both this docket and PU-11-696 have been complicated by the lack of landowner and community desire for replants and that planting/replanting efforts have occurred over a period of close to five years. Thus, Basin Electric appreciates the opportunity to request compliance with the NDPSC's March 13, 2019 simplified version of the Tree and Shrub Mitigation Specifications and asks the Commission to amend the April 29, 2015 Order to incorporate the March 13<sup>th</sup> version of the Commission's Tree and Shrub Mitigation Specifications.

For the reasons identified above, Basin Electric would also request compliance with the NDPSC's March 13, 2019 simplified version of the Tree and Shrub Mitigation Specifications and asks the Commission to amend the original April 23, 2014 Order to incorporate the March 13<sup>th</sup> version of the Commission's Tree and Shrub Mitigation Specifications in the PU-11-696 docket.

Basin Electric believes the significant planting (and replanting) efforts undertaken since 2017 would meet the intent of and purpose of the NDPSC's updated Tree and Shrub Mitigation Specifications, that is to provide plantings that will provide a long-term benefit to landowners, farmers and ranchers, the community, wildlife, and the environment.

In conclusion, Basin Electric proposes to provide a combined final report to be sent by October 31, 2021, which will address the requirements of paragraphs five and two in the updated Tree and Shrub Mitigation Specifications in both the PU-14-813 and PU-11-696 dockets.

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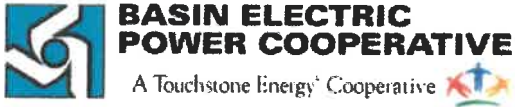
Please contact me at [ksolie@bepc.com](mailto:ksolie@bepc.com) or 701.202.5096 if you have any questions or require additional information.

Sincerely,

A handwritten signature in blue ink, appearing to read "K. Solie".

Kevin L. Solie, P.E.  
Senior Environmental Compliance Administrator

/kls  
Enclosures



February 16, 2017

Darrell Nitschke  
Executive Director  
North Dakota Public Service Commission  
600 East Boulevard; Dept. 408  
Bismarck, ND 58505-0480

Re: Basin Electric Power Cooperative  
North Killdeer Loop Phase I 345-kV Transmission Project As-Build Submittal  
PU-14-813

Dear Mr. Nitschke:

Enclosed is Basin Electric Power Cooperative's North Killdeer Loop Phase I 345-kV Transmission Project's final Structure Location, Plan and Profile and Design Specifications. A CD containing the electronic files is also enclosed. Due to the file size, the files cannot be updated directly to the Docket.

The Project was placed into electrical service in September 2016. The reclamation effort was completed in late November 2016. The grassland areas that require re-vegetation will be seeded in spring 2017. The re-vegetated areas will be monitored for final acceptance by Basin Electric staff.

For inquiries regarding the application, please call Cris Miller, Senior Environmental Project Specialist at (701) 557-5635.

Sincerely,

A handwritten signature in black ink that reads "Cris Miller".

Cris Miller  
Senior Environmental Project Specialist

/ser  
Enclosures

cc: Casey Jacobson  
Amanda Wangler

# 20170214 - ENG - NKL Phase 1 - Patent Gate to Kummer Ridge - 345kV Transmission Line Project Design Criteria Report

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## Design Criteria Report

**June 2015**

**BASIN ELECTRIC POWER COOPERATIVE**

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<b>TRANSMISSION LINE DESIGN DATA SUMMARY</b>		<b>I. GENERAL INFORMATION</b>								
		BORROWER:						DATE:		
		LINE IDENTIFICATION: North Killdeer Loop Phase 1 345 kV Transmission Line Project								
		VOLTAGE				LENGTH				
		TRANSMISSION		ADD'L CIRCUIT		TRANSMISSION		ADD'L CIRCUIT		
		345 kV				28.69 miles				
TYPE OF TANGENT STRUCTURE: Single Steel Pole						BASE POLE: 115 HT. _____ CL				
DESIGNED BY: Basin Electric Power Cooperative										
<b>II. CONDUCTOR DATA</b>										
Note: Add'l circuit by Mountrail Williams Electric Cooperative		SIZE (kcmil or IN.)		TRANSMISSION	OHGW	OPGW	ADD'L CIRCUIT			
		STRANDING		2312.0	7/16 EHS	71/571				
		MATERIAL		76/19	7	15				
		DIAMETER (IN)		ACSR	EHS	Alum. Clad Steel				
		WEIGHT (LB/FT.)		1.802	0.435	0.571				
		ULTIMATE STRENGTH (LBS.)		2.526	0.399	0.411				
		56,700	20,800	20,546						
<b>III. DESIGN LOADS (Wire)</b>										
		TRANSMISSION (LBS/FT)		OHGW (LBS/FT)	OPGW (LBS/FT)	ADD'L CIRCUIT (LBS/FT)				
NESC: <u>HEAVY</u> LOADING DISTRICT										
a. ICE: <u>1/2</u> IN.	Vertical.	3.958	0.981	1.075						
b. WIND ON ICED CONDUCT. <u>4</u> PSF	Transverse	0.934	0.478	0.524						
c. CONSTANT K <u>0.3</u>	Resultant + K	4.367	1.391	1.496						
HEAVY ICE(NO WIND) <u>1.25</u> IN.	Vertical.	7.272	3.019	3.241						
HIGH WIND(NO ICE) <u>31</u> PSF	Transverse	4.660	1.124	1.475						
EXTREME HIGH WIND/ICE										
ICE: <u>1/2</u> IN.	Vertical.	3.958	0.981	1.075						
WIND ON ICED CONDUCT. <u>9.2</u> PSF	Transverse	2.148	1.100	1.204						
<b>IV. SAG &amp; TENSION DATA</b>										
SPANS		AVERAGE(EST) <u>800-950</u> FT.		MAXIMUM(EST). <u>1200</u> FT.		RULING(EST.) <u>950</u> FT				
SOURCE OF SAG-TENSION DATA: ALCOA SAG 10				TRANSMISSION		OHGW		OPGW		(ESTIMATED)
<b>TENSIONS (% RATED STRENGTH)</b>				INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL	
NESC HEAVY (0°F, 1/2 IN, 4.00 PSF, 0.30 LB/F)				39.2	34.5	28.5	27.7	32	30.4	
MAXIMUM ICE 1.25 IN (32°F)				53.3		47.1		51.3		
HIGH WIND 31 PSF (60°F, 0 IN)				39.3		24.2		30		
UNLOADED LOW TEMPERATURE (-40°F)				32.7		14.0		17.3		
<b>SAGS (FT)</b>										
NESC DISTRICT LOADED (0°F)					25.3		27.37		27.17	
UNLOADED HIGH TEMP (212°F) (120°F FOR OHGW & OP)					35.5		23.63		24.49	
MAXIMUM ICE 1.25IN (0°F)					28.6		35.0		34.92	
LOADED 1/2" ICE, NO WIND (32°F)					26.7		25.55		25.74	
<b>V. CLEARANCES</b>										
MINIMUM CLEARANCES TO MAINTAINED AT: 212°F, FINAL SAG										
CLEARANCES IN FEET	RAILROADS	HIGHWAY	CULTIVATED FIELDS	RURAL ROADS				ADD. ALLOW. FOR TEMPLATE		
TRANSMISSION	38	30	30	30				--		
ADD'L CIRCUIT								--		
<b>VI. RIGHT OF WAY</b>										
WIDTH	150 FT (MIN.)			150 FT. (MAX.)						

VII. CONDUCTOR MOTION DATA						
HISTORY OF CONDUCTOR GALLOPING: MINIMAL TO RARE						
HISTORY OF AEOLIAN VIBRATION: YES – DAMPER REQUIRED						
a. TYPE OF VIBRATION DAMPERS USED (IF ANY)			STOCKBRIDGE (conductor) SPIRAL (OHGW and OPGW)			
b. TYPE OF ARMOR RODS USED (IF ANY)			PERFORMED AGS			
VIII. INSULATION						
NO. OF THUNDERSTORM DAYS/YR ~ 30 ELEV.ABOVE SEA LEVEL (MIN, MAX, FT) 2000 - 2500						
CONTAMINATION EXPECTED? <u>minimal</u> MAX EST. FOOTING RESISTANCE <u>25</u> Ω SHIELD ANGLE <u>20</u> °						
STRUCTURE TYPE	STRUCTURE DESIGNATION	NO. OF BELLS PIN OR POST	60 HZ DRY FLASHOVER	INSULATOR SIZE	M&E RATING / CANTILEVER STR	OTHER
TANGENT		18	965 kV	5-3/4 X 10	30K M&E	
STRAIN STRUC		19 (double string)	1050 kV	5-3/4 X 10	30K M&E	
IX. INSULATOR SWING						
CRITERIA: (1) <u>6</u> PSF ON BARE CONDUCTOR AT <u>40</u> °E (6 psf MIN) FOR <u>76</u> IN. CLEARANCE						
(2) <u>31</u> PSF HIGH WIND ON BARE CONDUCTOR AT <u>60</u> °F FOR <u>30</u> IN. CLEARANCE						
(3) <u>0</u> PSF ON BARE CONDUCTOR AT <u>60</u> °F FOR <u>104</u> IN. CLEARANCE						
(4) <u>9</u> PSF ON BARE CONDUCTOR AT <u>60</u> °F FOR <u>76</u> IN. CLEARANCE						
ALLOWABLE SWING ANGLE			ANGLE IN DEGREES			
NAME OF STR.	STRUCTURE TYPE	NO. OF INSULATORS.	(1) 6 PSF MIN WIND	(2) HIGH WIND	(3) 0 PSF WIND, 60°F	(4) 9 PSF WIND, 60°F
3ST	TANGENT	18	47° Max	72° Max	24° Max	47° Max
3SA	ANGLE	19				
3SDA	DEADEND	19 (38)				
X. ENVIRONMENTAL AND METEOROLOGICAL DATA						
TEMPERATURE: MIN <u>-50</u> ° MAX. <u>110</u> ° AVERAGE YEARLY LOW <u>-30</u> °			EXTREME WIND VELOCITIES (MPH): 10 YR. <u>60</u> 50 YR. <u>    </u> 100 YR <u>80</u> 90 mph 3-second gust (maximum recorded)			
MAXIMUM HEIGHT OF SNOW ON THE GROUND UNDER THE CONDUCTOR(FT): <u>2.0</u>			DESCRIBE TERRAIN AND CHARACTERISTICS OF SOIL:			
CORROSIVENESS OF ATMOSPHERE: MINIMAL			1. Rolling hills and plains dissected by streams. 2. Soils comprised of lean clays, silt soils, and sandy clays/silts overlaying sandy lean clay glacial till with cobbles and boulders.			
XI. STRUCTURE DATA						
SPECIES OF WOOD: <u>N/A</u>			DESIGNATED BENDING FIBER STRESS <u>N/A</u>			
SPANS (FT) FOR TANGENT TYPE <u>3ST</u>			BASE POLE <u>115</u> FT	OTHER HEIGHTS/CLASSES AND BRACING		
LEVEL GROUND SPAN			950'			
MAX. HORIZON. SPAN LIMITED BY STRUCTURE STRENGTH			1200'			
MAX. VERTICAL SPAN LIMITED BY STRUCTURE STRENGTH			1400'			
MAX. HORIZONTAL SPAN LIMITED BY COND. SEPARATION			>1200'			
MAX. SPAN LIMITED BY UNDERBUILD			--			
MAX. SPAN LIMITED BY GALLOPING			>1200'			
EMBEDMENT DEPTH: Concrete Pier Foundations				PRESERVATIVE: <u>N/A</u> (TYPE & RETENTION) <u>N/A</u>		
GUYING: TYPE OF ANCHORS: <u>n/a</u> GUY SIZE AND R.B.S.: <u>n/a</u>						
XII. LINE DESCRIPTION						
TANGENTS <u>70</u> %		LIGHT ANLES <u>5</u> %		AVERAGE NUMBER OF LINE ANGLES PER MILE <u>0.3</u>		
MEDIUM ANGLES <u>15</u> %		DEADEND & HEAVY ANGLES <u>10</u> %		MAXIMUM DISTANCE BETWEEN FULL DEADENDS (IN MILES) <u>5</u> MILES		

## A. INTRODUCTION

Basin Electric Power Cooperative is a consumer-owned, regional cooperative headquartered in Bismarck, North Dakota. Basin Electric is proposing construction of a 345kV transmission line in northwest North Dakota that will run approximately 30 miles from the Patent Gate Substation near Arnegard, North Dakota to the Kummer Ridge Substation near Johnson's Corner, North Dakota.

The proposed transmission line will be constructed using steel single-pole structures.

A location map is shown in the Appendix.

## B. CLIMATE

The semi-arid climate for the transmission line is characterized by cold, dry winters and moderately hot summers. The area is subject to large annual variations in temperature because it is near the center of the North American land mass. Arctic air moves into the region from the north and northwest during the winter, causing periods of extreme cold alternating with milder temperatures. Summer temperatures are usually warm, but some hot spells and occasional cool days can be expected. The transmission line design will incorporate the following climate conditions.

### 1. Temperature

Temperature extremes: Lowest: -50°F (12/23/1983) Highest: 110°F (07/05/1936)

Mean lowest daily minimum temperature: -6.1°F

Mean annual temperature: 41.9°F

### 2. Wind

Basic Wind Speed: 90 mph (from NESC Figure 250-2)

Coldest month mean wind velocity: 9.7 mph (December)

Prevailing wind direction for coldest month: NW

### 3. Precipitation

Average annual precipitation: 14.3 inches

Expected maximum 24-hour snow accumulations: 15 inches

### 4. Isokeraunic Level

The Isokeraunic level for the area is 30.

### 5. Frost Depth

The average depth for frost penetration is 5 feet.

## C. ELEVATION

Elevation ranges from 2000 feet to 2500 feet above sea level.

## D. CODES AND STANDARDS

This transmission line will be constructed in accordance with Rural Utilities Service (RUS) Standards. In addition, design, materials, and construction will conform to the latest revision of the following:

1. NESC – National Electrical Safety Code
2. ASTM – American Society for Testing and Materials
3. ANSI – American National Standards Institute

4. AISC – American Institute of Steel Construction
5. IEEE – Institute of Electrical and Electronic Engineers
6. ASCE – American Society of Civil Engineers
7. AWS – American Welding Society
8. NEMA – National Electrical Manufacturers Association
9. OSHA – Occupational Safety and Health Act
10. ASME – American Society of Mechanical Engineers

All federal, state, local, and municipal government requirements will also be adhered to.

#### E. GENERAL CRITERIA

##### 1. Nominal Voltage

The nominal phase-to-phase voltage is 345 kV.

##### 2. Structure Type

Steel single-pole structures on concrete foundations will be used. A comprehensive structure design criteria is contained in the Appendix.

##### 3. Line Access and Structure Numbers

Special access may be required to some structures. Gates will be provided in existing fences. Structure numbers will be provided at the top of every 5<sup>th</sup> structure, in addition to deadends, angles, and crossings..

##### 4. Thermal Capacity

Basin Electric Power Cooperative has had satisfactory electric operation using a single 2306.2 MCM ACSR conductor per phase at 345 kV. The electrical operating characteristic of this line will be similar with the single 2312 MCM ACSR conductor. The maximum summer current rating is 1810 amperes at 100°C and at 2 feet per second crosswind. The maximum winter current rating is 2525 amperes at 100°C and at 2 feet per second crosswind. Thermal capacity is not a limiting factor for this transmission line.

##### 5. Electrical Effects Analysis

Basin Electric's experience with 345 kV transmission lines indicates that they do not produce objectionable levels of audible noise, television interference, electric or magnetic fields off the right-of-way. Therefore, no specific study for such electrical effects is planned for this project.

##### 6. Transposition Structures

Due to the delta configurations on tangents and deadends, and the stacked configurations from the angles, transposition structures will not be necessary.

## F. INSULATION COORDINATION

### 1. Insulation Requirements for Power Frequency

Power frequency voltages rarely control insulation design except in highly contaminated conditions. For this 345 kV line, the 60 hertz wet line crest voltage is (1.05 x 345 kV):

$$\frac{362}{\sqrt{3}} \times \sqrt{2} = 295 \text{ kV}$$

Seven (7) standard 5¾" x 10" suspension insulators would be sufficient. However, a reduction in flashover voltage is caused by rain and is further decreased by contaminants within the rainwater. To compensate for the contaminated conditions, the leakage distance (the distance along the surface of the insulator) has to be increased. Even for very lightly contaminated areas, RUS recommends a total leakage distance of up to 1 inch per kV (RMS line to ground). On that basis, a leakage distance of 209 inches or a minimum of 18 insulators would be required. The insulation design must obviously withstand the power frequency voltage during all weather conditions including the high wind condition. A power frequency air gap of 30 inches shall be maintained during maximum insulator swing condition.

### 2. Insulation for Switching Surge

It is assumed that the maximum per unit switching surge for the 345 kV line will be kept below a level of 2.8 by using surge arresters. For design purposes the switching surge voltage is:

$$\frac{262}{\sqrt{3}} \times \sqrt{2} \times 2.8 = 826 \text{ kV to ground}$$

The basic insulation level of the line is the withstand value of the impulse voltage of the insulator string which can successfully withstand the expected switching surge.

### 3. Insulation for Lightning Surges

Insulator strings with 18 units on steel and wood structures have proven satisfactory lightning performance. Angle structures may have additional units to maintain clearance. Angle and Deadend Structures will have 19 (38) units per string. To prevent the near certainty of flashover due to a lightning strike, the following criteria will be maintained:

Minimum OHGW Shielding Angle	20 degrees
Maximum Grounding Resistance	25 ohms

### 4. Insulator-Hardware Assemblies

The hardware and components of insulator assemblies shall withstand the following loading conditions based upon the appropriate conductor tensions.

	<u>MAXIMUM PERCENT OF RATED STRENGTH</u>
NESC	40
1¼" Ice	70

Tangent and small angle suspensions will use 30,000 lb single-string insulators. For medium angles, 30,000 lb single-string insulators will be used. For large running angles and deadends, 30,000 lb double-string insulators will be used. Single-string assemblies may also need to be doubled at significant crossings. Insulators will be standard 5¾-inch x 10-inch glass

Armor grip suspension (AGS) units will be used for conductor and OPGW. Suspension shoes with armor rod will be used for OHGW. Hardware for assemblies will be suitable for hot line maintenance. Corona free clamps and armor rods will be used. Corona rings will not be needed.

Internally fired dead-ends and mid-span splices (AMP Type) will not be considered.

## G. CLEARANCES

### 1. Phase Spacing

Phase spacing for design ruling span will be 28 feet, but may vary for special ruling spans and specific cases.

### 2. Crossing Clearances (Vertical)

The following minimum clearances will be used for the line design:

CROSSING TYPE	CLEARANCE @ 100°C (ft)
A. Agricultural Land	30.0
b. Rural Roads	30.0
c. Highways and Paved County Roads	30.0
d. Railroads	38.0
e. Communication Lines	15.0
f. Waterways, lakes, ponds, rivers, and streams	34.0 or as required by the Corps of Engineers or other agency
g. Power Lines:	
0 to 69 kV	15.0
to 138 kV	16.0
to 161 kV	17.0
to 230 kV	18.0
to 345 kV	19.0
h. Buildings	18.0

Vertical clearances over special crossings should be provided as the situation demands. The sag of existing conductors and wires will be neglected in order to allow adequate clearances during galloping conductor conditions.

3. Minimum Horizontal Clearances at Crossings

No structure will be located within the right-of-way of another utility, except under special circumstances as approved by the utility. Horizontal clearances from transmission structures are given below:

<u>Distance From</u>	<u>Recommended Clearance (ft)</u>
Communication lines	50.0
Distribution line	50.0
Pipelines	50.0
Railroad Centerline	Structures to be located off right-of-way
Roads & Highways	Structures to be located off right-of-way

4. Right-of-Way Width

A right-of-way width of 150 feet has been chosen per the requirements of NESC Rule 234, which governs clearance requirements from the conductor to structures (buildings, towers, antenna, etc.) directly on the edge of the right-of-way. The right-of-way width provides additional room for construction and maintenance. Additional temporary construction easements may be obtained to provide working space at deadend and angle structure locations, as required to install conductor.

5. Clearance Between Conductor and Overhead Ground Wire

The OHGW vertical separation will be about 25 feet at the structure attachment points. Initial unloaded tension shall not exceed 25 percent of rated strength at 0°F and OHGW sags shall not exceed 80 percent of the final conductor sag at 60°F with no wind. During iced conductor and OHGW conditions, the conductor has a tendency to drop its ice first. If the OHGW has not dropped its ice, the reduced separation may result in a flashover from the conductor. To ensure adequate phase-to-ground clearance, the minimum vertical separation between conductor and OHGW during differential ice (½" ice at 32°F) conditions shall be 5 feet.

6. Insulator Swing

All tangent and angle structures for this project will utilize suspension insulators which are free to swing about their points of support. The amount of swing varies with such factors as conductor tension, temperature, wind velocity, and the ratio of the vertical to horizontal spans.

Insulator swing charts will be developed which show the allowable vertical span to horizontal span ratio for the tangent structures under the following three conditions (per RUS Bulletin 1724E-200, Table 7-1):

- a. The normal, no wind clearance at 60°F (final) shall be no less than 104 inches. Angle structures will be checked to verify the above criteria is maintained during minimum and maximum insulator swing conditions.
- b. A 9-pound wind at 60°F (Final) while maintaining a 76-inch lightning surge clearance.

- c. A 6-pound per square foot transverse wind ( $\approx 48$  mph) at  $-40^{\circ}\text{F}$  (Initial) while maintaining a 76-inch switching surge clearance to ground.
- d. A 31-pound per square foot transverse wind ( $\approx 90$  mph) at  $60^{\circ}\text{F}$  (Final) and maintaining the power frequency clearance of 30 inches.

## H. CONDUCTOR

### 1. Selection

Conductor selection is based on load flow data and Basin Electric's past operating experience with 345 kV lines. A Thrasher 2312.0 MCM 76/19 ACSR conductor will meet the electrical load requirements for this project. The physical and electrical characteristics of the conductor are listed below:

#### 2312.0 MCM 76/19 ACSR

Code Name	Thrasher
Overall Minimum Diameter	1.802 in.
Cross Sectional Area	1.9144 sq. in.
Weight Per 1,000 Feet	2.526 lbs.
Rated Strength, Standard	56,700 lbs.

#### Resistance (Ohm/Mile)

AC at $25^{\circ}\text{C}$	0.0457
AC at $75^{\circ}\text{C}$	0.0529

### 2. Tension Limitations

Sag-tension data for the conductor is based on the following limitations:

- a. Initial tension at the NESC heavy load shall not exceed 40 percent of rated strength.
- b. Initial bare tension at  $0^{\circ}\text{F}$  shall not exceed 28 percent of rated strength.
- c. Final bare tension at  $0^{\circ}\text{F}$  shall not exceed 23 percent of rated strength.
- d. Initial tension at  $1\frac{1}{4}$ " ice at  $0^{\circ}\text{F}$  shall not exceed 54 percent of rated strength.

Sag-tension data is provided for the NESC heavy loading condition as well as special loadings including the heavy ice load of  $1\frac{1}{4}$  inch at  $0^{\circ}\text{F}$ , Initial, and a 100 mph wind at  $60^{\circ}\text{F}$ , Final.

Ground clearance will be checked at a maximum temperature of  $100^{\circ}\text{C}$ . Uplift on suspension insulators will be checked at  $-40^{\circ}\text{F}$ .

### 3. Galloping Conductors

Galloping conductors have occurred within the project area and will be accounted for in the design. Fortunately, single-loop galloping rarely occurs in spans over 600 to 700 feet (Design Manual for High Voltage Transmission Lines, RUS 1724E-200). Galloping will be checked under a weather condition consisting of  $32^{\circ}\text{F}$ ,  $\frac{1}{2}$ " radial

ice, 2 psf wind, and final sag. Lissajous ellipses, which show the theoretical envelop of the galloping conductor, will be prepared for both conductor's designs as follows:

- a. Full loop analysis for spans up to 700 feet.
- b. Double loop analysis for spans 700 feet to maximum.

#### 4. Vibration Protection

Conductor tension limitations have been selected to limit aeolian vibrations and conductor oscillation on the line. Stockbridge type dampers will be used to limit vibration and protect the conductors. Sprial type dampeners will be used for overhead groundwire and optical groundwire.

### I. OVERHEAD GROUND WIRE AND GROUNDING

#### 1. Selection

The overhead ground wire will be extra high strength (EHS) galvanized steel, strand, 7/16 inch, and 20,800 pounds minimum breaking strength.

The optical ground wire (OPGW) will be used to establish a fiber optic path for the entire line. Therefore, the single pole steel structures will have one OPGW and one galvanized steel wire. The OPGW sags will match those of the OHGW under normal loads.

#### 2. Tension Limitations

a. Sag-tension data for the OHGW is based on the following limitations:

- 1) Not greater than 80 percent of conductor sag at 60°F, Final.
- 2) Initial bare tension at 0°F shall not exceed 15 percent of minimum breaking strength.
- 3) Initial 1¼-inch ice at 0°F .

b. Sag-tension data (not limiting conditions) is provided for the NESC heavy loading condition as well as the following special loadings:

- 1) 1¼ inch ice at 0°F
- 2) 110 mph wind at 60°F

c. Uplift on OHGW attachments will be checked at -40°F. Clearance between the ½" iced OHGW and bare conductor at 32°F will also be verified.

#### 3. Shielding Angle

A shielding angle of 20 degrees will provide an adequate shielding angle to prevent lightning strikes to the conductor. Standard practice and calculated trip out rates substantiate the selected shield angle. Using an average span of 950 feet, an isokeraunic level of 30 and footing resistance of 25 ohms, calculations show the outage rate due to lightning will be under 0.5 per 100 miles per year for this project, well below the generally accepted limit.

#### 4. Grounding

The lightning performance of the line is dependent upon the structure footing resistance. Since the lines lie in an area where the isokeraunic level is fairly high, a

25-ohm maximum design ground resistance has been chosen. Ground rods will be installed, as required, to provide a maximum resistance of 25-ohms.

Fences and gates within the transmission line right-of-way will be grounded to prevent electrostatic voltage build-up and electromagnetic shock hazards.

## J. STRUCTURE LOADING CRITERIA

### 1. Structure Design Loads

The structures shall meet the strength requirements of the latest edition of the National Electric Safety Code (NESC). In addition, the structures will be designed to withstand a high wind condition and a heavy ice condition.

The extreme wind load was calculated per ASCE Manual 74, "Guidelines for Electrical Transmission Line Structural Loading." This standard is written for reliability-based design methods, and was updated in 2010.

The following table defines all load cases and overload factors to be applied:

Load Case	Overload Factors
<ul style="list-style-type: none"> <li>NESC Heavy (0°F, ½" Ice, 4 psf wind, initial tension) NESC 250 B</li> </ul>	Vertical = 1.5 Transverse = 2.5 Tension = 1.65 Wind on structure = 2.5
<ul style="list-style-type: none"> <li>Extreme Wind (60°F, bare, 31 psf wind, final tension) NESC 250 C</li> </ul>	Vertical = 1.1 Transverse = 1.1 Tension = 1.1 Wind on structure = 1.1
<ul style="list-style-type: none"> <li>Extreme Ice with Concurrent Wind (15°F, ½" Ice, 9.2 psf wind, initial tension) NESC 250 D</li> </ul>	Vertical = 1.1 Transverse = 1.1 Tension = 1.1 Wind on structure = 1.1
<ul style="list-style-type: none"> <li>Heavy Ice (0°F, 1 ¼ " Ice, no wind, initial tension)</li> </ul>	Vertical = 1.1 Transverse = 1.1 Tension = 1.1 Wind on structure = 1.1
<ul style="list-style-type: none"> <li>Camber (40°F, bare, 2 psf wind, final tension)</li> </ul>	Vertical = 1.0 Transverse = 1.0 Tension = 1.0

	Wind on structure = 1.0
--	-------------------------

All load cases include tension components and insulator hardware. Some minor adjustment of load cases will be necessary based on type of structure used.

#### K. FOUNDATIONS

Drilled-pier concrete foundations will constitute the typical foundation system for all structures. Transmission foundations for single pole structures are subjected to significant lateral forces and overturning moments. Drilled-pier concrete foundations will utilize the use of steel reinforcement.

#### REFERENCES

1. Electric Power Research Institute (EPRI): "Transmission Line Reference Book 345 kV and Above", Project UHV, Pittsfield, Mass. 19

20170214 - ENG - NKL  
Phase 1 - Patent Gate to  
Kummer Ridge - 345kV  
Transmission Line Project  
Design Criteria Report

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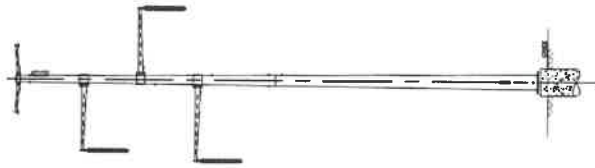
Appendix

Project Location Map

# PATENT GATE SUBSTATION TO KUMMER RIDGE SUBSTATION 345KV TRANSMISSION LINE PROJECT

**LINE FEATURES:**

**LINE LENGTH**  
 PATENT GATE TO KUMMER RIDGE ——— 28.7 MILES  
 RIGHT OF WAY WIDTH ——— 150 FEET  
**STRUCTURE TYPE**  
 PATENT GATE TO KUMMER RIDGE ——— GALV. STEEL SINGLE POLES  
 (TOTAL 161 STRUCTURES)  
**DESIGN RULING SPAN** ——— 1000 FEET  
**CONDUCTOR** ——— 2312 KCMIL 76/19 ACSR THRASHER  
**OPTICAL GROUND WIRE** ——— AC-71671, .571 INCH DIAMETER, 36 FIBERS  
**PERMITTING AUTHORITY** ——— ND PUBLIC SERVICE COMMISSION  
**EIS ENVIRONMENTAL IMPACT STATEMENT** ——— WESTERN AND US FOREST SERVICE



<b>FACILITY:</b> TRANSMISSION SYSTEM MAINTENANCE <b>LOCATION/UNIT:</b> PATENT GATE TO KUMMER RIDGE 345KV LINE <b>CONTRACT/VERSION:</b>	<b>DESIGNED BY:</b> S. VASBRUGER <b>DRAWN BY:</b> S. BURCARD <b>CHECKED BY:</b> J. BERNHARDT <b>DATE:</b> 7/16/15 <b>SCALE:</b> NONE <b>PROJECT/CONTRACT NUMBER:</b>
TITLE SHEET	
<b>BASIN ELECTRIC POWER COOPERATIVE</b> <small>A Touchstone Energy Cooperative</small>	

D	ISSUED	A. BURCARD	S. VASBRUGER	7/16/15	DATE
REV.	DESCRIPTION	DRWN	DSGN	APPD	

0	ISSUED	A. BURCARD	S. VASBRUGER	7/16/15	DATE
REV.	DESCRIPTION	DRWN	DSGN	APPD	

0	ISSUED	A. BURCARD	S. VASBRUGER	7/16/15	DATE
REV.	DESCRIPTION	DRWN	DSGN	APPD	

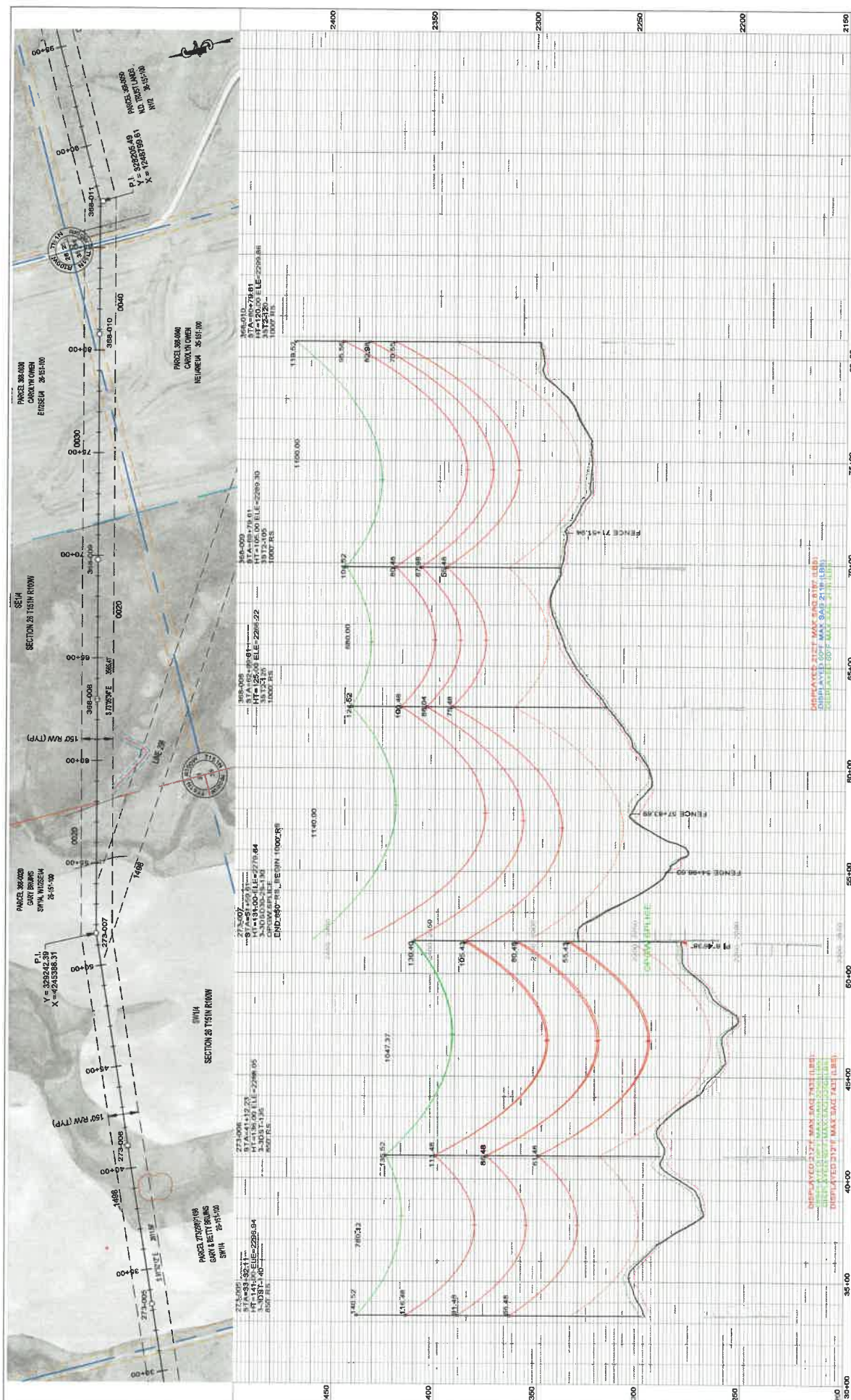
**BASIN ELECTRIC POWER COOPERATIVE  
CASE NO. PU-14-813**

**ASBUILT  
PLAN AND PROFILES AND STRUCTURE LOCATIONS FOR  
NORTH KILLDEER LOOP PHASE 1  
345KV TRANSMISSION PROJECT**

**LINE 368 - PATENT GATE TO KUMMER RIDGE SEGMENT**

**NORTH DAKOTA PUBLIC SERVICE COMMISSION  
FEBRUARY 2017**





LEGEND		DESIGN INFORMATION		REVISIONS		PROJECT INFORMATION	
---	CULTURAL/TRIBAL AVOIDANCE	DATE	BY	NO.	DATE	BY	NO.
---	WETLAND AVOIDANCE	DATE	BY	NO.	DATE	BY	NO.
---	BARBED WIRE FENCE	DATE	BY	NO.	DATE	BY	NO.
---	QUARTER SECTION LINE	DATE	BY	NO.	DATE	BY	NO.
---	PROPERTY LINE	DATE	BY	NO.	DATE	BY	NO.
---	ACCESS EASEMENT	DATE	BY	NO.	DATE	BY	NO.
---	UNDERGROUND UTILITY	DATE	BY	NO.	DATE	BY	NO.
---	OVERHEAD UTILITY	DATE	BY	NO.	DATE	BY	NO.
---	ACCESS EASEMENT	DATE	BY	NO.	DATE	BY	NO.

NO.	DESCRIPTION	DATE	BY
2	AS BUILT	12/16	S. VASBINDER
1	UPDATED OP&W INFORMATION	10/16	C. KNOLL
0	FOR CONSTRUCTION	07/16	R. LANG

DATE	BY	NO.	DESCRIPTION
12/16	S. VASBINDER	0015	ISSUED FOR CONSTRUCTION
10/16	C. KNOLL	0014	REVISED FOR CONSTRUCTION
07/16	R. LANG	0013	REVISED FOR CONSTRUCTION
07/16	S. WISEMAN	0012	REVISED FOR CONSTRUCTION

DATE	BY	NO.	DESCRIPTION
12/16	S. VASBINDER	0015	ISSUED FOR CONSTRUCTION
10/16	C. KNOLL	0014	REVISED FOR CONSTRUCTION
07/16	R. LANG	0013	REVISED FOR CONSTRUCTION
07/16	S. WISEMAN	0012	REVISED FOR CONSTRUCTION

DATE	BY	NO.	DESCRIPTION
12/16	S. VASBINDER	0015	ISSUED FOR CONSTRUCTION
10/16	C. KNOLL	0014	REVISED FOR CONSTRUCTION
07/16	R. LANG	0013	REVISED FOR CONSTRUCTION
07/16	S. WISEMAN	0012	REVISED FOR CONSTRUCTION

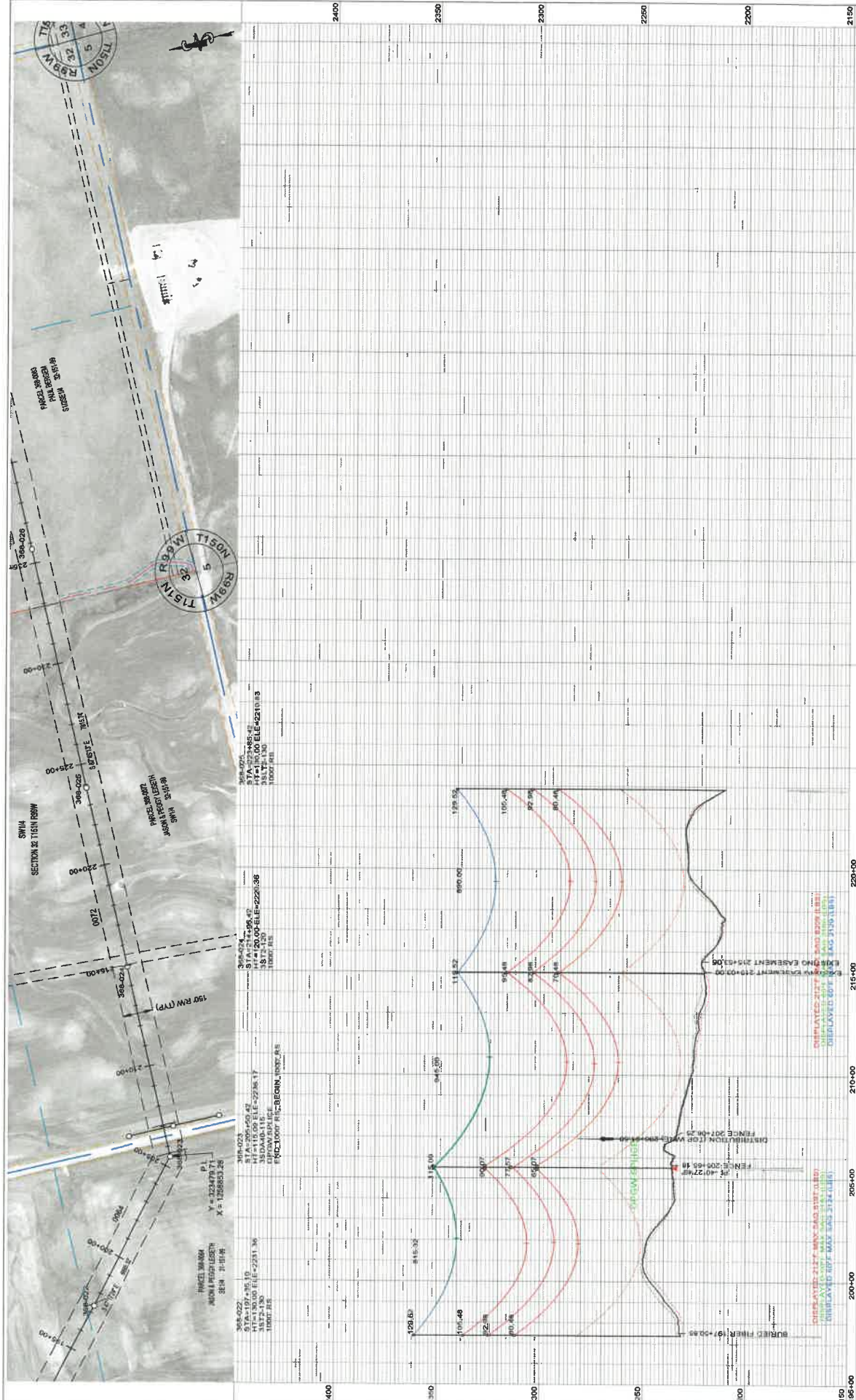
  

DATE	BY	NO.	DESCRIPTION
12/16	S. VASBINDER	0015	ISSUED FOR CONSTRUCTION
10/16	C. KNOLL	0014	REVISED FOR CONSTRUCTION
07/16	R. LANG	0013	REVISED FOR CONSTRUCTION
07/16	S. WISEMAN	0012	REVISED FOR CONSTRUCTION

BASIN ELECTRIC POWER COOPERATIVE  
 A Not-for-Profit Member Cooperative  
 PROJECT: TRANSMISSION SYSTEM MAINTENANCE  
 STATION: 30+00 TO 80+83  
 STRUCTURE: 273-005 TO 368-010  
 SCALE: VERTICAL = 20FT  
 HORIZONTAL = 100FT  
 SHEET NO. 2  
 368-090-T3-002







DATE	BY	SCALE	DESCRIPTION
08/15	S. VASBINDER	1000'	ISSUED FOR PERMIT
08/15	C. KNOLL	1000'	ISSUED FOR PERMIT
08/15	R. LANG	1000'	ISSUED FOR PERMIT
08/15	S. WISEMAN	1000'	ISSUED FOR PERMIT

REVISION	DATE	BY	DESCRIPTION
3	AS BUILT		
2	MOVED STR #28B-022 BACK 10'		
1	UPDATED OPGW INFORMATION		
0	FOR CONSTRUCTION		

CLK	SV	SW	12/16	11/16	10/15	CONDUCTOR	DATE
1	10790	22081	30274	10790	22081	30274	10/15
2	6851	10735	6912	6851	10735	6912	10/15
3	2188	6851	6912	2188	6851	6912	10/15

DATE	BY	SCALE	DESCRIPTION
08/15	S. VASBINDER	1000'	ISSUED FOR PERMIT
08/15	C. KNOLL	1000'	ISSUED FOR PERMIT
08/15	R. LANG	1000'	ISSUED FOR PERMIT
08/15	S. WISEMAN	1000'	ISSUED FOR PERMIT

DATE	BY	SCALE	DESCRIPTION
08/15	S. VASBINDER	1000'	ISSUED FOR PERMIT
08/15	C. KNOLL	1000'	ISSUED FOR PERMIT
08/15	R. LANG	1000'	ISSUED FOR PERMIT
08/15	S. WISEMAN	1000'	ISSUED FOR PERMIT

**LEGEND**  
 CULTURAL/TRIBAL AVOIDANCE  
 WETLAND AVOIDANCE  
 PARALLEL WIRE PRICE  
 UNDERGROUND UTILITY  
 OVERHEAD UTILITY  
 SECTION LINE  
 QUARTER SECTION LINE  
 EASEMENT SECTION LINE  
 PROPERTY LINE  
 ACCESS BARRIER LINE  
 ACCESS BOUNDARIES

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 317A-197+95.10  
 317A-190  
 1000' RES

368-023  
 STA=205+95.45  
 317A-197+95.45  
 317A-190  
 1000' RES

368-024  
 STA=205+95.80  
 317A-197+95.80  
 317A-190  
 1000' RES

368-025  
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 317A-197+96.15  
 317A-190  
 1000' RES

368-026  
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 317A-190  
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368-027  
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 1000' RES

368-028  
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 1000' RES

368-029  
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 1000' RES

368-030  
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368-033  
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 1000' RES

368-034  
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368-036  
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368-068  
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 1000' RES

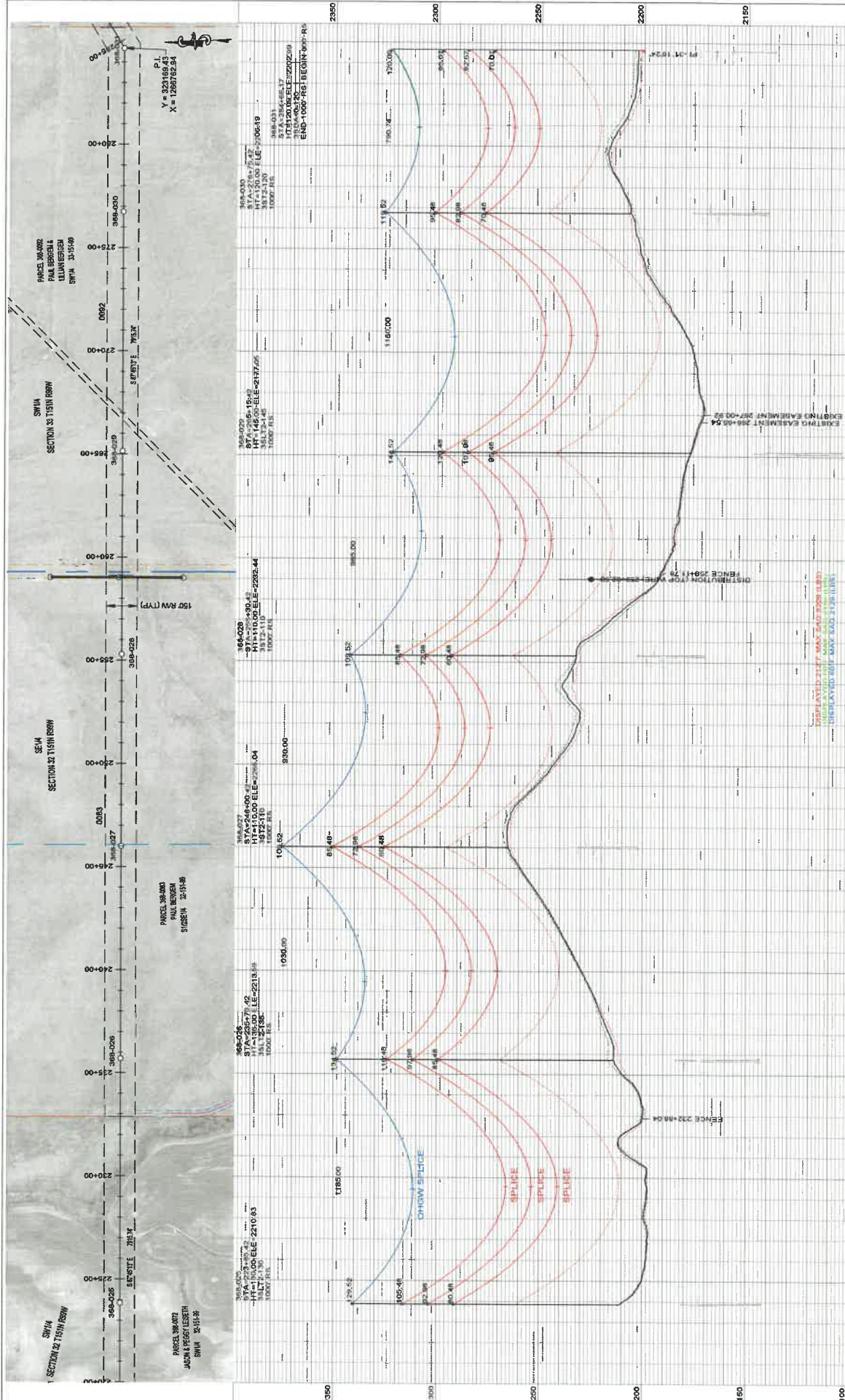
FACILITY TRANSMISSION SYSTEM MAINTENANCE  
 368-022 TO 368-078 PATENT GATE TO KUMMER RIDGE  
 MORENOE COUNTY, NORTH CAROLINA

BASIN ELECTRIC OPERATIVE  
 A TRANSMISSION ENERGY CORPORATION

SCALE: VERTICAL = 20 FT  
 HORIZONTAL = 200 FT

PLAN AND PROFILES  
 STATION: 195+00 TO 223+89  
 STRUCTURE: 368-022 TO 368-025

368-090-T3-005



REVISIONS		DESIGN INFORMATION		DATE		BY		CHECKED BY		SCALE		PROJECT	
NO.	DESCRIPTION	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
2	AS BUILT	12/16	SW	12/16	SW	12/16	SW	12/16	SW	12/16	SW	12/16	SW
1	UPDATED OFGW INFORMATION	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
0	FOR CONSTRUCTION	08/15	OPGW	08/15	OPGW	08/15	OPGW	08/15	OPGW	08/15	OPGW	08/15	OPGW

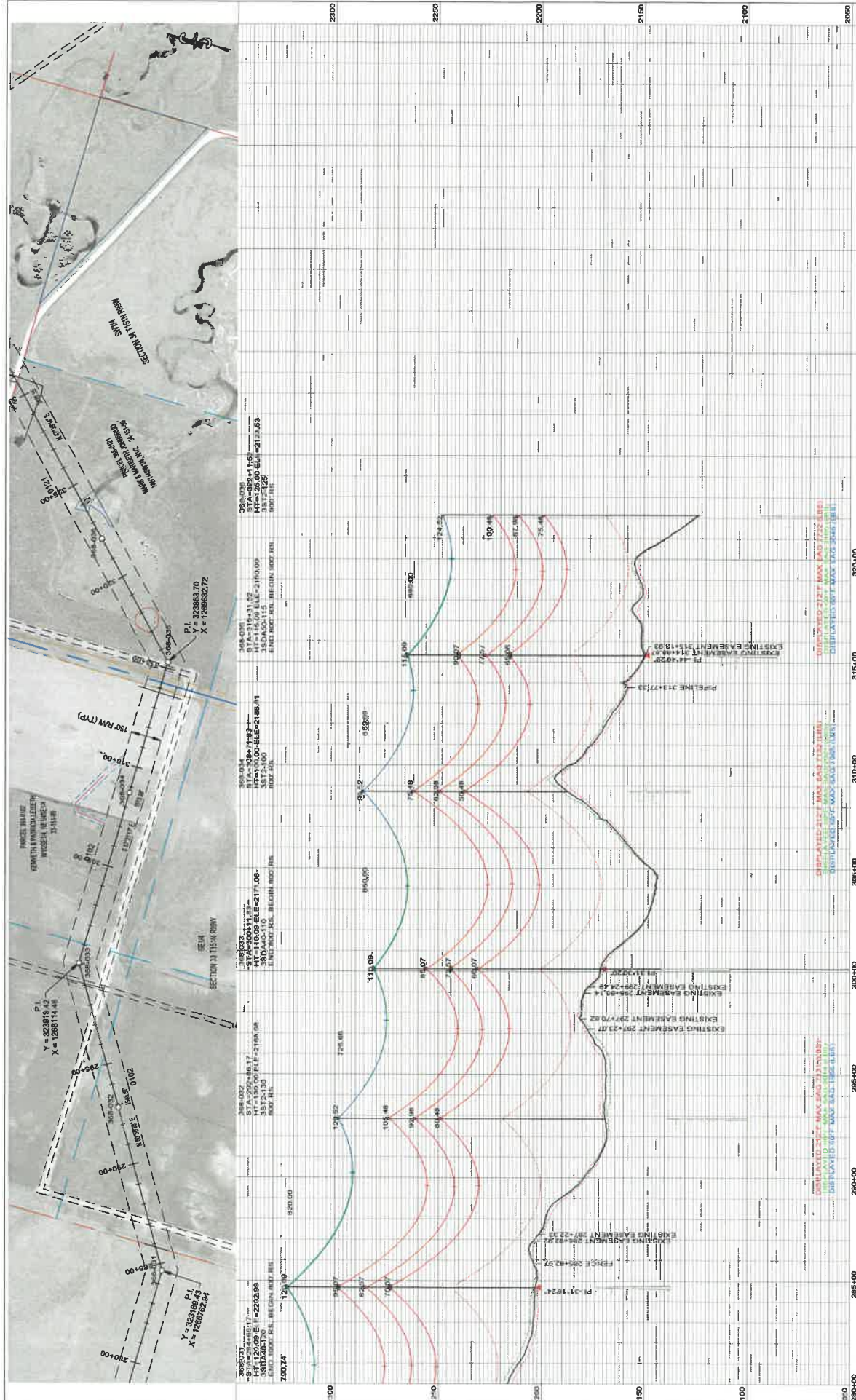
LEGEND		DESIGN INFORMATION		DATE		BY		CHECKED BY		SCALE		PROJECT	
SYMBOL	DESCRIPTION	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
(Symbol)	CULTURAL/TRIBAL AVOIDANCE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	WETLAND AVOIDANCE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	SECTION LINE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	QUARTER SECTION LINE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	SIXTEENTH SECTION LINE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	UNDERGROUND PRELIM	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	UNDERGROUND UTILITY	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	ACCESS CENTERLINE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	ACCESS SIDELINE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
(Symbol)	OVERHEAD UTILITY	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW

PROJECT INFORMATION		DATE		BY		CHECKED BY		SCALE		PROJECT	
NO.	DESCRIPTION	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
1	TRANSMISSION SYSTEM MAINTENANCE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
2	PATENT GATE TO KUMMER RIDGE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
3	MCKENZIE	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW

PLANNING INFORMATION		DATE		BY		CHECKED BY		SCALE		PROJECT	
NO.	DESCRIPTION	DATE	BY	DATE	BY	DATE	BY	DATE	BY	DATE	BY
1	PLAN AND PROFILES	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
2	STATION 220+00 TO 234+66	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW
3	STRUCTURE 368+625 TO 368+651	10/16	SW	10/16	SW	10/16	SW	10/16	SW	10/16	SW



LEGEND		DESIGN INFORMATION		DESIGNER		DATE	
---	CULTURAL/TRIAL AVOIDANCE	DATE	08/15	DATE	08/15	DATE	08/15
---	WETLAND AVOIDANCE	DATE	08/15	DATE	08/15	DATE	08/15
---	BARBED WIRE FENCE	DATE	08/15	DATE	08/15	DATE	08/15
---	UNDERGROUND PIPELINE	DATE	08/15	DATE	08/15	DATE	08/15
---	ACCESS CENTERLINE	DATE	08/15	DATE	08/15	DATE	08/15
---	OVERHEAD UTILITY	DATE	08/15	DATE	08/15	DATE	08/15

REV	DESCRIPTION	DATE	APP	DATE	APP	DATE	APP
2	AS BUILT	12/16	SV	12/16	SV	12/16	SV
1	UPDATED OPGW INFORMATION	10/15	CLK	10/15	CLK	10/15	CLK
0	FOR CONSTRUCTION	08/15	CLK	08/15	CLK	08/15	CLK

SECTION INFORMATION		DESIGNER		DATE	
SECTION	2312	DATE	08/15	DATE	08/15
SCALE	1"=50'	DATE	08/15	DATE	08/15
PROJECT	TRANSMISSION SYSTEM MAINTENANCE	DATE	08/15	DATE	08/15
LOCATION	PATENT GATE TO KUMMER RIDGE	DATE	08/15	DATE	08/15
OWNER	MCKENZIE	DATE	08/15	DATE	08/15

PROJECT INFORMATION		DESIGNER		DATE	
PROJECT	TRANSMISSION SYSTEM MAINTENANCE	DATE	08/15	DATE	08/15
LOCATION	PATENT GATE TO KUMMER RIDGE	DATE	08/15	DATE	08/15
OWNER	MCKENZIE	DATE	08/15	DATE	08/15
SCALE	1"=50'	DATE	08/15	DATE	08/15

PLAN AND PROFILES		DATE	
STATION	280+00 TO 322+45	DATE	08/15
STRUCTURE	368-031 TO 368-036	DATE	08/15

BANK ELECTRIC POWER COOPERATIVE	
A TOUCHSTONE ENERGY CORPORATION	
DATE	10/20/2007
SCALE	1"=50'
PROJECT	TRANSMISSION SYSTEM MAINTENANCE
LOCATION	PATENT GATE TO KUMMER RIDGE
OWNER	MCKENZIE
SCALE	1"=50'
PROJECT	TRANSMISSION SYSTEM MAINTENANCE
LOCATION	PATENT GATE TO KUMMER RIDGE
OWNER	MCKENZIE
SCALE	1"=50'

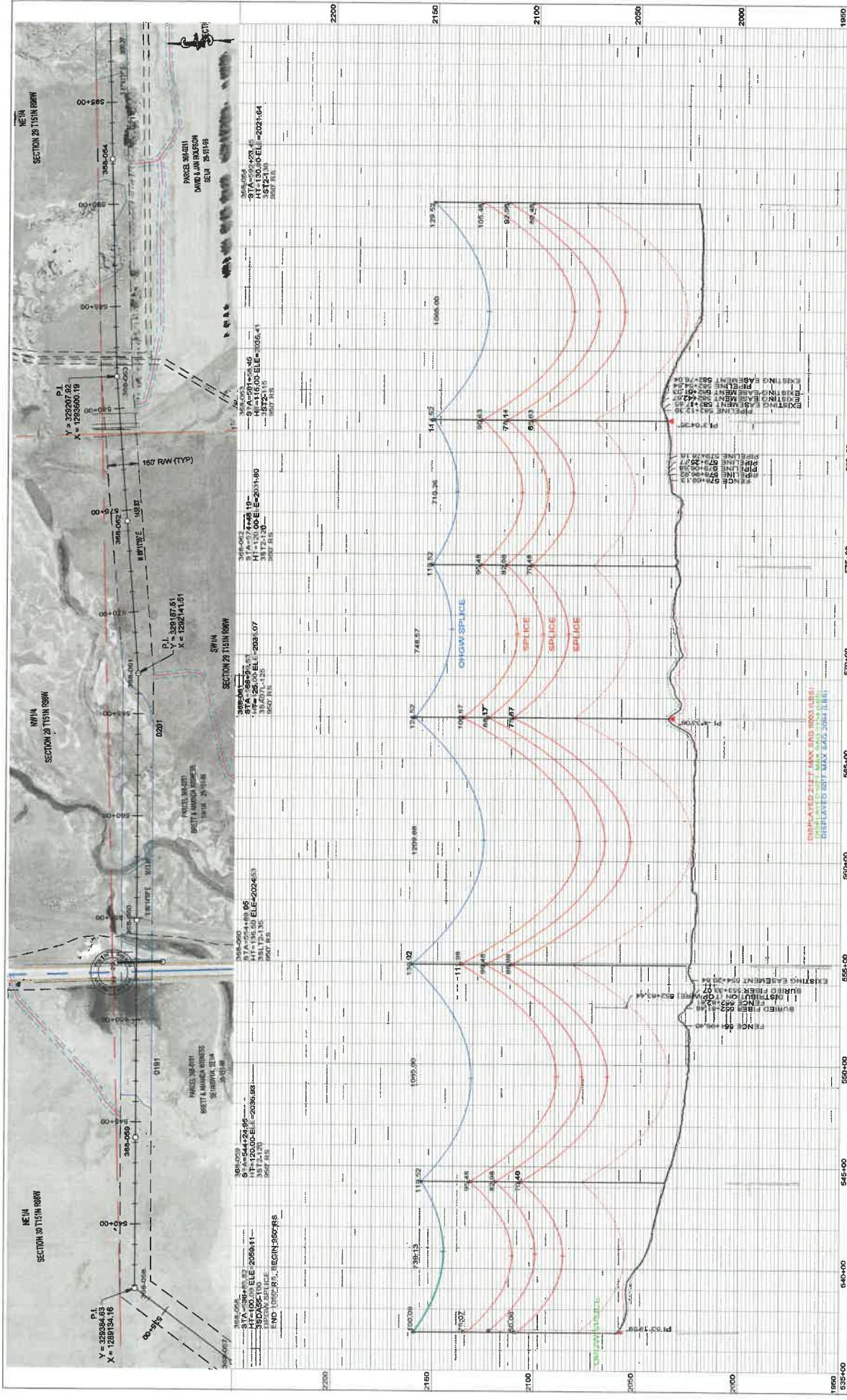












REV.	DESCRIPTION	DATE	BY	CHK	APPD	DATE	DESCRIPTION
1	AS BUILT	12/16	SW	SW			
2	UPDATED OPGW INFORMATION	10/15	CONDUCTOR	2312 KCMIL 70/19 THRIER	30052	850'	
0	FOR CONSTRUCTION	08/15	OPGW	571' 36" FIBER	2164	6510	10467
		08/15	OPGW	7718 EHS	2094	5069	8703
		08/15	OPGW	2094	5069	8703	850'

DESIGN INFORMATION	DATE	BY	CHK	APPD
CONDUCTOR	08/15	SW	SW	
FIBER	08/15	CONDUCTOR	2312 KCMIL 70/19 THRIER	30052
OPGW	08/15	OPGW	571' 36" FIBER	2164
EHS	08/15	OPGW	7718 EHS	2094
OPGW	08/15	OPGW	2094	5069
OPGW	08/15	OPGW	850'	8703

DESIGNER	CHECKER	DATE
S. VASBINDER	08/15	
C. KNOLL	08/15	
R. LANG	08/15	
S. WISEMAN	08/15	

PROJECT	SCALE	DATE
TRANSMISSION SYSTEM MAINTENANCE	HORIZONTAL = 200 FT	08/15
BLATTEN GATE TO KUMMER RIDGE	VERTICAL = 20 FT	08/15
MCKENZIE		08/15

PROJECT NO.	SCALE	DATE
368-090-T3-013	HORIZONTAL = 200 FT	08/15
	VERTICAL = 20 FT	08/15

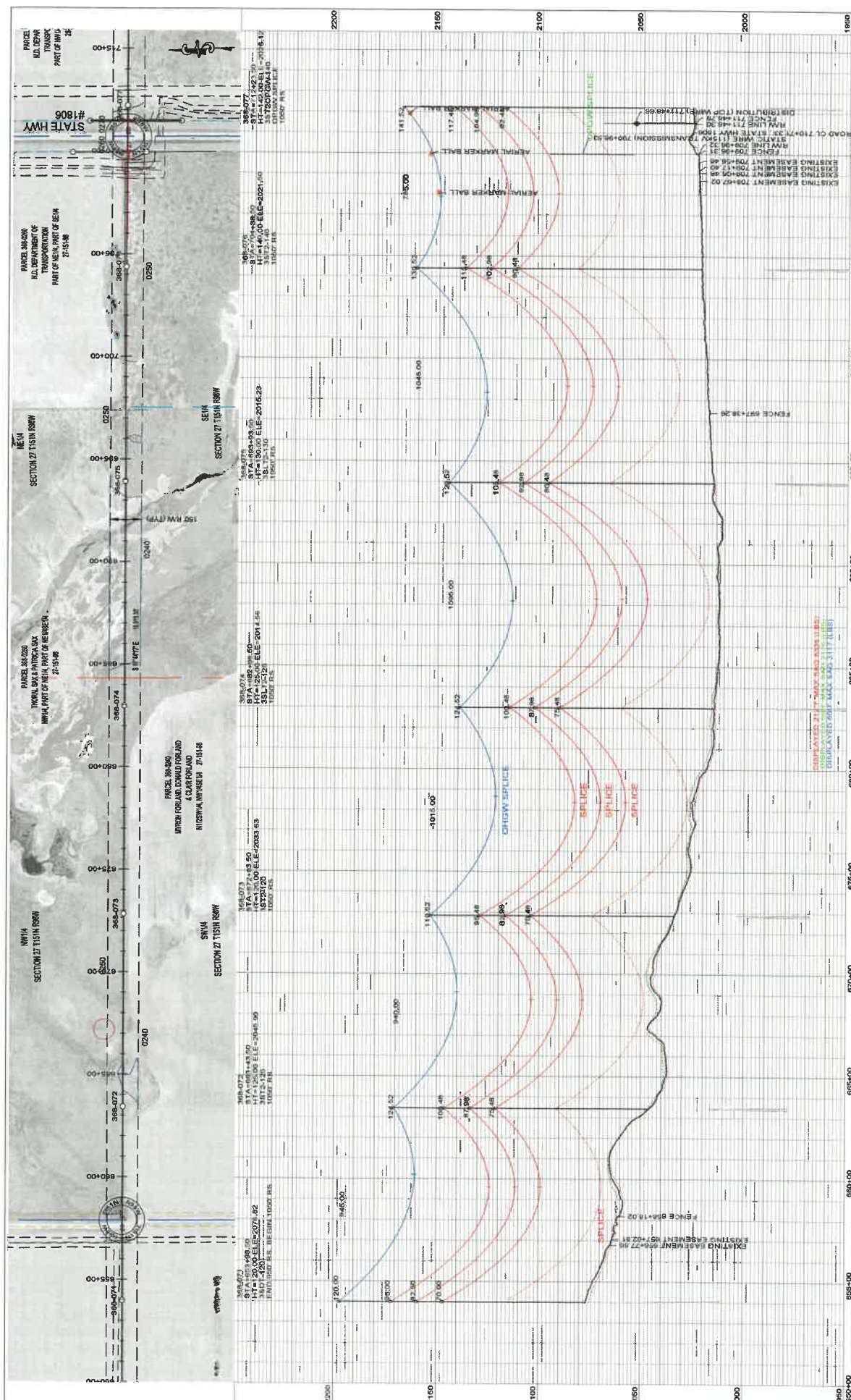
PROJECT	SCALE	DATE
TRANSMISSION SYSTEM MAINTENANCE	HORIZONTAL = 200 FT	08/15
BLATTEN GATE TO KUMMER RIDGE	VERTICAL = 20 FT	08/15
MCKENZIE		08/15

PROJECT NO.	SCALE	DATE
368-090-T3-013	HORIZONTAL = 200 FT	08/15
	VERTICAL = 20 FT	08/15

SECTION 30 T15IN OSW  
SECTION 29 T15IN OSW  
SECTION 28 T15IN OSW  
SECTION 27 T15IN OSW  
SECTION 26 T15IN OSW  
SECTION 25 T15IN OSW  
SECTION 24 T15IN OSW  
SECTION 23 T15IN OSW  
SECTION 22 T15IN OSW  
SECTION 21 T15IN OSW  
SECTION 20 T15IN OSW  
SECTION 19 T15IN OSW  
SECTION 18 T15IN OSW  
SECTION 17 T15IN OSW  
SECTION 16 T15IN OSW  
SECTION 15 T15IN OSW  
SECTION 14 T15IN OSW  
SECTION 13 T15IN OSW  
SECTION 12 T15IN OSW  
SECTION 11 T15IN OSW  
SECTION 10 T15IN OSW  
SECTION 09 T15IN OSW  
SECTION 08 T15IN OSW  
SECTION 07 T15IN OSW  
SECTION 06 T15IN OSW  
SECTION 05 T15IN OSW  
SECTION 04 T15IN OSW  
SECTION 03 T15IN OSW  
SECTION 02 T15IN OSW  
SECTION 01 T15IN OSW





REV.	DESCRIPTION	DATE	APPD	DRWR	CHK SV	SW SV	SW SV	10/16	12/16	CONDUCT.	SIZE	DESIGN INFORMATION	REVISION	DATE	BY	CHKD BY	DATE
2	AS BUILT																
1	UPDATED OPGW INFORMATION																
0	FOR CONSTRUCTION																

NO.	DATE	BY	CHKD BY	DATE
0815	10/16/16	S. VASBINDER	C. KNOLL	10/16/16
0815	10/16/16	S. VASBINDER	S. WISEMAN	10/16/16
0815	10/16/16	S. VASBINDER	R. LANG	10/16/16
0815	10/16/16	S. VASBINDER	S. WISEMAN	10/16/16

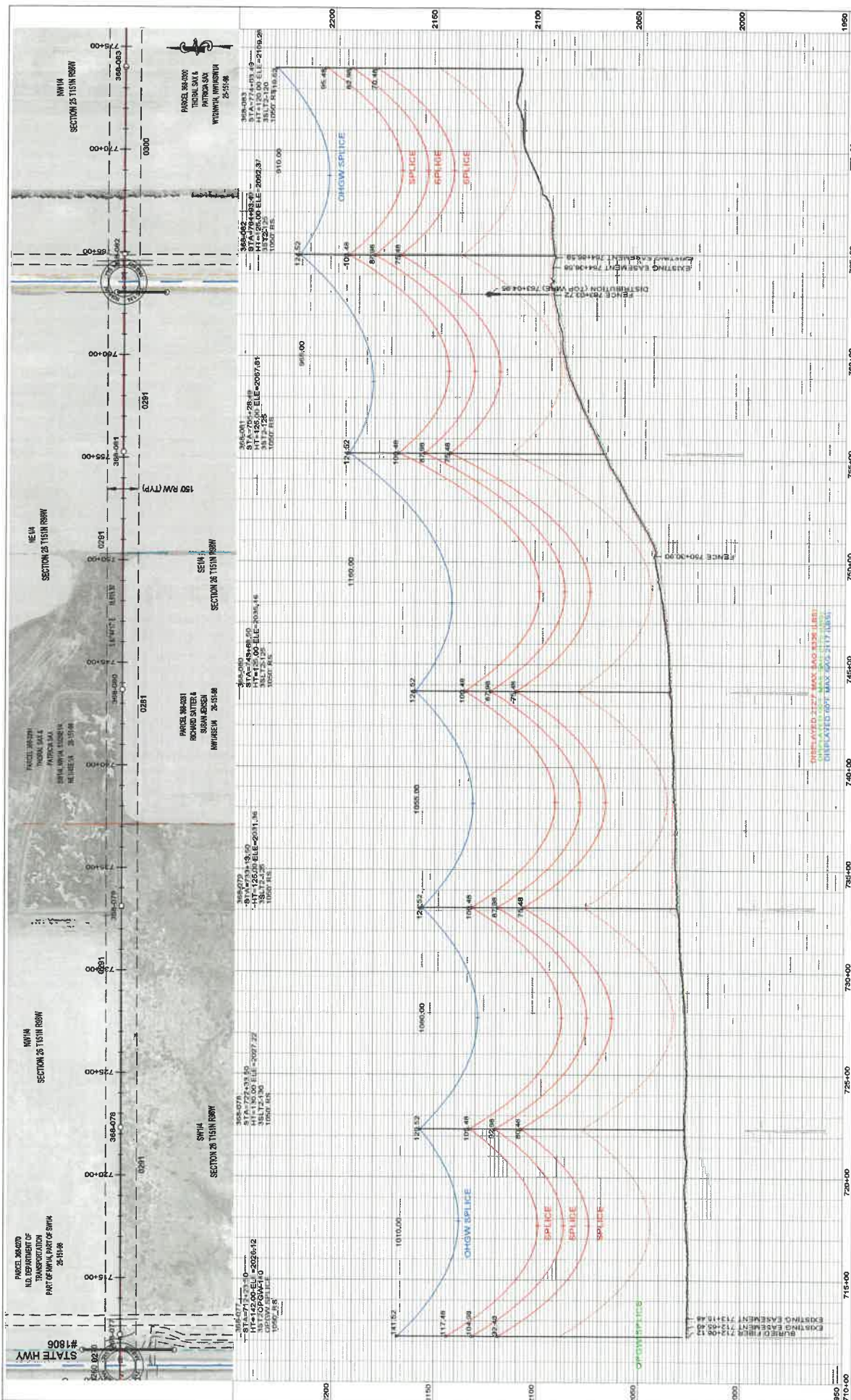
SCALE	HORIZONTAL	VERTICAL
AS SHOWN	1" = 200'	1" = 20'

PROJECT	NO.
TRANSMISSION SYSTEM MAINTENANCE	368-090-T3-015

CLIENT	PROJECT NO.
BASIN ELECTRIC POWER COOPERATIVE	368-090-T3-015



DATE	BY	DESCRIPTION
08/15/15	S. VASBINDER	DESIGN INFORMATION
08/15/15	C. KNOLL	DESIGN INFORMATION
08/15/15	R. LANG	DESIGN INFORMATION
08/15/15	S. WISEMAN	DESIGN INFORMATION

REV.	DATE	DESCRIPTION
3	AS BUILT	INITIATED O&M INFORMATION.
2	MOVED STR #82 AND 5	INITIATED O&M INFORMATION.
1	MOVED STR #91 AND 30	AND STR #82 AND 50
0	FOR CONSTRUCTION	

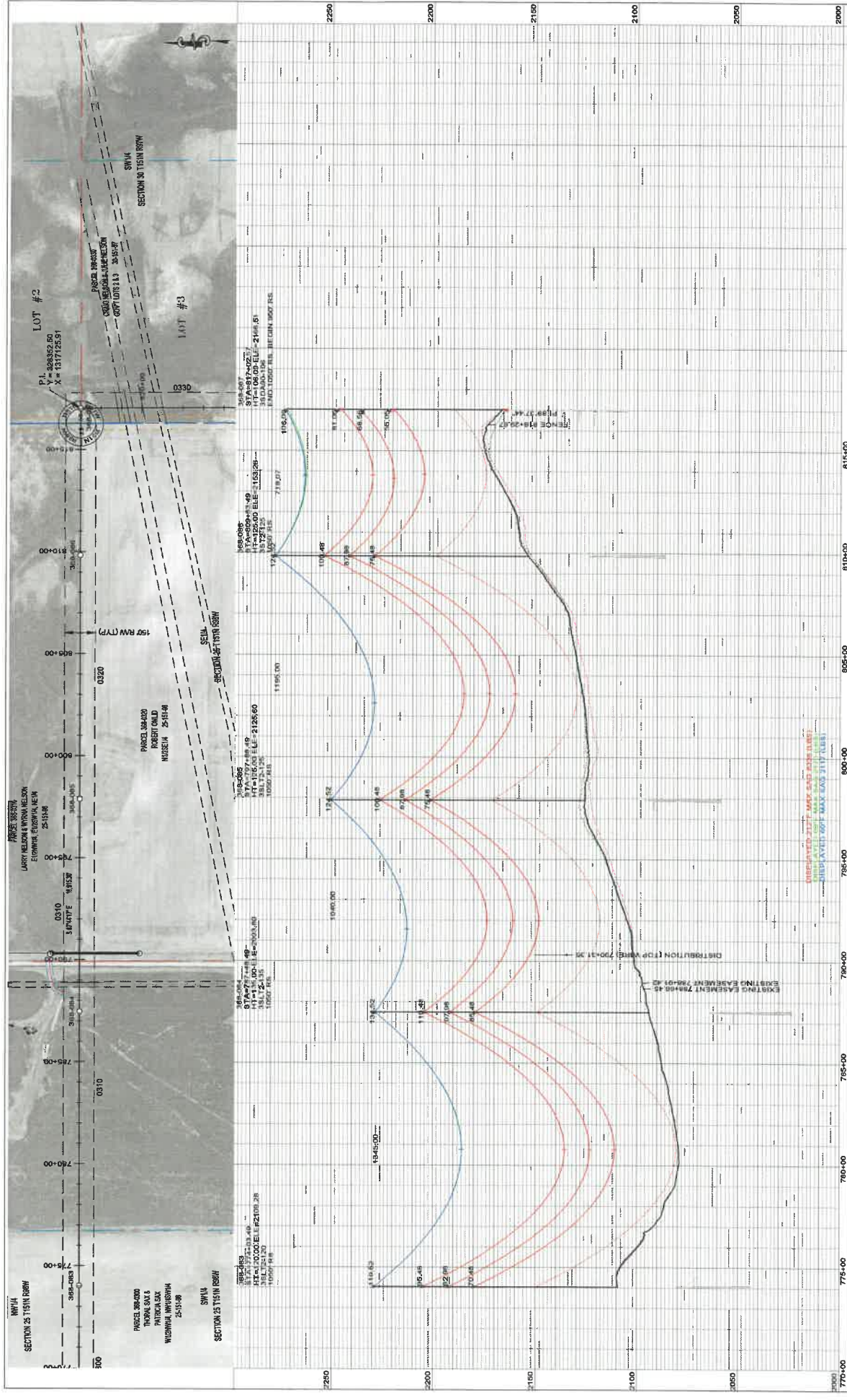
DATE	BY	DESCRIPTION
08/15/15	S. VASBINDER	DESIGN INFORMATION
08/15/15	C. KNOLL	DESIGN INFORMATION
08/15/15	R. LANG	DESIGN INFORMATION
08/15/15	S. WISEMAN	DESIGN INFORMATION

DATE	BY	DESCRIPTION
08/15/15	S. VASBINDER	DESIGN INFORMATION
08/15/15	C. KNOLL	DESIGN INFORMATION
08/15/15	R. LANG	DESIGN INFORMATION
08/15/15	S. WISEMAN	DESIGN INFORMATION

**LEGEND**  
 SECTION LINE  
 QUARTER SECTION LINE  
 SIXTEENTH SECTION LINE  
 PERTH LINE  
 ACCESS SCENELINE  
 ACCESS SCENELINE  
 CULTURAL/TERRACE AVOIDANCE  
 WETLAND AVOIDANCE  
 UNDERGROUND UTILITY  
 UNDERGROUND UTILITY  
 OVERHEAD UTILITY

BASIN ELECTRIC INCORPORATED  
 A TRANSMISSION MAINTENANCE COMPANY  
 PLAN AND PROFILES  
 STATION: 710+00 TO 774+07  
 STRUCTURE: 368-077 TO 368-083  
 368-090-T3-016  
 3



REVISIONS		DESCRIPTION		DATE	BY	CHK	APP	DATE	DESCRIPTION
2	AS BUILT	CLK	SV	SW	12/16				
1	UPDATED OPGW INFORMATION	CLK	SV	SW	10/15				
0	FOR CONSTRUCTION	CLK	SV	SW	08/15				
		DRWN	DSGN	APPD	DATE				

LEGEND	
	SECTION LINE
	CULTURAL/TRIBAL AVOIDANCE
	WETLAND AVOIDANCE
	BARBED WIRE FENCE
	QUARTER SECTION LINE
	PROPERTY LINE
	ACCESS EASEMENT
	ACCESS UTILITY
	OVERHEAD UTILITY

DESCRIPTION		DATE		BY	
DESCRIPTION	DATE	BY	DATE	BY	DATE
2312 ACQUIL/7818 TRAILER	10/28	S. VASBINDER	8/15/00	S. VASBINDER	8/15/00
716 EHS	2/17	C. KNOLL	8/15/00	C. KNOLL	8/15/00
716 EHS	2/17	R. LANG	8/15/00	R. LANG	8/15/00
716 EHS	2/17	S. WRBEMAN	8/15/00	S. WRBEMAN	8/15/00

PROJECT INFORMATION	
PROJECT NO.	388-080-T3-017
DATE	8/15/00
BY	S. VASBINDER
CHK	C. KNOLL
APP	R. LANG
DATE	8/15/00

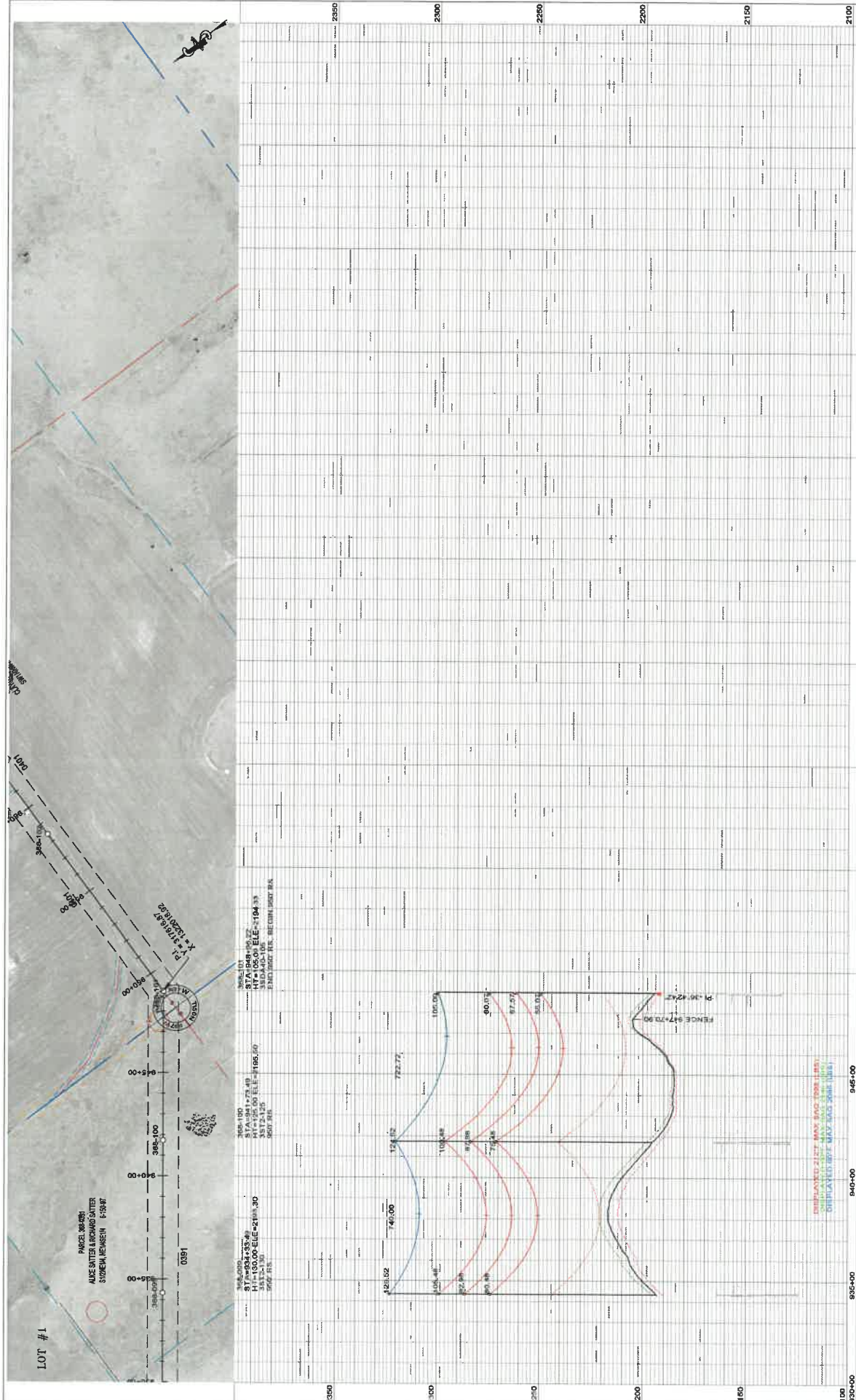
TITLE	
TRANSMISSION SYSTEM MAINTENANCE	
PATENT GATE TO KUMMER RIDGE	
MCKENZIE	

SCALE	
VERTICAL: 1" = 20'	
HORIZONTAL: 1" = 40'	
PLAN AND PROFILES	
STATION: 770+00 TO 815+00	
STRUCTURE: 368-083 TO 368-087	

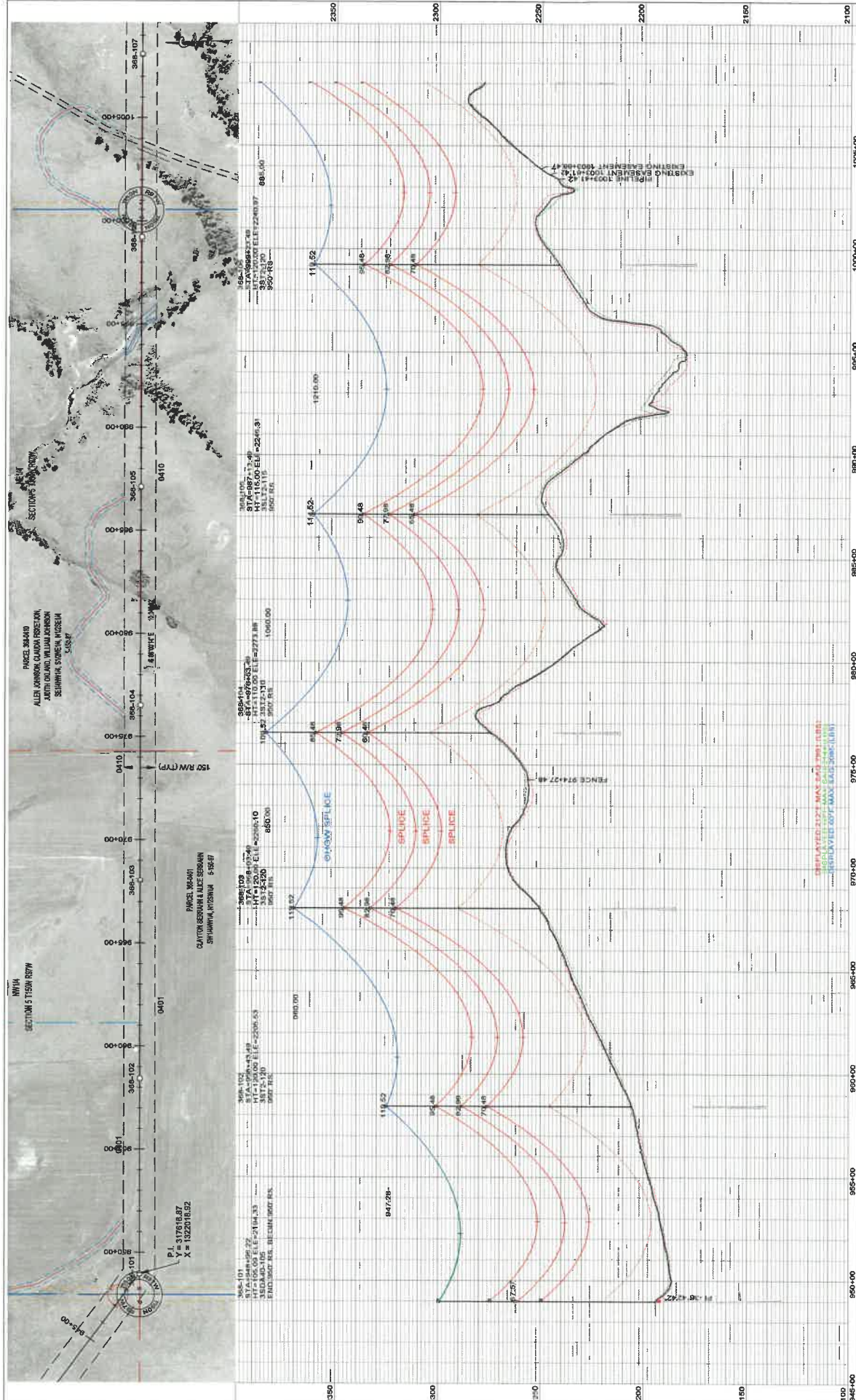






LEGEND		DESIGN INFORMATION		DATE		SCALE		PROJECT	
---	CULTURAL / TRIBAL AVOIDANCE	---	SECTION LINE	08/15	08/15	1" = 40'	1" = 40'	PAINTELECTRIC	
---	WETLAND AVOIDANCE	---	QUARTER SECTION LINE	08/15	08/15	1" = 40'	1" = 40'	ACTIVE	
---	BARBED WIRE FENCE	---	SIXTEENTH SECTION LINE	08/15	08/15	1" = 40'	1" = 40'	A TRANSMISSION DESIGN COORDINATOR	
---	PROPERTY LINE	---	PROPERTY LINE	08/15	08/15	1" = 40'	1" = 40'	SCALE: VERTICAL 1" = 20 FT	
---	ACCESS CENTERLINE	---	ACCESS CENTERLINE	08/15	08/15	1" = 40'	1" = 40'	HORIZONTALLY 1" = 40 FT	
---	UNDERGROUND UTILITY	---	ACCESS CENTERLINE	08/15	08/15	1" = 40'	1" = 40'	DATE: 08/15/2017	
---	OVERHEAD UTILITY	---	ACCESS CENTERLINE	08/15	08/15	1" = 40'	1" = 40'	DRAWN BY: S. WISEMAN	
								PROJECT NO: 368-099 TO 368-101	
								PROJECT NAME: TRANSMISSION SYSTEM MAINTENANCE	
								PROJECT LOCATION: PATENT GATE TO KUMMER RIDGE	
								PROJECT CLIENT: MCKENZIE	
								PROJECT DESIGNER: S. VASBINDER	
								PROJECT CHECKER: C. KNOLL	
								PROJECT DATE: 08/15	
								PROJECT SCALE: 1" = 40'	
								PROJECT SHEET NO: 2	
								PROJECT TOTAL SHEETS: 2	

2 AS BUILT  
 1 UPDATED OP&W INFORMATION  
 0 FOR CONSTRUCTION  
 REV. DESCRIPTION



DATE	BY	DESCRIPTION
08/15	S. VASSINDER	DESIGN INFORMATION
08/15	C. KNOLL	DESIGN INFORMATION
08/15	S. WISEMAN	DESIGN INFORMATION
08/15	R. LANG	DESIGN INFORMATION
08/15	S. WISEMAN	DESIGN INFORMATION

REV	DATE	DESCRIPTION
2	AS BUILT	AS BUILT
1	UPDATED OPGW INFORMATION	UPDATED OPGW INFORMATION
0	FOR CONSTRUCTION	FOR CONSTRUCTION

REV	DATE	DESCRIPTION
0	FOR CONSTRUCTION	FOR CONSTRUCTION
1	UPDATED OPGW INFORMATION	UPDATED OPGW INFORMATION
2	AS BUILT	AS BUILT

SECTION	DATE	BY	DESCRIPTION
SECTION 5 TISSON RD	04/10	0410	SECTION 5 TISSON RD
SECTION 6 TISSON RD	04/10	0410	SECTION 6 TISSON RD

NO.	DATE	BY	DESCRIPTION
368-101	04/10	0410	368-101
368-102	04/10	0410	368-102
368-103	04/10	0410	368-103
368-104	04/10	0410	368-104
368-105	04/10	0410	368-105
368-106	04/10	0410	368-106
368-107	04/10	0410	368-107

NO.	DATE	BY	DESCRIPTION
999-001	04/10	0410	999-001
999-002	04/10	0410	999-002
999-003	04/10	0410	999-003
999-004	04/10	0410	999-004
999-005	04/10	0410	999-005
999-006	04/10	0410	999-006
999-007	04/10	0410	999-007
999-008	04/10	0410	999-008
999-009	04/10	0410	999-009
999-010	04/10	0410	999-010
999-011	04/10	0410	999-011
999-012	04/10	0410	999-012
999-013	04/10	0410	999-013
999-014	04/10	0410	999-014
999-015	04/10	0410	999-015
999-016	04/10	0410	999-016
999-017	04/10	0410	999-017
999-018	04/10	0410	999-018
999-019	04/10	0410	999-019
999-020	04/10	0410	999-020
999-021	04/10	0410	999-021
999-022	04/10	0410	999-022
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999-026	04/10	0410	999-026
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999-096	04/10	0410	999-096
999-097	04/10	0410	999-097
999-098	04/10	0410	999-098
999-099	04/10	0410	999-099
999-100	04/10	0410	999-100

**SECTION LINE**  
**QUARTER SECTION LINE**  
**SIXTEENTH SECTION LINE**  
**PROPERTY LINE**  
**ACCESS CENTRELINE**  
**ACCESS UTILITY**  
**OVERHEAD UTILITY**

**CULTURAL/TERRIL AVOIDANCE**  
**WETLAND AVOIDANCE**  
**BARBED WIRE FENCE**  
**UNDERGROUND UTILITY**  
**OVERHEAD UTILITY**

**LEGEND**

**STATION: 945+00 TO 1005+07**  
**STRUCTURE: 368-101 TO 368-106**

**DESIGN INFORMATION**  
 DATE: 08/15  
 DRAWN: S. WISEMAN  
 CHECKED: R. LANG  
 APPROVED: S. WISEMAN  
 PROJECT: TRANSMISSION SYSTEM MAINTENANCE  
 FACILITY: PATENT GATE TO KUMMER RIDGE  
 COUNTY: MCKENZIE

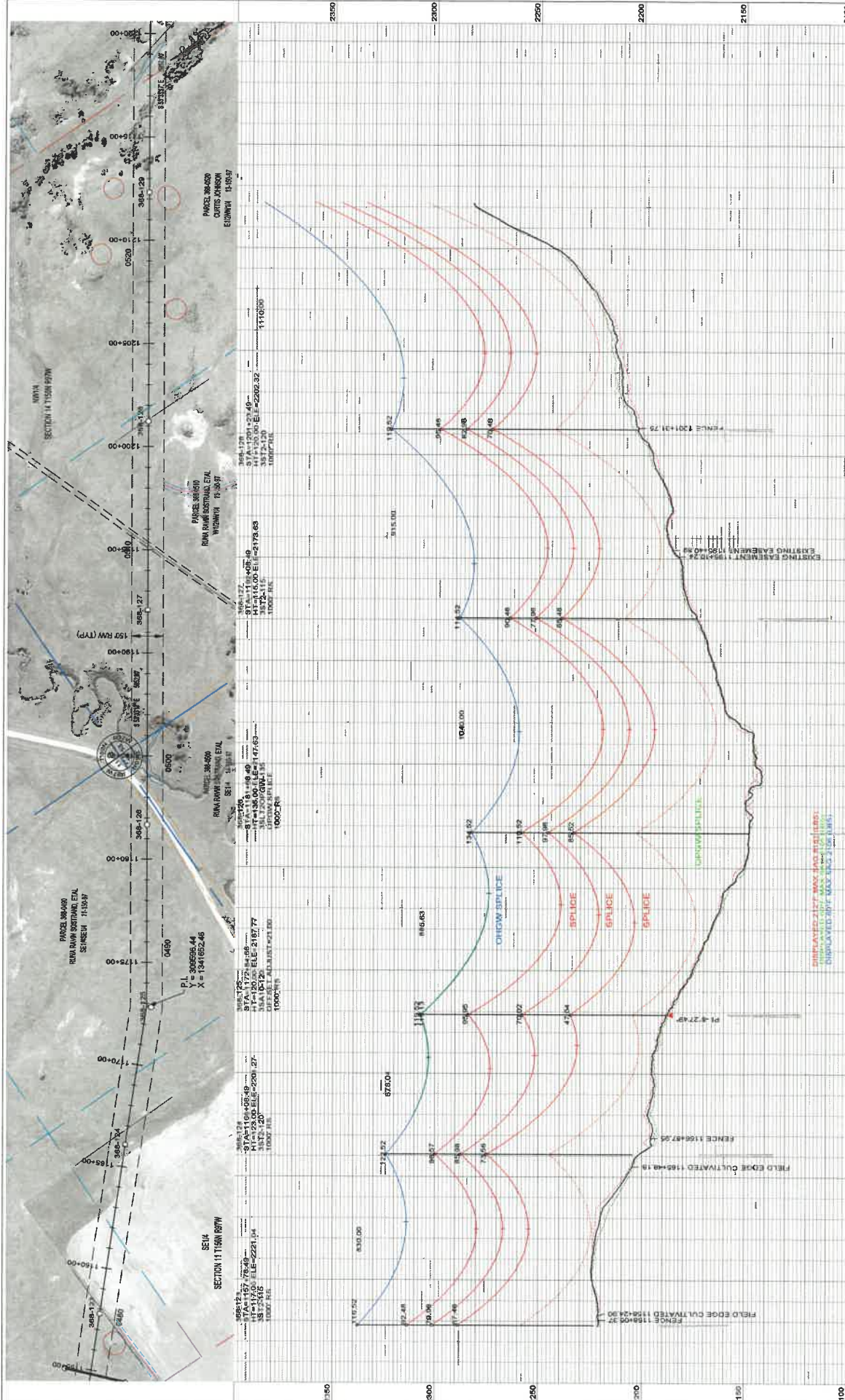
**SCALE: 1" = 20'**  
**DATE: 08/15/2017**  
**BY: S. WISEMAN**

**368-090-T3-021**  
**2**









SECTION LINE		DESCRIPTION	
---	CULTURAL/TERRAIN AVOIDANCE	---	SECTION LINE
---	WETLAND AVOIDANCE	---	QUARTER SECTION LINE
---	RIGHT-OF-WAY	---	SIXTEENTH SECTION LINE
---	UNDERGROUND UTILITY	---	ACCESS CENTERLINE
---	OVERHEAD UTILITY	---	ACCESS SIDEWALK

REV.	DESCRIPTION
2	AS BUILT
1	UPDATED OPGW INFORMATION
0	FOR CONSTRUCTION

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

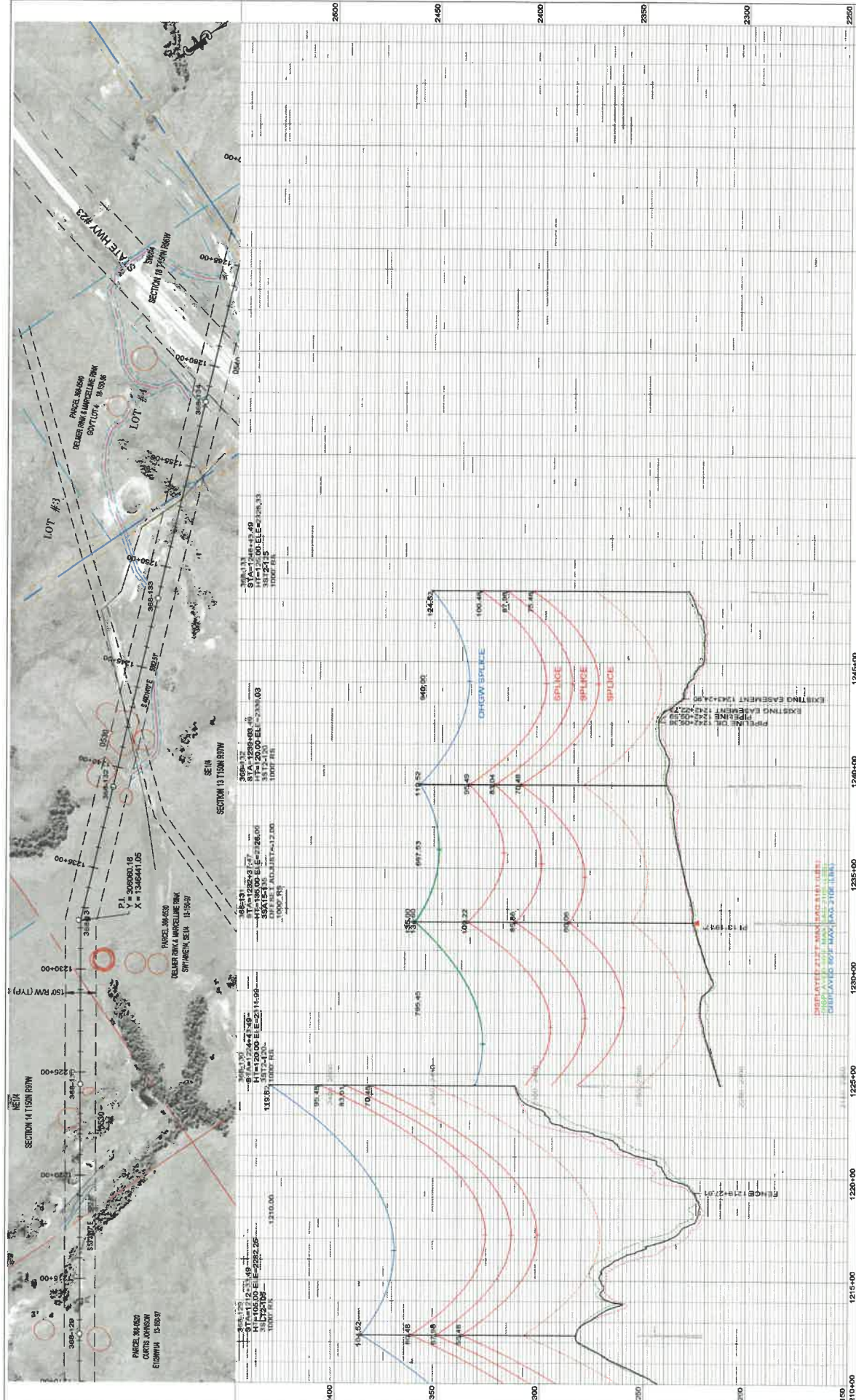
DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW

DATE	BY	CHK	SV	SW	12/16	10/15	CONDUCT.	SIZE	DESCRIPTION
11/15/16	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	W. LANG	237.5000	7/19	OHGW
11/15/16	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	R. LANG	571.36	FIBER	OHGW
11/15/16	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	S. WISEMAN	716	EHS	OHGW



REV.	DESCRIPTION	DRWN	DSGN	APPD	DATE	OHGW	7H6 EHS	2185	5874	9836	1000'	DESIGNER	DATE	DATE	DATE	DATE	DATE	DATE	DATE
2	AS BUILT	CLK	SV	SW	12/15														
1	UPDATED OHGW INFORMATION	CLK	SV	SW	10/15	CONDUCT.	2312	ACWILL	78/19	10980	21816	30056	1000'						
0	FOR CONSTRUCTION	CLK	SV	SW	08/15	OPGW	571	35	FIBER	2185	5874	10689	1000'						

DESIGN INFORMATION	REVISION	DATE	BY	CHKD BY	DATE
DESIGNER	S. VASBINDER	08/15			
DESIGNER	C. KNOLL	08/15			
DESIGNER	R. WISEMAN	08/15			
DESIGNER	R. LANG	08/15			
DESIGNER	S. WISEMAN	08/15			

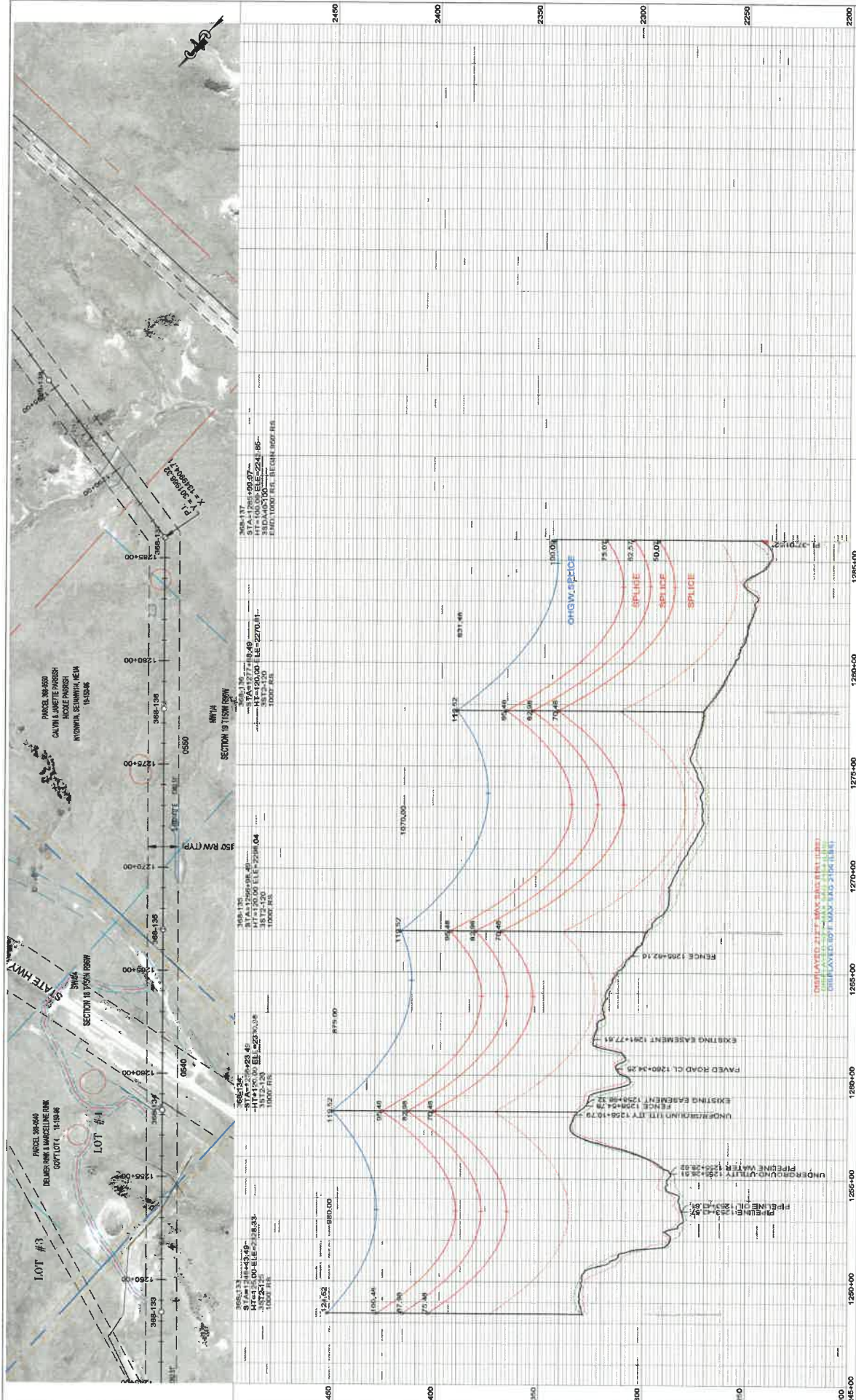
  

PROJECT INFORMATION	DATE	BY	CHKD BY	DATE
PROJECT INFORMATION	08/15			
PROJECT INFORMATION	08/15			
PROJECT INFORMATION	08/15			

SCALE	DATE	BY	CHKD BY	DATE
SCALE	08/15			
SCALE	08/15			
SCALE	08/15			

**BASIN ELECTRIC COOPERATIVE**  
 A member of the Basin Electric System  
 PROJECT: TRANSMISSION SYSTEM MAINTENANCE  
 STATION: 1210+00 TO 1249+47  
 STRUCTURE: 388-129 TO 388-133  
 SCALE: VERTICAL = 20FT  
 HORIZONTAL = 200FT  
 SHEET NO.: 388-090-T3-026  
 OF 2



DATE	BY	REVISION	DESCRIPTION
08/15	S. VASBINDER	08/15	AS BUILT
08/15	C. KNOLL	08/15	1 UPDATED OPGW INFORMATION
08/15	R. LANG	08/15	0 FOR CONSTRUCTION
08/15	S. WISEMAN	08/15	REV.

DESIGN INFORMATION	DESIGNER	DATE
2312 KCMIL 7818 THUNDER	S. VASBINDER	12/19
OPGW	C. KNOLL	08/15
57" 35 FIBER	R. LANG	08/15
716 EHS	S. WISEMAN	08/15

SECTION LINE	QUARTER SECTION LINE	PROPERTY LINE	ACCESS EASEMENT
---	---	---	---
---	---	---	---
---	---	---	---
---	---	---	---

REVISION	DATE	BY	DESCRIPTION
08/15	08/15	S. VASBINDER	REVISION
08/15	08/15	C. KNOLL	REVISION
08/15	08/15	R. LANG	REVISION
08/15	08/15	S. WISEMAN	REVISION

**PLAN AND PROFILES**  
**STATION: 1245+00 TO 1286+03**  
**STRUCTURE: 368-133 TO 368-137**

**DESIGN INFORMATION**

**DESIGNER:** S. VASBINDER, C. KNOLL, R. LANG, S. WISEMAN

**DATE:** 08/15

**SCALE:** VERTICAL = 20 FT, HORIZONTAL = 1" = 100'

**PROJECT:** FACILITY TRANSMISSION SYSTEM MAINTENANCE - OPERATIVE GATE TO KUMMER RIDGE 445 AVENUE, MORENOZIE

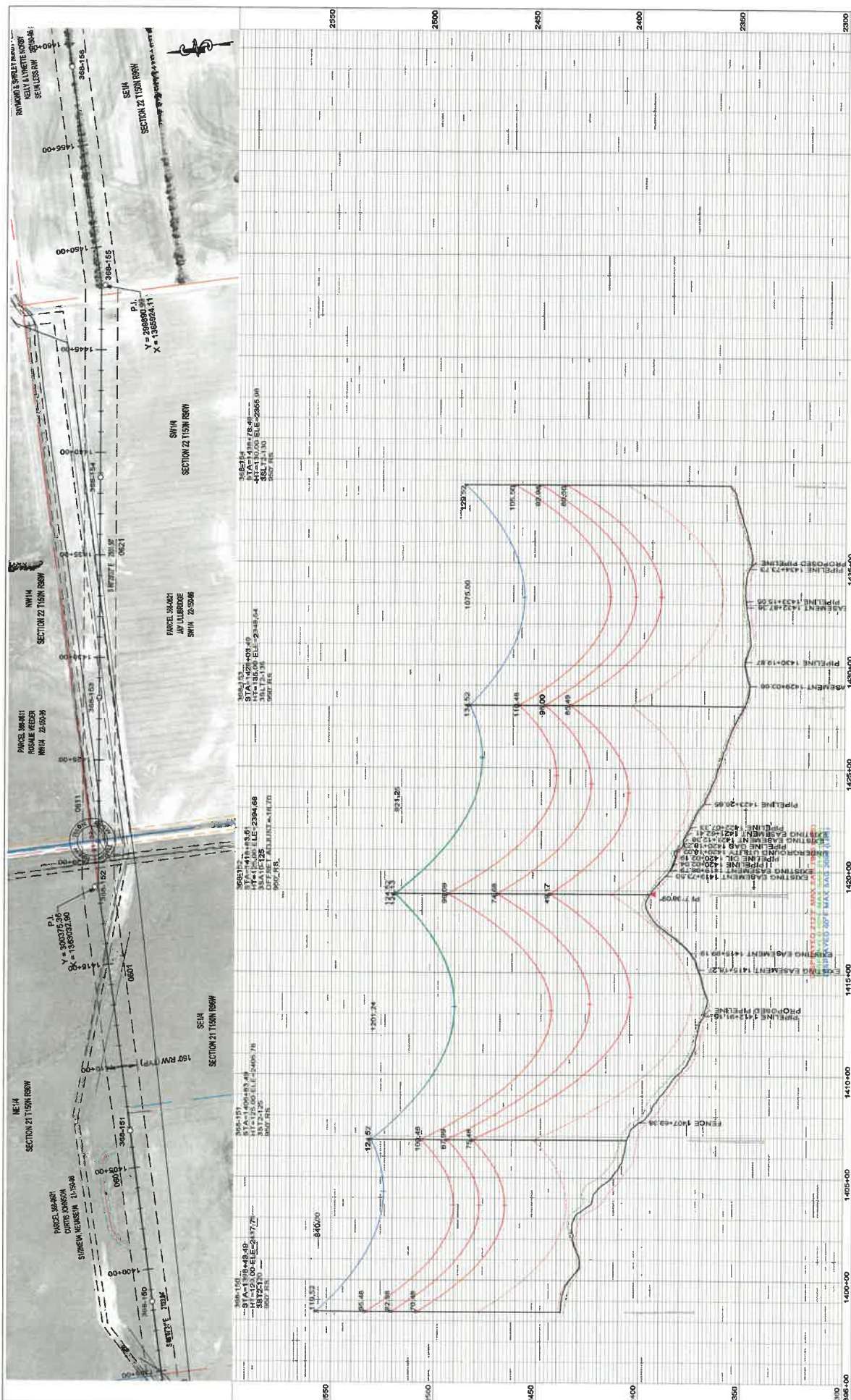
**CLIENT:** BASIN ELECTRIC COOPERATIVE, A TARRANT COUNTY COOPERATIVE

**PROJECT NO.:** 368-090-13-027

**DATE:** 08/15







REV.	DESCRIPTION	DATE	BY	CHK	APPD	DATE	DESCRIPTION
2	AS BUILT						
1	UPDATED OP&W INFORMATION						
0	FOR CONSTRUCTION						

DATE	BY	CHK	APPD	DATE	DESCRIPTION
08/15	S. VASBINDER				
08/16	C. KNOLL				
08/15	R. LANG				
08/16	S. WISEMAN				

DATE	BY	CHK	APPD	DATE	DESCRIPTION
08/15	S. VASBINDER				
08/16	C. KNOLL				
08/15	R. LANG				
08/16	S. WISEMAN				

DATE	BY	CHK	APPD	DATE	DESCRIPTION
08/15	S. VASBINDER				
08/16	C. KNOLL				
08/15	R. LANG				
08/16	S. WISEMAN				

DATE	BY	CHK	APPD	DATE	DESCRIPTION
08/15	S. VASBINDER				
08/16	C. KNOLL				
08/15	R. LANG				
08/16	S. WISEMAN				

**LEGEND**

- CULTURAL/TRIBAL AVOIDANCE
- WETLAND AVOIDANCE
- UNDERGROUND UTILITY
- OVERHEAD UTILITY
- SECTION LINE
- QUARTER SECTION LINE
- SECTION LINE
- UNDERGROUND PRELIM
- ACCESS CENTERLINE
- ACCESS SUBLINE

**DESIGN INFORMATION**

DATE	BY	CHK	APPD	DATE	DESCRIPTION
08/15	S. VASBINDER				
08/16	C. KNOLL				
08/15	R. LANG				
08/16	S. WISEMAN				

**STATION 1395+00 TO 1436+42**  
**STRUCTURE 368-150 TO 368-154**

**SCALE: VERTICAL 1"=20 FT, HORIZONTAL 1"=40 FT**

**PROJECT: TRANSMISSION SYSTEM MAINTENANCE - PATENT GATE TO KUMMER RIDGE**

**CLIENT: MCKENZIE**

**DATE: 08/15**

**BY: S. WISEMAN**

**CHK: R. LANG**

**APPD: S. WISEMAN**

**DATE: 08/16**

**PROJECT NO: 368-080-T3-030**

**SCALE: VERTICAL 1"=20 FT, HORIZONTAL 1"=40 FT**

**DATE: 08/15**

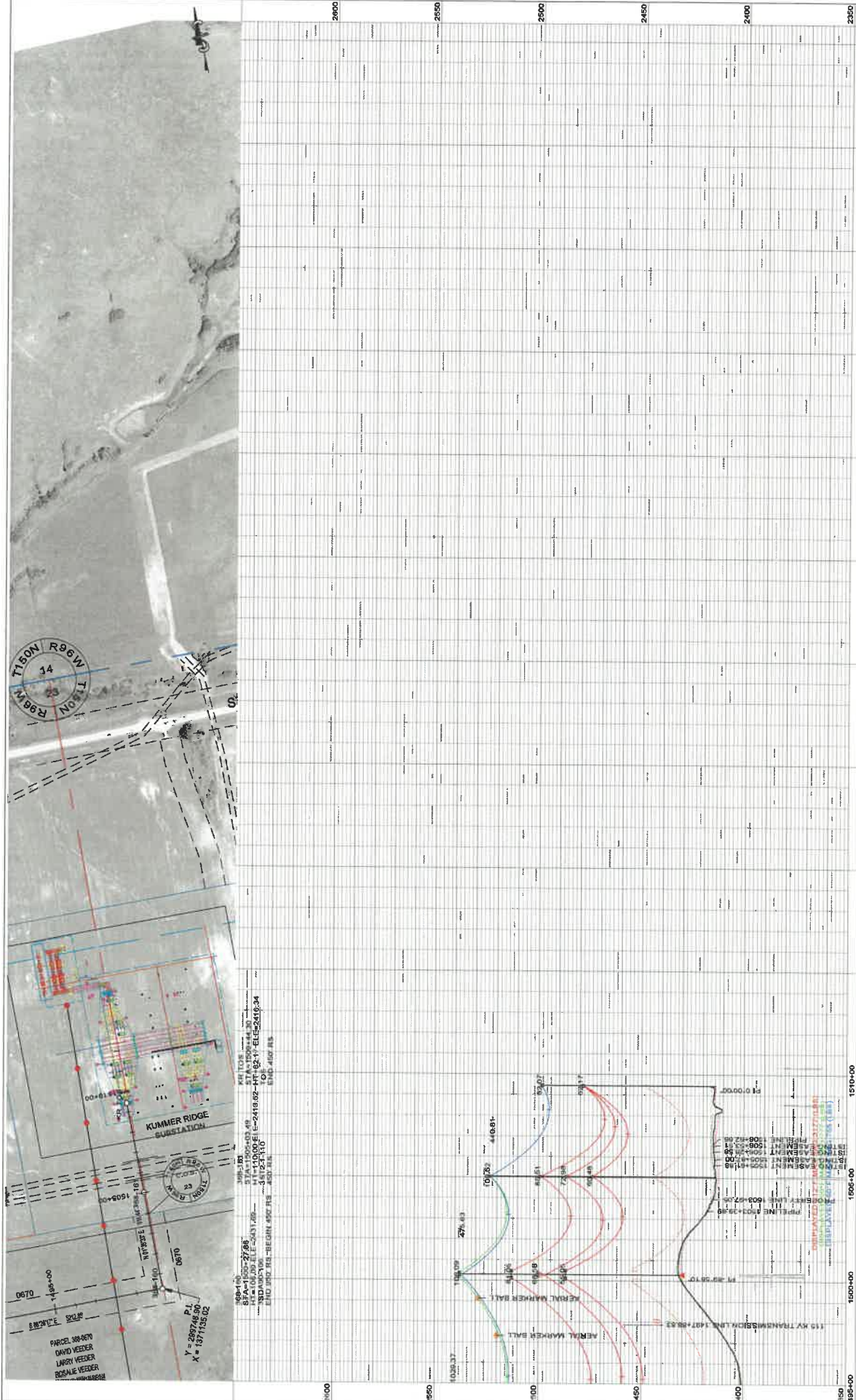
**BY: S. WISEMAN**

**CHK: R. LANG**

**APPD: S. WISEMAN**

**DATE: 08/16**





DATE	BY	DESCRIPTION
08/15	S. VASINDR	TRANSMISSION SYSTEM MAINTENANCE
08/15	C. KNOLL	PATENT GATE TO KUMMER RIDGE
08/15	R. LANG	MCKENZIE
08/15	S. WISEMAN	

REV	DESCRIPTION	DATE	APPD	DATE
2	AS BUILT	12/16		
1	UPDATED OPGW INFORMATION	10/15		
0	FOR CONSTRUCTION	08/15		

DESIGN INFORMATION	DATE	BY	CHK	APPD
2312 ACBIL/7/18 TRIMMER	08/15	C. KNOLL		
571-36 FIBER	08/15	R. LANG		
7/18 EHS	08/15	S. WISEMAN		

DESCRIPTION	DATE	APPD
OPGW	08/15	S. WISEMAN
7/18 EHS	08/15	S. WISEMAN

SECTION	DATE	BY	CHK	APPD
SECTION	08/15	S. WISEMAN		
QUARTER SECTION	08/15	S. WISEMAN		
SIXTEENTH SECTION	08/15	S. WISEMAN		
EIRLY LINE	08/15	S. WISEMAN		
ACCESS LINE	08/15	S. WISEMAN		
UNDERGROUND UTILITY	08/15	S. WISEMAN		
OVERHEAD UTILITY	08/15	S. WISEMAN		

BASIN ELECTRIC  
 POWER COOPERATIVE  
 A Not-for-Profit Electric Cooperative

SCALE: VERTICAL = 20 FT  
 HORIZONTAL = 200 FT

PLAN AND PROFILES  
 STATION: 1485+00 TO 1510+00  
 STRUCTURE: 369-160 TO KR TOS

369-080-T3-032  
 2

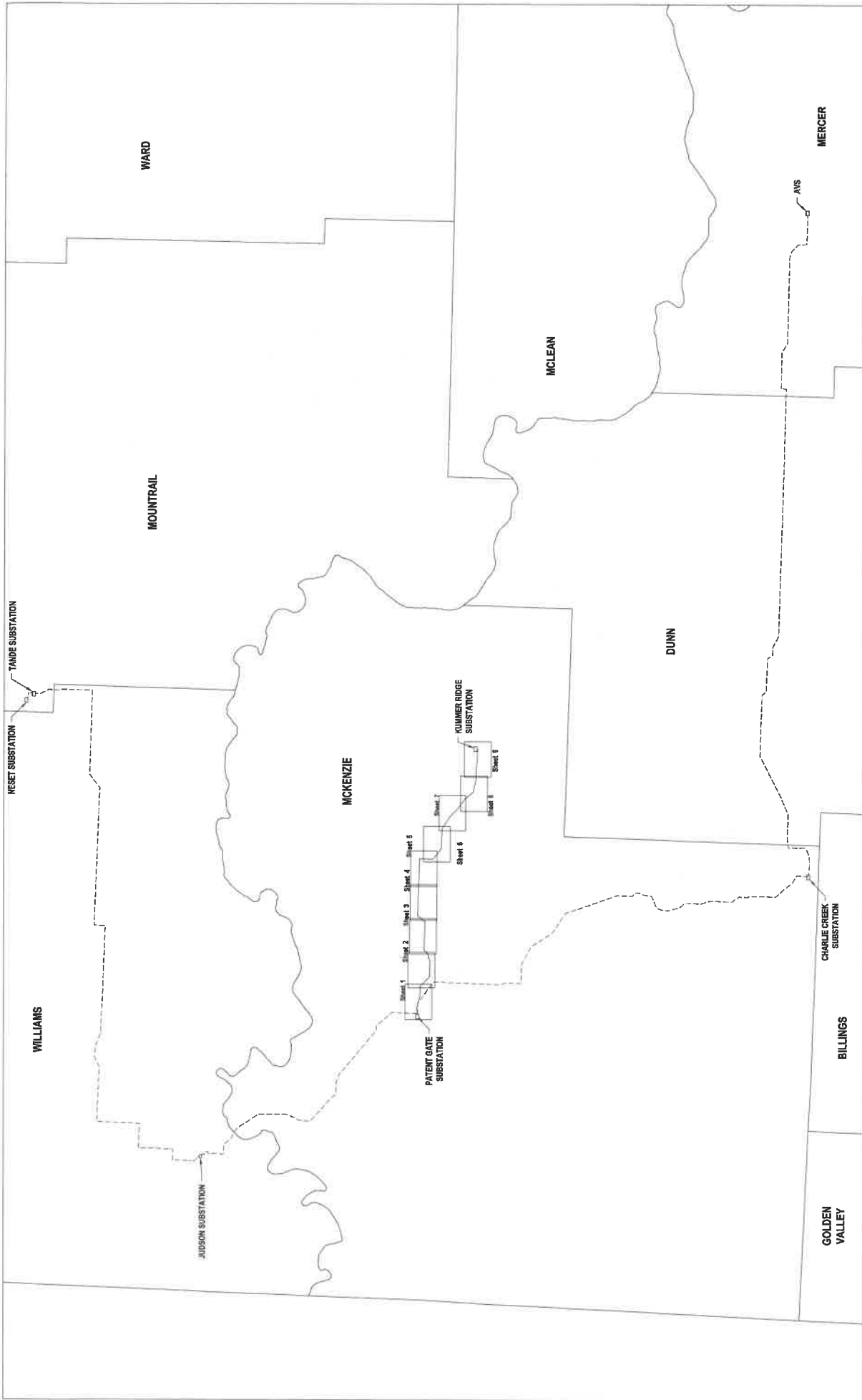
**BASIN ELECTRIC POWER COOPERATIVE  
CASE NO. PU-14-813**

**ASBUILT  
PLAN AND PROFILES AND STRUCTURE LOCATIONS FOR  
NORTH KILLDEER LOOP PHASE 1  
345kV TRANSMISSION PROJECT**

**LINE 368 - PATENT GATE TO KUMMER RIDGE SEGMENT**

**NORTH DAKOTA PUBLIC SERVICE COMMISSION  
FEBRUARY 2017**

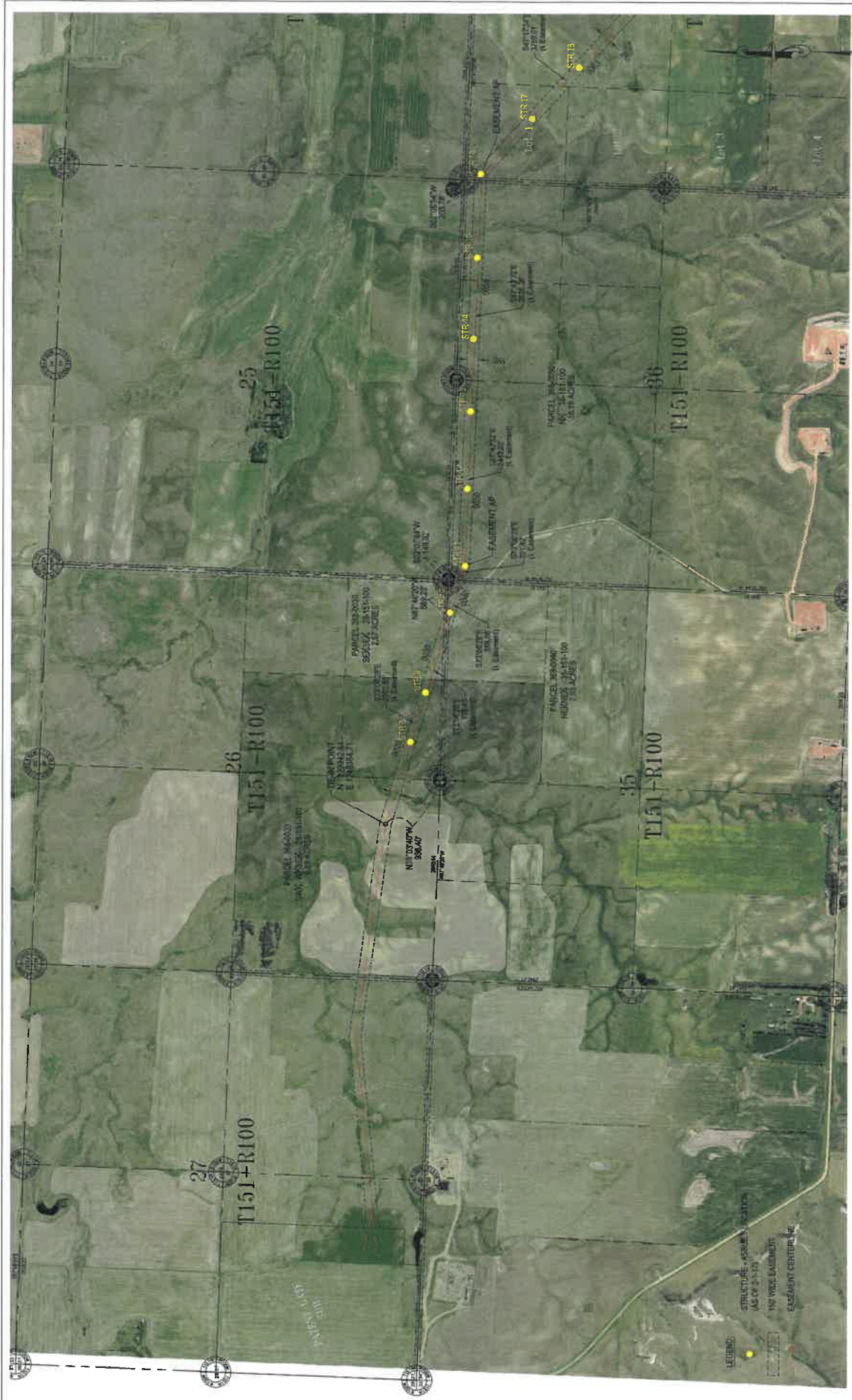




ASBUILT STRUCTURE LOCATIONS  
 CASE #PU-14-813

STATE OF MONTANA  
 GREAT PLAINS  
 BASIN ELECTRIC  
 POWER COOPERATIVE  
 A Truistone Energy Corporation





Basics of Bearing is NAD83 ND State Plane North Zone - International Foot. All distances are Ground Distance. Combined scale factor = 0.99985172

SEC. 26, 35 & 36 - T151N-R100W  
 SEC. 31 & 32 - T151N-R99W  
 MCKENZIE COUNTY, NORTH DAKOTA

NOTE:  
 ASBUILT STRUCTURE PLACEMENT AS OF 2-1-2017

PSC SUBMITTAL FOR LINE 368  
 CASE #PU-14-813  
 345KV TRANSMISSION LINE  
 BASIN ELECTRIC  
 POWER COOPERATIVE

A. Transmission Energy Cooperative, RDA



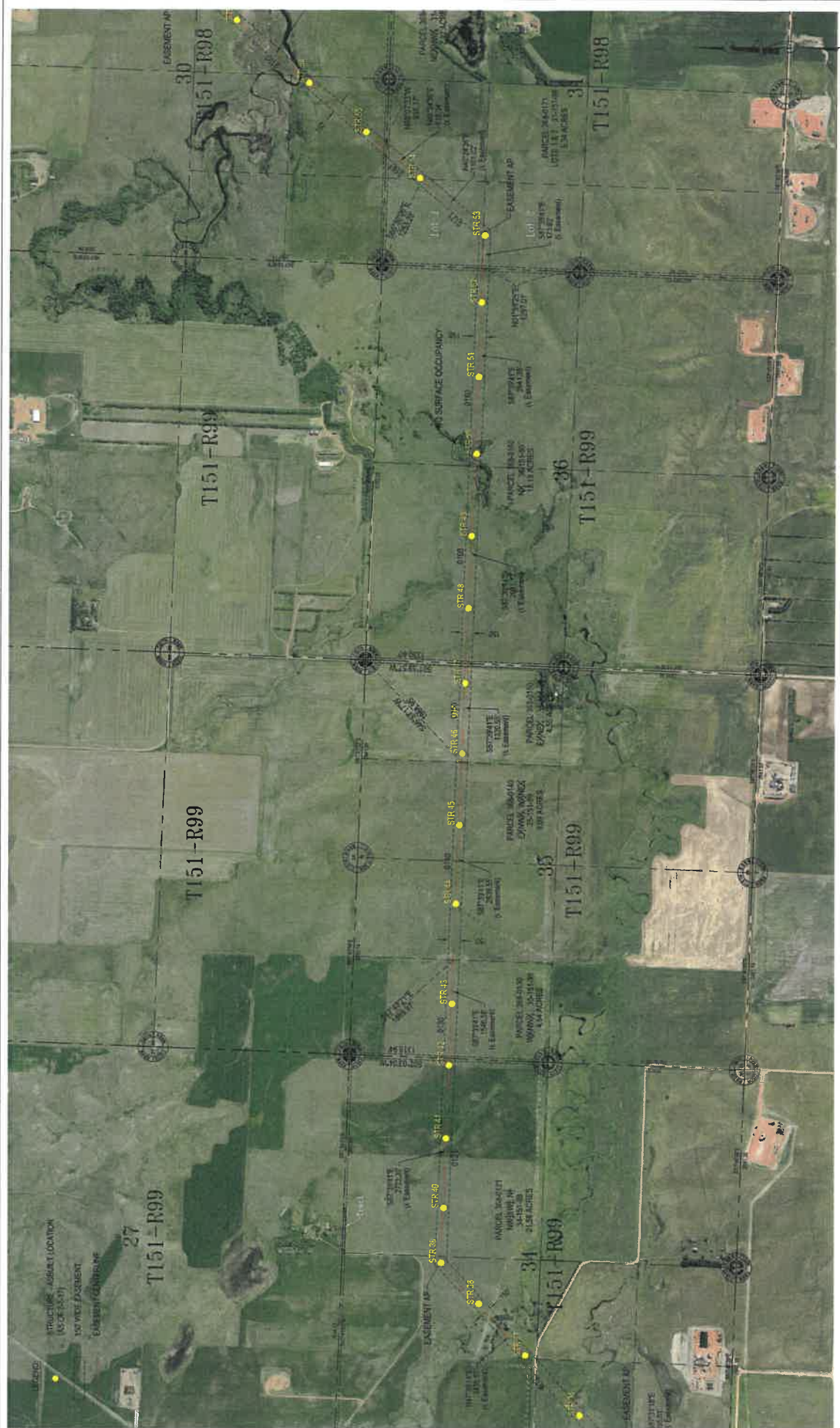
Basics of Surveying is NAD83 10' State Plane North Zone - International Feet. All distances are ground distances. Combined scale factor = 0.9998172

SEC. 32, 33, 34 & 35 - T151N-R99W  
MCKENZIE COUNTY, NORTH DAKOTA

NOTE:  
ASBUILT STRUCTURE PLACEMENT AS OF 2-1-2017

PSC SUBMITTAL FOR LINE 368  
CASE #PU-14-813

TELEPHONE COOPERATIVE  
POWER COOPERATIVE  
A Telephone Energy Cooperative



Back of Bearing is N00°00'00" East, True North, Zone: International Feet. All distances are Ground Distances. Contour Scale Factor = 0.99984172

SEC. 35 & 36 - T151N-R99W  
 SEC. 29, 30 & 31 - T151N-R98W  
 MCKENZIE COUNTY, NORTH DAKOTA

NOTE:  
 ASBUILT STRUCTURE PLACEMENT AS OF 2-1-2017

PSC SUBMITTAL FOR LINE 368  
 CASE #PU-14-813

34.5KV TRANSMISSION LINE  
 MCKENZIE POWER COOPERATIVE  
 A "TrueSource Energy" Corporation



Based on Data by InVivoGIS, Inc. State Plane North Zone - International Feet. All Distances are Ground Distances. Contour Scale Factor = 0.99985712

SEC. 26, 27, 28 & 29 - T151N-R98W  
 MCKENZIE COUNTY, NORTH DAKOTA

NOTE:  
 ASBULLT STRUCTURE PLACEMENT AS OF 2-1-2017

PSC SUBMITTAL FOR LINE 368  
 CASE #PU-14-813

345KV TRANSMISSION LINE  
 POWER COOPERATIVE  
 A Involution Energy Corporation 100%



Base of Bearing is N4033 ND State Plane North Zone - International Feet. All Distances are Ground Distances. Combined scale factor = 0.9998172

SEC. 25 & 26 - T151N-R96W  
 SEC. 30 & 31 - T151N-R97W  
 MCKENZIE COUNTY, NORTH DAKOTA

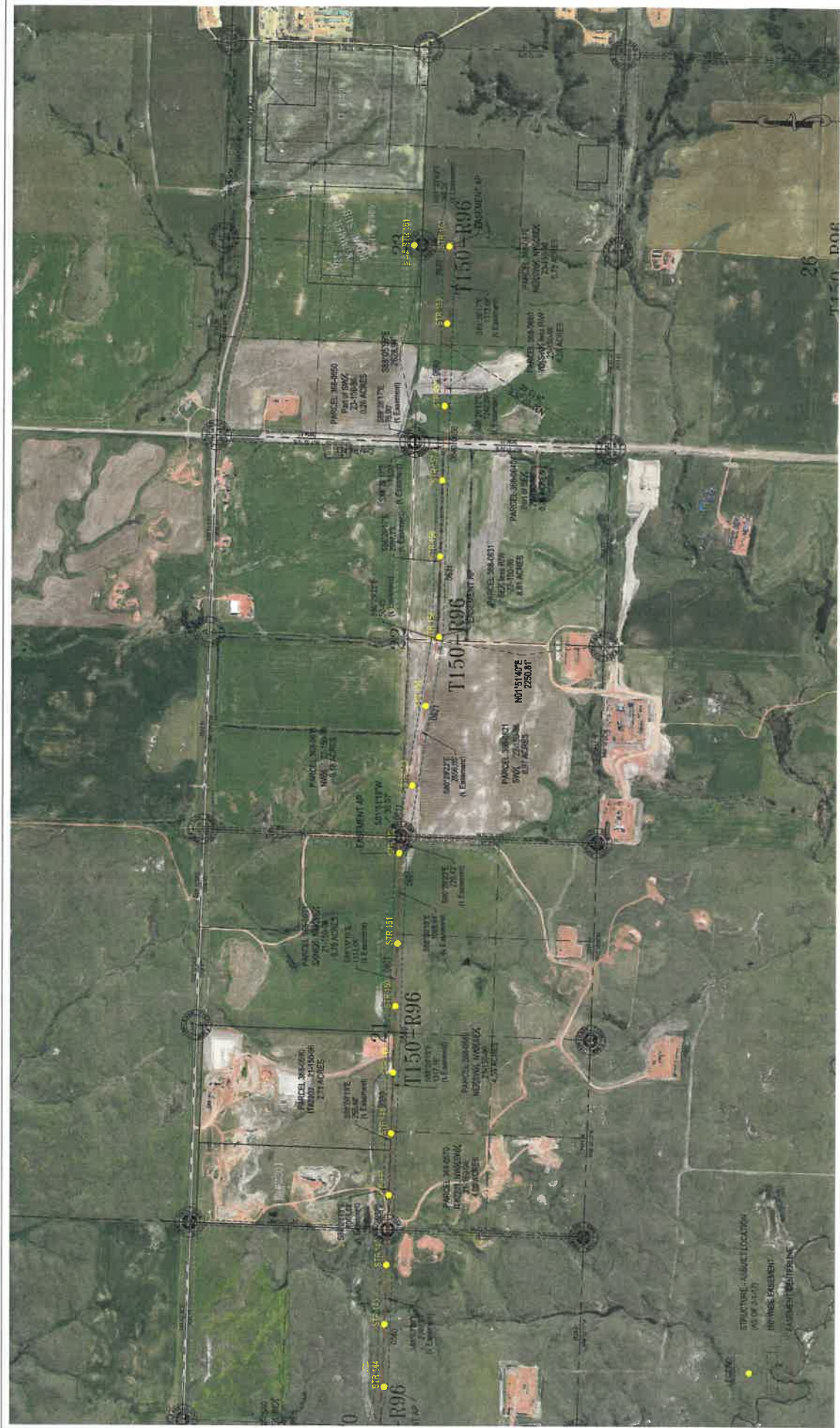
NOTE:  
 ASBUILT STRUCTURE PLACEMENT AS OF 2-1-2017

PSC SUBMITTAL FOR LINE 368  
 CASE #PU-14-813  
 MCKENZIE TRANSMISSION LINE  
 BASIN ELECTRIC  
 POWER COOPERATIVE  
 A Tractorium Energy Company









Scale of Bearing is N40°03'40" East Plane North Zone - International Feet. All Distances are Ground Distances. Combined scale factor = 0.99999172

SEC. 21, 22 & 23 - T1150N-R96W  
MCKENZIE COUNTY, NORTH DAKOTA

NOTE:  
ASBUILT STRUCTURE PLACEMENT AS OF 2-1-2017

PSC SUBMITTAL FOR LINE 368  
CASE #PU-14-813

ALASKA TRANSMISSION LINE  
POWER COOPERATIVE  
A member Energy Cooperative NDA



August 16, 2017

Darrell Nitschke  
Executive Director  
North Dakota Public Service Commission  
600 East Boulevard - Dept. 408  
Bismarck, ND 58505-0480

Re: Case No. PU-14-813  
Basin Electric Power Cooperative  
North Killdeer Loop Phase I 345-kV Transmission Project  
Partial Tree/Shrub Mitigation Plan

Dear Mr. Nitschke:

As per conditions of the Tree and Shrub Mitigation Specifications in the North Dakota Public Service Commission ( ND PSC) Findings of Fact, Conclusions of Law and Order for the North Killdeer Loop Phase I 345-kV Transmission Project (Project) in Case No. PU-14-813, you will find Basin Electric Power Cooperative's (Basin Electric) initial Tree/Shrub Mitigation Plan (Plan). Because we have not identified all tree planting opportunities, this submittal represents the initial portion of the Project's overall tree/shrub Mitigation Plan. This Partial Tree/Shrub Mitigation Plan has been filed electronically to the PU-14-813 docket.

The Project was approximately 28 miles in length, located between the newly installed Patent Gate and Kummer Ridge Substations all located within McKenzie County. The transmission line was placed into electrical service in late September 2016.

Pre-project and post-project tree/shrub surveys were performed by our consultant. The total number of tree/shrubs removed is estimated to be 1,129 from nineteen landowners. Ten of the nineteen landowners have requested replacement plantings consisting of 1,534 (767 x 2) trees/shrubs.

The remaining obligation for tree/shrub replacement is 724 (362 x 2), of which Basin Electric's pursuit of planting opportunities continues. Because this Project and the AVS to Naset 345-kV Transmission Project (PU-11-696) are occurring simultaneously, the offer for trees/shrub planting opportunities that was offered to various city, county, state and federal agencies in the Project area in PU-11-696 are combined for that purposes.

The following describes our partial Tree/Shrub Mitigation Plan for the North Killdeer Loop Phase I 345-kV Transmission Project in specific terms when known and in general planning terms:

**Tree/Shrub Replacement Plan**

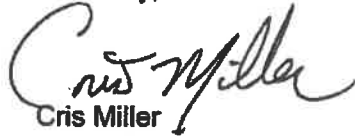
- **Pre-Planting Efforts**
  - Perform pre-project and post-project tree/shrub surveys that identifying species present and the quantification of tree/shrubs.
  - Identified landowners who requested replacement tree/shrubs on their property on a 2:1 replacement basis.
  
- **Landowner Tree/Shrub Planting Effort**
  - Communicated the landowner listings and the number of tree/shrub replacements required to the McKenzie County Soil Conservation Service (SCS) staff.
  - Basin Electric committed to be the funding source to the SCS to support the planting of the trees/shrubs on a 2:1 basis for 10 individual landowners.
  - SCS staff is coordinating with landowner to identify suitable lands for tree/shrub plantings and make recommendations for the specific tree/shrub varieties to enhance survivability.
  - Basin Electric committed to the additional cost of incorporating ground fabric in all tree/shrub planting projects. The placement of ground fabric is a strongly recommended by the SCS as it increases the survivability of the trees/shrubs.
  
- **Non-Landowner Tree/Shrub Planting Efforts -(Est. > 19,000 Tree/shrubs Required)**
  - Basin Electric will continue to identify Tree/Shrub replacement opportunities that create a public benefit by formal and informal communication with local, county, and state agencies.
    - Preference given for planting projects in the affected five counties, (Mercer, Dunn, McKenzie, Williams and Mountrail).
    - Formal communication to city, county and state agencies informing them of potential tree/shrub planting opportunities sent out March 2, 2017, as referenced in PU-11-696.

With the recent outreach effort to the various state, county and city agencies, numerous tree/shrub planting opportunities continue to be identified. When specific tree/shrub planting opportunities are identified and detailed planting plans developed, they will be submitted to the ND PSC for approval.

August 16, 2017  
Page 3

For inquiries regarding this initial Tree/Shrub Mitigation Plan, please contact me directly at 701 - 557-5635 or [cmiller@bepc.com](mailto:cmiller@bepc.com) .

Sincerely,

A handwritten signature in black ink that reads "Cris Miller". The signature is written in a cursive style with a large initial "C".

Cris Miller  
Senior Environmental Project Specialist

/ser  
Enclosures

cc: Casey Jacobson  
Amanda Wangler  
Mike Murray