



**Liberty Utilities**<sup>®</sup>  
EMPIRE DISTRICT

**Reliability of Service &  
Vegetation Management Plan to the  
Oklahoma Corporation Commission**

**Sam McGarrah  
Director, System Performance  
PO Box 127  
Joplin, MO 64802  
417-625-6526  
Sam.Mcgarrah@libertyutilities.com**

February 20, 2020

## **Table of Contents:**

### **Section 1:**

Service Territory Description and Map(s)  
-Number of Customers  
-Number of Circuits  
-Map(s) given in Appendix

### **Section 2:**

Vegetation Management Report

### **Section 3:**

Reliability Indices Report  
-By Oklahoma System  
-By Circuit  
Major Event Report  
Performance Report

### **Section 4:**

Circuit Analysis/Improvement Program

Attachments: Maps, Etc.

## **Section 1: Service Territory Description and Map**

<b>Circuit Number:</b>	<b>Number of Customers:</b>	<b>Substation Name:</b>
1861	767	Welch - North
2712	207	Baxter Springs - West
2912	740 <sup>(a)</sup>	Baxter Springs - 12th Street
3631	632	Fairland - West
3632	244	Fairland - West
3752	596 <sup>(b)</sup>	Seneca - East
3771	665	Quapaw - Eagle Picher
3772	561	Quapaw - Eagle Picher
3773	4	Quapaw - Eagle Picher
3811	778	Commerce - North
3812	904	Commerce - North
4281	19	Fairland - Southwest
4282	541	Fairland - Southwest
	<b>Total Customers: 6,658</b>	

(a) Circuit extends into two states. Includes both Oklahoma and Kansas customers.

(b) Circuit extends into two states. Includes both Oklahoma and Missouri customers.

## **Section 2: 2019 OCC Vegetation Management Report**

### **2019 Transmission Vegetation Management**

The Empire District Electric Company, a Liberty Utilities company, (“Liberty–Empire”) performs transmission system maintenance plan on a six-year cycle. Due to the systemic nature of transmission systems, Liberty–Empire manages transmission line segments in Oklahoma in conjunction with the remainder of the system. Much of the system lies outside the state of Oklahoma but has potential to affect reliability for Oklahoma customers.

The entire transmission system is annually surveyed for potential issues. Aerial patrol in the fall of 2019 detected a few locations of interest which were addressed during the first part of 2020.

### **2019 Distribution Vegetation Management**

The clearing of potentially problematic vegetation is pre-planned at each jobsite by CN Utility Consultants’ arborist. Vegetation clearing, herbicide and TGR application is performed by Wright Tree Service, Shade Tree, Mid Central Contractors, Kenny Singer Construction or EDKO. Pruning techniques will follow International Society of Arboriculture guidelines and ANSI A-300 standards. Liberty–Empire’s Vegetation Control Procedures will serve as a field guide. A cycle work-plan is provided with this report. We continue to monitor our program researching our different resources and schedule to improve our efficiencies.

Our Arborists continue to inform the public with handouts about an upcoming issue with Emerald Ash Borers and the impact on their Ash trees.

OCC Four Year Vegetation Cycle Schedule With Actual Costs								
Cycle	Year	Circuit ID	Miles	Actual Clearing and Herbicide Application	Maint. Yr.	Maint. Yr. mi. total	Planning Cost	Actual Cycle Year Cost
3	1	1861	34.8	\$ 254,295.00	2014		\$ 19,670.02	\$ 273,965.02
3	1	3811	14	\$ 137,010.05	2014		\$ 12,577.96	\$ 149,588.01
3	1	3812	15.9	\$ 173,427.96	2014		\$ 10,376.64	\$ 183,804.60
3	1	4281	1.4	n/a	2014		n/a	n/a
3	1	4282	8.7	\$ 65,862.52	2014		\$ 6,164.78	\$ 72,027.30
		<b>annual summary</b>		<b>\$ 630,595.53</b>		<b>74.8</b>	<b>\$ 48,789.40</b>	<b>\$ 679,384.93</b>
3	2	3631	54.7	\$ 273,372.78	2015		\$ 32,782.43	\$ 306,155.21
3	2	3773	16.6	\$ 21,096.14	2015		\$ 3,014.29	\$ 24,110.43
		<b>annual summary</b>		<b>\$ 294,468.92</b>		<b>71.3</b>	<b>\$ 35,796.72</b>	<b>\$ 330,265.64</b>
3	3	3771	67.8	\$ 106,150.49	2016		\$ 17,148.44	\$ 123,298.93
3	3	3772	1.5	\$ 133.66	2016		\$ 208.44	\$ 342.10
3	3	3752	21.4	\$ 89,043.62	2016		\$ 7,168.58	\$ 96,212.20
		<b>annual summary</b>		<b>\$ 195,327.77</b>		<b>90.7</b>	<b>\$ 24,525.46</b>	<b>\$ 219,853.23</b>
3	4	2712	41	\$ 84,178.09	2017		\$ 5,813.31	\$ 89,991.40
3	4	2912	25.1	\$ 116,561.12	2017		\$ 12,270.88	\$ 128,832.00
		<b>annual summary</b>		<b>\$ 200,739.21</b>		<b>66.1</b>	<b>\$ 18,084.19</b>	<b>\$ 218,823.40</b>
<b>3</b>	<b>Cycle totals</b>	<b>12 circuits</b>	<b>302.9</b>	<b>\$ 1,321,131.43</b>		<b>302.9</b>	<b>\$ 127,195.77</b>	<b>\$ 1,448,327.20</b>
4	1	1861	34.8	\$ 38,279.02	2018		\$ 11,182.77	\$ 49,461.79
4	1	3811	14	\$ 46,134.50	2018		\$ 6,972.87	\$ 53,107.37
4	1	3812	15.9	\$ 44,839.98	2018		\$ 4,286.51	\$ 49,126.49
4	1	4281	1.4	\$ 960.72	2018		\$ 723.49	\$ 1,684.21
4	1	4282	8.7	\$ 32,898.55	2018		\$ 3,726.37	\$ 36,624.92
		<b>annual summary</b>		<b>\$ 163,112.77</b>		<b>74.8</b>	<b>\$ 26,892.01</b>	<b>\$ 190,004.78</b>
4	2	3631	54.7	\$ 167,389.06	2019		\$ 14,639.38	\$ 182,028.44
4	2	3773	16.6	\$ 30,659.60	2019		\$ 1,457.81	\$ 32,117.41
		<b>annual summary</b>		<b>\$ 198,048.66</b>		<b>71.3</b>	<b>\$ 16,097.19</b>	<b>\$ 214,145.85</b>
4	3	3771	67.8		2020			
4	3	3772	1.5		2020			
4	3	3752	21.4		2020			
		<b>annual summary</b>				<b>90.7</b>		
4	4	2712	41		2021			
4	4	2912	25.1		2021			
		<b>annual summary</b>				<b>66.1</b>		
<b>4</b>	<b>Cycle totals</b>	<b>12 circuits</b>	<b>302.9</b>	<b>\$ 361,161.43</b>		<b>302.9</b>	<b>\$ 42,989.20</b>	<b>\$ 404,150.63</b>

### **Section 3: Reliability Report and Major Event Report**

#### **Reliability Indices for Oklahoma Facilities – System Excluding Major Events**

	<b>SAIDI</b>	<b>SAIFI</b>
<b>January</b>	13.02	0.094
<b>February</b>	2.91	0.031
<b>March</b>	15.69	0.205
<b>April</b>	1.34	0.015
<b>May</b>	35.55	0.273
<b>June</b>	8.37	0.105
<b>July</b>	17.18	0.165
<b>August</b>	24.88	0.089
<b>September</b>	6.05	0.110
<b>October</b>	10.26	0.243
<b>November</b>	15.15	0.230
<b>December</b>	4.25	0.026

**THE EMPIRE DISTRICT ELECTRIC COMPANY**  
**CUSTOMER OUTAGE STATISTICS AND INDICES FOR OKLAHOMA**  
1/1/2015 to 12/31/2015  
EXCLUDING MAJOR EVENT DAYS

CIRCUIT NUMBER	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUST. ON AFFECTED CIRCUITS	SAIFI	CAIDI	SAIDI	ASAI
1861	17	36.42	133	21,684	758	0.175	163.04	28.61	0.99995
2712	5	4.74	49	2,820	194	0.253	57.55	14.57	0.99997
2912	25	39.49	426	30,902	728	0.585	72.54	42.45	0.99992
3631	22	34.10	1,428	155,371	837	1.706	108.80	185.65	0.99965
3752	19	21.44	1,874	141,734	588	3.187	75.63	241.04	0.99954
3771	23	33.64	3,316	240,117	1,236	2.683	72.41	194.29	0.99963
3773	1	1.03	1	62	118	0.008	62.00	0.53	0.99999
3811	27	26.20	4,754	257,556	907	5.240	54.18	283.90	0.99946
3812	21	27.47	4,113	227,500	763	5.392	55.31	298.24	0.99943
4281	1	1.12	1	67	14	0.071	67.00	4.79	0.99999
4282	12	27.39	636	45,659	541	1.176	71.79	84.40	0.99984
	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUSTOMERS SERVED	SAIFI	CAIDI	SAIDI	ASAI
Total:	173	253.04	16,731	1,123,472	6,687	2.502	67.15	168.00	0.99968

**THE EMPIRE DISTRICT ELECTRIC COMPANY**  
**CUSTOMER OUTAGE STATISTICS AND INDICES FOR OKLAHOMA**  
1/1/2016 to 12/31/2016  
EXCLUDING MAJOR EVENT DAYS

CIRCUIT NUMBER	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUST. ON AFFECTED CIRCUITS	SAIFI	CAIDI	SAIDI	ASAI
1861	10	19.59	2,362	276,244	769	3.070	116.95	359.09	0.99932
2712	5	6.35	5	381	191	0.026	76.20	1.99	0.99999
2912	10	7.54	1,657	72,034	732	2.264	43.47	98.43	0.99981
3631	28	39.14	1,324	73,867	664	1.993	55.79	111.22	0.99979
3632	9	12.03	40	5,301	238	0.168	132.53	22.27	0.99996
3752	22	70.49	1,316	199,004	589	2.235	151.22	337.93	0.99936
3771	25	34.54	1,531	111,499	1,261	1.214	72.83	88.41	0.99983
3773	3	4.39	121	8,528	119	1.017	70.48	71.66	0.99986
3811	28	26.75	3,193	260,797	909	3.514	81.68	286.98	0.99946
3812	15	16.19	2,615	208,544	767	3.410	79.75	271.98	0.99948
4282	6	6.90	607	45,334	539	1.126	74.69	84.11	0.99984
	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUSTOMERS SERVED	SAIFI	CAIDI	SAIDI	ASAI
Total:	161	243.91	14,771	1,261,533	6,810	2.169	85.41	185.25	0.99965

**THE EMPIRE DISTRICT ELECTRIC COMPANY**  
**CUSTOMER OUTAGE STATISTICS AND INDICES FOR OKLAHOMA**  
1/1/2017 to 12/31/2017  
EXCLUDING MAJOR EVENT DAYS

CIRCUIT NUMBER	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUST. ON AFFECTED CIRCUITS	SAIFI	CAIDI	SAIDI	ASAI
1861	16	28.95	106	10,328	771	0.138	97.43	13.40	0.99997
2712	28	45.41	123	9,756	196	0.629	79.32	49.88	0.99990
2912	7	6.28	830	42,660	729	1.138	51.40	58.49	0.99989
3631	15	28.69	295	22,960	613	0.481	77.83	37.44	0.99993
3632	17	30.05	358	59,096	239	1.499	165.07	247.44	0.99953
3752	10	38.73	654	23,396	590	1.109	35.77	39.67	0.99992
3771	21	33.28	2,095	251,351	1,266	1.654	119.98	198.48	0.99962
3772	1	0.52	5	157	5	1.000	31.40	31.40	0.99994
3773	4	4.40	125	13,511	121	1.035	108.09	111.89	0.99979
3811	23	34.30	2,313	217,973	909	2.545	94.24	239.79	0.99954
3812	10	10.11	863	42,510	767	1.126	49.26	55.46	0.99989
4281	3	6.50	22	3,969	20	1.100	180.41	198.45	0.99962
4282	7	12.12	759	131,199	539	1.408	172.86	243.41	0.99954
	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUSTOMERS SERVED	SAIFI	CAIDI	SAIDI	ASAI
Total:	162	279.34	8,548	828,866	6,763	1.264	96.97	122.57	0.99977

**THE EMPIRE DISTRICT ELECTRIC COMPANY**  
**CUSTOMER OUTAGE STATISTICS AND INDICES FOR OKLAHOMA**  
1/1/2018 to 12/31/2018  
EXCLUDING MAJOR EVENT DAYS

CIRCUIT NUMBER	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUST. ON AFFECTED CIRCUITS	SAIFI	CAIDI	SAIDI	ASAI
1861	32	55.15	902	190,014	766	1.178	210.66	248.06	0.99953
2712	14	18.20	641	68,916	201	3.189	107.51	342.87	0.99935
2912	10	15.06	1,749	158,815	736	2.378	90.80	215.91	0.99959
3631	20	31.09	155	11,570	617	0.251	74.65	18.75	0.99996
3632	9	26.85	321	54,171	241	1.331	168.76	224.54	0.99957
3752	25	47.41	2,401	356,979	594	4.042	148.68	600.97	0.99886
3771	29	46.74	1,818	86,009	1,034	1.758	47.31	83.16	0.99984
3772	3	3.17	5	337	280	0.018	67.40	1.20	0.99999
3773	2	3.66	180	18,966	121	1.488	105.37	156.74	0.99970
3811	29	37.29	114	9,126	909	0.125	80.05	10.04	0.99998
3812	9	8.39	231	13,063	767	0.301	56.55	17.03	0.99997
4281	1	1.48	20	1,792	20	1.000	89.60	89.60	0.99983
4282	15	17.40	960	84,733	539	1.782	88.26	157.30	0.99970
	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUSTOMERS SERVED	SAIFI	CAIDI	SAIDI	ASAI
Total:	198	311.89	9,497	1,054,491	6,728	1.411	111.03	156.72	0.99970

**THE EMPIRE DISTRICT ELECTRIC COMPANY**  
**CUSTOMER OUTAGE STATISTICS AND INDICES FOR OKLAHOMA**  
1/1/2019 to 12/31/2019  
EXCLUDING MAJOR EVENT DAYS

CIRCUIT NUMBER	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUST. ON AFFECTED CIRCUITS	SAIFI	CAIDI	SAIDI	ASAI
1861	48	113.77	1,943	219,869	767	2.533	113.16	286.66	0.99945
2712	15	17.89	469	24,646	207	2.271	52.55	119.32	0.99977
2912	18	25.34	285	31,318	740	0.385	109.89	42.32	0.99992
3631	33	164.91	3,463	335,934	632	5.480	97.01	531.63	0.99899
3632	18	54.91	198	37,033	244	0.811	187.04	151.77	0.99971
3752	20	35.18	768	57,335	597	1.287	74.65	96.10	0.99982
3771	18	25.76	684	81,844	665	1.029	119.65	123.10	0.99977
3772	24	50.83	592	30,655	561	1.055	51.78	54.64	0.99990
3811	14	16.40	879	73,309	786	1.118	83.40	93.24	0.99982
3812	15	17.23	459	32,931	904	0.508	71.75	36.43	0.99993
4281	1	1.42	19	1,627	19	1.000	85.63	85.63	0.99984
4282	8	15.39	802	102,749	539	1.487	128.12	190.56	0.99964
	NUMBER OF OUTAGES	OUTAGE HOURS REPORTED	CUSTOMERS AFFECTED	CUSTOMER OUTAGE MINUTES	TOTAL CUSTOMERS SERVED	SAIFI	CAIDI	SAIDI	ASAI
Total:	232	539.03	10,561	1,029,250	6,655	1.587	97.46	154.66	0.99970

## **Major Event Report**

On May 18<sup>th</sup>, 2019 at approximately 1:08 PM, a micro-burst of wind hit a chat pile causing 7 transmission poles to fall, which resulted in the radial tap to the town of Commerce, Oklahoma fail. Liberty–Empire issued an all hands on-deck call to allocate as many linemen as possible to the outage. After assessing the situation, crews from Liberty-Empire’s Kodiak service center and Mid-Central Contractors also supported our Baxter Springs crews in the restoral efforts. Once the transmission poles were replaced power was resorted to all Commerce customers.

Interruption Cause:	Micro-burst
Date of Interruption:	05/18/19
Regional Location:	Area 212 – Ottawa County
Customer % without power:	26% (1,754 out of 6,655)
Outage Start:	5/18/19 1:08 PM
Last Outage Restored:	5/18/19 9:20 PM

## **Performance Report**

Liberty–Empire serves fewer than 100,000 customers within the 270.39 miles of distribution assets in Oklahoma. The minimum performance level is established through an engineering analysis of system performance for the period 2005-2019. The rural adjusted performance level was determined using the method provided by the Oklahoma Corporation Commission and applied to the minimum performance level by rule. The minimum performance levels and the rural adjusted performance levels are listed below.

<b>Measure</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Minimum</b>	<b>Rural Adjusted</b>
SAIFI	2.502	2.169	1.264	1.411	1.587	2.443	2.540
SAIDI	168.00	185.25	122.57	156.72	154.66	266.78	277.55

Liberty–Empire has met the minimum performance levels for the 2019 year. Below is a table of the minimum and rural adjusted performance levels compared to the 2018 indices data.

<b>Measure</b>	<b>Minimum</b>	<b>Rural Adjusted</b>	<b>2019</b>
SAIFI	2.443	2.540	1.587
SAIDI	266.78	277.55	154.66

The table below represents the total miles, total number of customers, and the ratio of line miles per customer.

<b>Total Miles</b>	<b>Customers</b>	<b>Line Miles per Customer</b>
270.39	6,655	0.0406

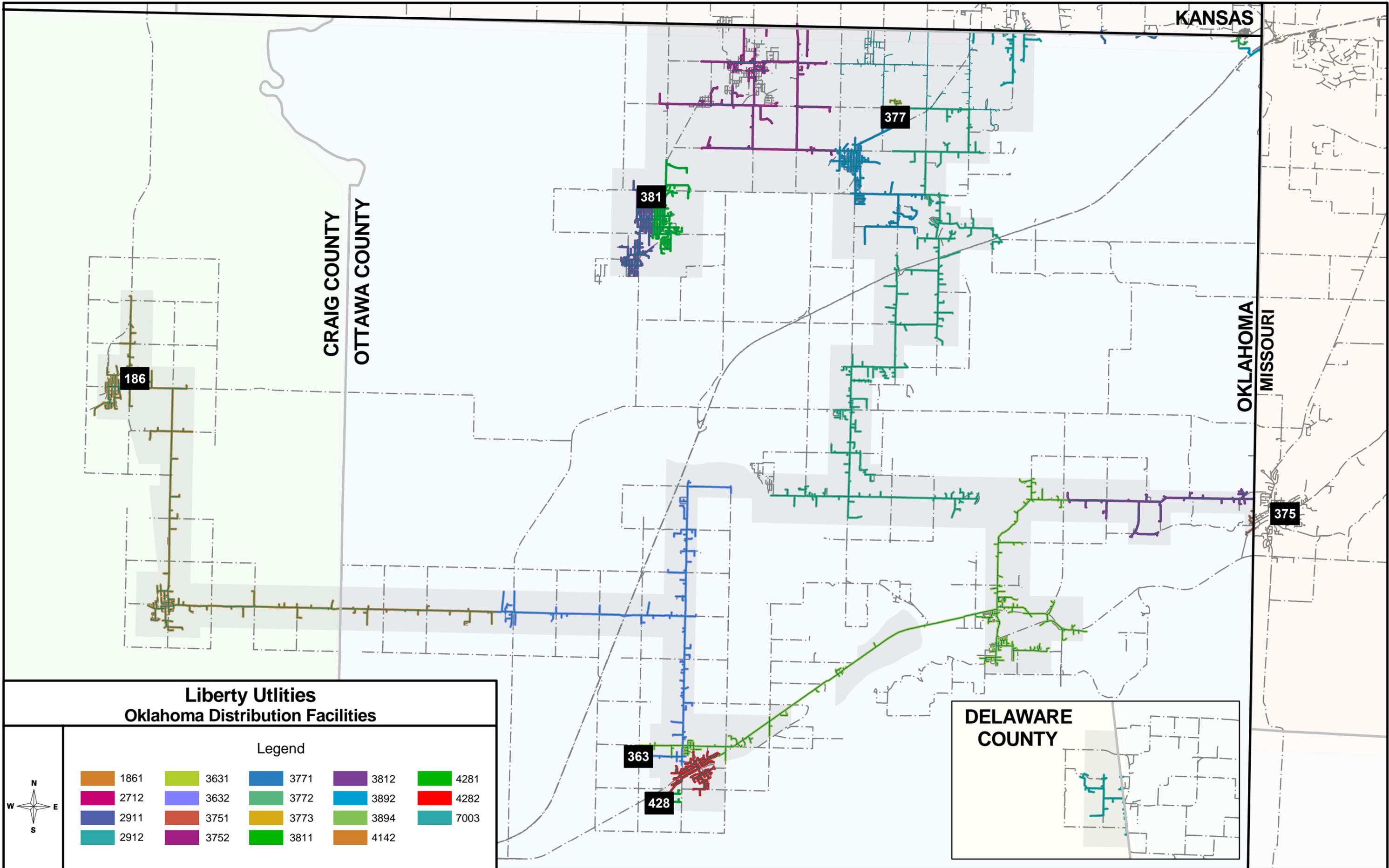
## **Section 4: Circuit Analysis / Improvement Program**

Liberty–Empire performs routine scheduled inspections and vegetation clearing to maintain the reliability of transmission and distribution circuits. Liberty–Empire also monitors reliability information on a monthly basis to determine if there are trends in reliability statistics which indicate a need for further investigation.

In 2019, distribution circuit 363-1 serving the area North of Fairland and Wyandotte was identified as Liberty-Empire’s worst performing circuit based on SAIDI and SAIFI. The circuit received a patrol inspection in 2017 which generated a pole replacement project and maintenance activities. The affected poles were replaced and the maintenance performed in 2018. A vegetation mid-cycle evaluation was performed in 2016, and annual vegetation maintenance was performed in 2019. Circuit sectionalization and protective device coordination have also been performed on the circuit in the past.

As part of Liberty-Empire’s Operation Toughen Up initiative, new transmission breakers were installed in 2015 at substation #363 – Fairland which serves circuit 363-1. The transmission breakers provide improved transmission sectionalization and reduce momentary outages for all customers served by substation #363 – Fairland.

A large-scale reconductor project commenced on circuit 363-1 in 2019. The ongoing project will replace the existing conductor with a larger conductor and significantly improve voltage support and power quality for Wyandotte customers. Unfortunately, three large outages occurred during the initial phases of the project construction. The outages were directly related to construction activities which have been addressed to avoid a future reoccurrence.



**Liberty Utilities  
Oklahoma Distribution Facilities**

Legend

1861	3631	3771	3812	4281
2712	3632	3772	3892	4282
2911	3751	3773	3894	7003
2912	3752	3811	4142	

