



11/06/2019

**City of Grand Rapids**

**Small and Micro Cell Wireless Facilities Sites**

**Radio Frequency (RF) Power Density Measurements**

**Executive Summary:**

Geotech, Inc. performed broadband power density measurements of existing small and micro cell sites to determine compliance or non-compliance with the existing requirements for the general public as set by the Federal Communications Commission (FCC) and other international agencies. As of August 23, 2019, seventy-one (71) sites were tested, and the measurements of the maximum power density were less than six (6) percent of the Maximum Permissible Exposure (MPE) limit as set by the FCC.

**Objective:**

Perform small and micro cell radio frequency testing to determine compliance or non-compliance of the Maximum Permissible Exposure (MPE) power densities with the applicable requirements as set by the Federal Communications Commission (FCC) and other international agencies.

Testing shall be performed for existing installations, and repeated every 3-years. New installation shall be tested on a yearly basis and repeated every 3-years.

**Background Information:**

1. Number of cell sites: As of this date, there are 121 existing and proposed sites. 71 sites were active and tested.
2. Several types of radio/antenna/pole installations have been installed and/or are proposed. The known radio frequencies of the small/micro cells range from 800 megahertz (MHz) to 6 gigahertz (GHz).
3. The following service providers have, or propose to have small/micro cells within the City limits: Verizon, AT&T, Sprint. (These sites are operated by ACD, Mobilitie, and Zayo).
4. The Federal Communications Commission (FCC) regulates and allocates the radio frequencies. The Institute of Electrical and Electronic Engineers (IEEE) has developed Standard 95.1; which was adopted by the FCC. Similar standards were developed by other agencies; which included the International Commission on Non-Ionizing Radiation

Protection (ICNIRP) and Canada Code 6. These standards define the limits for Maximum Permissible Exposure (MPE) Power Densities (in Watts/Meter Squared) as follows:

	<u>FCC</u> <u>(1.5-100GHz)</u>	<u>INCIRP</u> <u>(2-300GHz)</u>	<u>Canada</u> <u>(6-150GHz)</u>
Occupational	50	50	50
Non-Occupational (General Public)	10	10	10

5. Because the atmosphere is flooded with nearly unlimited radio transmissions from various sources, it may in some cases be difficult to distinguish between existing radiation levels and new small/micro cell radiation levels. Based on these factors, it was decided to perform broadband power density measurements to account for the frequencies ranging from 300KHz to 50GHz; which includes the operating frequencies for the small/micro cells. These measurements identify the existing power densities, and determine compliance or non-compliance with the FCC standards.
6. Ground level Safety: Radio frequency emissions from antennae used for cellular transmissions result in exposure levels on the ground that are typically below the safety limits which were adopted by the FCC based on the recommendations of expert organizations, and endorsed by agencies of the Federal Government responsible for health and safety.

**Testing Procedures and Parameters:**

1. Test Instrument: Narda NBM-550-S with FCC probe #EA5091
2. Measurements were made at:
  - a. Eighteen (18) inches and at ten (10) feet away and in-line with the cells. (The measurements at eighteen inches were discontinued during the course of the testing after learning that these tests were not necessary since the readings were expected to be high due to the close proximity to the cells.
  - b. Six (6) feet above ground at distances of 10 feet, 50 feet and 100 feet away from the pole/cell base
  - c. The banner arms
3. Measurements were broadband base and account for radio frequencies ranging from 300KHz to 50GHz
4. Measurements recorded the maximum readings as a percentage of the Maximum Permissible Exposure (MPE) power densities for occupational permissible limit. These measurements were converted to non-occupational (general public) power densities, and were compared with its MPE limit. Note: the MPE for non-occupational (general public) permissible limit is lower by a factor of 5 in comparison with the occupational permissible limit.

**Testing Results:** Refer to:

1. Attachment #1 – Summary of Radio Frequency (RF) Power Density Testing – Non-Occupational
2. Attachment #2 – Radio Frequency (RF) Power Density Testing - Non-Occupational
3. Attachment #3 – Radio Frequency (RF) Power Density Testing - Occupational and Non-Occupational

**Conclusions:**

1. The exposure levels in the vicinity of the cells are high, and the cells shall be turned off whenever work is to be performed on the lighting luminaires located on the poles.
2. The exposure of the general public to radio frequency power densities at six (6) feet above ground is less than six (6) percent of the Maximum Permissible Exposure set by the FCC.
3. The exposure to radio frequency power densities at the top banner arms is less than thirteen (13) percent of the Maximum Permissible Exposure set by the FCC.

<b>Attachment #1 - Summary of Radio Frequency (RF) Power Density Testing - Non-Occupational</b>											
<b>City of Grand Rapids/Small Cell Wireless Facilities Radio Frequency (RF) Power Density Testing - Non-Occupational</b>											
				<b>Results as Percentage (% of 10 Watts/Meter Squared) of Maximum Permissible Exposure (MPE) for FCC Non-Occupational Limits</b>							
				<b>Measurements at 6 feet above Ground</b>							
<b>Count</b>	<b>Small Cell</b>	<b>Approved Date</b>	<b>Address</b>	<b>Direction</b>	<b>Distance from Pole</b>			<b>Direction</b>	<b>Distance from Pole</b>		
					<b>10 ft.</b>	<b>50 ft.</b>	<b>100 ft.</b>		<b>10 ft.</b>	<b>50 ft.</b>	<b>100 ft.</b>
1	ACD	9/1/2017	370 Goodrich St. SW	W	0.95	2.175	2.78	E	5.5	4.7	3.42
2	ACD	9/23/2016	135 Monroe Center St. NW	W	0.413	0.8795	1.754	E	0.178	4.61	5.315
3	ACD	3/31/2017	1005 Baldwin St. SE	N	1.185	1.67	5.14	S	1.275	0.275	0.24
4	ACD	5/8/2018	216 Division Ave N	E	4.96	5.39	0.46	W	1.615	0.17	0.035
5	ACD	5/28/2019	81 Lyon St. NW	E	0.69	1.575	5.4	W	0.815	0.965	2.205
6	ACD	4/3/2017	10 Crescent St. NE	W	0.45	0.14	0.17	E	0.175	1.17	1.51
7	ACD	3/31/2017	243 Michigan St. NW	W	1.055	0.885	0.275	E	0.935	1.38	1.115
8	ACD	3/31/2017	405 Lafayette Ave. SE	N	0.98	0.845	0.76	S	0.765	0.835	0.785
9	ACD	9/29/2017	429 Paris St. SE	N	3.88	4.9	4.71	S	3.925	1.67	2.705
10	ACD	9/23/2016	37 Ionia Ave. SW	N	2.8	2.98	3.79	S	1.915	2.905	2.545
11	ACD	9/1/2017	198 Scribner Ave. NW	N	0.62	1.55	1.095	S	0.815	1.27	0
12	ACD	9/9/2016	105 Front Ave. NW	E	0.655	0.715	1.8	N	1.91	1.405	1.83
13	ACD	11/3/2017	2350 Elliott St. SE	E	0.51	0.055	0	W	0.415	0.45	0.485
14	ACD	1/13/2017	3702 Sparks Dr. SE	E	0.505	0.555	0.45	W	0.585	0.425	0.585
15	ACD	1/13/2017	3433 Lake Eastbrook Blvd.	E	0.54	0.475	0.555	W	1.305	0.53	0.425
16	ACD	11/3/2017	2321 Raybrook St. SE	N	0.135	0.4	0.53	S	0.425	0.47	0.21
17	ACD	1/20/2017	3982 Camelot Dr. SE	E	0.31	0.08	0.08	W	0.105	0.21	0.24
18	ACD	9/23/2016	12 Fulton St. E	E	0.47	0.26	0.515	W	0.455	0.345	0.24
19	ACD	3/31/2017	37 LaGrave Ave. SE	N	0.45	0.38	1.535	S	2.25	3.075	2.2
20	ACD	3/31/2017	1598 Division Ave. S	N	3.415	4.98	3.23	S	2.75	2.445	1.365
21	ACD	2/21/2017	1209 Cass Ave. SE	E	2.185	1.915	2.44	W	2.305	1.645	0.5
22	ACD	2/21/2017	932 Madison Ave. SE	S	2.735	3.1	3.205	N	1.75	2.39	2.44
23	ACD	2/21/2017	732 Jefferson Ave. SE	N	3.58	3.605	1.91	S	3.17	0.275	1.375
24	ACD	3/31/2017	187 Antoine St. SW	E	1.23	1.06	0.82	W	0.31	0.29	0.935
25	ACD	2/21/2017	618 Madison Ave. SE	N	4.5	3.845	2.36	S	2.96	4.515	4.52
26	ACD	6/5/2018	829 Franklin St. SE	E	0.45	0.74	2.94	W	2.545	0.93	0.035
27	ACD	9/1/2017	1601 Fuller Ave. SE	N	1.83	1.695	1.245	S	1.09	1.83	1.27
28	ACD	4/28/2017	2640 Breton Ave. SE	N	1.59	1.2	0.88	S	1.515	1.565	1.695
29	ACD	10/10/2017	321 Richard Terrace SE	N	1.795	1.14	1.195	S	2.635	0.61	1.43
30	ACD	1/13/2017	30 Marion Ave. NW	N	2.075	1.055	1.18	S	2.03	2.24	2.175
31	ACD	1/13/2017	219 Jackson Pl. NW	N	3.57	4.485	4.455	S	3.84	3.815	3.34
32	ACD	1/13/2017	1503 Alpine Ave. NW	N	4.58	4.98	4.44	S	3.52	2.08	3.575
33	ACD	11/3/2017	1128 Muskegon Ave. NW	N	0.58	4	2.515	S	0.08	0.055	1.38
34	ACD	3/31/2017	890 Seward Ave. NW	N	5.22	4.88	4.635	S	5.05	4.905	4.395
35	ACD	3/31/2017	1432 Scribner Ave. NW	N	5.245	3.605	4.85	S	4.655	2.995	3.1
36	ACD	1/13/2017	700 Scribner Ave. NW	N	2.915	3.05	2.625	S	3.59	3.72	3.505
37	AT&T	2/28/2019	1426 Lake Dr. SE	E	1.14	1.775	3.63	W	3.685	5.01	4.85
38	AT&T	7/2/2018	240 Fuller Ave. SE	E	1.35	1.31	0.82	W	2.065	2.44	0.62
39	AT&T	7/18/2018	10 Fuller Ave. NE	N	1.14	0.505	0.19	S	1.03	1.575	1.005
40	AT&T	10/23/2018	978 Cherry St. SE	E	1.115	1.85	1.42	W	0.85	0.37	0.49
41	AT&T	7/18/2018	1301 Dunham St. SE	E	2.705	1.3	2.41	W	1.595	3.365	3.945
42	AT&T	1/2/2019	206 Fulton St. W	W	3.045	2.065	0.93	E	0.885	0.665	0
43	Mobilitie	12/20/2016	2458 Eastern Ave. SE	N	0.45	0.56	0.53	S	0.455	0.405	1.05
44	Mobilitie	2/21/2017	1610 Broadway Ave. NW	N	1.75	1.485	1.375	S	1.35	0.875	2.515
45	Mobilitie	12/28/2017	1150 Leonard St. NW	W	0.985	0.515	2.99	E	1.5	1.14	3.285
46	Mobilitie	5/1/2017	1001 White Ave. NW	SE	0.715	2.65	0.555	NW	1.8	1.75	1.325
47	Mobilitie	3/6/2017	652 Alpine Ave. NW	E	3.765	2.78	0.31	W	1.96	0.85	1.695
48	Mobilitie	12/20/2016	1006 Bridge St. NW	E	0.82	0.225	2.385	W	2.015	1.705	1.405
49	Mobilitie	2/21/2017	625 Douglas St. NW	E	4.01	3.11	2.465	W	1.325	0.77	1.645
50	Mobilitie	9/25/2017	366 Richard Terrace SE	E	0.745	0.32	0.475	W	0.285	0.105	0.29
51	Mobilitie	12/11/2017	1202 Sigsbee St. SE	E	0.88	1.16	0.935	W	1.855	1.445	1.62
52	Mobilitie	10/10/2017	110 Abney Ave. SE	N	0.72	1.265	1.895	S	1.1	0.45	0.48
53	Mobilitie	3/6/2017	3812 Sparks Dr. SE	E	0.505	0.82	0.98	W	1.035	0.74	0.93
54	Mobilitie	12/20/2016	1308 Thomas St. SE	E	0.715	2.095	4.98	W	1.14	0.69	0.24
55	Mobilitie	3/21/2018	902 Madison Ave. SE	N	0.77	2.675	2.145	S	1.695	0.135	0.555
56	Mobilitie	6/6/2018	400 Stone St. SW	E	0.85	1.085	1.38	W	0.61	0.69	0.29
57	Mobilitie	12/20/2016	222 Cutler St. SW	E	1.57	1.325	0.74	W	0.795	1.195	1.3
58	Mobilitie	3/6/2017	2214 Division Ave. S	N	0.69	1.085	1.04	S	1.27	1.085	1.38
59	Mobilitie	3/21/2018	2355 Division Ave. S	N	0.08	0.29	0.66	S	0.205	0.31	0.275
60	Mobilitie	1/31/2018	122 Claremont Pl. NE	N	0.515	1.615	2.705	S	2.285	1.615	2.465
61	Mobilitie	2/21/2017	51 Gay Ave. SE	N	0.685	0.555	1.115	S	0.14	0.61	0.27
62	Mobilitie	9/7/2018	524 Wealthy St. NE	E	0.86	0.77	0.585	W	0.415	0.735	0.515
63	Mobilitie	9/18/2017	419 Fountain St. NE	E	0.14	0.07	0.415	W	1.415	1.35	0.555
64	Mobilitie	3/6/2017	473 Fulton St. E	E	5.19	5.235	5.49	W	3.125	4.03	3.235
65	Mobilitie	1/26/2018	310 Lafayette Ave. NE	N	0.225	1.88	5.59	S	4.45	3.26	1.325
66	Mobilitie	2/21/2017	498 Lafayette Ave. NE	N	4.615	4.67	4.425	S	3.22	3.02	1.69
67	Mobilitie	10/10/2017	1199 Ball Ave. NE	N	0.845	0	1.405	S	1.03	1.22	1.27
68	Mobilitie	12/20/2016	20 Buckley St. SE	N	1.51	1.53	0.685	S	0.635	1.085	1.67
69	Mobilitie	3/6/2017	127 Wealthy St. SE	E	1.325	3.45	3.125	W	4.905	4.77	3.125
70	ACD	5/24/2019	1163 Wealthy St. SE	E	0.69	0.98	0.74	W	1.555	0.275	0.425
71	ACD	12/4/2018	782 Fuller Ave. SE	N	1.205	1.595	1.045	S	1.22	1.2	0.65
<b>Summary of Radio Frequency (RF) Power Density Testing - Non-Occupational</b>											
Max					5.2450	5.3900	5.5900		5.5000	5.0100	5.3150
Min					0.0800	0.0000	0.0000		0.0800	0.0550	0.0000
Median					0.9850	1.3250	1.3800		1.4150	1.1950	1.3250
Average					1.6531	1.8288	1.9618		1.7473	1.6070	1.5706
<b>Notes:</b>											
1. For a complete description of testing procedures, parameters and results-see Full Report											
2. All values presented as a percentage of 10 watt/meter squared for non-occupational maximum permissible exposure											
3. Direction refers to measurement parallel to street direction											
4. Measurement at 6 feet above ground represents pedestrian height											
5. Above measurements are for active sites as of 8-23-2019											

**Attachment #2 - Radio Frequency (RF) Power Density Testing - Non-Occupational**

**City of Grand Rapids/Small Cell Wireless Facilities Radio Frequency (RF) Power Density Testing - Non-Occupational**

Count	OBJECT ID	Small Cell	Pole Owner	Site ID	Site Status	Approved Date	Address	Results as Percentage (% of 10 Watts/Meter Squared) of Maximum Permissible Exposure (MPE) for FCC Non-Occupational Limits								
								Measurements at 6 feet above Ground								
								Direction	Distance from Pole			Direction	Distance from Pole			
									10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.	
1	461	ACD	Grand Rapids	10013	Installation Complete	9/1/2017	370 Goodrich St. SW	W	0.95	2.175	2.78	E	5.5	4.7	3.42	
2	23	ACD	Grand Rapids	10016	Installation Complete	9/23/2016	135 Monroe Center St. NW	W	0.413	0.8795	1.754	E	0.178	4.61	5.315	
3	37	ACD	Grand Rapids	10022	Installation Complete	3/31/2017	1005 Baldwin St. SE	N	1.185	1.67	5.14	S	1.275	0.275	0.24	
4	886	ACD	Grand Rapids	10026	Installation Complete	5/8/2018	216 Division Ave N	E	4.96	5.39	0.46	W	1.615	0.17	0.035	
5	51	ACD	Grand Rapids	10027	Installation Complete	5/28/2019	81 Lyon St. NW	E	0.69	1.575	5.4	W	0.815	0.965	2.205	
6	39	ACD	Grand Rapids	10028	Installation Complete	4/3/2017	10 Crescent St. NE	W	0.45	0.14	0.17	E	0.175	1.17	1.51	
7	50	ACD	Grand Rapids	10030	Installation Complete	3/31/2017	243 Michigan St. NW	W	1.055	0.885	0.275	E	0.935	1.38	1.115	
8	40	ACD	Grand Rapids	10033	Installation Complete	3/31/2017	405 Lafayette Ave. SE	N	0.98	0.845	0.76	S	0.765	0.835	0.785	
9	52	ACD	Grand Rapids	10035	Installation Complete	9/29/2017	429 Paris St. SE	N	3.88	4.9	4.71	S	3.925	1.67	2.705	
10	24	ACD	Grand Rapids	10036	Installation Complete	9/23/2016	37 Ionia Ave. SW	N	2.8	2.98	3.79	S	1.915	2.905	2.545	
11	458	ACD	Grand Rapids	10037	Installation Complete	9/1/2017	198 Scribner Ave. NW	N	0.62	1.55	1.095	S	0.815	1.27	0	
12	22	ACD	Grand Rapids	10038	Installation Complete	9/9/2016	105 Front Ave. NW	E	0.655	0.715	1.8	N	1.91	1.405	1.83	
13	463	ACD	Grand Rapids	10054	Installation Complete	11/3/2017	2350 Elliott St. SE	E	0.51	0.055	0	W	0.415	0.45	0.485	
14	35	ACD	Grand Rapids	10057	Installation Complete	1/13/2017	3702 Sparks Dr. SE	E	0.505	0.555	0.45	W	0.585	0.425	0.585	
15	21	ACD	Grand Rapids	10060	Installation Complete	1/13/2017	3433 Lake Eastbrook Blvd. SE	E	0.54	0.475	0.555	W	1.305	0.53	0.425	
16	466	ACD	Grand Rapids	10061	Installation Complete	11/3/2017	2321 Raybrook St. SE	N	0.135	0.4	0.53	S	0.425	0.47	0.21	
17	36	ACD	Grand Rapids	10084	Installation Complete	1/20/2017	3982 Camelot Dr. SE	E	0.31	0.08	0.08	W	0.105	0.21	0.24	
18	25	ACD	Grand Rapids	10090	Installation Complete	9/23/2016	12 Fulton St. E	E	0.47	0.26	0.515	W	0.455	0.345	0.24	
19	38	ACD	Grand Rapids	10091	Installation Complete	3/31/2017	37 LaGrave Ave. SE	N	0.45	0.38	1.535	S	2.25	3.075	2.2	
20	49	ACD	Grand Rapids	14300	Installation Complete	3/31/2017	1598 Division Ave. S	N	3.415	4.98	3.23	S	2.75	2.445	1.365	
21	42	ACD	Grand Rapids	14302	Installation Complete	2/21/2017	1209 Cass Ave. SE	E	2.185	1.915	2.44	W	2.305	1.645	0.5	
22	43	ACD	Grand Rapids	14305	Installation Complete	2/21/2017	932 Madison Ave. SE	S	2.735	3.1	3.205	N	1.75	2.39	2.44	
23	44	ACD	Grand Rapids	14306	Installation Complete	2/21/2017	732 Jefferson Ave. SE	N	3.58	3.605	1.91	S	3.17	0.275	1.375	
24	47	ACD	Grand Rapids	14307	Installation Complete	3/31/2017	187 Antoine St. SW	E	1.23	1.06	0.82	W	0.31	0.29	0.935	
25	45	ACD	Grand Rapids	14308	Installation Complete	2/21/2017	618 Madison Ave. SE	N	4.5	3.845	2.36	S	2.96	4.515	4.52	
26	467	ACD	Grand Rapids	14309	Installation Complete	6/5/2018	829 Franklin St. SE	E	0.45	0.74	2.94	W	2.545	0.93	0.035	
27	464	ACD	Grand Rapids	14317	Installation Complete	9/1/2017	1601 Fuller Ave. SE	N	1.83	1.695	1.245	S	1.09	1.83	1.27	
28	34	ACD	Grand Rapids	14323	Installation Complete	4/28/2017	2640 Breton Ave. SE	N	1.59	1.2	0.88	S	1.515	1.565	1.695	
29	475	ACD	Grand Rapids	14350	Installation Complete	10/10/2017	321 Richard Terrace SE	N	1.795	1.14	1.195	S	2.635	0.61	1.43	
30	27	ACD	Grand Rapids	16401	Installation Complete	1/13/2017	30 Marion Ave. NW	N	2.075	1.055	1.18	S	2.03	2.24	2.175	
31	26	ACD	Grand Rapids	16402	Installation Complete	1/13/2017	219 Jackson Pl. NW	N	3.57	4.485	4.455	S	3.84	3.815	3.34	
32	29	ACD	Grand Rapids	16701	Installation Complete	1/13/2017	1503 Alpine Ave. NW	N	4.58	4.98	4.44	S	3.52	2.08	3.575	
33	896	ACD	Consumers	16702	Installation Complete	11/3/2017	1128 Muskegon Ave. NW	N	0.58	4	2.515	S	0.08	0.055	1.38	
34	31	ACD	Grand Rapids	16703	Installation Complete	3/31/2017	890 Seward Ave. NW	N	5.22	4.88	4.635	S	5.05	4.905	4.395	
35	32	ACD	Grand Rapids	16704	Installation Complete	3/31/2017	1432 Scribner Ave. NW	N	5.245	3.605	4.85	S	4.655	2.995	3.1	
36	33	ACD	Grand Rapids	16705	Installation Complete	1/13/2017	700 Scribner Ave. NW	N	2.915	3.05	2.625	S	3.59	3.72	3.505	
37	904	AT&T	Grand Rapids	GRRPD 010	Installation Complete	2/28/2019	1426 Lake Dr. SE	E	1.14	1.775	3.63	W	3.685	5.01	4.85	
38	465	AT&T	Grand Rapids	GRRPD 011	Installation Complete	7/2/2018	240 Fuller Ave. SE	E	1.35	1.31	0.82	W	2.065	2.44	0.62	
39	899	AT&T	Grand Rapids	GRRPD 012	Installation Complete	7/18/2018	10 Fuller Ave. NE	N	1.14	0.505	0.19	S	1.03	1.575	1.005	
40	900	AT&T	Grand Rapids	GRRPD 013	Installation Complete	10/23/2018	978 Cherry St. SE	E	1.115	1.85	1.42	W	0.85	0.37	0.49	
41	56	AT&T	Grand Rapids	GRRPD 018	Installation Complete	7/18/2018	1301 Dunham St. SE	E	2.705	1.3	2.41	W	1.595	3.365	3.945	
42	462	AT&T	Grand Rapids	GRRPD 030	Installation Complete	1/2/2019	206 Fulton St. W	W	3.045	2.065	0.93	E	0.885	0.665	0	
43	9	Mobilitie	Grand Rapids	DE90XS1YC-D	Installation Complete	12/20/2016	2458 Eastern Ave. SE	N	0.45	0.56	0.53	S	0.455	0.405	1.05	
44	16	Mobilitie	Grand Rapids	DE90XS1YQ-D	Installation Complete	2/21/2017	1610 Broadway Ave. NW	N	1.75	1.485	1.375	S	1.35	0.875	2.515	
45	457	Mobilitie	Grand Rapids	DE90XS1YR-D	Installation Complete	12/28/2017	1150 Leonard St. NW	W	0.985	0.515	2.99	E	1.5	1.14	3.285	
46	17	Mobilitie	Grand Rapids	DE90XS1YS-E	Installation Complete	5/1/2017	1001 White Ave. NW	SE	0.715	2.65	0.555	NW	1.8	1.75	1.325	
47	2	Mobilitie	Grand Rapids	DE90XS1YT-A	Installation Complete	3/6/2017	652 Alpine Ave. NW	E	3.765	2.78	0.31	W	1.96	0.85	1.695	
48	4	Mobilitie	Grand Rapids	DE90XS1YV-F	Installation Complete	12/20/2016	1006 Bridge St. NW	E	0.82	0.225	2.385	W	2.015	1.705	1.405	
49	14	Mobilitie	Grand Rapids	DE90XS1YW-I	Installation Complete	2/21/2017	625 Douglas St. NW	E	4.01	3.11	2.465	W	1.325	0.77	1.645	
50	18	Mobilitie	Grand Rapids	DE90XS1ZA-B	Installation Complete	9/25/2017	366 Richard Terrace SE	E	0.745	0.32	0.475	W	0.285	0.105	0.29	
51	58	Mobilitie	Grand Rapids	DE90XS1ZB-C	Installation Complete	12/11/2017	1202 Sigsbee St. SE	E	0.88	1.16	0.935	W	1.855	1.445	1.62	
52	59	Mobilitie	Grand Rapids	DE90XS1ZG-F	Installation Complete	10/10/2017	110 Abney Ave. SE	N	0.72	1.265	1.895	S	1.1	0.45	0.48	
53	12	Mobilitie	Grand Rapids	DE90XS1ZL-F	Installation Complete	3/6/2017	3812 Sparks Dr. SE	E	0.505	0.82	0.98	W	1.035	0.74	0.93	
54	11	Mobilitie	Grand Rapids	DE90XS1ZP-E	Installation Complete	12/20/2016	1308 Thomas St. SE	E	0.715	2.095	4.98	W	1.14	0.69	0.24	
55	53	Mobilitie	Grand Rapids	DE90XS1ZQ-E	Installation Complete	3/21/2018	902 Madison Ave. SE	N	0.77	2.675	2.145	S	1.695	0.135	0.555	
56	54	Mobilitie	Grand Rapids	DE90XS1ZT-C	Installation Complete	6/6/2018	400 Stone St. SW	E	0.85	1.085	1.38	W	0.61	0.69	0.29	
57	6	Mobilitie	Grand Rapids	DE90XS1ZU-A	Installation Complete	12/20/2016	222 Cutler St. SW	E	1.57	1.325	0.74	W	0.795	1.195	1.3	
58	3	Mobilitie	Grand Rapids	DE90XS1ZV-A	Installation Complete	3/6/2017	2214 Division Ave. S	N	0.69	1.085	1.04	S	1.27	1.085	1.38	
59	55	Mobilitie	Grand Rapids	DE90XS1ZW-C	Installation Complete	3/21/2018	2355 Division Ave. S	N	0.08	0.29	0.66	S	0.205	0.31	0.275	
60	454	Mobilitie	Grand Rapids	DE90XS497-C	Installation Complete	1/31/2018	122 Claremont Pl. NE	N	0.515	1.615	2.705	S	2.285	1.615	2.465	
61	13	Mobilitie	Grand Rapids	DE90XS501-F	Installation Complete	2/21/2017	51 Gay Ave. SE	N	0.685	0.555	1.115	S	0.14	0.61	0.27	
62	60	Mobilitie	Grand Rapids	DE90XS502-G	Installation Complete	9/7/2018	524 Wealthy St. NE	E	0.86	0.77	0.585	W	0.415	0.735	0.515	
63	19	Mobilitie	CE	DE90XS503-E	Installation Complete	9/18/2017	419 Fountain St. NE	E	0.14	0.07	0.415	W	1.415	1.35	0.555	
64	10	Mobilitie	Grand Rapids	DE90XS504-A	Installation Complete	3/6/2017	473 Fulton St. E	E	5.19	5.235	5.49	W	3.125	4.03	3.235	
65	453	Mobilitie	Grand Rapids	DE90XS518-D	Installation Complete	1/26/2018	310 Lafayette Ave. NE	N	0.225	1.88	5.59	S	4.45	3.26	1.325	
66	15	Mobilitie	Grand Rapids	DE90XS521-D	Installation Complete	2/21/2017	498 Lafayette Ave. NE	N	4.615	4.67	4.425	S	3.22	3.02	1.69	
67	455	Mobilitie	Grand Rapids	DE90XS943-O	Installation Complete	10/10/2017	1199 Ball Ave. NE	N	0.845	0	1.405	S	1.03	1.22	1.27	
68	7	Mobilitie	Grand Rapids	DE90XS142-A	Installation Complete	12/20/2016	20 Buckley St. SE	N	1.51	1.53	0.685	S	0.635	1.085	1.67	
69	5	Mobilitie	Grand Rapids	DE90XS19-B	Installation Complete	3/6/2017	127 Wealthy St. SE	E	1.325	3.45	3.125	W	4.905	4.77	3.125	
70	889	ACD	Grand Rapids	14353	Permit Approved	5/24/2019	1163 Wealthy St. SE	E	0.69	0.98	0.74	W	1.555	0.275	0.425	
71	476	ACD	Parks	14354	Permit Approved	12/4/2018	782 Fuller Ave. SE	N	1.205	1.595	1.045	S	1.22	1.2	0.65	

Radio Frequency (RF) Power Density Testing - Non-Occupational					
Max	5.2450	5.3900	5.5900	5.5000	5.3150
Min	0.0800	0.0000	0.0000	0.0800	0.0000
Median	0.9850	1.3250	1.3800	1.4150	1.1950
Average	1.6531	1.8288	1.9618	1.7473	1.5706

- Notes:
- All values presented as a percentage of 10 watt/meter squared for non-occupational maximum permissible exposure
  - Direction refers to measurement parallel to street direction
  - Measurement at 6 feet above ground represents pedestrian height
  - Above measurements are for active sites as of 8-23-2019

### Attachment #3 - Radio Frequency (RF) Power Density Testing - Occupational & Non-Occupational

#### City of Grand Rapids/Small Cell Wireless Facilities Radio Frequency (RF) Power Density Testing - Occupational & Non-Occupational

Count	OBJECT ID	Small Cell	Pole Owner	Site ID	Site Status	Approved Date	Address	Results as Percentage (% of 50 Watts/Meter Squared) of Maximum Permissible Exposure (MPE) for FCC Occupational Limits															
								Measurements at Horizontal Plane with Cell								Measurements at 6 feet above Ground							
								Direction N		Direction W		Direction S		Direction E		Direction	Distance from Pole			Direction	Distance from Pole		
								18 in.	10 ft.	18 in.	10 ft.	18 in.	10 ft.	18 in.	10 ft.		10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.
1	461	ACD	Grand Rapids	10013	Installation Complete	9/1/2017	370 Goodrich St. SW	45.85	13.2	90.76	47.96	144.1	28.75	162	35.19	W	0.19	0.435	0.556	E	1.1	0.94	0.684
2	23	ACD	Grand Rapids	10016	Installation Complete	9/23/2016	135 Monroe Center St. NW	479	27.72	not accessible		173.3	17.06	468.7	17.36	W	0.0826	0.1759	0.3508	E	0.0356	0.922	1.063
3	37	ACD	Grand Rapids	10022	Installation Complete	3/31/2017	1005 Baldwin St. SE	3.764	0.4372	5.343	0.7939	27.28	5.169	5769	176.9	N	0.237	0.334	1.028	S	0.255	0.055	0.048
4	886	ACD	Grand Rapids	10026	Installation Complete	5/8/2018	216 Division Ave N	33.22	5.392	4161	161.8	15.17	3.715	15.17	3.715	E	0.992	1.078	0.092	W	0.323	0.034	0.007
5	51	ACD	Grand Rapids	10027	Installation Complete	5/28/2019	81 Lyon St. NW		6.677		127.2		1.796		0.6754	E	0.138	0.315	1.08	W	0.163	0.193	0.441
6	39	ACD	Grand Rapids	10028	Installation Complete	4/3/2017	10 Crescent St. NE	55.52	7.553	5.148	1.336	18.27	2.977	2549	108.2	W	0.09	0.028	0.034	E	0.035	0.234	0.302
7	50	ACD	Grand Rapids	10030	Installation Complete	3/31/2017	243 Michigan St. NW	185.7	13.1	85.82	23.94	6.762	2.156	314.5	44.37	W	0.211	0.177	0.055	E	0.187	0.276	0.223
8	40	ACD	Grand Rapids	10033	Installation Complete	3/31/2017	405 Lafayette Ave. SE	138.9	19.24	91.92	26.61	109.7	18.22	228.8	40.1	N	0.196	0.169	0.152	S	0.153	0.167	0.157
9	52	ACD	Grand Rapids	10035	Installation Complete	9/29/2017	429 Paris St. SE	86.04	31.53	163.3	44.51	152.3	33.59	175.8	18.84	N	0.776	0.98	0.942	S	0.785	0.334	0.541
10	24	ACD	Grand Rapids	10036	Installation Complete	9/23/2016	37 Ionia Ave. SW	38.8	10.59	67.42	17.38	5.332	1.447	23.23	4.079	N	0.56	0.596	0.758	S	0.383	0.581	0.509
11	458	ACD	Grand Rapids	10037	Installation Complete	9/1/2017	198 Scribner Ave. NW	536.3	39.52	9.278	2.703	3.038	1.023	12.01	5.332	N	0.124	0.31	0.219	S	0.163	0.254	(in road)
12	22	ACD	Grand Rapids	10038	Installation Complete	9/9/2016	105 Front Ave. NW	25.55	7.48	17.7	8.16	198.9	21.52	17.43	29.86	E	0.131	0.143	0.36	N	0.382	0.281	0.366
13	463	ACD	Grand Rapids	10054	Installation Complete	11/3/2017	2350 Elliott St. SE		12.26		26.95		20.91		9.124	E	0.102	0.011	0	W	0.083	0.09	0.097
14	35	ACD	Grand Rapids	10057	Installation Complete	1/13/2017	3702 Sparks Dr. SE		5.351		17.98		14.91		7.502	E	0.101	0.111	0.09	W	0.117	0.085	0.117
15	21	ACD	Grand Rapids	10060	Installation Complete	1/13/2017	3433 Lake Eastbrook Blvd. SE	32.63	9.66	63.77	6	25.42	2.95	68.67	21.96	E	0.108	0.095	0.111	W	0.261	0.106	0.085
16	466	ACD	Grand Rapids	10061	Installation Complete	11/3/2017	2321 Raybrook St. SE		9.622		11.39		13.5		5.886	N	0.027	0.08	0.106	S	0.085	0.094	0.042
17	36	ACD	Grand Rapids	10084	Installation Complete	1/20/2017	3982 Camelot Dr. SE		7.73		9.254		4.333		2.666	E	0.062	0.016	0.016	W	0.021	0.042	0.048
18	25	ACD	Grand Rapids	10090	Installation Complete	9/23/2016	12 Fulton St. E	248.1	34.05	12.59	1.881	30.15	10.52	224.6	33.58	E	0.094	0.052	0.103	W	0.091	0.069	0.048
19	38	ACD	Grand Rapids	10091	Installation Complete	3/31/2017	37 LaGrave Ave. SE	479.5	35.77	264.3	22.61	138	21.19	250.1	32.21	N	0.09	0.076	0.307	S	0.45	0.615	0.44
20	49	ACD	Grand Rapids	14300	Installation Complete	3/31/2017	1598 Division Ave. S	76.38	14.57	9.55	9.654	31.34	4.58	21.07	5.688	N	0.683	0.996	0.646	S	0.55	0.489	0.273
21	42	ACD	Grand Rapids	14302	Installation Complete	2/21/2017	1209 Cass Ave. SE	7.633	6.246	22.45	1.71	46	18.19	90.58	4.356	E	0.437	0.383	0.488	W	0.461	0.329	0.1
22	43	ACD	Grand Rapids	14305	Installation Complete	2/21/2017	932 Madison Ave. SE	1.393	1.144	1.126	1.096	1.001	0.885	0.4716	0.4409	S	0.547	0.62	0.641	N	0.35	0.478	0.488
23	44	ACD	Grand Rapids	14306	Installation Complete	2/21/2017	732 Jefferson Ave. SE	27.1	6.48	67.82	11.21	164.9	25.29	96.62	20.31	N	0.716	0.721	0.382	S	0.634	0.055	0.275
24	47	ACD	Grand Rapids	14307	Installation Complete	3/31/2017	187 Antoine St. SW		5.047		14.54		8.311		4.784	E	0.246	0.212	0.164	W	0.062	0.058	0.187
25	45	ACD	Grand Rapids	14308	Installation Complete	2/21/2017	618 Madison Ave. SE	77	2.11	72.04	8.56	51.45	11.97	10.17	12.09	N	0.9	0.769	0.472	S	0.592	0.903	0.904
26	467	ACD	Grand Rapids	14309	Installation Complete	6/5/2018	829 Franklin St. SE	8.02	2.53	48.11	4.72	25.52	3.86	14.09	3.89	E	0.09	0.148	0.588	W	0.509	0.186	0.007
27	464	ACD	Grand Rapids	14317	Installation Complete	9/1/2017	1601 Fuller Ave. SE		0.3858		11.95		10.78		1.376	N	0.366	0.339	0.249	S	0.218	0.366	0.254
28	34	ACD	Grand Rapids	14323	Installation Complete	4/28/2017	2640 Breton Ave. SE		6.697		3.415		1.887		0.7673	N	0.318	0.24	0.176	S	0.303	0.313	0.339
29	475	ACD	Grand Rapids	14350	Installation Complete	10/10/2017	321 Richard Terrace SE	245.6	44.8	82.81	32.89	77.09	28.76	104	41.23	N	0.359	0.228	0.239	S	0.527	0.122	0.286
30	27	ACD	Grand Rapids	16401	Installation Complete	1/13/2017	30 Marion Ave. NW	84.03	5.51	100	5.64	27.93	6.78	34.63	5.78	N	0.415	0.211	0.236	S	0.406	0.448	0.435
31	26	ACD	Grand Rapids	16402	Installation Complete	1/13/2017	219 Jackson Pl. NW	10.18	6.38	70.78	5.14	50.35	8.73	81.55	6.8	N	0.714	0.897	0.891	S	0.768	0.763	0.668
32	29	ACD	Grand Rapids	16701	Installation Complete	1/13/2017	1503 Alpine Ave. NW	205.7	27.54	409.8	51.56	140.2	18.47	70.51	21.05	N	0.916	0.996	0.888	S	0.704	0.416	0.715
33	896	ACD	Consumers	16702	Installation Complete	11/3/2017	1128 Muskegon Ave. NW	106.6	22.12	54.33	12.45	62.47	22.91	71.97	25.91	N	0.116	0.8	0.503	S	0.016	0.011	0.276
34	31	ACD	Grand Rapids	16703	Installation Complete	3/31/2017	890 Seward Ave. NW	150.6	12.96	22.92	7.28	24.63	5.44	81.34	13.47	N	1.044	0.976	0.927	S	1.01	0.981	0.879
35	32	ACD	Grand Rapids	16704	Installation Complete	3/31/2017	1432 Scribner Ave. NW	209	49.34	150.7	16.34	52.33	19.72	169.6	32.71	N	1.049	0.721	0.97	S	0.931	0.599	0.62
36	33	ACD	Grand Rapids	16705	Installation Complete	1/13/2017	700 Scribner Ave. NW	381	42.63	189.5	28.59	50.97	11.85	103.1	27.33	N	0.583	0.61	0.525	S	0.718	0.744	0.701
37	904	AT&T	Grand Rapids	GRRPD 010	Installation Complete	2/28/2019	1426 Lake Dr. SE	0.83	0.92	0.89	0.13	0	0	0.13	(Primary)	E	0.228	0.355	0.726	W	0.737	1.002	0.97
38	465	AT&T	Grand Rapids	GRRPD 011	Installation Complete	7/2/2018	240 Fuller Ave. SE		(Primary)		0.6307		0.1446		0.4952	E	0.27	0.262	0.164	W	0.413	0.488	0.124
39	899	AT&T	Grand Rapids	GRRPD 012	Installation Complete	7/18/2018	10 Fuller Ave. NE		0.4886		0.4351		0.7679		0.7775	N	0.228	0.101	0.038	S	0.206	0.315	0.201
40	900	AT&T	Grand Rapids	GRRPD 013	Installation Complete	10/23/2018	978 Cherry St. SE	3.16	0.08	1.73	0.27	2.38	1.37	6.03	0.53	E	0.223	0.37	0.284	W	0.17	0.074	0.098
41	56	AT&T	Grand Rapids	GRRPD 018	Installation Complete	7/18/2018	1301 Dunham St. SE (Tree-Inaccessible)	16.05	Tree	4.87	1.9	4.45	Tree	6.02	Tree	E	0.541	0.26	0.482	W	0.319	0.673	0.789
42	462	AT&T	Grand Rapids	GRRPD 030	Installation Complete	1/2/2019	206 Fulton St. W	0.5691	0.4499	0.3948	0.355	0.3121	0.3031	0.2978	0.2771	W	0.609	0.413	0.186	E	0.177	0.133	(In Road)
43	9	Mobilite	Grand Rapids	DE90XS1YC-D	Installation Complete	12/20/2016	2458 Eastern Ave. SE		0.8251		0.7742		0.8166		1.059	N	0.09	0.112	0.106	S	0.091	0.081	0.21
44	16	Mobilite	Grand Rapids	DE90XS1YQ-D	Installation Complete	2/21/2017	1610 Broadway Ave. NW	POWER	SHUT	OFF	AT	SERVICE	DISCON			N	0.35	0.297	0.275	S	0.27	0.175	0.503
45	457	Mobilite	Grand Rapids	DE90XS1YR-D	Installation Complete	12/28/2017	1150 Leonard St. NW	8.67	2.83	5.02	3.12	7.84	1.62	5.52	1.09	W	0.197	0.103	0.598	E	0.3	0.228	0.657
46	17	Mobilite	Grand Rapids	DE90XS1YS-E	Installation Complete	5/1/2017	1001 White Ave. NW	0.35	0.22	0.25	0.12	0.58	0.54	0.4	0.06	SE	0.143	0.53	0.111	NW	0.36	0.35	0.265

### Attachment #3 - Radio Frequency (RF) Power Density Testing - Occupational & Non-Occupational

#### City of Grand Rapids/Small Cell Wireless Facilities Radio Frequency (RF) Power Density Testing - Occupational & Non-Occupational

Count	OBJECT ID	Small Cell	Pole Owner	Site ID	Site Status	Approved Date	Address	Results as Percentage (% of 50 Watts/Meter Squared) of Maximum Permissible Exposure (MPE) for FCC Occupational Limits															
								Measurements at Horizontal Plane with Cell								Measurements at 6 feet above Ground							
								Direction N		Direction W		Direction S		Direction E		Distance from Pole			Distance from Pole				
								18 in.	10 ft.	18 in.	10 ft.	18 in.	10 ft.	18 in.	10 ft.	Direction	10 ft.	50 ft.	100 ft.	Direction	10 ft.	50 ft.	100 ft.
47	2	Mobilitie	Grand Rapids	DE90XS1YT-A	Installation Complete	3/6/2017	652 Alpine Ave. NW	4.03	1.96	3.18	2.01	1.01	1.48	1.98	0.35	E	0.753	0.556	0.062	W	0.392	0.17	0.339
48	4	Mobilitie	Grand Rapids	DE90XS1YV-F	Installation Complete	12/20/2016	1006 Bridge St. NW	9.99	11.83	5.34	1.15	15.55	1.47	4.96	1.65	E	0.164	0.045	0.477	W	0.403	0.341	0.281
49	14	Mobilitie	Grand Rapids	DE90XS1YW-I	Installation Complete	2/21/2017	625 Douglas St. NW	3.38	0.74	1.85	0.98	4.47	0.65	3.38	0.28	E	0.802	0.622	0.493	W	0.265	0.154	0.329
50	18	Mobilitie	Grand Rapids	DE90XS1ZA-B	Installation Complete	9/25/2017	366 Richard Terrace SE	2.8	1.1	5.27	1.54	1.15	1.86	0.4	0.57	E	0.149	0.064	0.095	W	0.057	0.021	0.058
51	58	Mobilitie	Grand Rapids	DE90XS1ZB-C	Installation Complete	12/11/2017	1202 Sigsbee St. SE	4.63	0.75	3.02	0.6	2.39	0.15	4.19	0.68	E	0.176	0.232	0.187	W	0.371	0.289	0.324
52	59	Mobilitie	Grand Rapids	DE90XS1ZG-F	Installation Complete	10/10/2017	110 Abney Ave. SE	7.88	0.97	4.51	0.33	7.04	3.54	6.71	0.5	N	0.144	0.253	0.379	S	0.22	0.09	0.096
53	12	Mobilitie	Grand Rapids	DE90XS1ZL-F	Installation Complete	3/6/2017	3812 Sparks Dr. SE		0.2056		0.5924		0.621		0.55	E	0.101	0.164	0.196	W	0.207	0.148	0.186
54	11	Mobilitie	Grand Rapids	DE90XS1ZP-E	Installation Complete	12/20/2016	1308 Thomas St. SE	5.7	1.29	1.18	0.75	1.37	0.94	2.41	1.95	E	0.143	0.419	0.996	W	0.228	0.138	0.048
55	53	Mobilitie	Grand Rapids	DE90XS1ZQ-E	Installation Complete	3/21/2018	902 Madison Ave. SE	146.5	19.25	45.5	7.647	35.37	8.686	31.74	4.468	N	0.154	0.535	0.429	S	0.339	0.027	0.111
56	54	Mobilitie	Grand Rapids	DE90XS1ZT-C	Installation Complete	6/6/2018	400 Stone St. SW		0.6777		0.638		0.8277		1.8471	E	0.17	0.217	0.276	W	0.122	0.138	0.058
57	6	Mobilitie	Grand Rapids	DE90XS1ZU-A	Installation Complete	12/20/2016	222 Cutler St. SW		0.7058		0.2782		0.8166		1.007	E	0.314	0.265	0.148	W	0.159	0.239	0.26
58	3	Mobilitie	Grand Rapids	DE90XS1ZV-A	Installation Complete	3/6/2017	2214 Division Ave. S		2.598		5.552		7.482		2.557	N	0.138	0.217	0.208	S	0.254	0.217	0.276
59	55	Mobilitie	Grand Rapids	DE90XS1ZW-C	Installation Complete	3/21/2018	2355 Division Ave. S		0.8203		1.729		1.344		1.242	N	0.016	0.058	0.132	S	0.041	0.062	0.055
60	454	Mobilitie	Grand Rapids	DE90XS497-C	Installation Complete	1/31/2018	122 Claremont Pl. NE	5.308	0.6894	5.360	0.8325	2.486	0.5363	not accessible		N	0.103	0.323	0.541	S	0.457	0.323	0.493
61	13	Mobilitie	Grand Rapids	DE90XS501-F	Installation Complete	2/21/2017	51 Gay Ave. SE	5.024	1.144	6.956	2.831	5.824	0.9872	5.882	1.662	N	0.137	0.111	0.223	S	0.028	0.122	0.054
62	60	Mobilitie	Grand Rapids	DE90XS502-G	Installation Complete	9/7/2018	524 Wealthy St. NE	5.13	0.07	6.93	1.03	5.23	0.12	2.45	1.4	E	0.172	0.154	0.117	W	0.083	0.147	0.103
63	19	Mobilitie	CE	DE90XS503-E	Installation Complete	9/18/2017	419 Fountain St. NE	536.3	39.5	29.278	2.703	3.038	1.023	12.01	5.332	E	0.028	0.014	0.083	W	0.283	0.27	0.111
64	10	Mobilitie	Grand Rapids	DE90XS504-A	Installation Complete	3/6/2017	473 Fulton St. E	1.277	1.197	0.945	0.936	0.6279	0.5977	1.206	1.171	E	1.038	1.047	1.098	W	0.625	0.806	0.647
65	453	Mobilitie	Grand Rapids	DE90XS518-D	Installation Complete	1/26/2018	310 Lafayette Ave. NE	8.382	1.470	6.480	2.562	4.592	1.323	4.051	0.5495	N	0.045	0.376	1.118	S	0.89	0.652	0.265
66	15	Mobilitie	Grand Rapids	DE90XS521-D	Installation Complete	2/21/2017	498 Lafayette Ave. NE	5.98	0.5310	2.538	1.883	3.598	0.4732	3.215	0.5771	N	0.923	0.934	0.885	S	0.644	0.604	0.338
67	455	Mobilitie	Grand Rapids	DE90XS943-O	Installation Complete	10/10/2017	1199 Ball Ave. NE		1.377		1.908		1.191		1.016	N	0.169	In Road	0.281	S	0.206	0.244	0.254
68	7	Mobilitie	Grand Rapids	DE90XT42-A	Installation Complete	12/20/2016	20 Buckley St. SE		0.0344		0.053		0.0265		0.0413	N	0.302	0.306	0.137	S	0.127	0.217	0.334
69	5	Mobilitie	Grand Rapids	DE90XS19-B	Installation Complete	3/6/2017	127 Wealthy St. SE	0.0795	0.0742	0.1113	0.5030	0.2198	0.0763	0.1060	0.0530	E	0.265	0.69	0.625	W	0.981	0.954	0.625
70	889	ACD	Grand Rapids	14353	Permit Approved	5/24/2019	1163 Wealthy St. SE	1.61	0.44	0.78	0.37	1.03	0.55	2.87	0.97	E	0.138	0.196	0.148	W	0.311	0.055	0.085
71	476	ACD	Parks	14354	Permit Approved	12/4/2018	782 Fuller Ave. SE		10.53		5.971		8.791		4.658	N	0.241	0.319	0.209	S	0.244	0.24	0.13

Notes:

- The values are presented as a percentage of 50 watt/meter squared for occupational maximum permissible exposure and 10 watt/meter squared for non-occupational maximum permissible exposure
- Direction refers to measurement parallel to street direction
- Measurement at 6 feet above ground represents pedestrian height
- Above measurements are for active sites as of 8-23-2019

Additional Measurement 8-23-2019		
	at 17ft & 35ft	at 17ft & 35ft
1005 Baldwin St. SE	N 0.1446/0.1653	S 0.1791/0.1240
10 Crescent St. NE	W 0.4414/0.3905	E 0.2962/0.1998
37 Ionia Ave. SW	N 0.0657/0.0782	S 0.0840/0.0813
37 LaGrave Ave. SE	N 0.4051/0.2837	S 0.1009/0.1830
122 Claremont Pl. NE	N 0.1033/0.1240	S 0.0295/0.0875
51 Gay Ave. SE	N 0.1833/0.1579	S 0.2951/0.1759
419 Fountain St. NE	W 0.0758/0.0689	E 0.1033/0.1309
473 Fulton St. E	W 0.2565/0.2864	E 0.5564/0.7790
310 Lafayette Ave. NE	N 0.2819/0.1436	S 0.1102/0.1653
127 Wealthy St. SE	W 0.2703/0.4663	E 0.4186/0.4398

Radio Frequency (RF) Power Density Testing - Occupational														
Max	536	49	4161	162	199	34	5769	177	1.0490	1.0780	1.1180	1.1000	1.0020	1.0630
Min	0.0795	0.0344	0.1113	0.0530	0.0000	0.0000	0.1060	0.0413	0.0160	0.0110	0.0000	0.0160	0.0110	0.0070
Median	16.0500	5.1990	9.4140	2.7030	15.1700	2.1560	14.6300	3.7150	0.1970	0.2810	0.2760	0.2830	0.2390	0.2730
Average	93	10	130	12	39	7	227	13	0.3306	0.3710	0.3924	0.3495	0.3214	0.3232

Measurements at the Banner Arms (% of FCC Occupational)	
2312 Raybrook St NE	1.542
81 Lyon St NW	2.529
243 Michigan St NW	2.048
10 Crescent St NE	1.383
216 N. Division Ave	0.669

Comparison of Maximum Permissible Limits (MPE) vs. Maximum Actual Measurements												
FCC Limits for MPE vs. Actual Measurements				ICNIRP Limits for MPE vs. Actual Measurements >2-300GHz				Canada Limits for MPE vs. Actual Measurements				
Occupational Permissible Limit	5	mW/Cm2	50	W/M2	5	mW/Cm2	50	W/M2	5	mW/Cm2	50	W/M2
General Public Permissible Limit	1	mW/Cm2	10	W/M2	1	mW/Cm2	10	W/M2	1	mW/Cm2	10	W/M2
Max Measurement at 6 Feet Above Ground	0.0559	mW/Cm2	0.559	W/M2	0.0559	mW/Cm2	0.559	W/M2	0.0559	mW/Cm2	0.559	W/M2

International Commission on Non-Ionizing Radiation Protection (ICNIRP)

**Attachment #3 - Radio Frequency (RF) Power Density Testing - Occupational & Non-Occupational**

**City of Grand Rapids/Small Cell Wireless Facilities Radio Frequency (RF) Power Density Testing - Occupational & Non-Occupational**

					Power Density Measurement Conversions (mW/Cm2) for Non-Occupational									Results as Percentage (% of 10 Watts/Meter Squared) of Maximum Permissible Exposure (MPE) for FCC Non-Occupational								
					Measurements at 6 feet above Ground						Measurements at 6 feet above Ground											
Count	OBJECT ID	Small Cell	Pole Owner	Site ID	Direction	Distance from Pole			Direction	Distance from Pole			Direction	Distance from Pole			Direction	Distance from Pole				
						10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.		
1	461	ACD	Grand Rapids	10013	W	0.0095	0.02175	0.0278	E	0.055	0.047	0.0342	W	0.95	2.175	2.78	E	5.5	4.7	3.42		
2	23	ACD	Grand Rapids	10016	W	0.00413	0.008795	0.01754	E	0.00178	0.0461	0.05315	W	0.413	0.8795	1.754	E	0.178	4.61	5.315		
3	37	ACD	Grand Rapids	10022	N	0.01185	0.0167	0.0514	S	0.01275	0.00275	0.0024	N	1.185	1.67	5.14	S	1.275	0.275	0.24		
4	886	ACD	Grand Rapids	10026	E	0.0496	0.0539	0.0046	W	0.01615	0.0017	0.00035	E	4.96	5.39	0.46	W	1.615	0.17	0.035		
5	51	ACD	Grand Rapids	10027	E	0.0069	0.01575	0.054	W	0.00815	0.00965	0.02205	E	0.69	1.575	5.4	W	0.815	0.965	2.205		
6	39	ACD	Grand Rapids	10028	W	0.0045	0.0014	0.0017	E	0.00175	0.0117	0.0151	W	0.45	0.14	0.17	E	0.175	1.17	1.51		
7	50	ACD	Grand Rapids	10030	W	0.01055	0.00885	0.00275	E	0.00935	0.0138	0.01115	W	1.055	0.885	0.275	E	0.935	1.38	1.115		
8	40	ACD	Grand Rapids	10033	N	0.0098	0.00845	0.0076	S	0.00765	0.00835	0.00785	N	0.98	0.845	0.76	S	0.765	0.835	0.785		
9	52	ACD	Grand Rapids	10035	N	0.0388	0.049	0.0471	S	0.03925	0.0167	0.02705	N	3.88	4.9	4.71	S	3.925	1.67	2.705		
10	24	ACD	Grand Rapids	10036	N	0.028	0.0298	0.0379	S	0.01915	0.02905	0.02545	N	2.8	2.98	3.79	S	1.915	2.905	2.545		
11	458	ACD	Grand Rapids	10037	N	0.0062	0.0155	0.01095	S	0.00815	0.0127	0	N	0.62	1.55	1.095	S	0.815	1.27	0		
12	22	ACD	Grand Rapids	10038	E	0.00655	0.00715	0.018	N	0.0191	0.01405	0.0183	E	0.655	0.715	1.8	N	1.91	1.405	1.83		
13	463	ACD	Grand Rapids	10054	E	0.0051	0.00055	0	W	0.00415	0.0045	0.00485	E	0.51	0.055	0	W	0.415	0.45	0.485		
14	35	ACD	Grand Rapids	10057	E	0.00505	0.00555	0.0045	W	0.00585	0.00425	0.00585	E	0.505	0.555	0.45	W	0.585	0.425	0.585		
15	21	ACD	Grand Rapids	10060	E	0.0054	0.00475	0.00555	W	0.01305	0.0053	0.00425	E	0.54	0.475	0.555	W	1.305	0.53	0.425		
16	466	ACD	Grand Rapids	10061	N	0.00135	0.004	0.0053	S	0.00425	0.0047	0.0021	N	0.135	0.4	0.53	S	0.425	0.47	0.21		
17	36	ACD	Grand Rapids	10084	E	0.0031	0.0008	0.0008	W	0.00105	0.0021	0.0024	E	0.31	0.08	0.08	W	0.105	0.21	0.24		
18	25	ACD	Grand Rapids	10090	E	0.0047	0.0026	0.00515	W	0.00455	0.00345	0.0024	E	0.47	0.26	0.515	W	0.455	0.345	0.24		
19	38	ACD	Grand Rapids	10091	N	0.0045	0.0038	0.01535	S	0.0225	0.03075	0.022	N	0.45	0.38	1.535	S	2.25	3.075	2.2		
20	49	ACD	Grand Rapids	14300	N	0.03415	0.0498	0.0323	S	0.0275	0.02445	0.01365	N	3.415	4.98	3.23	S	2.75	2.445	1.365		
21	42	ACD	Grand Rapids	14302	E	0.02185	0.01915	0.0244	W	0.02305	0.01645	0.005	E	2.185	1.915	2.44	W	2.305	1.645	0.5		
22	43	ACD	Grand Rapids	14305	S	0.02735	0.031	0.03205	N	0.0175	0.0239	0.0244	S	2.735	3.1	3.205	N	1.75	2.39	2.44		
23	44	ACD	Grand Rapids	14306	N	0.0358	0.03605	0.0191	S	0.0317	0.00275	0.01375	N	3.58	3.605	1.91	S	3.17	0.275	1.375		
24	47	ACD	Grand Rapids	14307	E	0.0123	0.0106	0.0082	W	0.0031	0.0029	0.00935	E	1.23	1.06	0.82	W	0.31	0.29	0.935		
25	45	ACD	Grand Rapids	14308	N	0.045	0.03845	0.0236	S	0.0296	0.04515	0.0452	N	4.5	3.845	2.36	S	2.96	4.515	4.52		
26	467	ACD	Grand Rapids	14309	E	0.0045	0.0074	0.0294	W	0.02545	0.0093	0.00035	E	0.45	0.74	2.94	W	2.545	0.93	0.035		
27	464	ACD	Grand Rapids	14317	N	0.0183	0.01695	0.01245	S	0.0109	0.0183	0.0127	N	1.83	1.695	1.245	S	1.09	1.83	1.27		
28	34	ACD	Grand Rapids	14323	N	0.0159	0.012	0.0088	S	0.01515	0.01565	0.01695	N	1.59	1.2	0.88	S	1.515	1.565	1.695		
29	475	ACD	Grand Rapids	14350	N	0.01795	0.0114	0.01195	S	0.02635	0.0061	0.0143	N	1.795	1.14	1.195	S	2.635	0.61	1.43		
30	27	ACD	Grand Rapids	16401	N	0.02075	0.01055	0.0118	S	0.0203	0.0224	0.02175	N	2.075	1.055	1.18	S	2.03	2.24	2.175		
31	26	ACD	Grand Rapids	16402	N	0.0357	0.04485	0.04455	S	0.0384	0.03815	0.0334	N	3.57	4.485	4.455	S	3.84	3.815	3.34		
32	29	ACD	Grand Rapids	16701	N	0.0458	0.0498	0.0444	S	0.0352	0.0208	0.03575	N	4.58	4.98	4.44	S	3.52	2.08	3.575		
33	896	ACD	Consumers	16702	N	0.0058	0.04	0.02515	S	0.0008	0.00055	0.0138	N	0.58	4	2.515	S	0.08	0.055	1.38		
34	31	ACD	Grand Rapids	16703	N	0.0522	0.0488	0.04635	S	0.0505	0.04905	0.04395	N	5.22	4.88	4.635	S	5.05	4.905	4.395		
35	32	ACD	Grand Rapids	16704	N	0.05245	0.03605	0.0485	S	0.04655	0.02995	0.031	N	5.245	3.605	4.85	S	4.655	2.995	3.1		
36	33	ACD	Grand Rapids	16705	N	0.02915	0.0305	0.02625	S	0.0359	0.0372	0.03505	N	2.915	3.05	2.625	S	3.59	3.72	3.505		
37	904	AT&T	Grand Rapids	GRRPD 010	E	0.0114	0.01775	0.0363	W	0.03685	0.0501	0.0485	E	1.14	1.775	3.63	W	3.685	5.01	4.85		
38	465	AT&T	Grand Rapids	GRRPD 011	E	0.0135	0.0131	0.0082	W	0.02065	0.0244	0.0062	E	1.35	1.31	0.82	W	2.065	2.44	0.62		
39	899	AT&T	Grand Rapids	GRRPD 012	N	0.0114	0.00505	0.0019	S	0.0103	0.01575	0.01005	N	1.14	0.505	0.19	S	1.03	1.575	1.005		
40	900	AT&T	Grand Rapids	GRRPD 013	E	0.01115	0.0185	0.0142	W	0.0085	0.0037	0.0049	E	1.115	1.85	1.42	W	0.85	0.37	0.49		
41	56	AT&T	Grand Rapids	GRRPD 018	E	0.02705	0.013	0.0241	W	0.01595	0.03365	0.03945	E	2.705	1.3	2.41	W	1.595	3.365	3.945		
42	462	AT&T	Grand Rapids	GRRPD 030	W	0.03045	0.02065	0.0093	E	0.00885	0.00665	0	W	3.045	2.065	0.93	E	0.885	0.665	0		
43	9	Mobilite	Grand Rapids	DE90XS1YC-D	N	0.0045	0.0056	0.0053	S	0.00455	0.00405	0.0105	N	0.45	0.56	0.53	S	0.455	0.405	1.05		
44	16	Mobilite	Grand Rapids	DE90XS1YQ-D	N	0.0175	0.01485	0.01375	S	0.0135	0.00875	0.02515	N	1.75	1.485	1.375	S	1.35	0.875	2.515		
45	457	Mobilite	Grand Rapids	DE90XS1YR-D	W	0.00985	0.00515	0.0299	E	0.015	0.0114	0.03285	W	0.985	0.515	2.99	E	1.5	1.14	3.285		
46	17	Mobilite	Grand Rapids	DE90XS1YS-E	SE	0.00715	0.0265	0.00555	NW	0.018	0.0175	0.01325	SE	0.715	2.65	0.555	NW	1.8	1.75	1.325		



**Attachment #3 - Radio Frequency (RF) Power Density Testing - Occupational & Non-Occupational**

**City of Grand Rapids/Small Cell Wireless Facilities Radio Frequency (RF) Power Density Testing - Occupational & Non-Occupational**

					Power Density Measurement Conversions (mW/Cm2) for Non-Occupational									Results as Percentage (% of 10 Watts/Meter Squared) of Maximum Permissible Exposure (MPE) for FCC Non-Occupational						
					Measurements at 6 feet above Ground						Measurements at 6 feet above Ground									
Count	OBJECT ID	Small Cell	Pole Owner	Site ID	Direction	Distance from Pole			Direction	Distance from Pole			Direction	Distance from Pole			Direction	Distance from Pole		
						10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.		10 ft.	50 ft.	100 ft.
47	2	Mobilitie	Grand Rapids	DE90XS1YT-A	E	0.03765	0.0278	0.0031	W	0.0196	0.0085	0.01695	E	3.765	2.78	0.31	W	1.96	0.85	1.695
48	4	Mobilitie	Grand Rapids	DE90XS1YV-F	E	0.0082	0.00225	0.02385	W	0.02015	0.01705	0.01405	E	0.82	0.225	2.385	W	2.015	1.705	1.405
49	14	Mobilitie	Grand Rapids	DE90XS1YW-I	E	0.0401	0.0311	0.02465	W	0.01325	0.0077	0.01645	E	4.01	3.11	2.465	W	1.325	0.77	1.645
50	18	Mobilitie	Grand Rapids	DE90XS1ZA-B	E	0.00745	0.0032	0.00475	W	0.00285	0.00105	0.0029	E	0.745	0.32	0.475	W	0.285	0.105	0.29
51	58	Mobilitie	Grand Rapids	DE90XS1ZB-C	E	0.0088	0.0116	0.00935	W	0.01855	0.01445	0.0162	E	0.88	1.16	0.935	W	1.855	1.445	1.62
52	59	Mobilitie	Grand Rapids	DE90XS1ZG-F	N	0.0072	0.01265	0.01895	S	0.011	0.0045	0.0048	N	0.72	1.265	1.895	S	1.1	0.45	0.48
53	12	Mobilitie	Grand Rapids	DE90XS1ZL-F	E	0.00505	0.0082	0.0098	W	0.01035	0.0074	0.0093	E	0.505	0.82	0.98	W	1.035	0.74	0.93
54	11	Mobilitie	Grand Rapids	DE90XS1ZP-E	E	0.00715	0.02095	0.0498	W	0.0114	0.0069	0.0024	E	0.715	2.095	4.98	W	1.14	0.69	0.24
55	53	Mobilitie	Grand Rapids	DE90XS1ZQ-E	N	0.0077	0.02675	0.02145	S	0.01695	0.00135	0.00555	N	0.77	2.675	2.145	S	1.695	0.135	0.555
56	54	Mobilitie	Grand Rapids	DE90XS1ZT-C	E	0.0085	0.01085	0.0138	W	0.0061	0.0069	0.0029	E	0.85	1.085	1.38	W	0.61	0.69	0.29
57	6	Mobilitie	Grand Rapids	DE90XS1ZU-A	E	0.0157	0.01325	0.0074	W	0.00795	0.01195	0.013	E	1.57	1.325	0.74	W	0.795	1.195	1.3
58	3	Mobilitie	Grand Rapids	DE90XS1ZV-A	N	0.0069	0.01085	0.0104	S	0.0127	0.01085	0.0138	N	0.69	1.085	1.04	S	1.27	1.085	1.38
59	55	Mobilitie	Grand Rapids	DE90XS1ZW-C	N	0.0008	0.0029	0.0066	S	0.00205	0.0031	0.00275	N	0.08	0.29	0.66	S	0.205	0.31	0.275
60	454	Mobilitie	Grand Rapids	DE90XS497-C	N	0.00515	0.01615	0.02705	S	0.02285	0.01615	0.02465	N	0.515	1.615	2.705	S	2.285	1.615	2.465
61	13	Mobilitie	Grand Rapids	DE90XS501-F	N	0.00685	0.00555	0.01115	S	0.0014	0.0061	0.0027	N	0.685	0.555	1.115	S	0.14	0.61	0.27
62	60	Mobilitie	Grand Rapids	DE90XS502-G	E	0.0086	0.0077	0.00585	W	0.00415	0.00735	0.00515	E	0.86	0.77	0.585	W	0.415	0.735	0.515
63	19	Mobilitie	CE	DE90XS503-E	E	0.0014	0.0007	0.00415	W	0.01415	0.0135	0.00555	E	0.14	0.07	0.415	W	1.415	1.35	0.555
64	10	Mobilitie	Grand Rapids	DE90XS504-A	E	0.0519	0.05235	0.0549	W	0.03125	0.0403	0.03235	E	5.19	5.235	5.49	W	3.125	4.03	3.235
65	453	Mobilitie	Grand Rapids	DE90XS518-D	N	0.00225	0.0188	0.0559	S	0.0445	0.0326	0.01325	N	0.225	1.88	5.59	S	4.45	3.26	1.325
66	15	Mobilitie	Grand Rapids	DE90XS521-D	N	0.04615	0.0467	0.04425	S	0.0322	0.0302	0.0169	N	4.615	4.67	4.425	S	3.22	3.02	1.69
67	455	Mobilitie	Grand Rapids	DE90XS943-O	N	0.00845	0	0.01405	S	0.0103	0.0122	0.0127	N	0.845	0	1.405	S	1.03	1.22	1.27
68	7	Mobilitie	Grand Rapids	DE90XS142-A	N	0.0151	0.0153	0.00685	S	0.00635	0.01085	0.0167	N	1.51	1.53	0.685	S	0.635	1.085	1.67
69	5	Mobilitie	Grand Rapids	DE90XS19-B	E	0.01325	0.0345	0.03125	W	0.04905	0.0477	0.03125	E	1.325	3.45	3.125	W	4.905	4.77	3.125
70	889	ACD	Grand Rapids	14353	E	0.0069	0.0098	0.0074	W	0.01555	0.00275	0.00425	E	0.69	0.98	0.74	W	1.555	0.275	0.425
71	476	ACD	Parks	14354	N	0.01205	0.01595	0.01045	S	0.0122	0.012	0.0065	N	1.205	1.595	1.045	S	1.22	1.2	0.65

Radio Frequency (RF) Power Density Testing - Non-Occupational												
Max	0.0525	0.0539	0.0559	0.0550	0.0501	0.0532	5.2450	5.3900	5.5900	5.5000	5.0100	5.3150
Min	0.0008	0.0000	0.0000	0.0008	0.0006	0.0000	0.0800	0.0000	0.0000	0.0800	0.0550	0.0000
Median	0.0099	0.0133	0.0138	0.0142	0.0120	0.0133	0.9850	1.3250	1.3800	1.4150	1.1950	1.3250
Average	0.0165	0.0183	0.0196	0.0175	0.0161	0.0157	1.6531	1.8288	1.9618	1.7473	1.6070	1.5706

Measurement Parameters			
Instrument: Narda NBM-550-S with FCC probe #EA5091			
Measurements made at 6 feet above ground at 10 feet, 50 feet and 100 feet from the pole/cell base			
Measurements are broadband base and account for radio frequencies ranging from 300KHz to 50GHz			
Maximum Permissible Exposure (MPE) Power Densities in Watts/Meter Squared			
	FCC (1.5-100GHz)	INCIRP (2-300GHz)	Canada (6-150GHz)
Occupational	50	50	50
General Public	10	10	10