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July 27, 2015

EX PARTE VIA ECFS

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Expanding the Economic and Innovation Opportunities of Spectrum through Incentive Auctions, GN Docket No. 12-268, AU Docket No. 14-252;

Dear Ms. Dortch:

In order to better understand the incentive auction simulation data that the Commission released on May 20, 2015 and July 10, 2015,[1] AT&T has conducted an analysis of impairments that will be caused by the in-band broadcasters in the Commission's Scenario 1 results (allowing use of the duplex gap) using the ISIX methodology. This ex parte will outline that analysis and provide observations and results.

ISIX analysis:

To conduct the ISIX analysis of in-band impairments, we used the FCC's TVStudy program and the FCC's ISIX methodology, specifying use of the F(50,50) curves as per the Public Notice and not the F(50,10) curves noted in the TVStudy instructions. Using these tools, the goal was to measure and report on the ISIX impairments caused by the 13 in-band stations in the proposed approach allowing duplex gap impairments for an 84 MHz band plan, which assumed in-band stations in the following DMAs: Harlingen TX, Los Angeles CA, Harrisburg PA, Madison WI, Buffalo NY, Milwaukee WI, Flint MI, San Diego CA, Syracuse NY and Wilkes-Barre PA.

The FCC did not identify the specific TV stations proposed in each market for in-band placement, so we selected "median" stations in the relevant DMAs. More

[1] "Incentive Auction Task Force Releases Initial Clearing Target Optimization Simulations," *Public Notice*, DA 15-606, AU Docket No. 14-252, GN Docket 12-268 (May 20, 2015); Letter from Gary M. Epstein, Chair, Incentive Auction Task Force, to Marlene H. Dortch, Secretary, Federal Communications Commission, GN Docket No. 12-268 (dated July 10, 2015).

specifically, looking at only non-participating stations in the identified DMAs,[2] we identified a station with engineering specifications that was neither at the high end, nor at the low end, of the stations in the market.

The station actually assigned in-band by the FCC may cause greater or lesser impairments than the station we selected, depending on geography and actual power levels of the station's operations. Indeed, while our results align closely with the published FCC results for the top 20 markets, there are some differences likely driven by power/geography differences in the stations assigned by the FCC (which have not been revealed) and the stations we selected for assignment.

To account for border restraints, we used the ISIX impairments for the Canadian border region that we previously developed as part of AT&T's international impairments study. Consistent with the assumptions in the July 10 letter, we considered only operating television stations in Canada and used the F(50,50) curves for the interference analysis. As per the assumptions in the July 10 letter, we did not import any impairment results for the Mexican border region.

Results of ISIX analysis:

The results of our analysis can be seen in the Summary page attached and in the pages that follow that provide a map-based view of the impairments for each individual block of an 84 MHz band plan. Note our results identify Category 1 impairments with impairments above zero. This produces some notable differences from the FCC's results. For example, the FCC's results show only two impaired blocks in Seattle. Our results suggest that every block in Seattle will be impaired to some degree – two blocks with Category 2 impairments and five blocks with Category 1 impairments.

The purpose of this analysis is to illustrate the full extent of the impairments (including Category 1 impairments) as measured by the ISIX methodology that will be present in-band if the FCC proceeds with the impairment threshold as currently proposed. As we have long argued, and as we now demonstrate with this summary, we believe the proposed level of impairment is unacceptable and will produce substantial and, in the case of non-border impairments, long-lasting if not permanent impairments. We have also indicated the degree to which each market contributes to the aggregate impairment threshold to understand the differences between market-specific impairment contributions on a weighted POPs basis.

[2] While the analysis attempted to duplicate the selection of nonparticipating stations identified by the FCC, the details of the FCC's selection methods were not specified (e.g., formula for estimating TV enterprise value from revenue). Accordingly, while AT&T's selection of nonparticipating stations falls within the general percentages shown in the July 10 letter, the AT&T's list may differ markedly from the FCC's.

Measuring Real World Device Impacts:

As AT&T has argued in this record, the impairments caused by in-band TV stations can, in the real world, go well beyond the impacts studied and measured by the ISIX tool, which is simply an impairment proxy. ISIX only measures impairments within 5 MHz of the channel's edge. Real world deployments don't recognize such limitations.[3]

This is particularly true with interference from DTV channels in the downlink band into the device receiver. Modern interoperable devices are capable of receiving signals across 4 to 5 LTE blocks in one pass band of the duplexer and high power TV transmissions into any open LTE block is likely to cause interference into all open blocks within a single duplexer.[4] There is currently no way to mediate this type of impact on all blocks within a single duplexer.

Therefore, AT&T conducted a second study to attempt to quantify these incremental downlink impairments. In this study, we assumed that the 84 MHz band would be deployed with two overlapping duplexers with 4 blocks in each pass band and that the presence of an interferer in the duplexer band would impair ALL blocks (not just the blocks measured by ISIX) using that duplexer. For example, because mobile Block A is 9 MHz away from TV Channel 41, ISIX completely ignores any impact to Block A from TV Channel 41 However, 5 MHz of TV Channel 41 would directly overlap the passband of a typical downlink receiver designed to cover mobile Blocks A-D.

The results show significant additional impairments in all markets and in many adjacent markets where the FCC has elected to assign a station in or within 5 MHz of the downlink passband—this would include impacts from TV Channels 38-41 into an A/B/C/D block duplexer and TV Channels 39-46 into a D/E/F/G block duplexer. See attached summary entitled "Summary Including Full Device Impacts." Taking this impact into account, for example, would result in all 7 blocks in Los Angeles being unusable rather than only the 5 blocks identified by ISIX. Indeed, as a percentage of total nationwide impairment, the FCC's 84 MHz scenario 1 would go from 13.24% aggregate impairment to over 18%.

Because ISIX will not measure interference effects more than 5 MHz away from the band edge of a TV channel, and does not account for the additional interference to

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[3] AT&T's study was not able to factor in the FCC's determination that the 600 MHz downlink requires 7-11 MHz of separation from television stations, because TVStudy/ISIX only extends to overlaps of + or -5 MHz. Taking into account all interference to mobile downlink from TV stations—i.e. including interference to blocks more than 5 MHz from a TV station (which ISIX overlooks entirely)--would more accurately reflect the impairments in the mobile band, which ISIX understates. See *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12-268 (June 2, 2014) at ¶¶ 87-93. AT&T's study also is conservative in that it is not able to separate the impact of receiver rejection from the impact of the mask for television out-of-band emissions in the field strengths employed as thresholds for ISIX in Case 2, which means that ISIX assumes TV channels overlapping the passband will be subject to attenuation that does not exist for real world operations.

[4] The details on duplexer arrangement for a given band plan will not be finalized by 3GPP until after the auction.

other blocks in a pass band duplexer from signal overload to any block in the passband, such downlink impairments will not be identified by the FCC as potential impairments at auction. But bidders will have to evaluate such impacts and factor them into their bidding strategies and valuations.

AT&T continues to urge the Commission to cap total permissible nationwide in-band impairments (AT&T proposed 3 percent), disregarding whatever levels are calculated for cross-border interference. This will facilitate reasonable national clearing targets while restraining incremental impairments that, unlike international impairments, will persist indefinitely.

In accordance with the Commission's rules, this letter is being filed electronically with the Secretary for inclusion in the public record.

Sincerely,

Joan Marsh

cc: Incentive Auction Task Force

Summary of ISIX Impairments

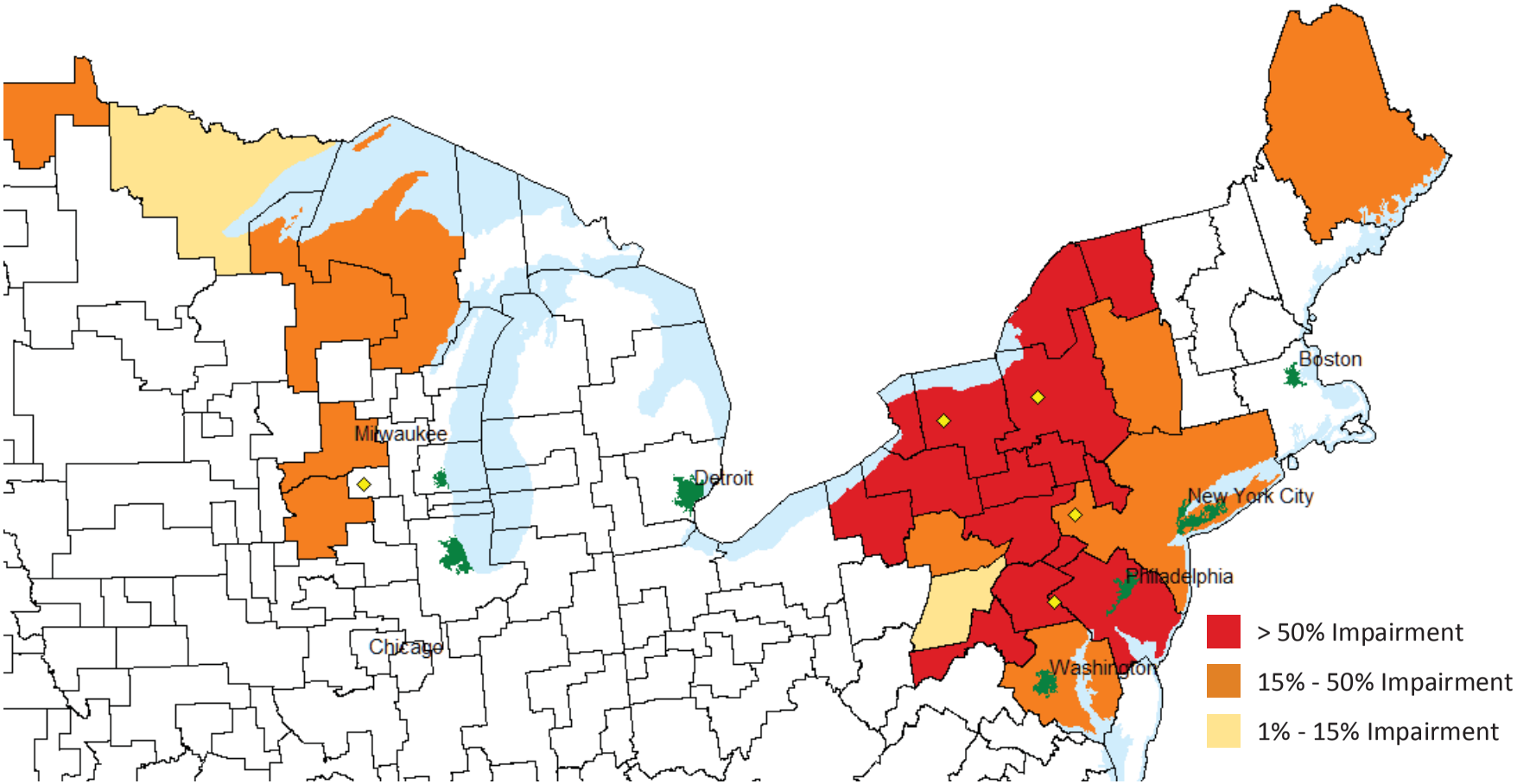
PEA No.	PEA Name	A	B	C	D	E	F	G	% of US Wtd POPs
1	New York, NY	15-50%	1-15%						0.70%
2	Los Angeles, CA	50%+	50%+	50%+	50%+	50%+			6.12%
3	Chicago, IL						1-15%	50%+	0.57%
5	Baltimore, MD-Washington, DC	15-50%							0.14%
6	Philadelphia, PA	50%+	15-50%						0.61%
12	Detroit, MI		1-15%	50%+	50%+	50%+	50%+	50%+	1.71%
14	Cleveland, OH		15-50%	50%+	50%+	50%+	1-15%	1-15%	0.32%
16	Seattle, WA	1-15%	1-15%	1-15%	50%+	50%+	1-15%	1-15%	0.55%
18	San Diego, CA	50%+	50%+	50%+	50%+	50%+			1.02%
23	Pittsburgh, PA			15-50%	15-50%	15-50%			0.04%
34	Fresno, CA	50%+	15-50%						0.06%
38	Milwaukee, WI						50%+	50%+	0.21%
41	Syracuse, NY	50%+	50%+	15-50%	50%+	50%+	50%+	50%+	0.13%
44	Rochester, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.20%
47	Brownsville, TX			50%+	50%+	50%+	50%+		0.06%
48	Harrisburg, PA	50%+	15-50%						0.02%
49	Albany, NY	15-50%							0.00%
54	Buffalo, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.02%
56	Kalamazoo, MI						15-50%	50%+	0.03%
61	Toledo, OH			50%+	50%+	50%+			0.03%
66	Lansing, MI			50%+	50%+	50%+	50%+	50%+	0.18%
68	Grand Rapids, MI						50%+	50%+	0.09%
76	Reno, NV	1-15%	1-15%						0.00%
77	Portland, ME					1-15%	1-15%	1-15%	0.00%
81	Saginaw, MI		1-15%	50%+	50%+	50%+	50%+	50%+	0.17%
88	Frederick, MD	50%+							0.03%
107	Bangor, ME	15-50%	15-50%	15-50%	15-50%	15-50%	15-50%	15-50%	0.00%
113	Erie, PA	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.01%
116	Rockford, IL						15-50%	50%+	0.05%
121	Altoona, PA	1-15%							0.00%
122	Madison, WI						50%+	50%+	0.03%
123	Mansfield, OH			50%+	50%+	50%+			0.02%
132	Corpus Christi, TX				1-15%	1-15%			0.00%
136	Williamsport, PA	50%+	50%+						0.06%
138	Burlington, VT		50%+	50%+	50%+	50%+	50%+	50%+	0.04%
141	Brainerd, MN					1-15%	15-50%	15-50%	0.01%
143	Keene, NH		15-50%	15-50%	15-50%	15-50%	15-50%	15-50%	0.08%

PEA No.	PEA Name	A	B	C	D	E	F	G	% of US Wtd POPs
148	Bellingham, WA	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.14%
153	Fond du Lac, WI						50%+	50%+	0.04%
155	Appleton, WI						50%+	50%+	0.02%
157	Yuma, AZ	15-50%	50%+	50%+	15-50%	15-50%			0.08%
160	Victoria, TX				1-15%	1-15%			0.00%
172	Duluth, MN	1-15%			1-15%	1-15%	15-50%	15-50%	0.00%
185	Marquette, MI	15-50%	1-15%		15-50%	15-50%		1-15%	0.02%
188	Jamestown, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.01%
190	Bozeman, MT	1-15%	1-15%						0.00%
194	State College, PA	15-50%	15-50%	15-50%					0.01%
201	Eagle Pass, TX				1-15%	1-15%			0.00%
203	Traverse City, MI						1-15%	15-50%	0.00%
209	Green Bay, WI							50%+	0.01%
210	Binghamton, NY	50%+	50%+						0.01%
223	Dubuque, IA	15-50%						1-15%	0.00%
224	De Kalb, IL							50%+	0.01%
227	Watertown, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.02%
253	Baraboo, WI	15-50%					15-50%	50%+	0.01%
254	Merrill, WI	15-50%			15-50%	15-50%			0.01%
260	Alpena, MI						1-15%	1-15%	0.00%
267	Sheboygan, WI						50%+	50%+	0.02%
269	Racine, WI						50%+	50%+	0.02%
271	Elmira, NY	50%+	50%+		15-50%	15-50%			0.01%
283	Plattsburgh, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.01%
287	Kenosha, WI						50%+	50%+	0.02%
296	Pottsville, PA	50%+	50%+						0.02%
303	Great Falls, MT	15-50%							0.00%
318	Thief River Falls, MN	15-50%		1-15%	50%+	50%+	50%+	50%+	0.00%
322	Minot, ND	50%+	1-15%	1-15%	50%+	50%+	50%+	50%+	0.01%
324	Honesdale, PA	50%+	50%+						0.01%
329	Kingsville, TX			1-15%	50%+	50%+	1-15%		0.00%
336	Grand Forks, ND						50%+	50%+	0.00%
351	Dickinson, ND	15-50%			1-15%	1-15%	1-15%	1-15%	0.00%
354	New London, WI							50%+	0.00%
387	Wahpeton, ND				1-15%	1-15%	1-15%	1-15%	0.00%
395	Jamestown, ND	15-50%			15-50%	15-50%	15-50%	15-50%	0.00%
									13.24%

1-15% Impairment
15-50% Impairment
50%+ Impairment

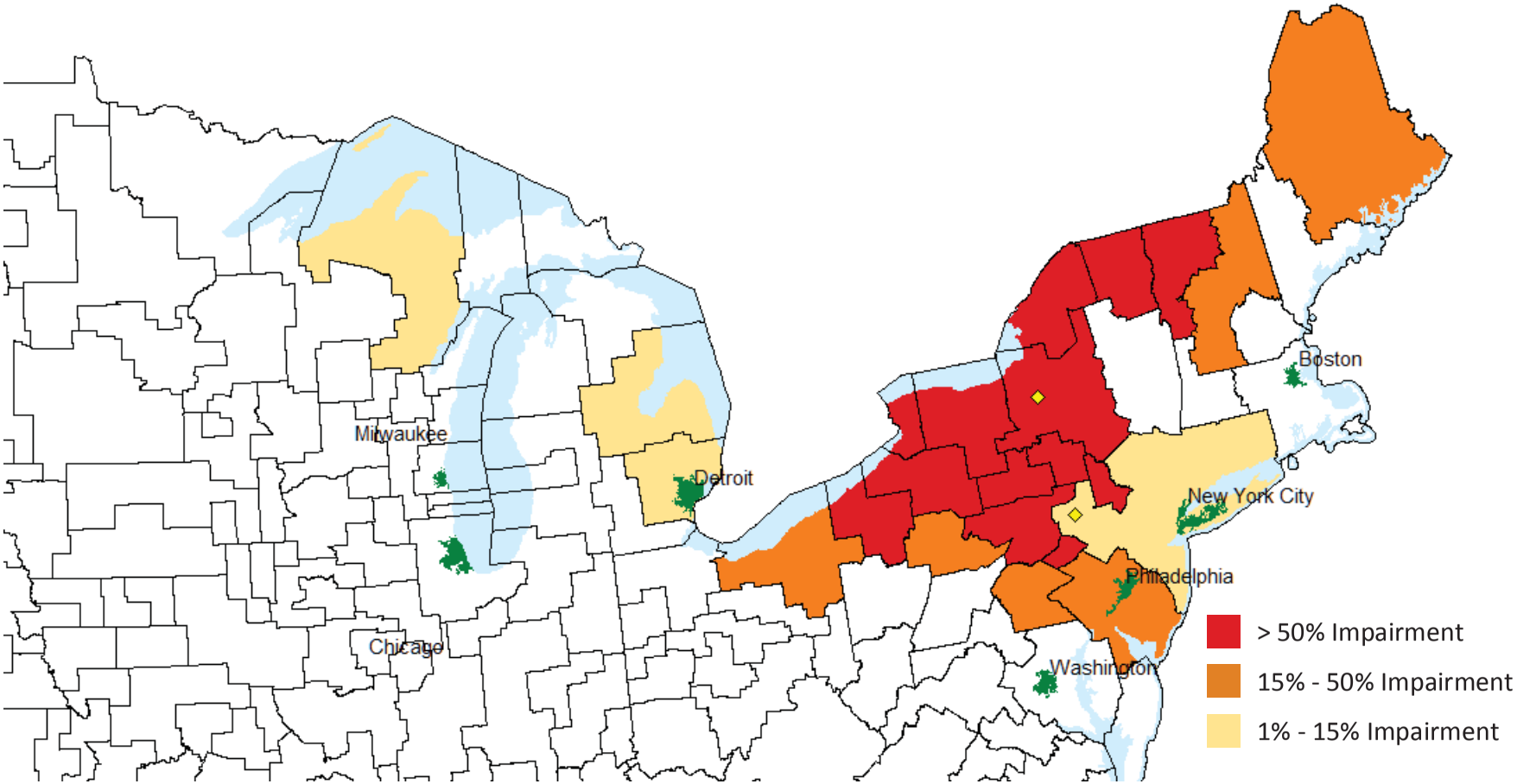
Northeast - Block A

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



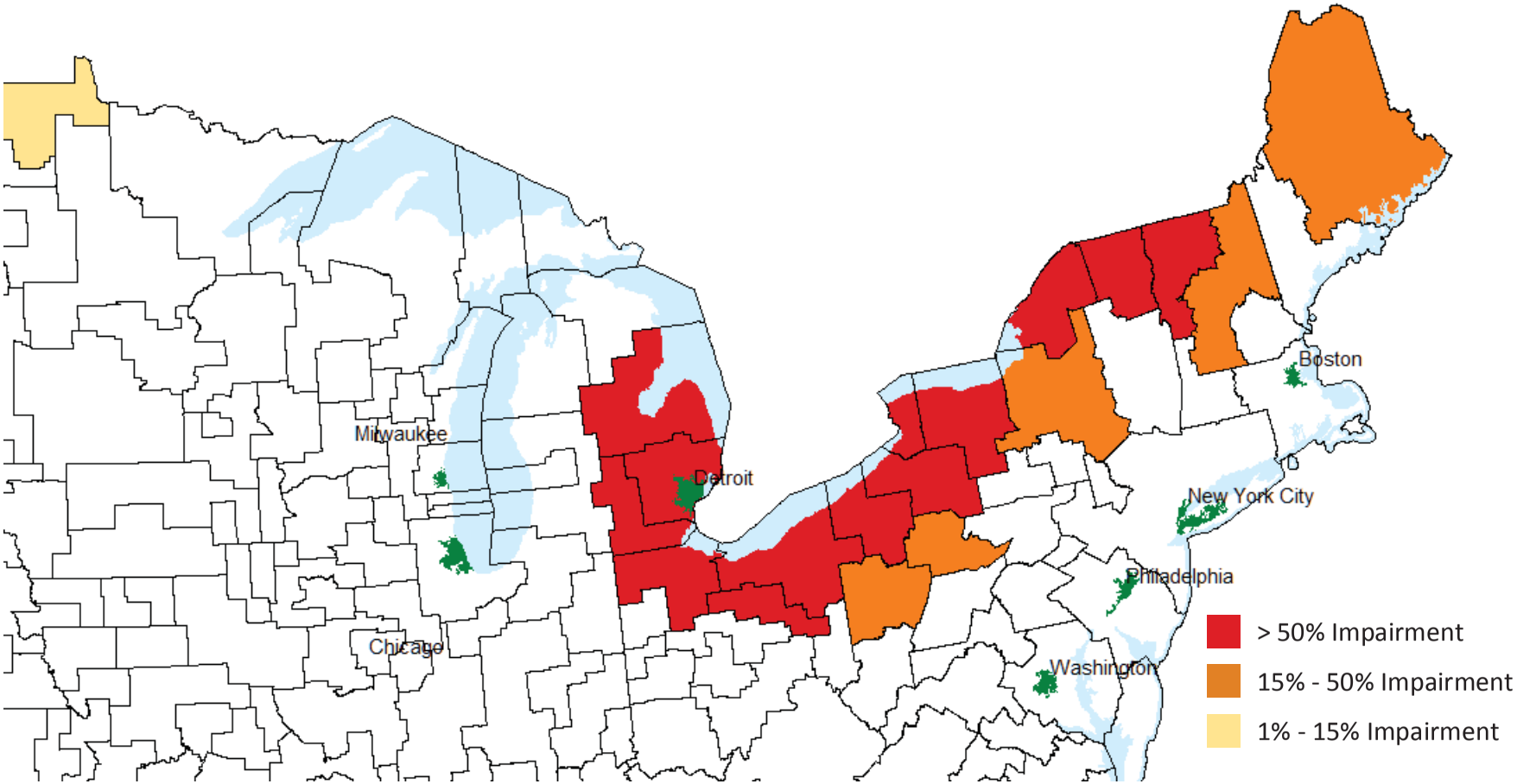
Northeast - Block B

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



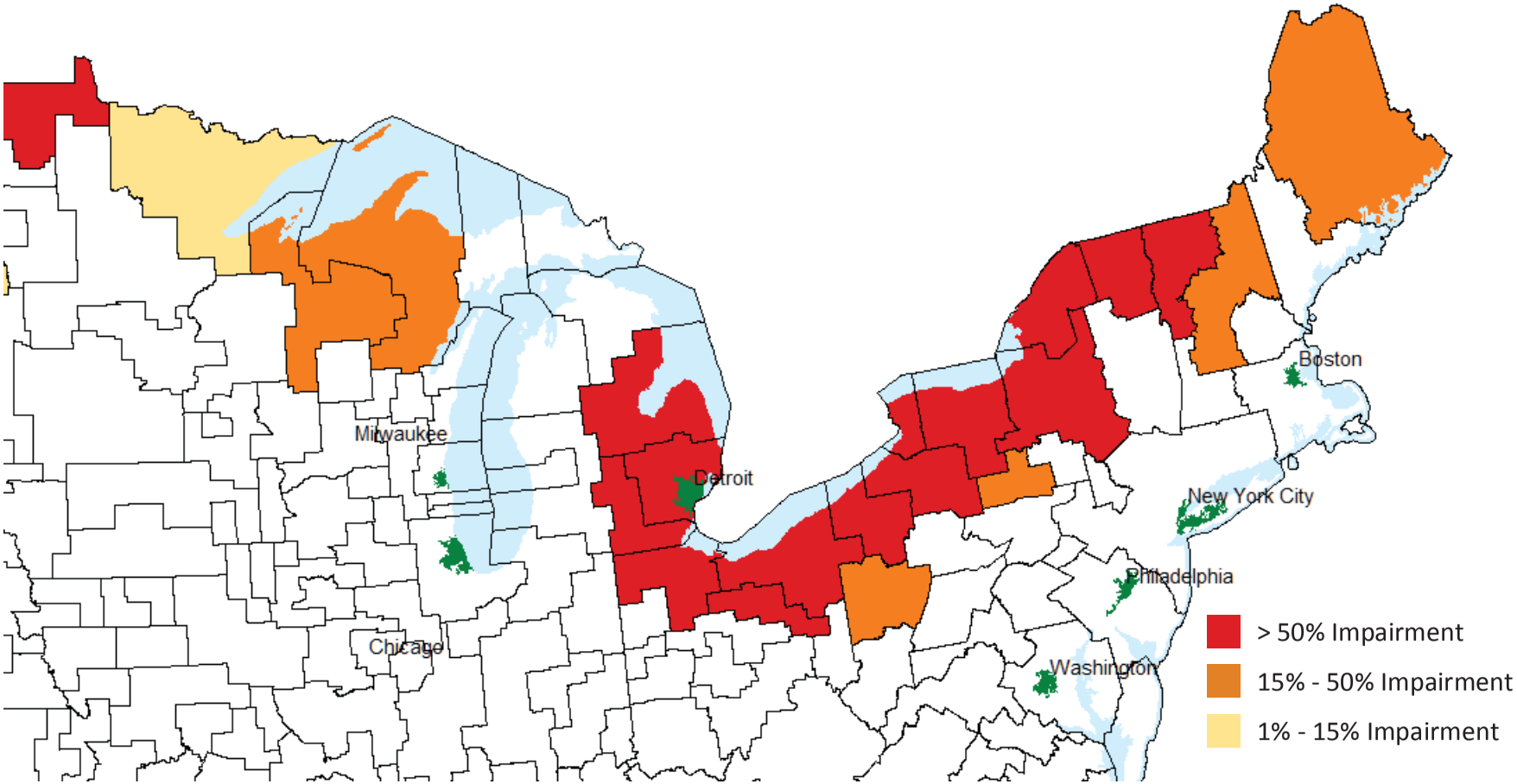
Northeast - Block C

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



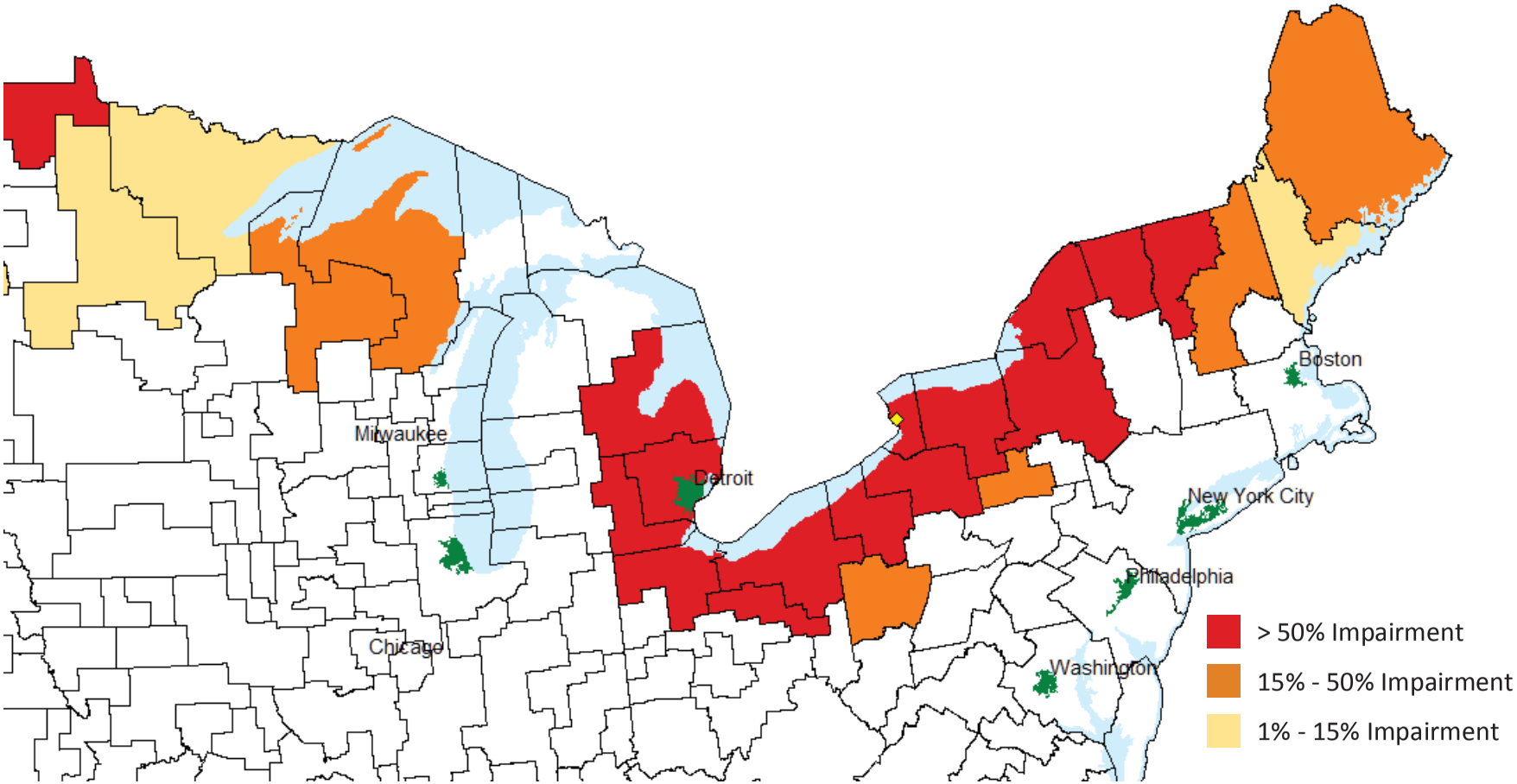
Northeast - Block D

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



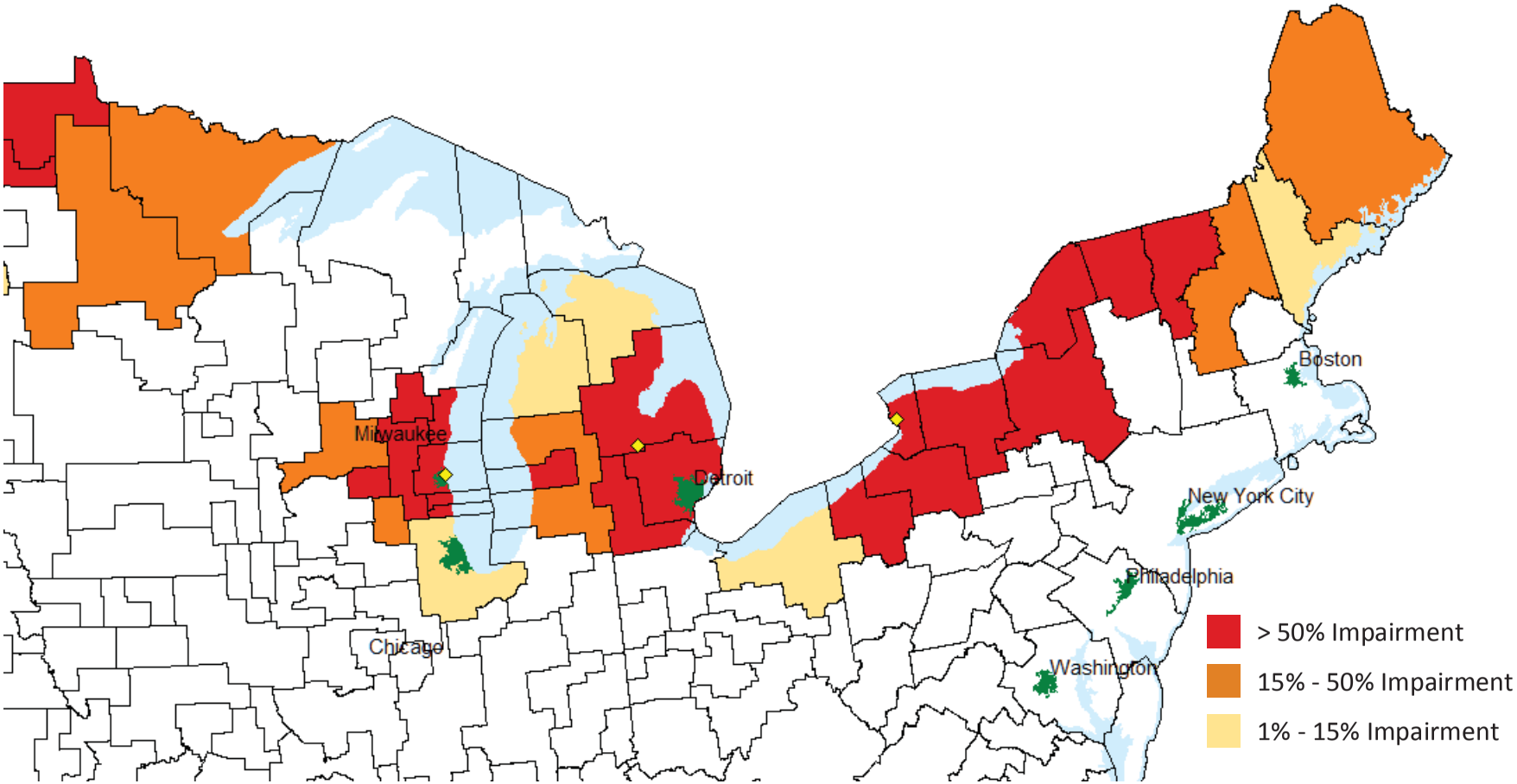
Northeast - Block E

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



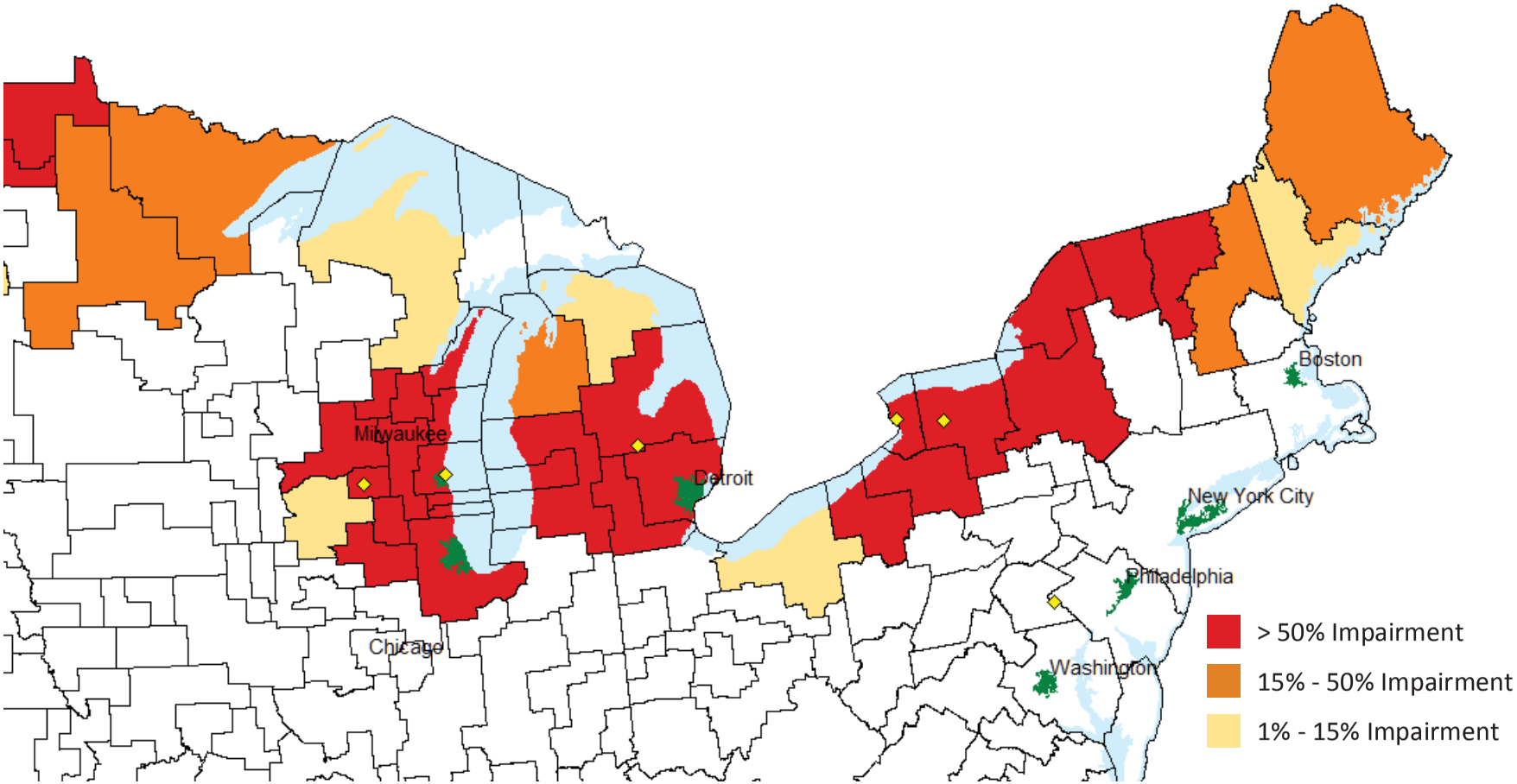
Northeast - Block F

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



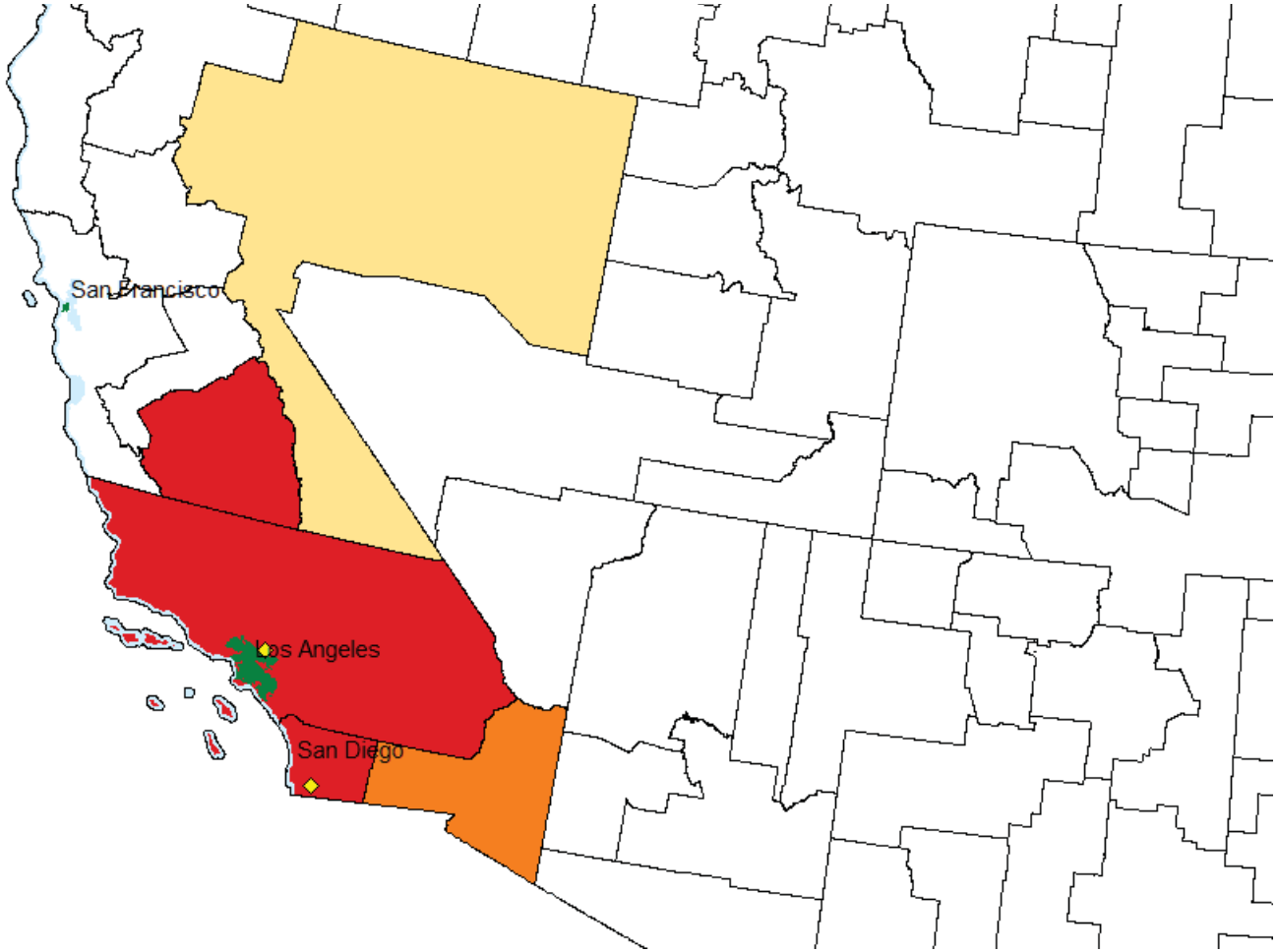
Northeast - Block G

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



Pacific - Block A

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



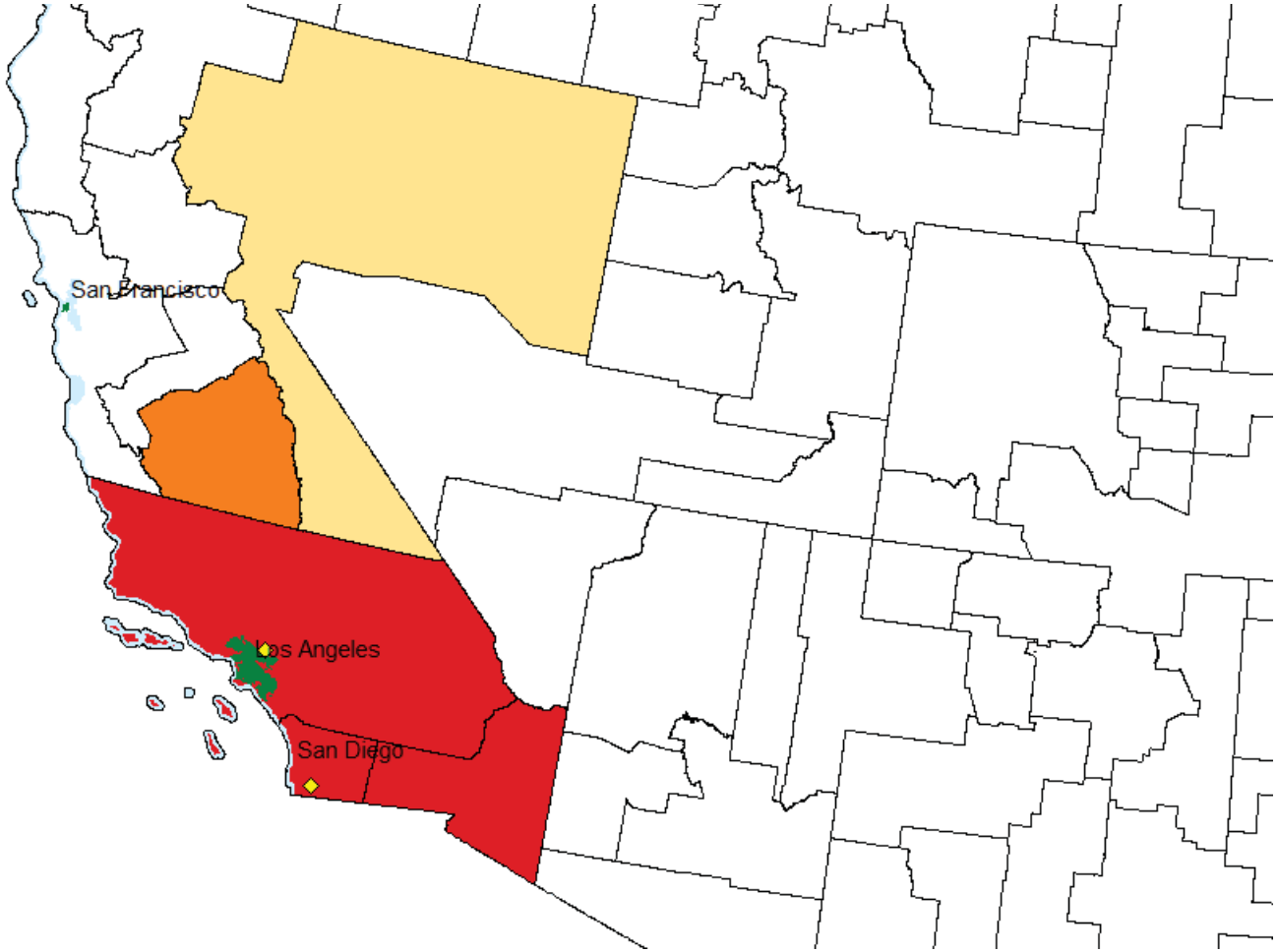
> 50% Impairment

15% - 50% Impairment

1% - 15% Impairment

Pacific - Block B

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



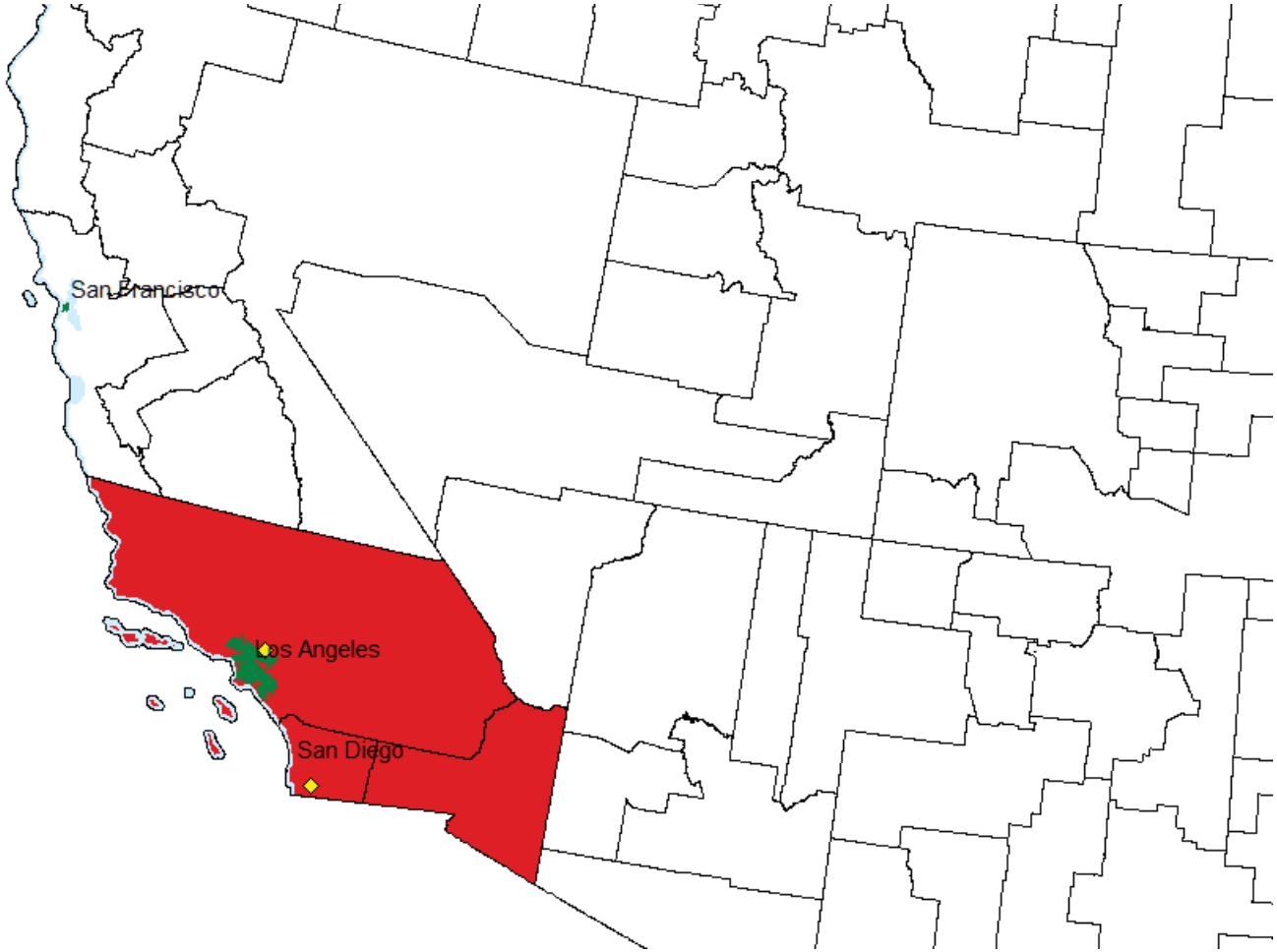
> 50% Impairment

15% - 50% Impairment

1% - 15% Impairment

Pacific - Block C

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



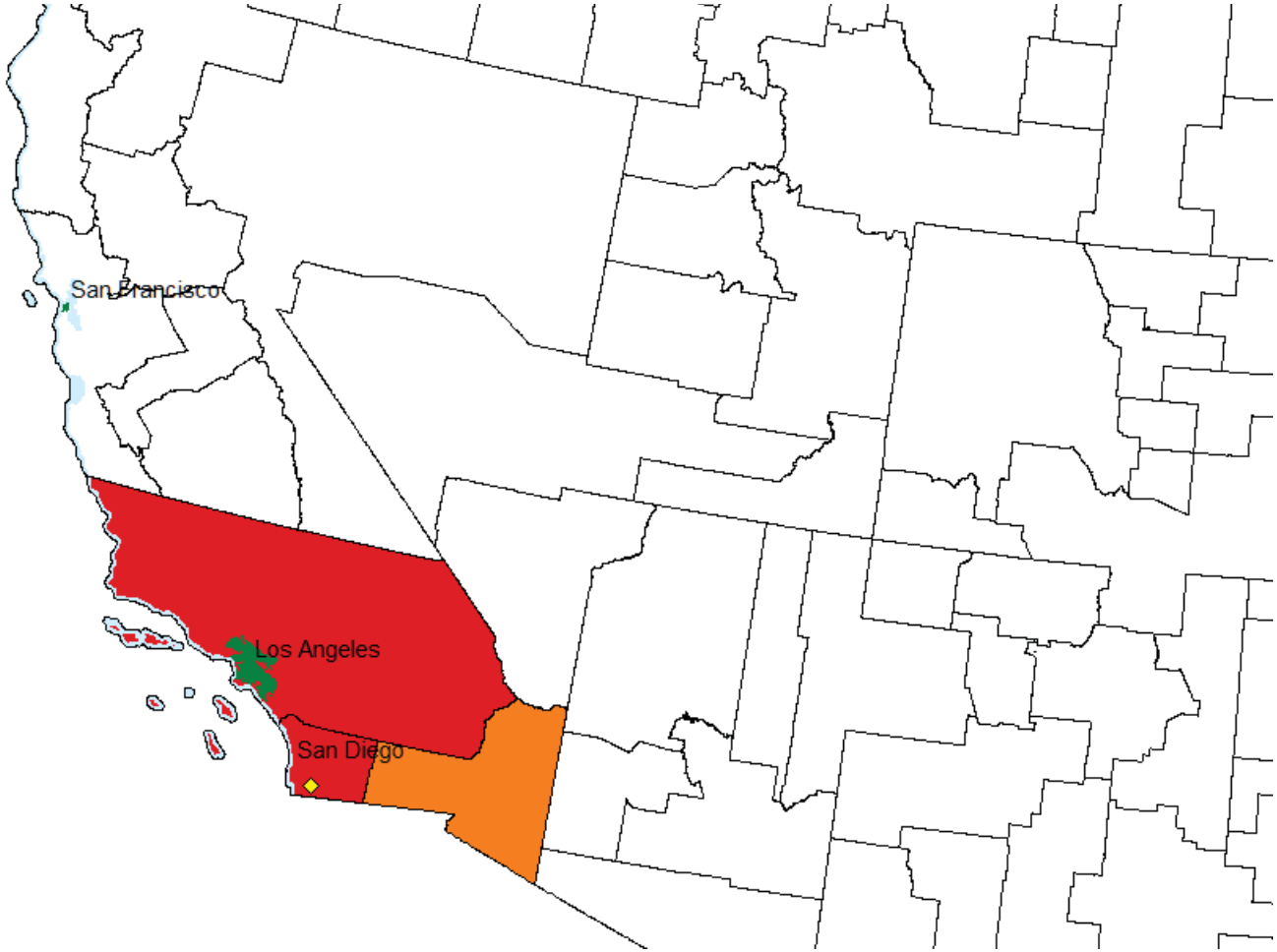
> 50% Impairment

15% - 50% Impairment

1% - 15% Impairment

Pacific - Block D

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



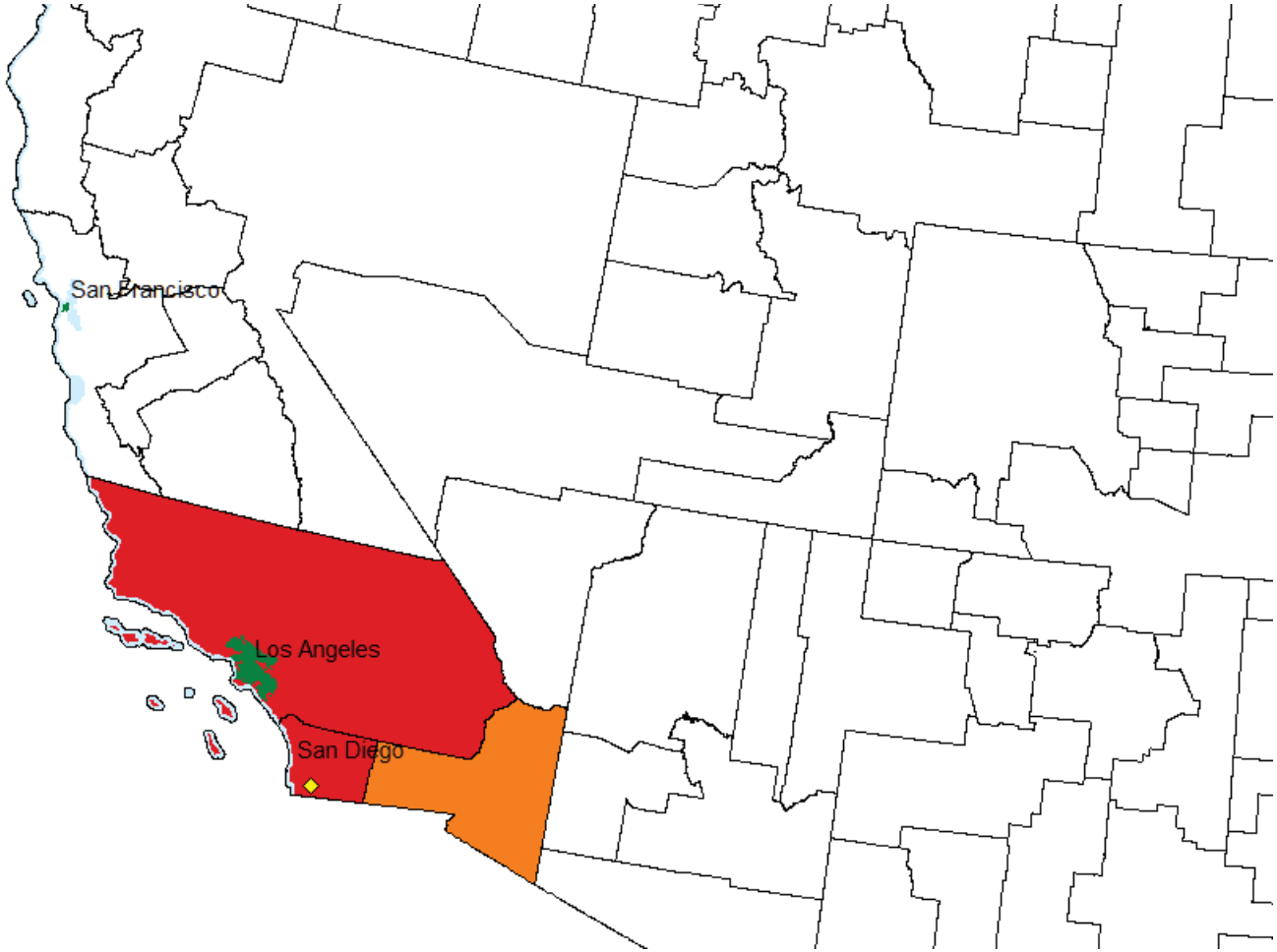
> 50% Impairment

15% - 50% Impairment

1% - 15% Impairment

Pacific - Block E

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G



> 50% Impairment

15% - 50% Impairment

1% - 15% Impairment

Pacific - Block F

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G

> 50% Impairment

15% - 50% Impairment

1% - 15% Impairment

Pacific - Block G

TV CH	38	39	40	41	42	43	44	45	46	47	48	49	50	51
84 MHz Plan	GB	A	B	C	D	E	F	G	GB	A	B	C	D	E	F	G

> 50% Impairment

15% - 50% Impairment

1% - 15% Impairment

Summary Including Full Device Impacts

PEA No.	PEA Name	A	B	C	D	E	F	G	% of US Wtd POPs
1	New York, NY	15-50%	15-50%	15-50%					1.54%
2	Los Angeles, CA	50%+	50%+	50%+	50%+	50%+	50%+	50%+	8.38%
3	Chicago, IL					50%+	50%+	50%+	1.52%
5	Baltimore, MD-Washington, DC	15-50%							0.14%
6	Philadelphia, PA	50%+	50%+	50%+					1.35%
12	Detroit, MI		1-15%	50%+	50%+	50%+	50%+	50%+	1.71%
14	Cleveland, OH		15-50%	50%+	50%+	50%+	1-15%	1-15%	0.32%
16	Seattle, WA	1-15%	1-15%	1-15%	50%+	50%+	1-15%	1-15%	0.55%
18	San Diego, CA	50%+	50%+	50%+	50%+	50%+	50%+	50%+	1.43%
23	Pittsburgh, PA			15-50%	15-50%	15-50%			0.04%
34	Fresno, CA	50%+	50%+	50%+					0.13%
38	Milwaukee, WI					50%+	50%+	50%+	0.31%
41	Syracuse, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.14%
44	Rochester, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.20%
47	Brownsville, TX			50%+	50%+	50%+	50%+		0.06%
48	Harrisburg, PA	50%+	50%+	50%+					0.04%
49	Albany, NY	15-50%	15-50%	15-50%					0.01%
54	Buffalo, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.02%
56	Kalamazoo, MI					50%+	50%+	50%+	0.05%
61	Toledo, OH			50%+	50%+	50%+			0.03%
66	Lansing, MI			50%+	50%+	50%+	50%+	50%+	0.19%
68	Grand Rapids, MI					50%+	50%+	50%+	0.13%
76	Reno, NV	1-15%	1-15%	1-15%					0.00%
77	Portland, ME					1-15%	1-15%	1-15%	0.00%
81	Saginaw, MI		1-15%	50%+	50%+	50%+	50%+	50%+	0.18%
88	Frederick, MD	50%+							0.03%
107	Bangor, ME	15-50%	15-50%	15-50%	15-50%	15-50%	15-50%	15-50%	0.00%
113	Erie, PA	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.01%
116	Rockford, IL					50%+	50%+	50%+	0.10%
121	Altoona, PA	1-15%	1-15%	1-15%					0.00%
122	Madison, WI					50%+	50%+	50%+	0.05%
123	Mansfield, OH			50%+	50%+	50%+			0.02%
132	Corpus Christi, TX				1-15%	1-15%			0.00%
136	Williamsport, PA	50%+	50%+	50%+					0.09%
138	Burlington, VT	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.05%
141	Brainerd, MN					1-15%	15-50%	15-50%	0.01%
143	Keene, NH	15-50%	15-50%	15-50%	15-50%	15-50%	15-50%	15-50%	0.09%

PEA No.	PEA Name	A	B	C	D	E	F	G	% of US Wtd POPs
148	Bellingham, WA	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.14%
153	Fond du Lac, WI					50%+	50%+	50%+	0.06%
155	Appleton, WI					50%+	50%+	50%+	0.03%
157	Yuma, AZ	50%+	50%+	50%+	15-50%	15-50%	15-50%	15-50%	0.12%
160	Victoria, TX				1-15%	1-15%			0.00%
172	Duluth, MN	1-15%			1-15%	1-15%	15-50%	15-50%	0.00%
185	Marquette, MI	15-50%	1-15%		15-50%	15-50%	1-15%	1-15%	0.02%
188	Jamestown, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.01%
190	Bozeman, MT	1-15%	1-15%						0.00%
194	State College, PA	15-50%	15-50%	15-50%					0.01%
201	Eagle Pass, TX				1-15%	1-15%			0.00%
203	Traverse City, MI					15-50%	15-50%	15-50%	0.00%
209	Green Bay, WI					50%+	50%+	50%+	0.02%
210	Binghamton, NY	50%+	50%+	50%+					0.01%
223	Dubuque, IA	15-50%				1-15%	1-15%	1-15%	0.01%
224	De Kalb, IL					50%+	50%+	50%+	0.04%
227	Watertown, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.02%
253	Baraboo, WI	15-50%				50%+	50%+	50%+	0.02%
254	Merrill, WI	15-50%			15-50%	15-50%			0.01%
260	Alpena, MI					1-15%	1-15%	1-15%	0.00%
267	Sheboygan, WI					50%+	50%+	50%+	0.03%
269	Racine, WI					50%+	50%+	50%+	0.02%
271	Elmira, NY	50%+	50%+	50%+	15-50%	15-50%			0.01%
283	Plattsburgh, NY	50%+	50%+	50%+	50%+	50%+	50%+	50%+	0.01%
287	Kenosha, WI					50%+	50%+	50%+	0.03%
296	Pottsville, PA	50%+	50%+	50%+					0.03%
303	Great Falls, MT	15-50%							0.00%
318	Thief River Falls, MN	15-50%		1-15%	50%+	50%+	50%+	50%+	0.00%
322	Minot, ND	50%+	1-15%	1-15%	50%+	50%+	50%+	50%+	0.01%
324	Honesdale, PA	50%+	50%+	50%+					0.02%
329	Kingsville, TX			1-15%	50%+	50%+	1-15%		0.00%
336	Grand Forks, ND						50%+	50%+	0.00%
351	Dickinson, ND	15-50%			1-15%	1-15%	1-15%	1-15%	0.00%
354	New London, WI					50%+	50%+	50%+	0.01%
387	Wahpeton, ND				1-15%	1-15%	1-15%	1-15%	0.00%
395	Jamestown, ND	15-50%			15-50%	15-50%	15-50%	15-50%	0.00%
									18.10%

1-15% Impairment
15-50% Impairment
50%+ Impairment