# Analysis of Canadian Wireless Spectrum Auctions

## Licence Ownership in the 700MHz, 2500MHz and 3500MHz Frequency Ranges

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# Overview

- Why this work matters
- Overview of spectrum auctions in Canada
- Questions about the state of licences
- Analysis and findings based on auction analysis
- Conclusions and recommendations

# Background

…in three easy pieces!

# The first piece

- Access to high-speed broadband (50Mbps download) outside urban areas is limited to 39% of rural households (CRTC, 2017)
- For 31% of rural households, fixed wireless internet (<25Mbps download) is the *only* viable option (CRTC, 2017)
  - "Practical" satellite service is only available for 1.5% of Canadian households
- Basic Services Objective intends to have 50Mbps download target  met for 90% of households by 2021 with remaining households covered in the following 10-15 years (CRTC, 2016)

# The second piece

- Outside urban areas, fibre optic and cable deployments are not sustainable (Adria & Brown, 2012; Rajabiun & Middleton, 2014)
- Wireless technologies can be used to provide services to end users and to “backhaul” connections to fibre-optic connection points
  - E.g. point-to-point 4G-LTE & microwave technologies

# The third piece

- Innovation, Science and Economic Development (ISED) Canada controls access to wireless spectrum and licences it to service providers
- Since 1999, access to licences has been provided by holding auctions (Taylor, 2012)

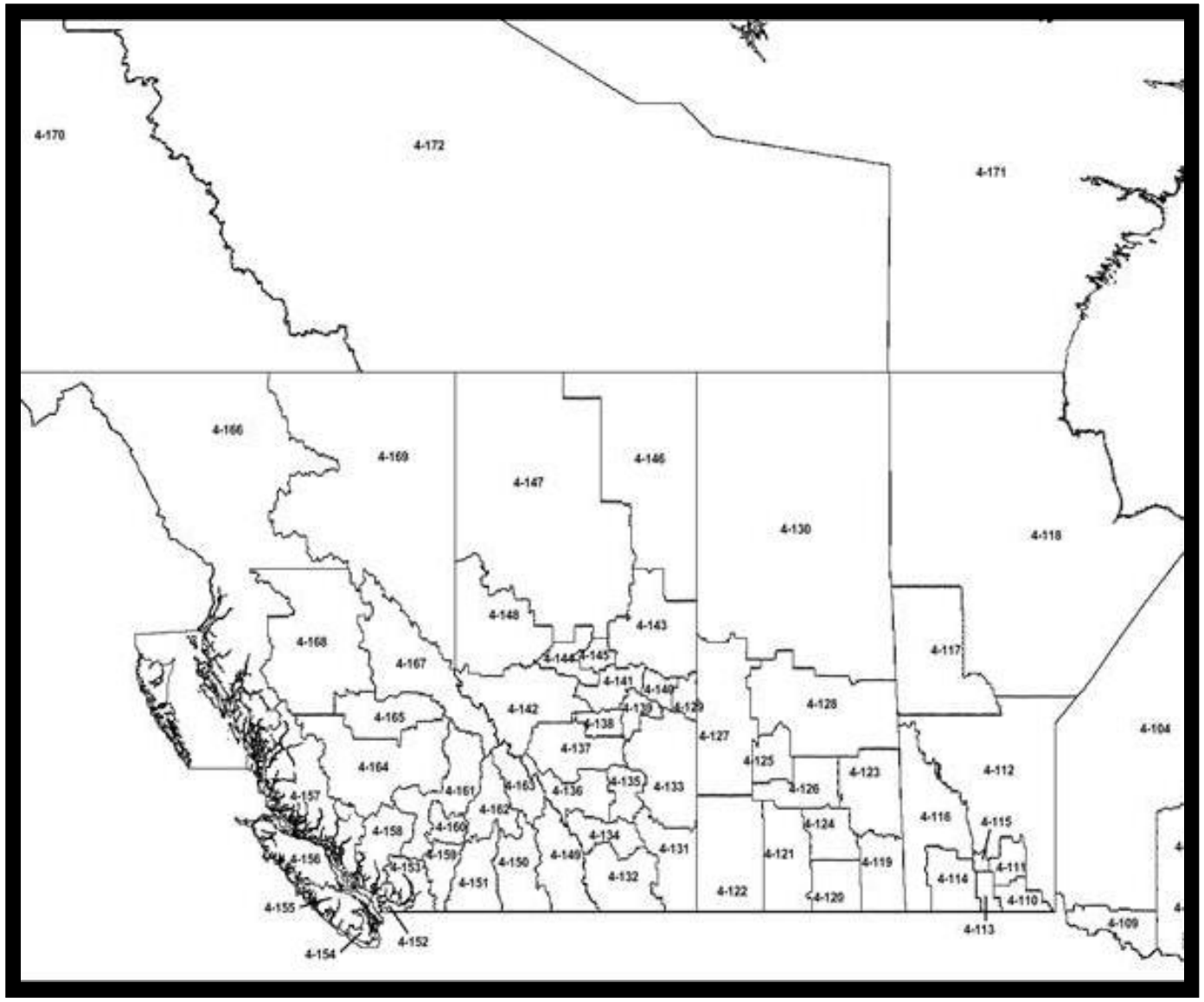
# Putting the three pieces together:

High-speed broadband access
for rural and remote Canadians
depends on a service provider's ability
to procure and use
wireless spectrum licences.

# Auctions

# From deficit to opportunity

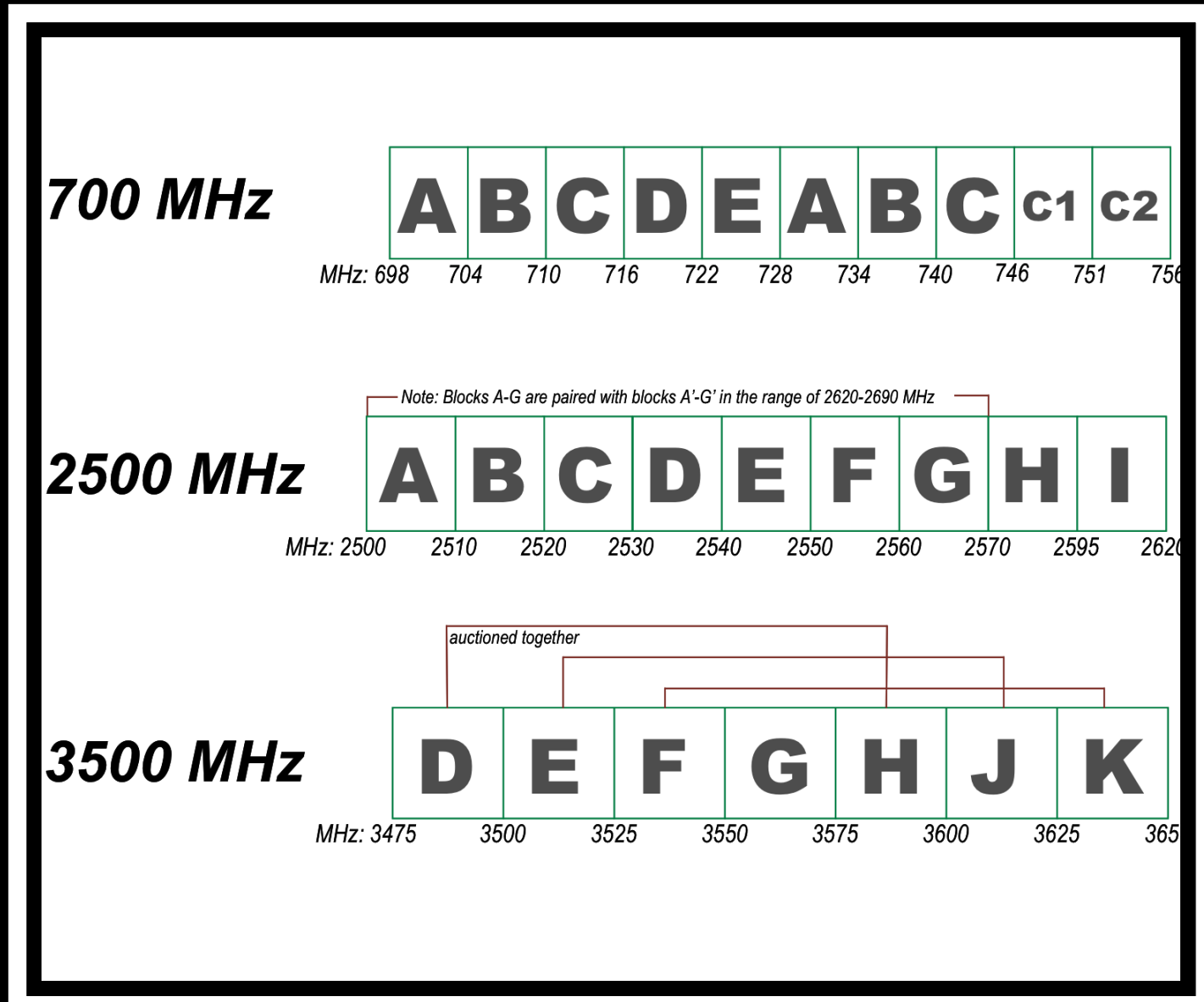
- Licences used to be awarded in “beauty contests”
- 1996 Budget Act allowed Industry Canada (now ISED) to pursue auctions, following examples in USA and elsewhere
- Eleven auctions have been held since 1999
- All auction proceeds go to General Revenue: $14 billion raised to date (ISED Canada, 2007; Longford, 2011; Taylor, 2013)
- ISED Canada data from 2010 showed 81% of all spectrum licences were in the hands of large incumbents
- Small providers are most likely to provide services in rural areas (Winseck, 1998) but have limited access to licences (Middleton & Van Gorp, 2009)




# Licence Areas

## Tier 4 example, Western Canada (ISED Canada, 2017)

- 700MHz uses Tier 2
- 2500 MHz uses Tiers 3 and 4
- 3500MHz uses Tier 4




# Licence Blocks

700 MHz, 2500 Mhz and 3500 Mhz

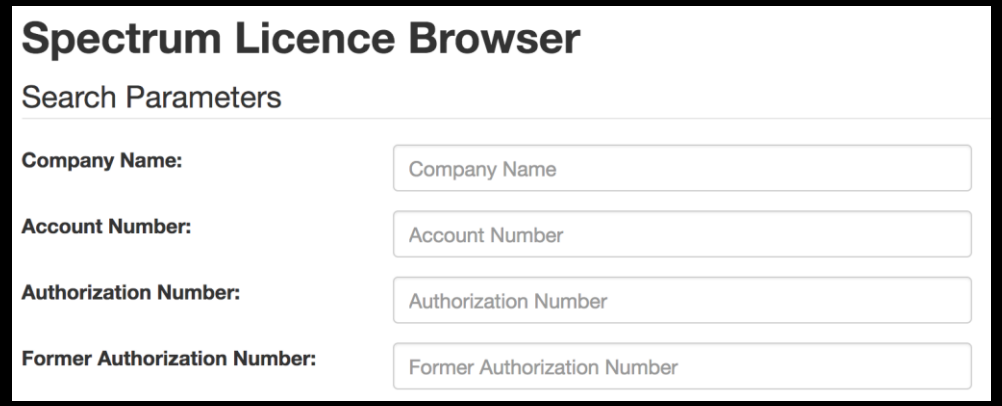
# The Research

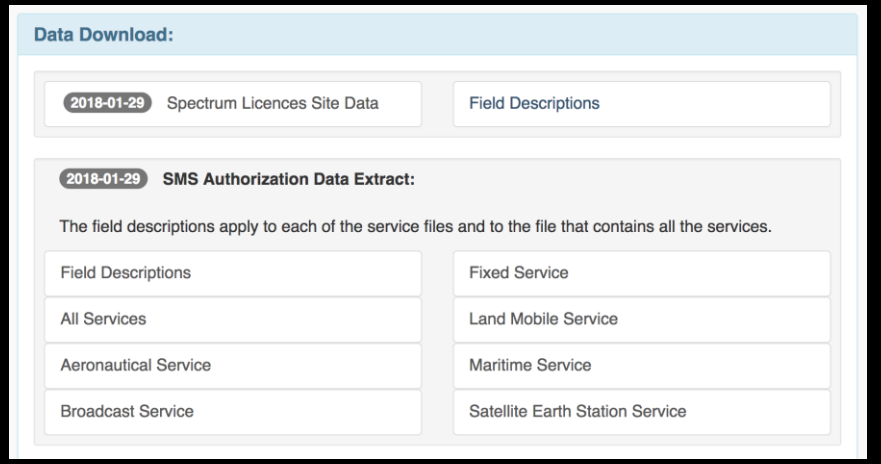
# Key questions for 700MHz, 2500MHz and 3500MHz auctions

- What portion of wireless spectrum licences were won by Canada's major ISPs or their subsidiaries?
- What portion of these licences are still held by major ISPs?
- Where licences were won by small or new providers, how often were those companies later acquired or subsumed?
- Is there evidence to suggest that ISED Canada's auction design choices led to decreased market concentration for wireless spectrum?

# Methodology

- Data sources
  - ISED Canada website (auction designs and winner information)
  - Corporate info from CRTC, Financial Post, Bloomberg, and other web sources
  - Spectrum Licence Browser
  - Spectrum Management System



# Methodology *(cont'd)*

- Data cleaned and normalized with OpenRefine; stored in DataVerse (Joseph, 2017)
- Spreadsheets and SQL processing used to link original auction winners to current equipment deployments

# Findings

# Inconsistent ISED Canada Data

- Auction results presented inconsistently
- Auction data includes frequency block information, but licence browser and spectrum management system data does not

| | Tier Data | Region | Frequency | Block Data | Owner Info | Licence Number |
|---|---|---|---|---|---|---|
| **Auction Winners** | Yes | Yes | Yes | Yes | Yes | |
| **Licence Browser** | Yes | Yes | Yes | | Yes | Yes |
| **Spectrum Mgmt** | Yes | Yes | Yes | | Yes | Yes |

# Auction Winners and Licence Holders

| Frequency | Auction Winners | Current Licence Holders | Current Licence Users |
|---|---|---|---|
| 700 Mhz | 8 | 9 | 9 |
| 2500 Mhz | 9 | 10 | 10 |
| 3500 Mhz | 33 | 19 | 8 |
| All 7 auctions | 41 | 25 | 18 |

- 27 companies only ever won licences at one auction; incumbent providers dominate auction participation
- 3500 MHz analysis hindered by inability to link more than 300 licences to current owners

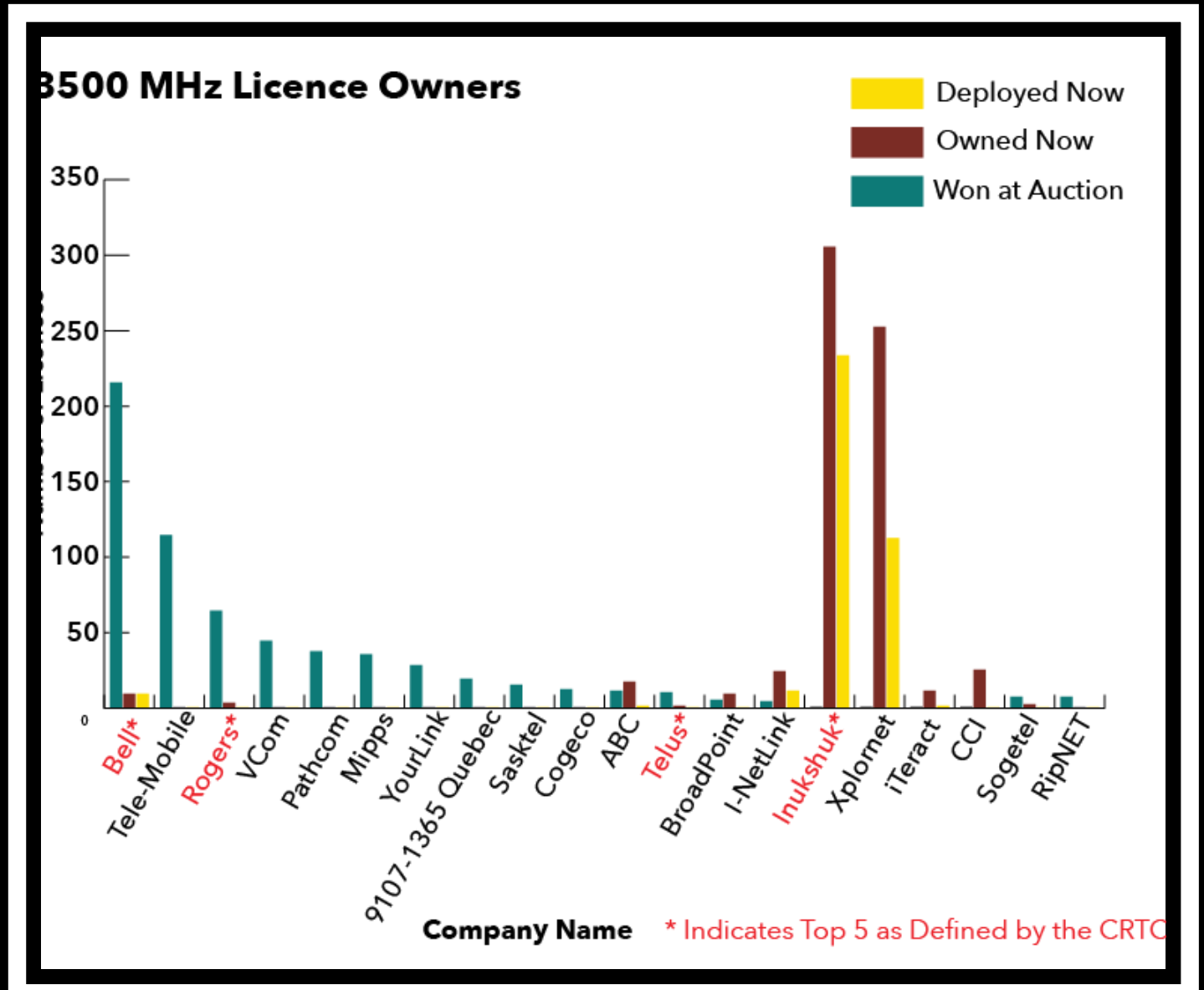
# Mergers and acquisitions

| Original Company | New Owner | Year of acquisition |
|---|---|---|
| Amtelecom | Bragg / Eastlink | 2016 |
| Chatham Internet Access | Xplornet | 2015 |
| Wind (now Freedom) | Shaw | 2016 |
| Mipps, Inc | Primus (acquired by Birch in 2016) | 2003 |
| MTS | Bell, with some services and subscribers distributed to Telus and Xplornet | 2017 |
| RIPNet | Xplornet | 2011 |
| Source Cable & Wireless | Rogers | 2014 |
| Telecom Ottawa | Atria (acquired by Rogers in 2010) | 2008 |
| Xcelco | Bragg / Eastlink | unknown |

# Licences held by Top 5 service providers

| | Won at Auction | Currently Owned | Linked to Current Deployments |
|---|---|---|---|
| 700 MHz | 92.78% | 92.78% | 92.75% |
| 2500 MHz | 76.74% | 77.08% | 97.83% |
| 3500 Mhz | 59.53% | 46.97% | 72.62% |

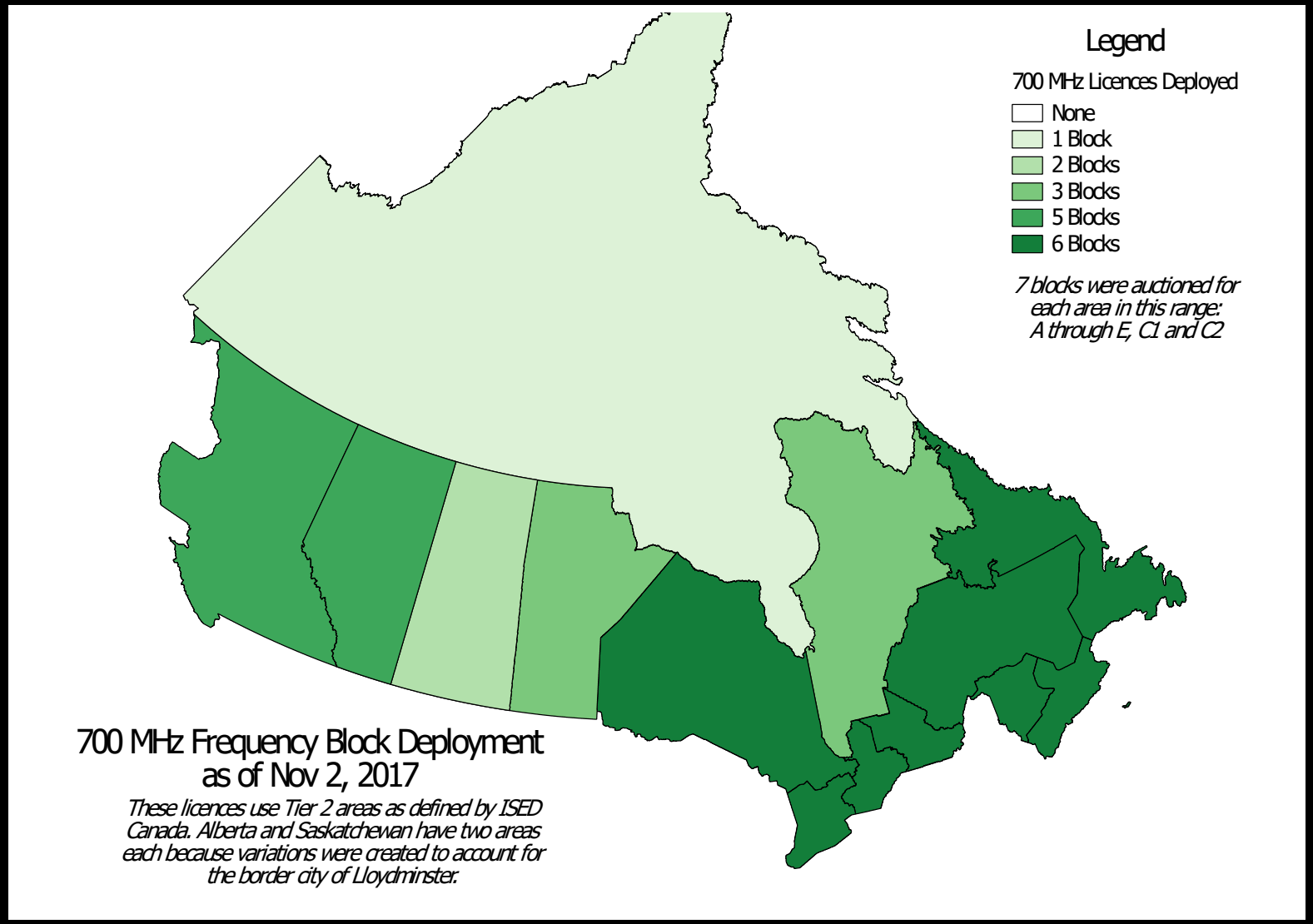
- The following companies are currently listed as Canada's Top 5: Group Bell, Group Quebecor, Group Rogers, Group Shaw and Group TELUS (CRTC, 2017)
- Few 700 MHz and 2500 MHz licences have changed hands (20 year licence terms)
- For 3500 MHz, 366 licences were seen to move. 48 went from independents to Top 5, and 40 went the other way. Most are being traded among smaller ISPs.



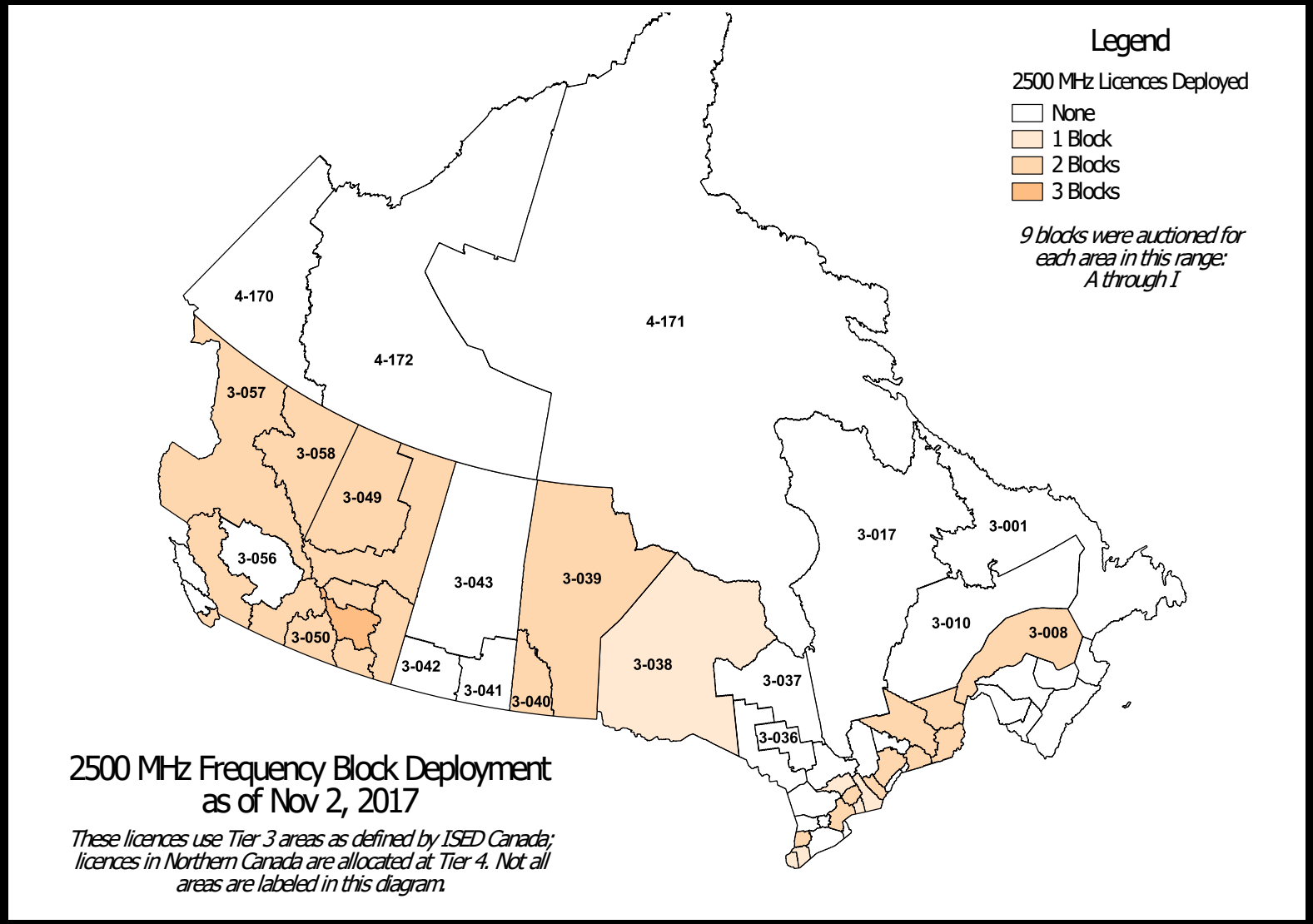

# Distribution of 3500 MHz licences

83% are owned by Inukshuk (Rogers/Bell partnership) and Xplornet

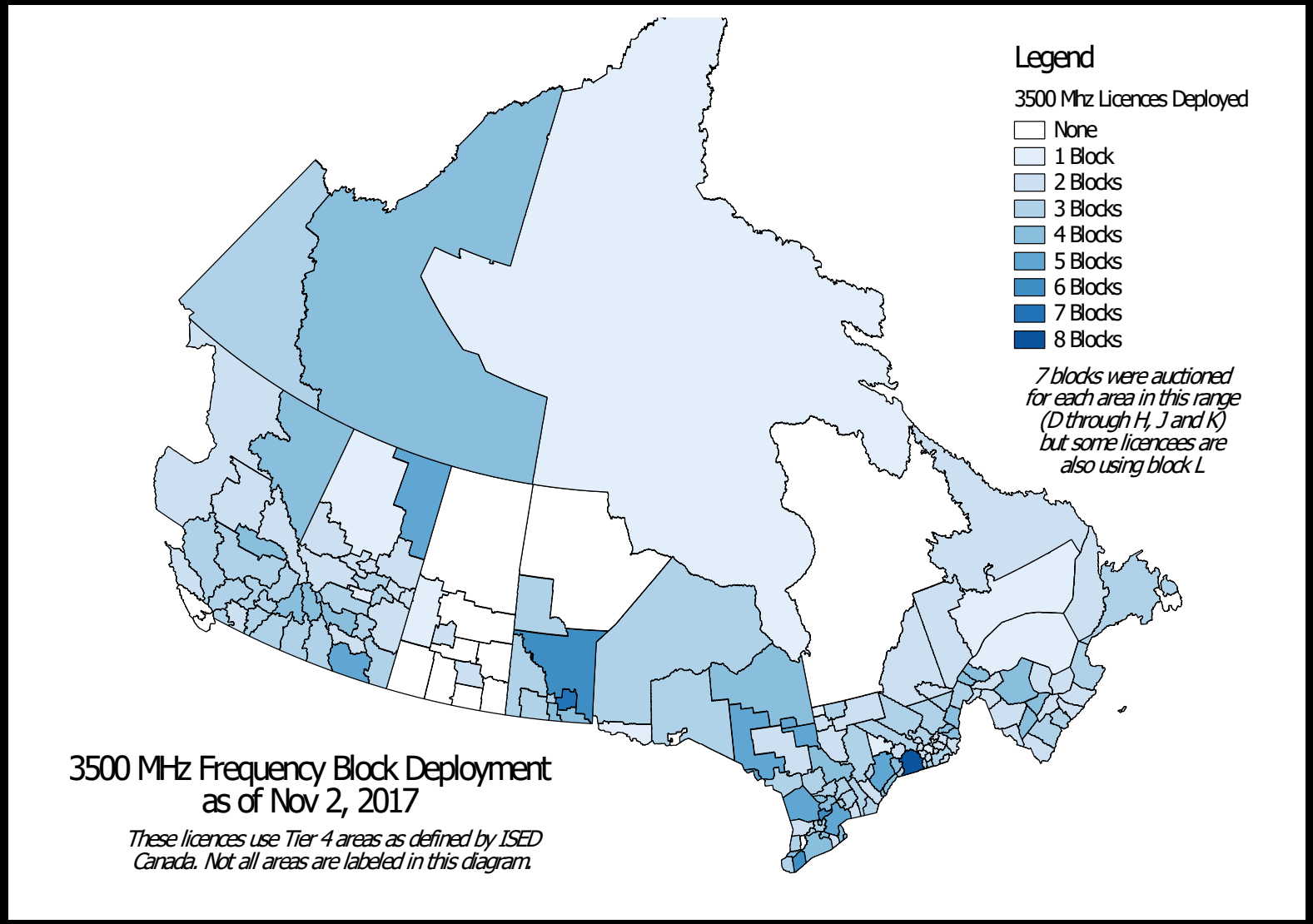
# ”Apparent” license deployments: 700MHz



# ”Apparent” license deployments: 2500MHz



# ”Apparent” license deployments: 3500MHz



# Conclusions and Recommendations

# Auction results and licence distributions

- Recent auctions have fewer participants and all auctions are dominated by Canada's Top 5
- Licences appear to be preferentially deployed in larger urban or industrial markets
- Xplornet and Bragg/Eastlink are becoming national players
- Many 3500 Mhz licences have changed hands but the original licence terms (10 years) has expired since the 2004 auction. 700 MHz and 2500 MHz licences are more recent and are based on 20-year terms.

# Better evidence would lead to better policy

- Allocation of licences (through auctions or other means) has a significant impact on service deployment and the state of competition
- ISED Canada could significantly improve its ability to measure the impact of its policy objectives and mechanisms (auction strategy and auction designs) if it tracked licences more carefully
  - Update auction winner info with licence/authorization number data once licences are issued
  - Track frequency block data in the licence browser and spectrum management system

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