1 Executive Summary

1.1 Introduction

Because of the Internet and related technologies, the world is now transitioning to more complex economic systems built around *knowledge*.[1] As a foundational cornerstone of these emerging systems of wealth creation, access to information and communications technology (ICT) has become critical to sustainable economic development in virtually every community and society on the planet.

For only the third time in history, society's system of wealth is changing. In knowledge-based economies, wealth creation is largely independent of place, local resources, and physical assets compared to the previous industrial era where wealth was based on significant physical resources, access to raw materials, manpower, and efficient transportation. Wealth now arises from human ingenuity, intellectual property, and novel business models. With growth and development timeframes in the new economy largely unconstrained by the building of physical infrastructure and the movement of goods and services, knowledge-based businesses often grow exponentially.

The economic impacts of new broadband infrastructure investment on a community's economy and social framework are felt soon after the investment is made and then continue well into the future. In the short-term, direct effects such as changes in employment, economic production, and behavior are generated during the course of the infrastructure deployment, which then begins to increase the region's contribution to the national gross domestic product (GDP). In the medium-term, indirect benefits become apparent. Examples of indirect benefits include cost savings, cost avoidance, productivity gains, and incremental economic activity. Over the longer term, *'induced effects'* develop. These include the transformative impacts on the economy such as the introduction of new industries/industry clusters and new ways of working.[2] Indeed, the ultimate value of a community's investment in high-speed broadband derives not from the infrastructure itself, but from the economic and social ecosystem that grows and evolves around it.[3]

In spite of the foundational nature of the required underlying connectivity infrastructure, Canada has yet to develop meaningful related technology policy and the results show. Canada, for instance, now ranks 14th in Broadband and in Innovation and whereas at most locations in Canada one may have the option of two wireline providers, in Västerås, Sweden, there are over 30.[4]

Accessible, affordable, and reliable high-speed broadband services, provided in a coordinated and interconnected system, is seen as foundational to supporting economic prosperity locally and regionally, enabling greater social connectedness and well-being of the region's population. High-speed broadband services provide foundational infrastructure for community prosperity, resiliency, and quality of life – not

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[1] Toffler, Alvin and Heidi; Revolutionary Wealth; Knopf; 2006-04-25.

[2] *Socioeconomic Effects of Broadband Speed;* Ericsson, Arthur D. Little, and Chalmers University of Technology; 2013-09.

[3] Smith, Steve; *The Economic Development Benefits of Broadband; Broadband Communities;* Broadband Communities Magazine; 2017-05/06.

[4] Lafleur, B. et al; *How Canada Performs – A Report Card on Canada's Innovation Performance*; Conference Board of Canada; 2013-04.

unlike roads, electricity, water and wastewater, and other essential utilities that support economic activity and community life.

Advancing a robust, diversified economy in northern Alberta is highly dependent on having the necessary infrastructure in place to access markets, reduce cost of service delivery, and enhance the quality of life. Realizing this, with the support of Alberta Economic Development and Trade (EDT), the Northern Alberta Development Council (NADC) together with the five Regional Economic Development Alliances (REDAs) spanning northern Alberta partnered to undertake this *Northern Alberta Broadband Preparedness Project*. The study was initiated to quantitatively evaluate the options available to enhance broadband infrastructure within the northern Alberta study area. The overall purpose of this report is to document:

1. Current broadband availability throughout the region (Current State).
2. Where each community would like to be in 3-, 5-, and 10-years (Desired State).
3. Potential benefits that might be realized once a world-class broadband infrastructure became available (Benefits Assessment).
4. The options available to communities and sub-regional areas interested in enhancing the availability of broadband infrastructure within their environs (Opportunities, Options, and Strategy);
5. The potential financials associated with the more do-it-yourself options (Business Cases).

Parts 1, 2, and 3 were completed and the results released in draft form. Each focused on the entire northern Alberta study region including the NADC area – the NADC area encompassing 60% of the Alberta landmass. To facilitate a greater focus on the opportunities, options, and illustrative financials within each region, Parts 4 and 5 were combined and undertaken separately for the regions covered by each REDA and the NADC.

The *Northern Alberta Broadband Preparedness Project* is being led by the Northeast Alberta Information HUB (Alberta HUB), one of five Regional Economic Development Alliances (REDAs) in northern Alberta. Funding for this study is provided by Alberta Economic Development and Trade (EDT), the Northern Alberta Development Council (NADC), and the five northern Alberta REDAs: Alberta HUB, Grizzly Regional Economic Alliance Society (GROWTH Alberta), Lesser Slave Lake Economic Alliance (LSLEA), Peace Region Economic Development Alliance (PREDA), and Regional Economic Development Initiative for Northwest Alberta (REDI). The study is inclusive of all municipalities, First Nations, and Métis Settlements within the area encompassed by the NADC and the five REDAs.

The NADC, along with Alberta HUB, GROWTH Alberta, LSLEA, PREDA, and REDI, focuses on advancing a robust, diversified economy in northern Alberta. Achieving continued economic growth in northern Alberta is highly dependent on having the necessary infrastructure to access global markets as well as providing connectivity for its residents.

The northern Alberta study area, outlined in Figure 1 in blue, is inclusive of the NADC region and the REDA regions. The footprint of the REDA's, collectively, and the NADC's are the same except for the NADC's southern boundary - the red line in Figure 1 shows the distinction and the NADC's southern-most boundary.

There are 32 municipal districts and counties, 2 cities, 35 towns, 23 villages, 24 summer villages, 154 hamlets, 33 First Nations and 8 Métis settlements with a total of 456,811 people in the study area. Approximately 41.9% are urban dwellers while 58.1% live in rural communities. Of the 58.1%, approximately 7.5% live on First Nations reserves or Métis Settlements.

Most northern Alberta communities are a member of a REDA. There are exceptions and for the purposes of this study, those communities that geographically fall within a REDA but are not a member of the REDA are listed and grouped with member communities of that REDA. This is done to facilitate the assessment of broadband opportunities, options, and strategy development at community and regional levels. Specifically, financially viable and operationally sustainable community or regional fibre-based network

builds often require partnering with neighbouring communities to increase scale and efficiency. Also, REDA membership can change over time.

The collection of information and data, and general research documented in this study, took place primarily between October 2016 and May 2017. Attempts were made to contact all communities and Internet Service Providers (ISPs) within the study's scope to provide input for the study. Despite efforts by the report's author, the NADC, and the REDAs, some communities and ISPs did not provide any information or data. Another challenge was keeping abreast of any changes within the communities and ISPs and refreshing the study's databases, analyses, and this report as required. As such, the contents of this report should be viewed as a '*snapshot*' in time, and the reader is reminded that a variety of changes may have occurred since the data was collected.

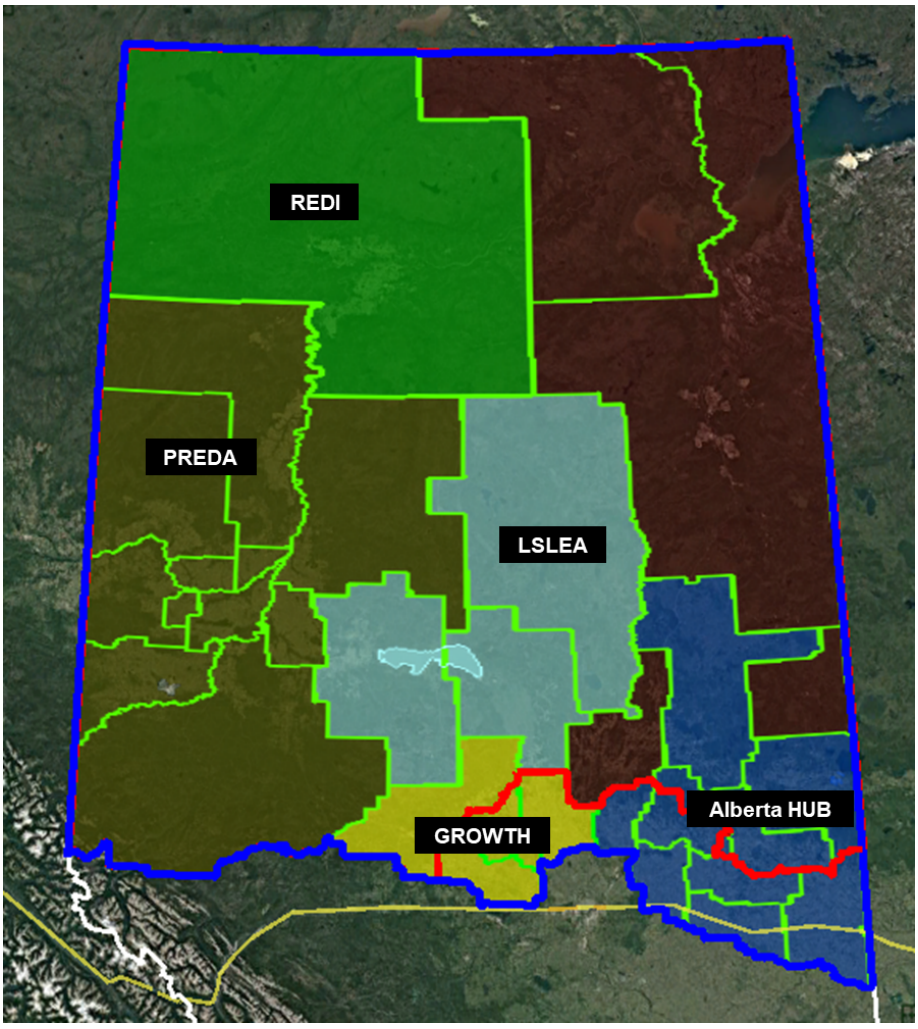


Figure 1 – Northern Alberta study area.

1.2 Landscape

The environment and underlying technologies, together with an ever-widening array of applications and impact areas, continue to evolve quickly. Since the beginning of this project, there have been several new developments that continue to shape the landscape.

Dec. 15, 2016 Federal Innovation, Science, and Economic Development (ISED) Canada announced the *Connect to Innovate Program* to provide up to $500 million in support of new

high-capacity open-access backbone networks; upgrades to existing backbone networks; improving resilience; and last mile access connections by 2021.

Dec. 21, 2016 Canadian Radio-television and Telecommunications Commission (CRTC) declared broadband Internet to be a basic telecommunications service.

Feb. 8, 2017 Statistics Canada released its 2016 Census of Population and Dwelling Counts.

Future Alberta SuperNet 2.0 – Expected changes include potentially a new operator before the original operations contract expires on June 30, 2018, as well as improvements to the terms and conditions for users of the SuperNet services.

1.3 Northern Alberta Development Council

1.3.1 NADC – At a Glance

The NADC region[5] covers approximately 60% of the Alberta's total landmass. The NADC's geographic borders extend north to Alberta's border with the Northwest Territories and east and west to Alberta's borders with Saskatchewan and British Columbia. It reaches south as far as the southern boundaries of the Municipal District (MD) of Greenview, Woodlands County, MD of Lesser Slave River, Athabasca County, Lac La Biche County, County of St. Paul, the Métis Settlements of Buffalo Lake, Kikino, and Fishing Lake, and the First Nations of Whitefish, Saddle Lake and Frog Lake.

Since the geographic footprints of the northern Alberta study area and the NADC region are very similar, it follows that the community compositions are also very similar. The NADC region is slightly smaller geographically – with a smaller population and fewer communities and businesses. There are 24 municipal districts and counties, 2 cities, 23 towns, 9 villages, 11 summer villages, 137 hamlets, 33 First Nations and 8 Métis settlements with a total of 377,000 people in the NADC area. Approximately 41% are urban dwellers while 59% live in rural communities. Of the 59%, approximately 8% live on First Nations reserves or Métis Settlements.

Except for Athabasca County and the Regional Municipality of Wood Buffalo (RMWB), all MD's and counties within the NADC region fall into one of the five REDAs. As REDA membership is at the discretion of the individual municipalities, there are several municipalities (cities, towns, and villages) which are either members of a different REDA than is the MD or county in which the municipality is situated or not a member of any. Though the statistics (population, density, and ISP services) for the latter non-REDA member municipalities are included under the '*Other*' category in this NADC section for completeness, from an analysis perspective, each is included in the analyses done for the MD or counties in which they are situated. To avoid duplication, the analyses in this section will therefore focus only on Athabasca County and the RMWB, as each are '*complete*' from a geographical or potential network deployment perspective.

As shown in Table 1, the non-REDA member NADC communities include 1 Municipal District (MD), 1 county, 2 Improvement Districts, 1 city, 5 towns, 3 villages, 8 summer villages, 19 hamlets, and 8 First Nations. Of the 164,501 residents, half (50.2%) live in municipalities while the remaining 81,857 (49.8%) are dispersed throughout the rural areas of the region.

[5] NADC; *NADC Area Profile: An Economic Description of the Region*; 2016-05.

Table 1 – Non-REDA Member NADC Communities

	Cities	Towns	Villages	Summer Villages	Hamlets	First Nations	Population	% of NADC
Athabasca County		Athabasca	Boyle	Bondiss Island Lake Island Lake South Mewatha Beach South Baptiste Sunset Beach West Baptiste Whispering Hills	Atmore Breynat Caslan Colinton Donatville Ellscott Grassland Meanook Perryvale Rochester Wandering River		12,583	7.6%
Regional Municipality of Wood Buffalo					Anzac Conklin Fort Chipewyan Fort MacKay Fort McMurray Gregoire Lake Estates Janvier South Saprae Creek	Athabasca Chipewyan Chipewyan Prairie Fort McKay Fort McMurray #468 Mikisew Cree Smith's Landing	73,340	44.6%
ID No. 24 - Wood Buffalo National Park							648	0.4%
Improvement District no. 349								
Other Municipalities	Grand Prairie	Slave Lake Beaverlodge Grande Cache Wembly	Donnelly Girouxville			Alexander Salt River #195	77,930	47.4%
80,106 48.7% 5	63,166 38.4% 1	17,168 10.4% 5	1,406 0.9% 3	904 0.5% 8	Population Percent 19	1,751 1.1% 8	164,501 1 49	1

As shown in Figure 2, Internet service levels meeting the new CRTC objective of 50 Mb/s down and 10 Mb/s up are available in only 5 of the 25 municipalities (including hamlets, First Nation, and Métis settlements) appearing in the chart. Of the 5 meeting the CRTC guidelines, 2 – the city of Grande Prairie and the town of Slave Lake – are beneficiaries of both TELUS' 150/150 Mb/s fibre service and Eastlink's 940/10 Mb/s cable service, 2 – Beaver Lodge and Wembly – have Eastlink's 940/10 Mb/s service, and 1– Girouxville – has a copper-based 10/1 Mb/s service from TELUS.

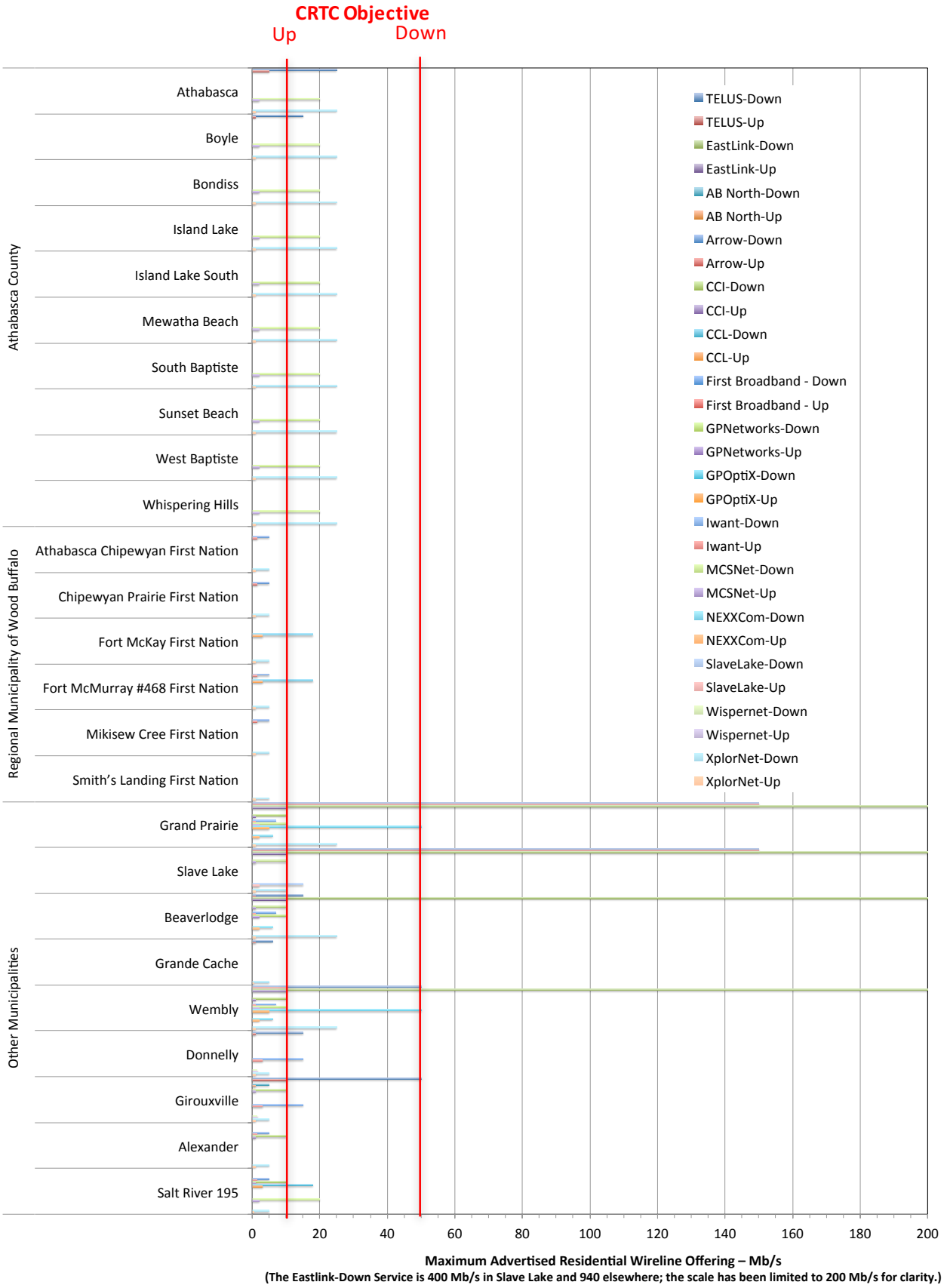


Figure 2 – NADC Internet service levels.

Deployment options and strategies depend on population and density. As is evident in Figure 3, premise densities across the communities appearing in the chart vary widely – from a low of 0.5 homes per square kilometer (or 1 home per 2 km^2) in the Rural Municipality of Wood Buffalo[6] to 293 homes/km^2 in the Summer Village of Sunset Beach. As the cost of providing enhanced broadband services increases substantially as the premise density decreases, the quality and availability of these services does so as well. As shown in Figure 3, the higher the premise density (red squares) relative to the population (top of the blue columns), the better the capital deployment financials will be. Conversely, the lower the density relative to the size of the population, the worse they will be. To be operationally sustainable, in the higher density areas, if the top of the blue column is below, say, 5,000 individuals, partnering with other communities will likely be necessary.

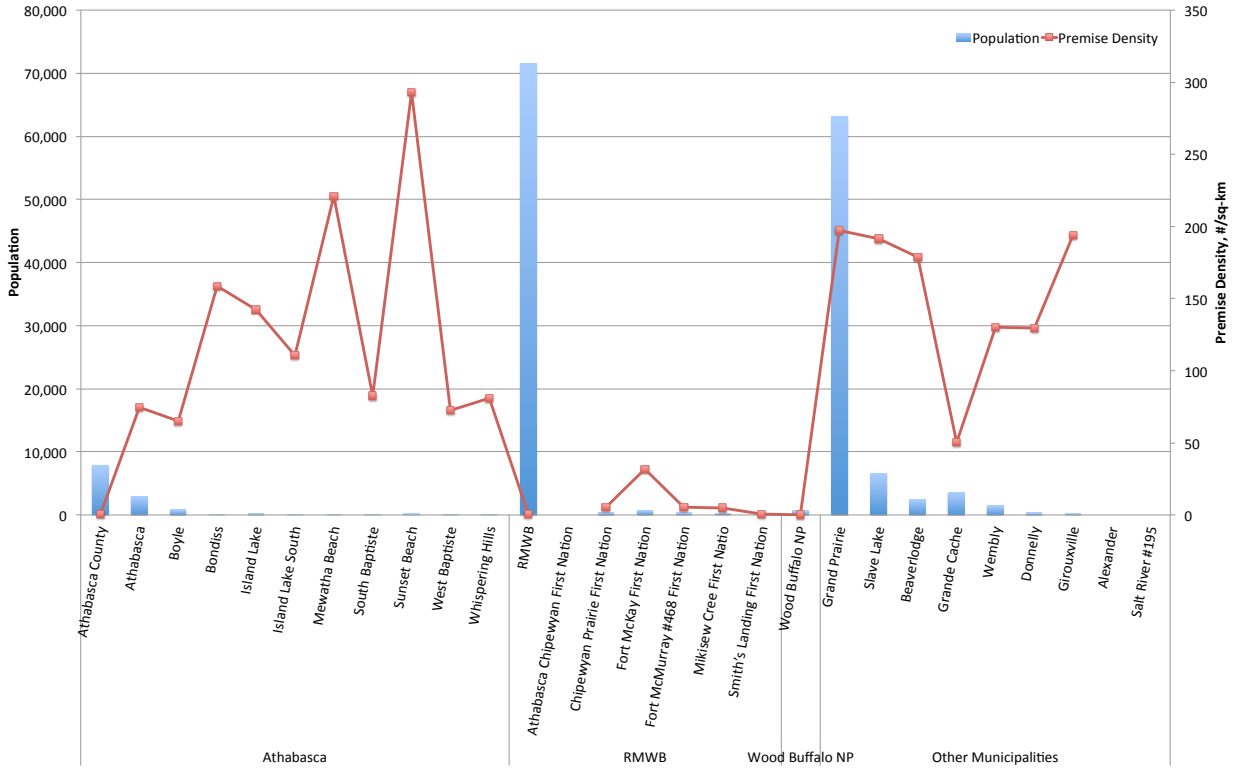


Figure 3 – NADC premise densities.

1.3.2 Plans for Broadband

The Town of Athabasca was in discussions with AxiaConnect last spring and has since been jointly reviewing their options in conjunction with Athabasca County.

The RMWB has been working on broadband for at least five years now and for at least part of that had engaged the services of the IBI Group in Edmonton.

Grande Cache is certainly interested in broadband, but with current financial difficulties is not in a position to move forward.

Slave Lake may participate in the Big Lakes County study.

[6] The rural density will be lower than this as this number includes the population of Fort McMurray. As Fort McMurray is not an incorporated entity, federal statistics include Fort McMurray with the RMWB numbers and the current split is not known.

1.3.3 Utility Networks in Athabasca County and the RMWB

Together, almost 86,000 northern Albertans live in the Athabasca and the RMWB regions.

The Town of Athabasca, the Village of Boyle, and Athabasca County have limited ISP options. TELUS offers bit rates of up to 25 Mb/s in the town (and less in the village). MCSNet also serves these urban areas as well as the summer villages and the rural areas of Athabasca County at bit rates comparable to TELUS' but at higher prices. Challenging terrain (valleys) in the town present issues for MCSNet. Low density is also an factor. Further complicating these issues, MCSNet is experiencing over-capacity on their towers. The Town of Athabasca at the time of the writing, is evaluating an option to have Axia lay fibre in select areas of their town. Athabasca County is also not satisfied with their current levels of Internet service and is seeking alternatives to improve broadband services to their residents.

Pre-conceptual fibre designs have been completed for the town of Athabasca, the village of Boyle, and the county as a whole. Pro-forma financials indicate that an open-access, inclusive, utlity-based fibre network could be deployed throughout the county and operated on a sustainable basis. Details are presented in Sec. 7.8.

The RMWB is comprised of an urban service area and rural communities. With a large population and negligible densities outside the urban service area, the RWMB will have the biggest issue with fibre deployment and unless significant grant funding or novel financing arrangements become available, wireless or hybrid fibre/wireless solutions will be needed. In May 2016, an uncontrolled wildfire swept through parts of the urban service area and the rural communities, forcing the largest wildfire evacuation in Alberta's history. As the damaged areas of Fort McMurray are rebuilt, there is an opportunity to deploy fibre infrastructure. Even without that option, Fort McMurray is large enough to deploy fibre and create a sustainable operation on their own. The remaining centres, however, will need to partner.

Five years ago, the Oil Sands Leadership Initiative funded a review of broadband infrastructure upgrade options for the municipalities of Anzac, Conklin, Fort Chipewyan, Fort MacKay, Gregoire Lake Estates, and Janvier. Though the capital estimates are now somewhat dated, the options and approaches remain valid and will be made available in Section 7.9.

1.4 Northern Alberta Information HUB Ltd. (Alberta HUB)

1.4.1 Alberta HUB – At a Glance

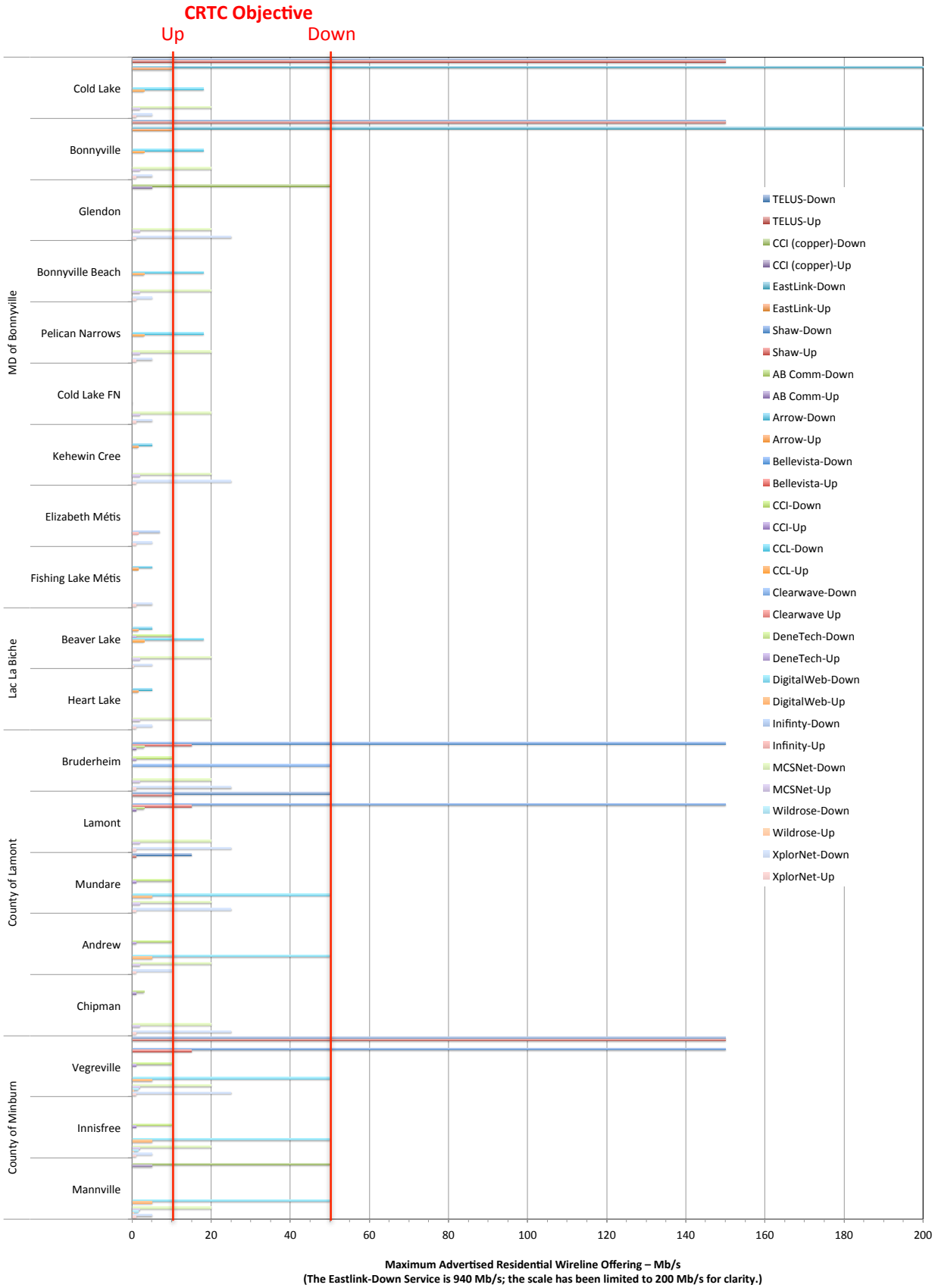
With a 2016 population of approximately 135,000 (including approximately 20,000 for the Alberta portion of the City of Lloydminster), the Alberta HUB region hosts a diverse economy with 4,860 businesses. It is strategically located - its transportation corridors connect Edmonton, the Saskatchewan border area, and the resource rich areas of northeastern Alberta. Some communities within Alberta HUB have completed their own population census subsequent to the Federal census. Therefore, the population figures provided in this report are subject to change.

As shown in Table 2, Alberta HUB includes 1 Municipal District (MD), 8 counties, 1 city, 10 towns, 13 villages, 55 hamlets, 7 First Nations, and 4 Métis Settlements. Of the 115,048 residents, under half (43.6%) live in municipalities while the remaining 65,864 (56.4%) are dispersed throughout the rural areas of the region.

Table 2 – Alberta HUB Communities

	Cities	Towns	Villages	Summer	Hamlets		First Nations	Métis	Population	% of HUB
MD of Bonnyville	Cold Lake	Bonnyville	Glendon	Bonnyville Beach Pelican Narrows	Ardmore Beaver Crossing Beaverdam Cherry Grove	Fort Kent La Corey Therien	Cold Lake Kehewin Cree	Elizabeth Fishing Lk.	37,630	32.7%
Lac La Biche County					Beaver Lake Hylo Lac La Biche	Plamondon Venice	Beaver Lake Heart Lake		8,928	7.8%
Lamont County		Bruderheim Lamont Mundare	Andrew Chipman		Hilliard St. Michael Star	Whitford Wostok			8,532	7.4%
County of Minburn		Vegreville	Innisfree Mannville		Lavoy Minburn	Ranfurly			9,917	8.6%
Smoky Lake County		Smoky Lake	Vina Wasketenau		Bellis Edwand	Spedden Warspite	Saddle Lake Whitefish (Goodfish)	Buffalo Lake Kikino	13,355	11.6%
County of St. Paul		Elk Point St. Paul		Horseshoe Bay	Ashmont Heinsburg Lafond Lindbergh Lottie Lake	Mallaig Riverview St. Edouard St. Lina St. Vincent	Frog Lake		13,895	12.1%
Thorhild County					Abee Egremont Long Lake Newbrook	Opal Radway Thorhild			3,254	2.8%
County of Two Hills		Two Hills	Myrnam Willingdon		Beauvallon Brosseau Derwent Duvernay	Hairy Hill Morecambe Musidora			5,332	4.6%
County of Vermilion River		Vermilion	Dewberry Kitscoty Marwayne Paradise Valley		Blackfoot Clandonald Islay McLaughlin	Rivercourse Streamstown Tulliby Lake			14,205	12.3%
52,330 45.5% 9	14,961 13.0% 1	28,738 25.0% 10	5,201 4.5% 13	284 0.2% 3	Population Percent of Alberta HUB 55		10,789 9.4% 7	2,745 2.4% 4	115,048 1 102	1

As shown in Figure 4, service level chart on the next two pages, Internet service levels meeting the new CRTC objective of 50 Mb/s down and 10 Mb/s up are available in only 7 of the 102 municipalities (including hamlets, First Nation, and Métis settlements) in the region. Of the 10 towns in Alberta HUB, four – Bonnyville, Cold Lake, St. Paul, and Vegreville – are beneficiaries of TELUS' generational fibre investment and the towns of Bruderheim and Lamont have 150/15 Mb/s service from Shaw Communications (Shaw). The Town of Vermilion has asymmetric 940/10 Mb/s service from Eastlink.


CRTC Objective
Up
Down
MD of Bonnyville
Cold Lake
Bonnyville
Glendon
Bonnyville Beach
Pelican Narrows
Cold Lake FN
Kehewin Cree
Elizabeth Métis
Fishing Lake Métis
Lac La Biche
Beaver Lake
Heart Lake
County of Lamont
Bruderheim
Lamont
Mundare
Andrew
Chipman
County of Minburn
Vegreville
Innisfree
Mannville
TELUS-Down
TELUS-Up
CCI (copper)-Down
CCI (copper)-Up
EastLink-Down
EastLink-Up
Shaw-Down
Shaw-Up
AB Comm-Down
AB Comm-Up
Arrow-Down
Arrow-Up
Bellevista-Down
Bellevista-Up
CCI-Down
CCI-Up
CCL-Down
CCL-Up
Clearwave-Down
Clearwave Up
DeneTech-Down
DeneTech-Up
DigitalWeb-Down
DigitalWeb-Up
Inifinty-Down
Infinity-Up
MCSNet-Down
MCSNet-Up
Wildrose-Down
Wildrose-Up
XplorNet-Down
XplorNet-Up
0
20
40
60
80
100
120
140
160
180
200
Maximum Advertised Residential Wireline Offering – Mb/s
(The Eastlink-Down Service is 940 Mb/s; the scale has been limited to 200 Mb/s for clarity.)

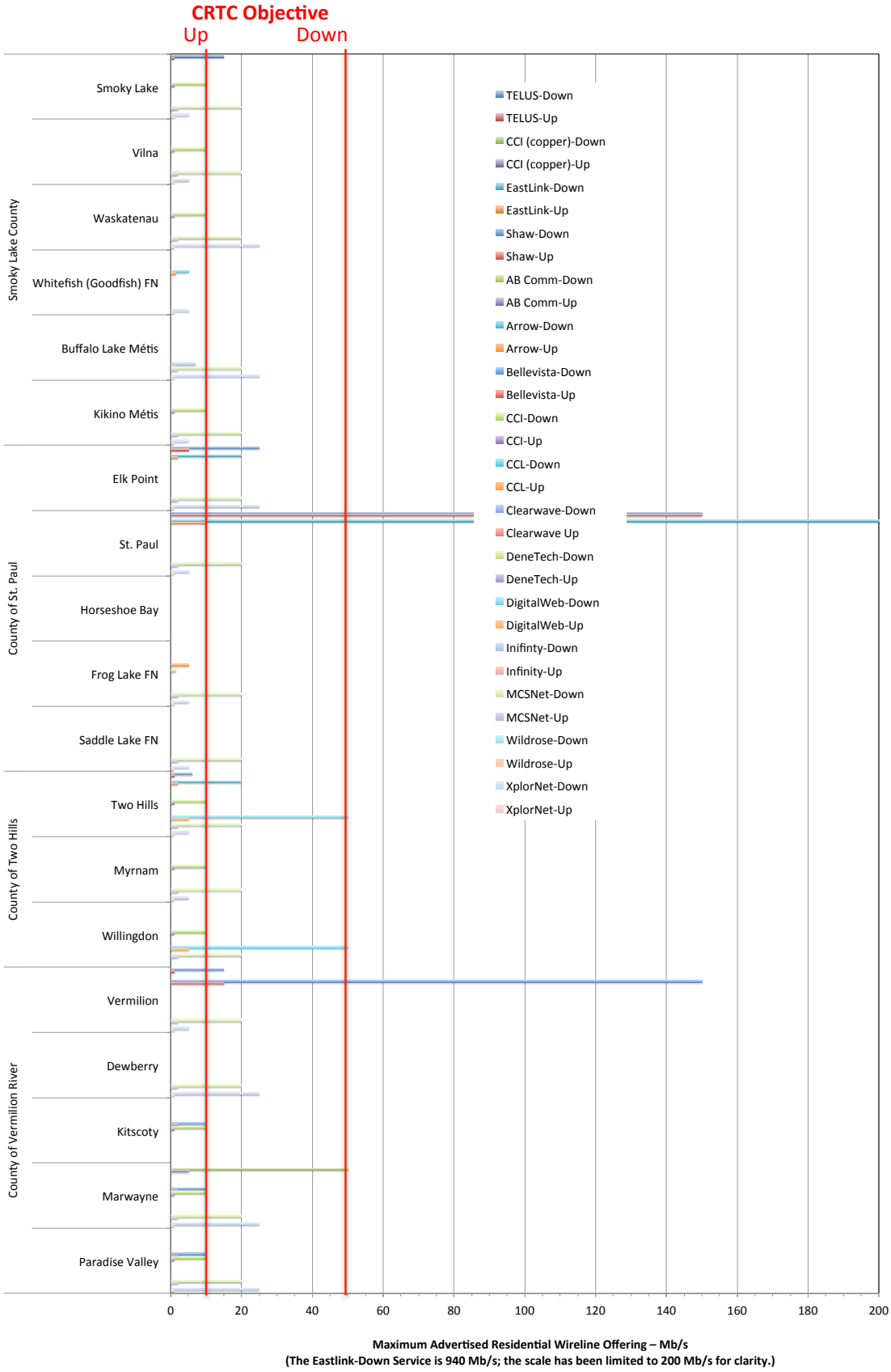


Figure 4 – Alberta HUB Internet service levels.

Deployment options and strategies depend on population and density. As is evident in Figure 5, premise densities across the Alberta HUB region vary widely – from a low of 0.32 homes per square kilometer (or 1 home per 3.125 km^2) in Lac La Biche County to 412 homes/km^2 in the Summer Village of Bonnyville Beach. As the cost of providing enhanced broadband services increases substantially as the premise density decreases, the quality and availability of these services does so as well. As shown in Figure 5, the higher the premise density (red squares) relative to the population (top of the blue columns), the better the capital deployment financials will be. Conversely, the lower the density relative to the size of the population, the worse they will be. To be operationally sustainable, in the higher density areas, if the top of the blue column is below, say, 5,000 individuals, partnering with other communities will likely be necessary.

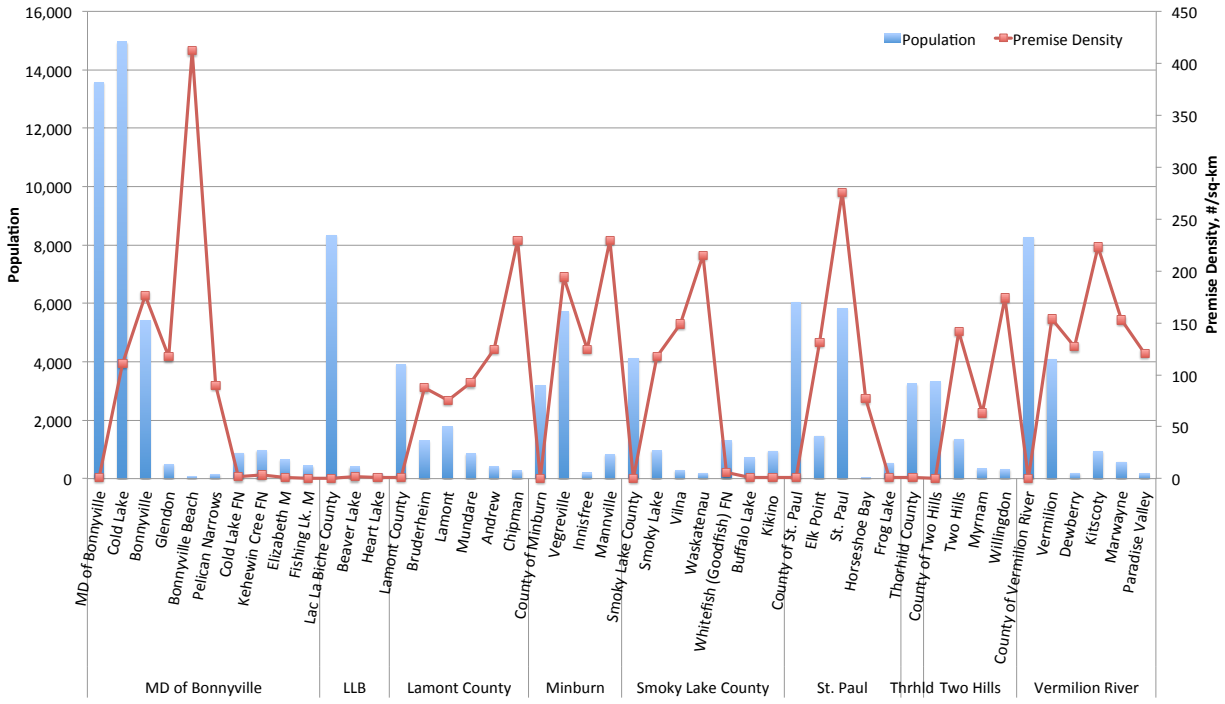


Figure 5 – Alberta HUB premise densities.

With large populations and negligible densities, the MDs and counties will have the biggest issue with fibre deployment and unless significant grant funding or novel financing arrangements become available, wireless or hybrid fibre/wireless solutions will be needed. The larger municipalities such as the City of Cold Lake, Bonnyville, Vegreville, and St. Paul could likely deploy fibre on their own. The remaining municipalities, possibly together with the counties will need to partner.

1.4.2 Plans for Broadband in Alberta HUB

Plans to improve broadband services in the region are at an early stage. The towns of Elk Point and Smoky Lake as well as the County of Vermilion River are '*Enthusiastic*' in their pursuit of enhanced and expanded broadband for their communities. Elk Point favours an Axia solution, Smoky Lake County is looking to Corridor Communications (CCI), and the County of Vermilion River, together with its urban centres is leveraging the Vermilion River Regional Alliance (VRRA) to evaluate the options to provide capable broadband infrastructure on an open-access utility basis.

(1) MD of Bonnyville

With the two largest centres in the MD of Bonnyville – Cold Lake and Bonnyville – happy with current service levels, enhancing broadband services throughout both the MD and the remaining communities will be challenging. Fibre is not yet on the MD's agenda and, courtesy of the downturn in the oil patch, capital is scarce. Given their small size, the remaining communities, including the First Nations and Métis Settlements, will need to partner to make a difference.

(2) Lac La Biche County

With a population of 8,330, an '*anchor*' hamlet (Lac La Biche) of 2,314 people, and the lowest premise density in the Alberta HUB region, improving broadband will involve improving fixed wireless services. The County of Lac La Biche would like to complete a broadband strategy within three years and improve services in their hamlets within five years.

(3) Lamont County

Within Lamont County, Bruderheim is the only community anxious to move forward with broadband. At 26% aerial fibre deployment (i.e., on poles), it would cost about $1 million dollars to pass every home and business with fibre. The issue is operational scale, but targetting the downtown business core first would afford them time to work out the operations details and complete a town-wide deployment within five years.

(4) County of Minburn

The County of Minburn is looking to the Internet Service Provider (ISP) community to improve wireless coverage and capacity across the County. More towers and fibre to those towers will be required.

Vegreville is a TELUS fibre community and Mannville is participating in the VRRA initiative.

(5) Smoky Lake County

Enhancing broadband service availability is very much on the County and the municipality's agenda. To date, their preference is to work with private providers.

The County has an equity position in CCI and sees fibre connected towers as the best approach and then the addition of a number of micro-tower sites to extend coverage to the remaining 2% of their rural population.

The Town of Smoky Lake is actively looking for and evaluating solutions to attain town-wide broadband connectivity. Fibre is the preferred option, and discussions with incumbent service providers are occurring. A wireless solution, which the Town would deploy itself, is also being considered.

Waskatenau is very interested and would like to see fibre in their village within three years, however, operational scale is a hurdle. Vilna did not respond, but appears to be interested.

(6) County of St. Paul

While the County of St. Paul is well aware of the value of enhanced broadband infrastructure, they have other infrastructure in need of upgrades and are facing some financial uncertainty due to changes in the assessment and collaboration costs. Leveraging the higher density areas of St. Paul and Elk Point is not likely as St. Paul has TELUS fibre and Elk Point is looking to Axia. On the plus-side, the average premise density in their rural areas is just over one premise/km.

(7) Thorhild County

Although Thorhild County recognizes the need for enhanced broadband services, options to make it so are not yet on their agenda.

(8) County of Two Hills

Unfortunately, neither the County of Two Hills, nor the Village of Myrnam responded to project inquiries relative to their vision or plans for enhancing broadband. As Willingdon is in the process of becoming a hamlet, that leaves the Town of Two Hills.

While the Town of Two Hills is interested in enhanced broadband services, it is not currently on their Council's agenda.

(9) County of Vermilion River

Under the auspices of the VRRA, the Town of Vermilion has applied for funding to undertake a comprehensive evaluation of their options to provide enhanced digital connectivity infrastructure across the Alliance, inclusive of all its members. The high-level financials for this initiative are outlined later in this report and will help serve as a guide to other Alberta HUB counties that are interested in the potential costs to move forward.

1.4.3 Utility Networks in Alberta HUB

Though representative financials are only provided for Bruderheim – a town with just over 600 premises – financials for urban centres both larger and smaller are available for consideration later sections of this report. As outlined in Table 7, comparative results for communities ranging in size from 4,250 premises down to 725 are available in both the GROWTH Alberta and NADC sections. Whereas financials for centres with in excess of some 2,000 premises are sustainable out of the gate, to reduce risk and improve sustainability, urban centres with less than 2,000 premises will need to collaborate with other communities, obtain grant funding, increase penetration rates, etc., to reduce risk and make the financials work.

Results for Lac La Biche County show that even though the urban centres there are concentrated in the southern half of Lac La Biche and an intercommunity network could be deployed for $4.17M, the densities are too low to establish a sustainable business case for fibre. Hence, either grant funding, a cash infusion, or a staged rollout over many years will be needed. Other options to improve the financials include cost sharing with local ISPs, leveraging linear infrastructure projects, and/or moving some of the cost to the tax roll, as is done for road and water infrastructure. Many MDs and counties within Alberta HUB will face the same issue.

Within the Alberta HUB, the Vermilion River Regional Alliance (VRRA) and its partner communities are the most advanced in recognizing the importance of broadband and looking for solutions to move forward. Indeed, the VRRA took the initiative to apply for CARES funding for a detailed study for the region, inclusive of the municipalities within its boundaries – specifically Town of Vermilion (lead), Dewberry, Kitscoty, Mannville, Marwayne, and Paradise Valley. The study – *VRRA Broadband Research Project* – will leverage the results of this work and then develop more detailed financials to evaluate the options of most interest to the region. As the more detailed financials have already been developed, they will be used in the analyses presented – thereby increasing both the accuracy and credibility of the financial results presented.

Even with worst-case deployment assumptions and no leverage from other linear infrastructure projects, the increased population numbers for the VRRA area help ensure that the financials for an extensive, inclusive, open-access fibre network in the VRRA area, 'work'. The result is very encouraging and bodes well for other MDs and counties within the Alberta HUB region.

1.5 Grizzly Regional Economic Alliance Society (GROWTH Alberta)

1.5.1 GROWTH Alberta – At a Glance

With a 2016 population of approximately 57,000, the GROWTH Alberta region hosts a diverse economy with 2,949 businesses. The region offers convenient access to the major energy centres in the North and is well positioned near major corridors for access to other parts of North America.

As shown in Table 3, GROWTH Alberta includes 4 counties, 7 towns, 2 villages, 13 summer villages, and 23 hamlets. Of the 56,407 residents, approximately half (48%) live in municipalities while the remaining 29,161 (52%) are dispersed throughout the rural areas of the region.

Table 3 – GROWTH Alberta Communities

	Towns	Villages	Summer Villages	Hamlets	Population	% of GROWTH
County of Barrhead	Barrhead			Campsie Manola Neerlandia Thunder Lake	10,867	19.3%
Lac Ste. Anne County	Mayerthorpe Onoway	Alberta Beach	Birch Cove Castle Island Nakamum Park Ross Haven Sandy Beach Silver Sands South View Sunrise Beach Sunset Point Val Quentin West Cove Yellowstone	Cherhill Glenevis Green Court Gunn Rich Valley Rochfort Bridge Sangudo	15,804	28.0%
Westlock County	Westlock	Clyde	Larkspur	Busby Dapp Fawcett Jarvie Nestow Pibroch Pickardville Tawatinaw Vimy	12,795	22.7%
Woodlands County	Whitecourt			Blue Ridge Fort Assiniboine Goose Lake	15,713	27.9%
Other	Legal (Sturgeon) Swan Hills (Big Lakes)				1,983	3.5%
29,161 51.7% 5	24,216 42.9% 7	1,448 2.6% 2	1,582 2.8% 13	Population Percent of Growth Alberta 23	56,407 1 50	1

According to the service level chart in Figure 6, Internet service levels meeting the new CRTC objective of 50 Mb/s down and 10 Mb/s up are available in only four of the 50 municipalities in the region. Mayerthorpe and Whitecourt have an asymmetric 940/10 Mb/s service from Eastlink, Alberta Beach has a 50/10 Mb/s copper-based service from TELUS, and Westlock boasts a symmetric 150/150 Mb/s service on TELUS fibre.

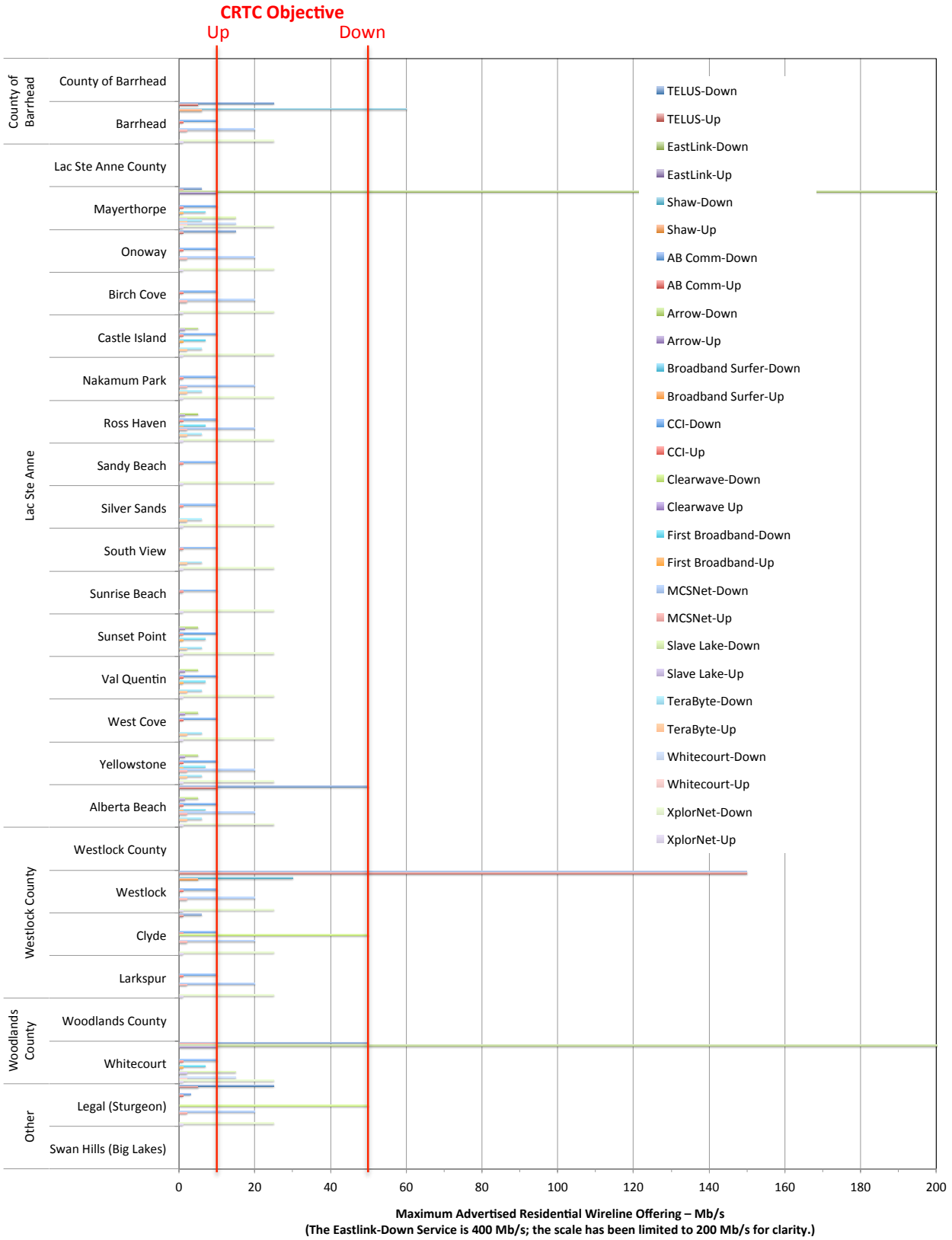


Figure 6 – GROWTH Alberta Internet service levels.

Deployment options and strategies depend on population and density. As is evident in Figure 7, premise densities across the GROWTH Alberta region vary widely – from a low of 0.25 homes per square kilometer (or 1 home per 4 km^2) in Woodlands County to 370 homes/km^2 in the hamlet of Alberta Beach (excluding summer villages).

As the cost of providing enhanced broadband services increases substantially as the premise density decreases, the quality and availability of these services does so as well. The higher the premise density (red squares) relative to the population (top of the blue columns), the better the capital deployment financials will be. Conversely, the lower the density relative to the size of the population, the worse they will be. To be operationally sustainable, in the higher density areas, if the top of the blue column is below, say, 5,000 individuals, partnering with other communities will likely be necessary.

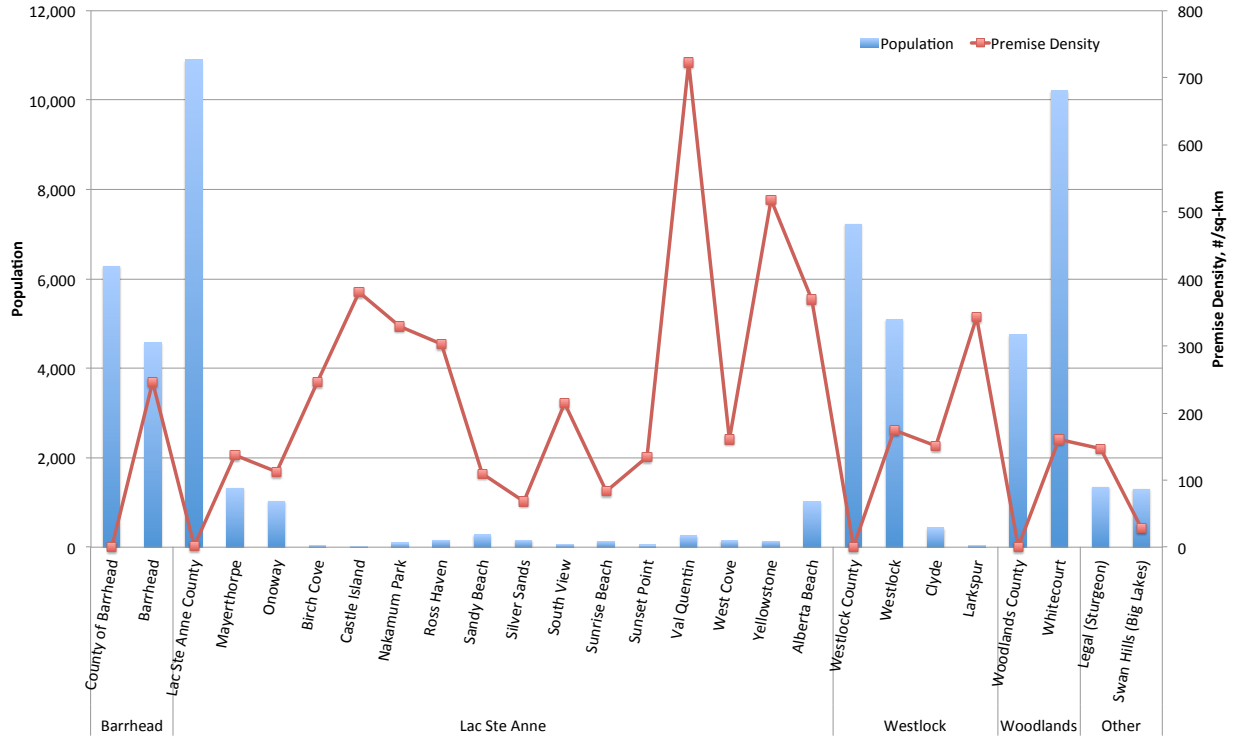


Figure 7 – GROWTH Alberta premise densities.

The large number of high density summer villages in GROWTH Alberta is somewhat unique. Given their density, fibre connections to the homes there would be straightforward. The small number of homes in each summer village, though, creates a financial sustainability issue due to the high cost of backhaul and the seasonal nature of the occupancy.

1.5.2 Plans for Broadband in GROWTH Alberta

The communities demonstrating the most interest in broadband in GROWTH Alberta and where near-term action is likely are the following:

Town of Swan Hills – The Town of Swan Hills is a partner in the Big Lakes County *Inter-Municipal Broadband Discovery Project*, which is being led by Big Lakes and recently received funding from the *Alberta Community Partnership (APC) Program*. The project will assess the options available to enhance broadband in the region. With several oil and gas operations located in the Swan Hills area, Swan Hills is home to a number of industry field offices. The presence of high-speed Internet is a factor in retaining those offices and company bases within and near Swan Hills. Within three years the Town of Swan Hills

envisions the initial deployment of broadband infrastructure and within a decade access to high-speed broadband would be assumed.

Barrhead County – Barrhead County would like to secure consistent Internet service levels and pricing for their residents and businesses – affordable is an important criterion as well. Recognizing their small size and their need to prioritize and align broadband capital expenditures with other infrastructure projects, the county is interested in devising a strategy and plan to achieve Internet access to all citizens and businesses within three years. The County is interested in learning what role especially rural municipalities should assume in achieving the CRTC's targets of 50 Mb/s download and 10 Mb/s upload, with deployment targets of 90% of Canadian households by 2021 and 100% by 2031. They also welcome guidance on how to achieve these targets.

Lac Ste. Anne County – When people move to Lac Ste. Anne County (often from urban centres), they expect available broadband services to be comparable to the urban service levels they may have become accustomed to. Since 2010, the county Council has adopted a utility model for broadband expansion. Since that time, the county's fixed wireless tower deployment has been funded through grant programs. It is anticipated that a similar strategy would be executed to fund fibre/broadband service to all unserved areas within five years.

1.5.3 Utility Networks in GROWTH Alberta

Comparative financial results for communities ranging in size from 4,250 premises (Whitecourt) to 2,000 premises (Barrhead) to 725 premises (Swan Hills) are provided. Whereas financials for centres with in excess of some 2,000 premises are sustainable out of the gate, to reduce risk and improve sustainability, urban centres with less than 2,000 premises will need to collaborate with other communities, obtain grant funding, increase penetration rates, etc., to reduce risk and make the numbers work.

With significant populations and negligible densities, the counties will have the biggest issue with fibre deployment and unless significant grant funding or novel financing arrangements become available, wireless or hybrid fibre/wireless solutions will be needed. Woodlands County could benefit from the presence of the region's largest centre and the County of Barrhead with Barrhead, but with TELUS fibre in Westlock and mostly smaller communities in Lac Ste. Anne, the financials will be a challenge throughout the region.

Taken individually, the financials for Barrhead, Swan Hills, and Woodlands County are challenging. However, should these three centres, together with Whitecourt, combine resources, a very positive business case could be had by all.

1.6 Lesser Slave Lake Economic Alliance (LSLEA)

1.6.1 LSLEA – At a Glance

There are approximately 30,000 residents and 1,230 businesses in the LSLEA region. Twenty-six percent of the region's residents live in First Nations reserves and Métis Settlements. The region is spread over a vast geographic area comprised of boreal forest, lakes, and plains in the south.[7]

As REDA membership is voluntary, affiliation changes over time, and is often geographically inconsistent. In the summary table for LSLEA below, Big Lakes County is now officially a member of PREDA, not LSLEA. However, High Prairie is not and remains a member of LSLEA.

[7] LSLEA; 2017-02-15.

Swan Hills, is a member of GROWTH Alberta. From a network and study perspective, Big Lakes County is best looked at from a geographical perspective wherein Big Lakes County is studied together with High Prairie and Swan Hills. To accommodate these discrepancies, in the Current State sections of this document, the inclusions are based on REDA membership. In both this and the analyses sections of the report, however, the inclusions are geographical – with the results duplicated for each REDA. In the case of Big Lakes County, the analyses are presented in both the LSLEA and the PREDA documents. The analysis for Swan Hills, appears in all three – GROWTH Alberta, LSLEA, and PREDA.

As shown in Table 4, from the analysis perspective, LSLEA includes 2 municipal districts (MDs), 1 county, 3 towns, 16 hamlets, 9 First Nations, and 3 Métis Settlements. Of the 30,114 residents, approximately a third (35%) live in municipalities while the remaining 19,598 (65%) are dispersed throughout the rural areas of the region.

Table 4 – LSLEA Communities

	Towns	Hamlets		First Nations	Métis Settlements	Population	% of LSLEA
Big Lakes County	High Prairie Swan Hills	Enilda Faust Grouard Joussard Kinuso		Driftpile Cree Nation Kapawe'no First Nation Sucker Creek First Nation Swan River First Nation Whitefish Lake First Nation	East Prairie Gift Lake Peavine	14,045	46.6%
MD of Lesser Slave River	Slave Lake	Canyon Creek Chisholm Flatbush Marten Beach	Smith Wagner Widewater	Sawridge First Nation		9,484	31.5%
MD of Opportunity		Calling Lake Red Earth Creek Sandy Lake /Pelican Mtn	Wabasca	Bigstone Cree Nation Loon River Cree First Nation Peerless Trout First Nation		6,585	21.9%
11,656 38.7% 3	10,516 34.9% 3	Population Percent of SLEA 16		6,373 21.2% 9	1,569 5.2% 3	30,114 1 34	1

According to the service level chart in Figure 8, Internet service levels meeting the new CRTC objective of 50 Mb/s down and 10 Mb/s up are available in only one of the 34 municipalities (including hamlets, First Nation, and Métis settlements) in the region. The Town of Slave Lake has an asymmetric 940/10 Mb/s service from Eastlink and, in the areas rebuilt after the fire, a symmetric 150 Mb/s fibre-based from TELUS.

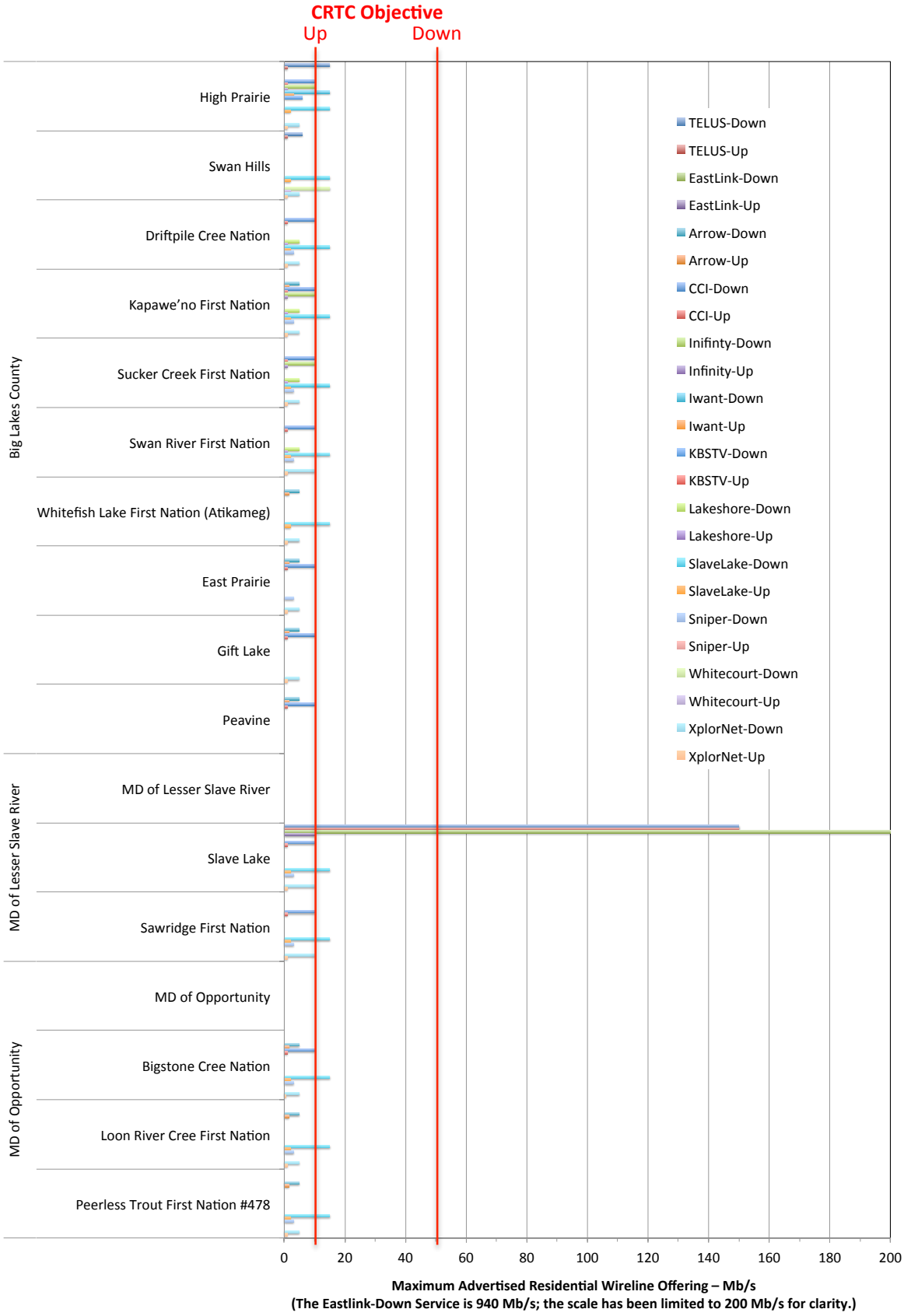


Figure 8 – LSLEA Internet service levels.

Deployment options and strategies depend on population and density. As is evident in Figure 9, premise densities across the LSLEA region vary widely – from a low of 0.1 homes per square kilometer (or 1 home per 10 km^2) in the MD of Lesser Slave River and the MD of Opportunity to 91 homes/km^2 in the Town of Slave Lake.

As the cost of providing enhanced broadband services increases substantially as the premise density decreases, the quality and availability of these services does so as well. The higher the premise density (red squares) relative to the population (top of the blue columns), the better the capital deployment financials will be. Conversely, the lower the density relative to the size of the population, the worse they will be. To be operationally sustainable, in the higher density areas, if the top of the blue column is below, say, 5,000 individuals, partnering with other communities will likely be necessary.

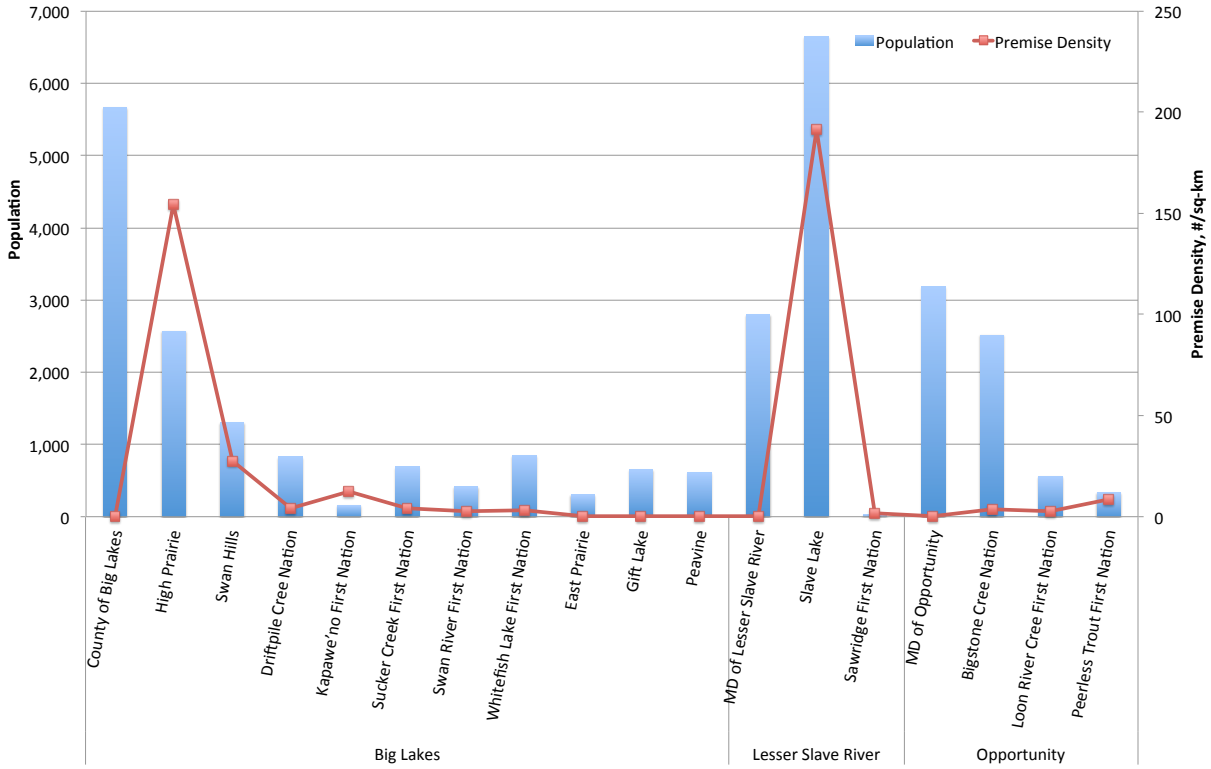


Figure 9 – LSLEA premise densities.

With large populations and negligible densities, the MDs and counties will have the biggest issue with fibre deployment and unless significant grant funding or novel financing arrangements become available, wireless or hybrid fibre/wireless solutions will be needed. Big Lakes County benefits from a slightly higher population density as well as the presence of two major centres. Lesser Slave River has Slave Lake, which helps, but the MD of Opportunity is pretty much entirely rural. At the municipal level, except possibly for Slave Lake, none of the municipalities in the region are large enough to support a fibre deployment on their own – collaboration with other communities or private industry will be needed.

1.6.2 Plans for Broadband in LSLEA

Within the LSLEA, Big Lakes County and its partner communities are advanced in recognizing the importance of broadband and looking for solutions to move forward.

Big Lakes County, the towns of High Prairie and Slave Lake, the MD of Lesser Slave River, and the Gift Lake Métis Settlement – Big Lakes County recently received funding from the *Alberta Community*

Partnership (APC) Program for its *Inter-Municipal Broadband Discovery Project* to assess the best ways to enhance broadband in the region. Big Lakes County will lead the project. At the time of the writing of this report, the project team is in the early stages of organizing and defining their broadband project.

Northern Alberta Broadband Society – The Northern Alberta Broadband Society, an independent voluntary organization, plans to improve broadband connectivity between the immediate Slave Lake region and the Peace River region.

Southshore Area First Nations and Lakeshore Internet Services – Lakeshore Internet Services (Lakeshore) provides fixed wireless-based Internet services to the First Nations and the communities in the Lesser Slave Lake area. Lakeshore's owner, the Lesser Slave Lake Indian Regional Council, is governed by its eight member/shareholder First Nations. The eight members include Driftpile, Duncan's, Horse Lake, Kapawe'no, Sawridge, Sturgeon Lake, Swan River, and Sucker Creek First Nations. Lakeshore strongly believes broadband will provide the infrastructure needed to develop and deliver advanced applications and services that will bring greater economic and social benefits to their communities and bridge the gaps that exist in employment, learning (online education), and healthcare. They would like to deploy fibre to their membership – they envision a pilot project as a way forward.

1.6.3 Utility Networks in LSLEA

Within the LSLEA, Big Lakes County and its partner communities are the most advanced in recognizing the importance of broadband and looking for solutions to move forward. Indeed, Big Lakes County took the initiative to obtain Alberta Community Partnership (ACP) funding for a detailed study for the Big Lakes County, inclusive of the municipalities, First Nations, and Métis settlements within its boundaries – specifically High Prairie, Swan Hills, the hamlets of Enilda, Faust, Grouard, Joussard, and Kinuso, the Kapewe'no First Nation, and the Métis settlement of Gift Lake. The study – *Inter-municipal Broadband Discovery Project* – will leverage the results of this work and then develop more detailed financials to evaluate the options of most interest to the County. As the more detailed financials have already been developed, they will be used in the analyses presented – thereby increasing both the accuracy and credibility of the financial results presented.

At the time of writing, neither the MD of Lesser Slave River nor the MD of Opportunity were ready for such a study. As such, the analyses in this document will focus on the results for Big Lakes County. As will be seen, the business case for an inclusive, open-access utility network focused on providing both fibre-to-the-premise (FTTP) networks in each of these communities as well as an inter-community connecting network within Big Lakes County, goes cashflow positive after seven years. Going forward, the model could be expanded to encompass options for both the MD of Lesser Slave River and the MD of Opportunity.

It is hoped that the Big Lakes County work will be leveraged by the Southshore Area First Nations and Lakeshore Internet Services as both realize the importance of broadband to deliver advanced applications and services that will bring greater economic and social benefits to their communities and bridge the gaps that exist in employment, learning (online education), and healthcare. They would like to deploy fibre to their membership – they envision a pilot project as a way forward. The models developed for Big Lakes should help make that possible. Partnering with Big Lakes would improve the financials for both.

1.7 Peace Region Economic Development Alliance (PREDA)

1.7.1 PREDA – At a Glance

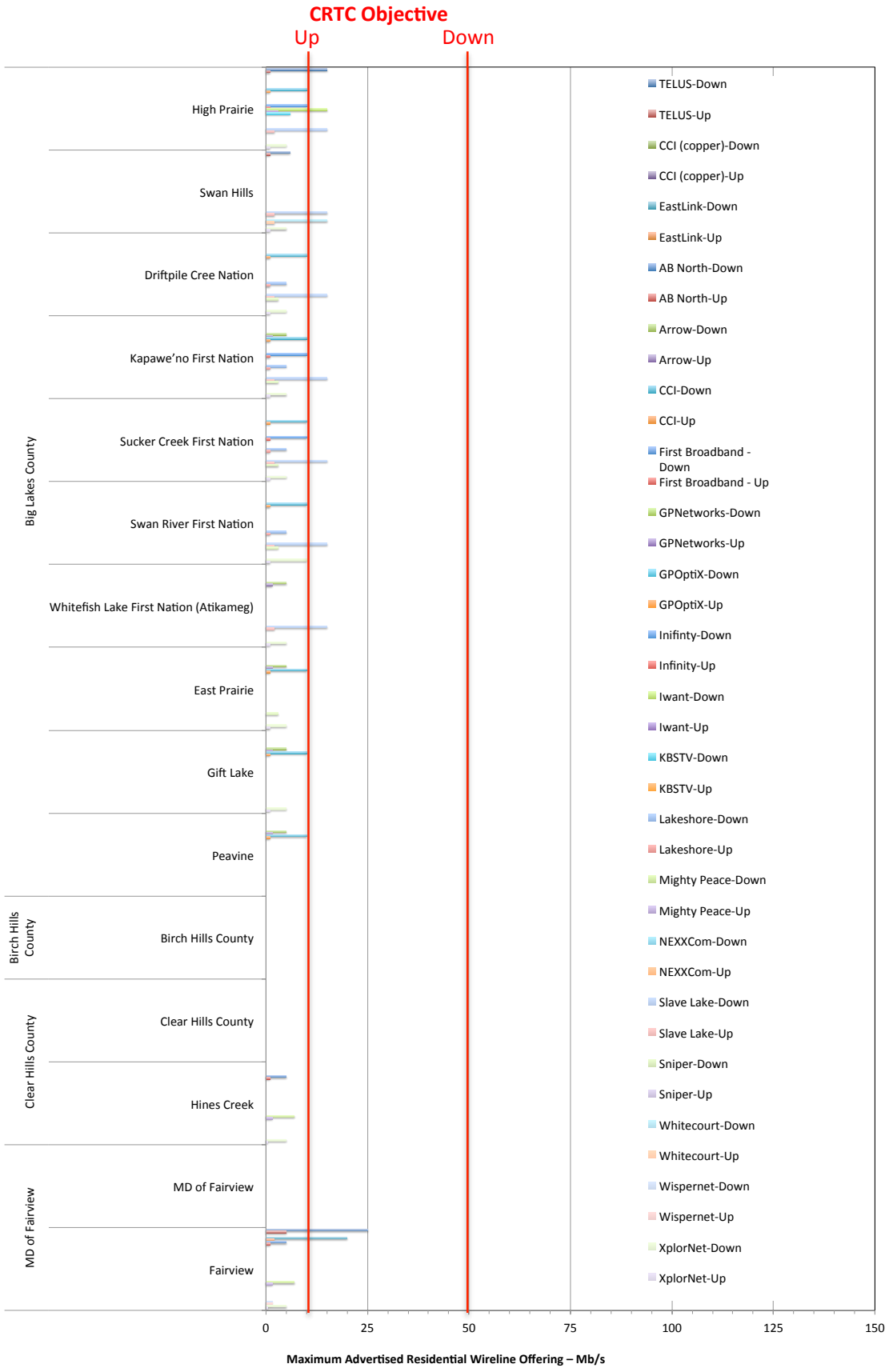
With almost 162,000 residents and 8,330 businesses, PREDA is the largest REDA by population in northern Alberta. The County of Grande Prairie and City of Grande Prairie are the most populated municipalities in the region. Resource extraction, primarily oil and gas, is the primary industry in a region spread over a vast geographic area comprising boreal forest, lakes, and land suitable for agriculture stretching from the Grande Prairie area in the south to the Peace River area in the north.

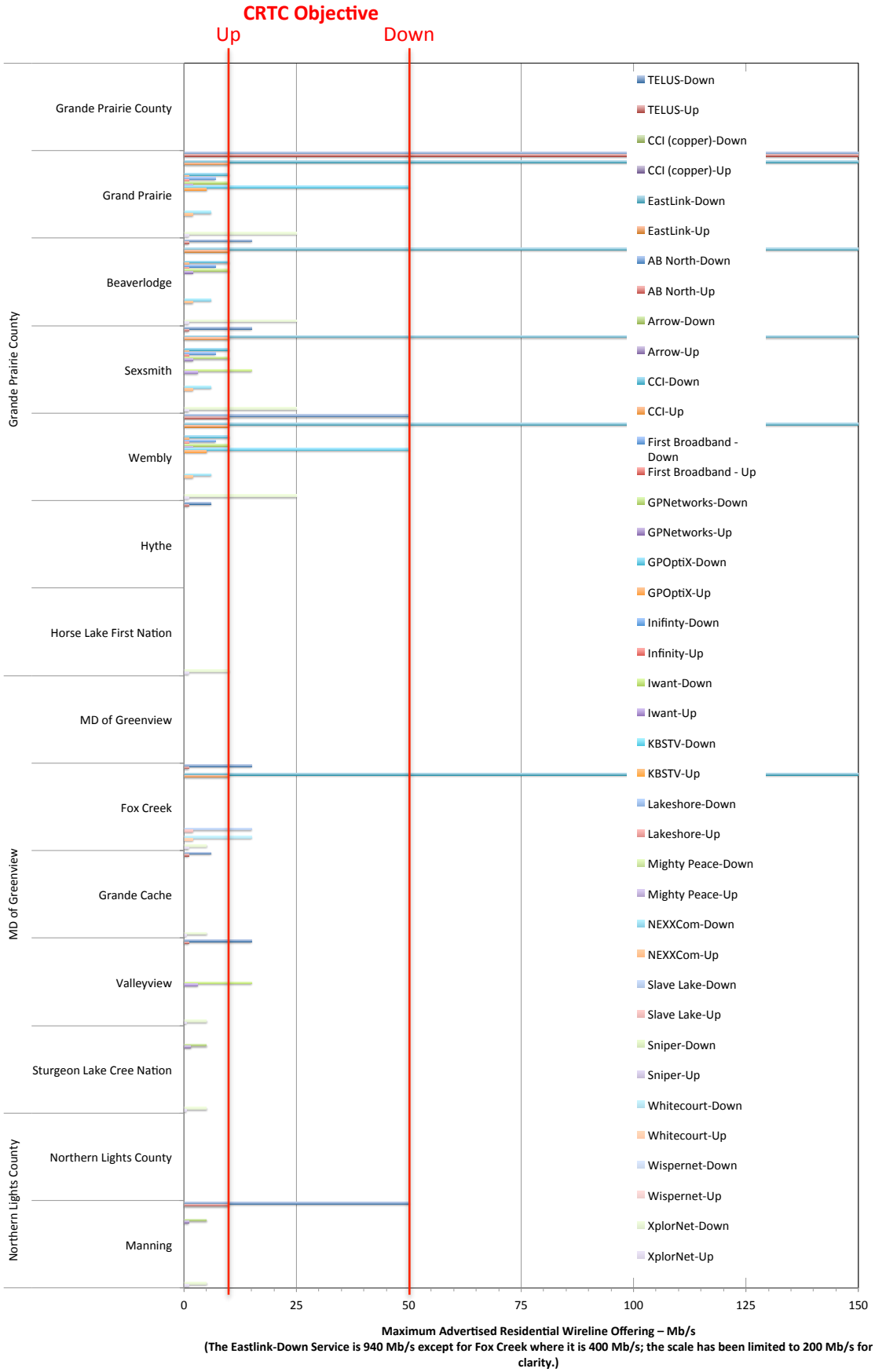
As shown in Table 5, PREDA includes 5 municipal districts (MDs), 7 counties, 1 city, 15 towns, 43 hamlets, 10 First Nations, and 3 Métis Settlements. Of the 161,245 residents, approximately two thirds (62.5%) live in municipalities while the remaining 60,476 (37.5%) are dispersed throughout the rural areas of the region.

Table 5 – PREDA Communities

	Cities	Towns	Villages	Hamlets	First Nations	Métis Settlements	Population	% of PREDA
Big Lakes County		High Prairie Swan Hills		Enilda Faust Grouard Joussard Kinuso	Driftpile Cree Nation Kapawe'no First Nation Sucker Creek First Nation Swan River First Nation Whitefish Lake (Atikameg)	East Prairie Gift Lake Peavine	14,045	8.7%
Birch Hills County				Eaglesham Peoria Tangent Watino Wanham			1,553	1.0%
Clear Hills County			Hines Creek	Cleardale Worsley			3,369	2.1%
MD of Fairview		Fairview		Bluesky Whitelaw			4,602	2.9%
Grand Prairie County	Grand Prairie	Beaverlodge Sexsmith Wembly	Hythe	Bezanson Clairmont Demmitt Dimsdale Elmworth Goodfare Huallen La Glace Teepee Creek Valhalla Centre Wedgewood	Horse Lake First Nation		93,366	57.9%
MD of Greenview		Fox Creek Grande Cache Valleyview		DeBolt Grovedale Landry Heights Little Smoky Ridgevalley	Sturgeon Lake Cree Nation		14,488	9.0%
Northern Lights County		Manning		Deadwood Dixonville North Star Notikewin			5,383	3.3%
Northern Sunrise County		Peace River	Nampa	Cadotte Lake Little Buffalo Marie Reine Reno St. Isidore	Lubicon Lake Band Woodland Cree First Nation		10,422	6.5%
MD of Peace 135		Grimshaw	Berwyn	Brownvale	Duncan's First Nation		5,153	3.2%
Saddle Hills County				Woking			2,225	1.4%
MD of Smoky River		Falher McLennan	Donnelly Girouxville	Guy Jean Cote			4,332	2.7%
MD of Spirit River		Spirit River	Rycroft				2,307	1.4%
52,524 32.6% 12	63,166 39.2% 1	34,355 21.3% 15	3,248 2.0% 7	Population Percent of PREDA 43	6,383 4.0% 10	1,569 1.0% 3	161,245 1 91	1

According to the service level charts in Figure 10, Internet services meeting the new CRTC objective of 50 Mb/s down and 10 Mb/s up are available in only 11 of the 91 communities (including hamlets, First Nation, and Métis settlements) in the region. The City of Grande Prairie and the Town of Peace River have TELUS fibre at 150/150 Mb/s, Beaverlodge, Sexsmith, and Wembley, have EastLink at 940/10 Mb/s, Fox Creek has EastLink at 400/10 Mb/s, and the remaining five have copper-based 50/10 Mb/s service. Services throughout the remaining communities and rural areas is uniformly poor relative to the new objectives.


CRTC Objective
Up
Down
Big Lakes County
High Prairie
Swan Hills
Driftpile Cree Nation
Kapawe'no First Nation
Sucker Creek First Nation
Swan River First Nation
Whitefish Lake First Nation (Atikameg)
East Prairie
Gift Lake
Peavine
Birch Hills County
Birch Hills County
Clear Hills County
Clear Hills County
Hines Creek
MD of Fairview
MD of Fairview
Fairview
TELUS-Down
TELUS-Up
CCI (copper)-Down
CCI (copper)-Up
EastLink-Down
EastLink-Up
AB North-Down
AB North-Up
Arrow-Down
Arrow-Up
CCI-Down
CCI-Up
First Broadband - Down
First Broadband - Up
GPNetworks-Down
GPNetworks-Up
GPOptiX-Down
GPOptiX-Up
Inifinty-Down
Infinity-Up
Iwant-Down
Iwant-Up
KBSTV-Down
KBSTV-Up
Lakeshore-Down
Lakeshore-Up
Mighty Peace-Down
Mighty Peace-Up
NEXXCom-Down
NEXXCom-Up
Slave Lake-Down
Slave Lake-Up
Sniper-Down
Sniper-Up
Whitecourt-Down
Whitecourt-Up
Wispernet-Down
Wispernet-Up
XplorNet-Down
XplorNet-Up
0
25
50
75
100
125
150
Maximum Advertised Residential Wireline Offering – Mb/s


CRTC Objective
Up
Down
Grande Prairie County
Grand Prairie
Beaverlodge
Sexsmith
Wembly
Hythe
Horse Lake First Nation
MD of Greenview
Fox Creek
Grande Cache
Valleyview
Sturgeon Lake Cree Nation
Northern Lights County
Manning
TELUS-Down
TELUS-Up
CCI (copper)-Down
CCI (copper)-Up
EastLink-Down
EastLink-Up
AB North-Down
AB North-Up
Arrow-Down
Arrow-Up
CCI-Down
CCI-Up
First Broadband - Down
First Broadband - Up
GPNetworks-Down
GPNetworks-Up
GPOptiX-Down
GPOptiX-Up
Inifinty-Down
Infinity-Up
Iwant-Down
Iwant-Up
KBSTV-Down
KBSTV-Up
Lakeshore-Down
Lakeshore-Up
Mighty Peace-Down
Mighty Peace-Up
NEXXCom-Down
NEXXCom-Up
Slave Lake-Down
Slave Lake-Up
Sniper-Down
Sniper-Up
Whitecourt-Down
Whitecourt-Up
Wispernet-Down
Wispernet-Up
XplorNet-Down
XplorNet-Up
0
25
50
75
100
125
150
Maximum Advertised Residential Wireline Offering – Mb/s
(The Eastlink-Down Service is 940 Mb/s except for Fox Creek where it is 400 Mb/s; the scale has been limited to 200 Mb/s for clarity.)

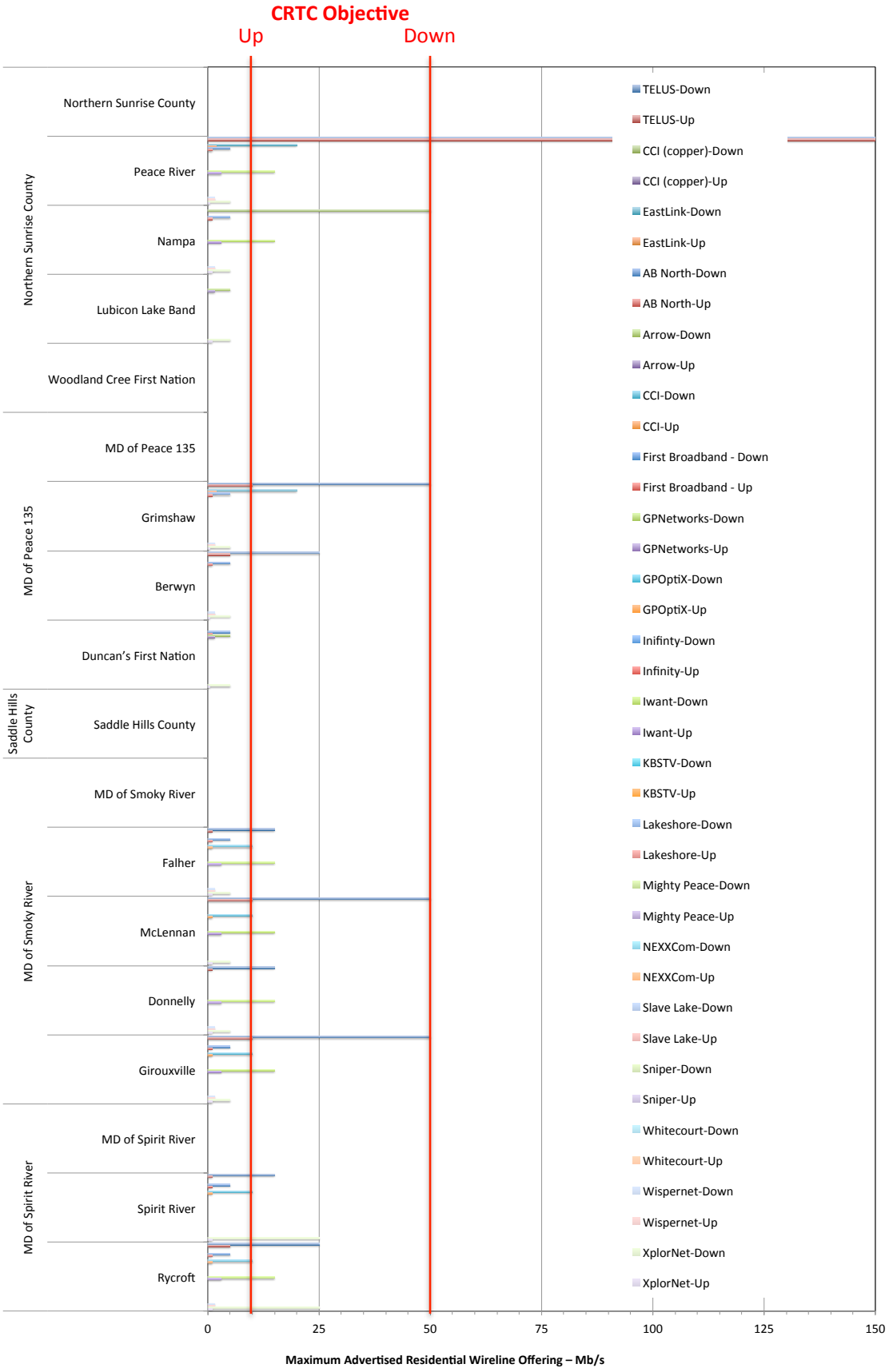
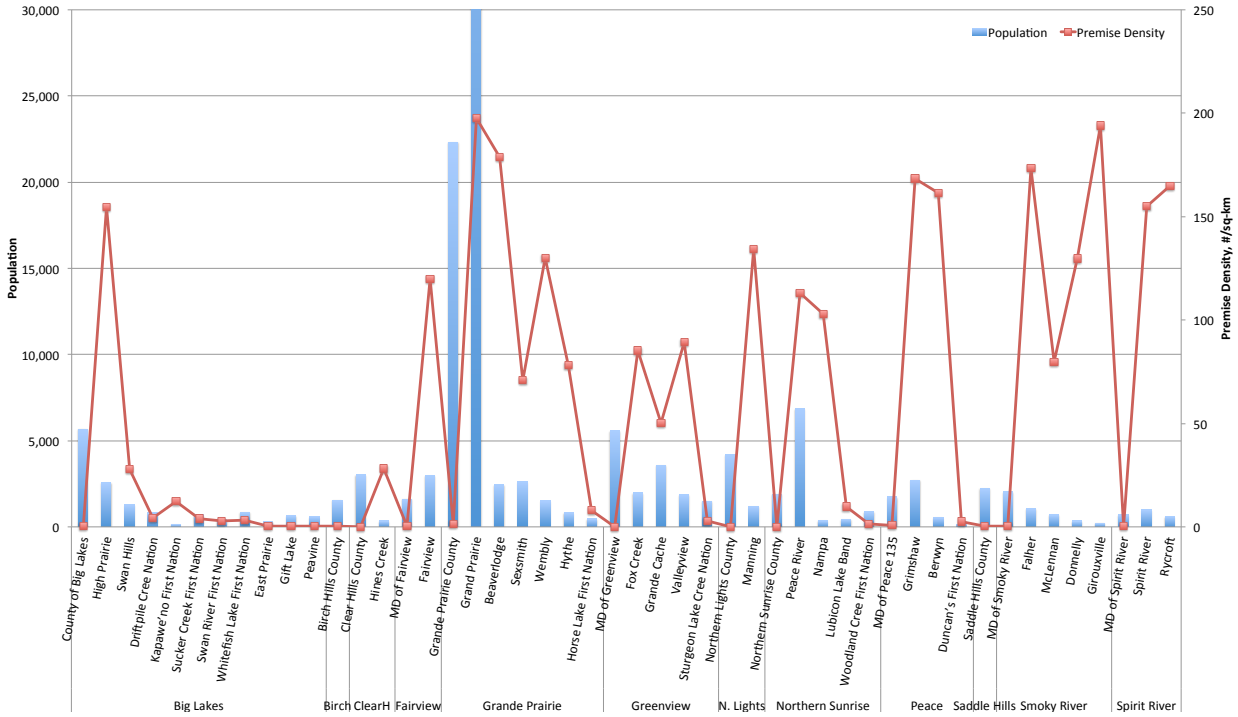


Figure 10 – PREDA Internet service levels.

Deployment options and strategies depend on population and density. As is evident in Figure 11, premise densities across the PREDA region vary widely – from a low of 0.038 homes per square kilometer (or 1 home per 26.5 km^2) in Northern Sunrise to 197 homes/km^2 in the City of Grande Prairie.

As the cost of providing enhanced broadband services increases substantially as the premise density decreases, the quality and availability of these services does so as well. The higher the premise density (red squares) relative to the population (top of the blue columns), the better the capital deployment financials will be. Conversely, the lower the density relative to the size of the population, the worse they will be. To be operationally sustainable, in the higher density areas, if the top of the blue column is below, say, 5,000 individuals, partnering with other communities will likely be necessary.



(To improve readability, the Population scale has been capped at 30k. The population of Grande Prairie is 63k.

Figure 11 – PREDA premise densities.

With large populations and negligible densities, the MDs and counties will have the biggest issue with fibre deployment and unless significant grant funding or novel financing arrangements become available, wireless or hybrid fibre/wireless solutions will be needed. The highest densities together with the largest communities are found in the County of Grande Prairie. Big Lakes County benefits from a slightly higher population density than the more rural MDs and counties as well as the presence of two major centres. As Peace River has TELUS fibre, deploying fibre in the remaining areas will be a challenge financially and hybrid fibre/wireless solutions will be needed. At the municipal level, except possibly for Grande Prairie and Peace River, none of the municipalities in the region are large enough to support a fibre deployment on their own – collaboration with other communities or private industry will be needed.

1.7.2 Plans for Broadband in PREDA

Along a continuum of interest, county and community level interest in broadband within the Peace Region Economic Development Alliance (PREDA) can best be described as '*visionary*' to '*status quo*'. The County of Grande Prairie's vision, a decade ago, led to more than 300 county-sponsored fixed wireless towers being built in the county and through their partnership with GPNetworks, fibre is being deployed to

subdivisions, towns, and villages. The County of Grande Prairie is poised to begin its next wave of enhancement to broadband services within their county. Its vision is to have greatly improved broadband speed available to its residents and businesses – speeds that fibre-based infrastructure is capable of.

Big Lakes County and its partner communities recently took the initiative to obtain Alberta Community Partnership (ACP) funding for a detailed broadband study for the County, inclusive of the municipalities, First Nations, and Métis settlements within its boundaries – specifically High Prairie, Swan Hills, the hamlets of Enilda, Faust, Grouard, Joussard, and Kinuso, the Kapewe'no First Nation, and the Métis settlement of Gift Lake. The study – *Inter-municipal Broadband Discovery Project* – will leverage the results of this work and then develop more detailed financials to evaluate the options of most interest to the County. As the more detailed financials have already been developed, they will be used in the analyses presented here – thereby increasing both the accuracy and credibility of the financial results presented.

The Town of Valleyview completed a Business Case for Broadband in July. Though they are a small community of some 1,000 premises, innovative approaches to both operations and financing have provided them with a positive business case. Valleyview is now moving on to the development of a business/implementation plan.

The councils of the five municipalities of Birch Hills County, Saddle Hills County, MD of Spirit River, Town of Spirit River, and Village of Rycroft are known as the G5 Municipalities. This group works together on matters of regional needs and inter-municipal cooperation, including broadband. Saddle Hills Utility Communications Network and the Peace River Internet Society (PRiS) provide fixed wireless-based Internet services in Saddle Hills County. Rycroft is planning to lay fibre conduit in conjunction with their upcoming curb and gutter project (summer 2017). Potentially, a community fibre project would see Rycroft and the Town of Spirit River leverage the construction of a new water pipeline between the two communities to bring fibre to both communities.

Saddle Hills County has undertaken the building of communications towers for the purposes of ISP co-location and, ultimately, the improvement of the quality of life for its residents and the success of its businesses. The construction of more towers is planned as they work toward their vision of having the county fully served. The county's view is long-term, and it is positioning for today's investments to still be beneficial in 10 to 20 years.

The MD of Smoky River as well as the towns of Falher and McLennan and the villages of Donnelly and Girouxville are poised to initiate a broadband plan.

1.7.3 Utility Networks in PREDA

To provide the more rural areas of PREDA with some guidance beyond more traditional wireless options, detailed financials for inclusive, open-access, lit fibre utilities for the Town of High Prairie, Big Lakes County, and the MD of Smoky River will be developed later in this report.

Though High Prairie is not a member of PREDA, it does fall within Big Lakes County, which is. The analysis is provided here as its size (population of approximately 1,000) is typical of many urban centres within PREDA and the results form part of the analyses for Big Lakes County.

The financials presented for High Prairie illustrate the issues communities such as Fairview, Beaver Lodge, Sexsmith, and Grimshaw will face when evaluating a community fibre access options. Financials for smaller communities such as Wembly, Manning, and Fahler can be found in the report for GROWTH Alberta – they are similar in size to Swan Hills. As High Prairie is large relative to most member communities and the financials are marginal, the idea will be to bring together several communities withinin reasonable proximity together and then leverage the larger client base to improve efficiency and margins. In general, the minimal aggregate size for buried builds is between 2 and 3 thousand premises.

The financials developed above for Big Lakes County show that the business case for an inclusive, open-access utility network focused on providing both fibre-to-the-premise (FTTP) networks in the urban centres as well as an inter-community connecting network within Big Lakes County, goes cashflow positive after seven years. Given their average premise density of only 0.2 premises/km^2, the results are encouraging. Though the county density is low, the population is concentrated along several corridors and with the urban centres involved, the operational scale is sufficient, but not by much. Given the importance of scale, should Big Lakes County proceed to establish a regional network operation, the operation could easily be expanded to encompass both the MD of Smoky River and others within the PREDA footprint – to mutual benefit of all communities involved.

The results for the MD of Smoky River are positive as well and can serve as a template for other communities looking for ways to move forward.

Given the similarities in population and density, it would seem that a similar regional fibre option would work for Northern Sunrise and Greenview. This is not the case, though, and both will have difficulty making the numbers work. The primary urban centre in Northern Sunrise is Peace River, which has TELUS fibre. Greenview's issue is that Grande Cache is far enough from the other centres that pooling operations with them may not be practical.

With both lower densities and fewer population centres, without grant funding, wireless will likely remain the dominant option for Clear Hills, Northern Lights, Saddle Hills, and Birch Hills. With higher densities, limited fibre networks focused on the urban centres are likely possible for Spirit River, Fairview, and Peace. Many options are available to the County of Grande Prairie.

1.8 Regional Economic Development Initiative for Northwest Alberta (REDI)

1.8.1 REDI – At a Glance

The REDI region is home to approximately 23,000 residents and 826 businesses. Its land supports boreal forest while the flat portions are suitable for agriculture in this remote part of Alberta. Twenty-nine percent of the region's residents live on First Nations reserves.

As shown in Table 6, REDI includes 1 county, 2 towns, 3 hamlets, 4 First Nations, and 1 Métis Settlements. Of the 22,780 residents, approximately a third (37%) live in municipalities, including hamlets) while the remaining 13,955 (63%) are dispersed throughout the rural areas of the region.

Table 6 – REDI Communities

	Towns	Hamlets	First Nations	Métis	Population	% of REDI
Mackenzie County	High Level Rainbow Lake	Fort Vermilion La Crete Zama City	Beaver First Nation Dene Tha' First Nation Little Red River Cree FN Tallcree First Nation	Paddle Prairie	22,017	100.0%
11,171 50.7% 1	3,954 18.0% 2	Population Percent of REDI 3	6,348 28.8% 4	544 2.5% 1	22,017 1 11	1

According to the service level chart in Figure 12, Internet service levels meeting the new CRTC objective of 50 Mb/s down and 10 Mb/s up are not available in any of the 11 municipalities (including hamlets, First Nation, and Métis settlements) in the region.

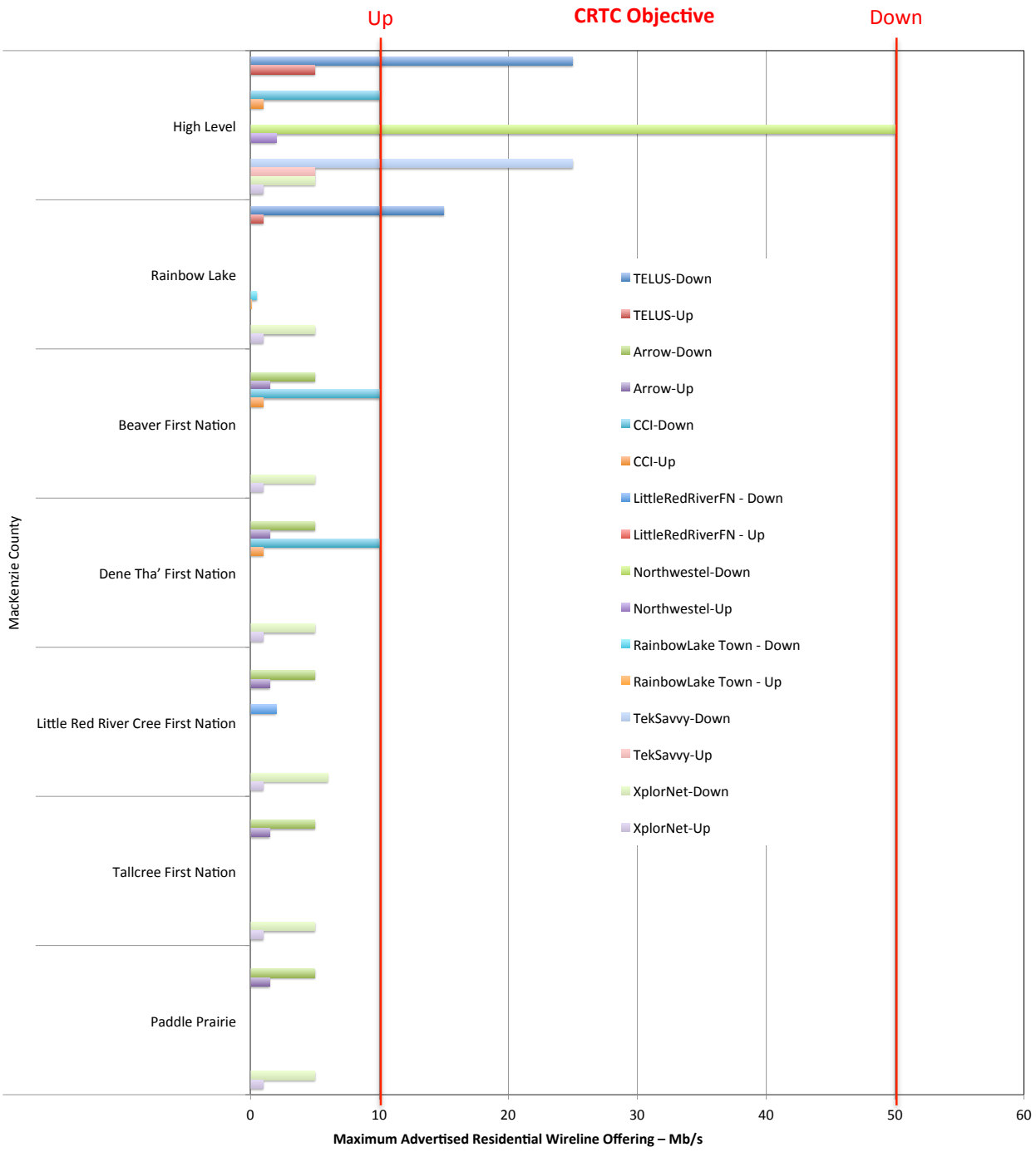


Figure 12 – REDI Internet service levels.

Deployment options and strategies depend on population and density. As is evident in Figure 13, premise densities across the LSLEA region vary widely – from a low of 0.04 homes per square kilometer (or 1 home per 22.6 km^2) in McKenzie County to 46 homes/km^2 in the Town High Level.

As the cost of providing enhanced broadband services increases substantially as the premise density decreases, the quality and availability of these services does so as well. The higher the premise density (red squares) relative to the population (top of the blue columns), the better the capital deployment financials will be. Conversely, the lower the density relative to the size of the population, the worse they

will be. To be operationally sustainable, in the higher density areas, if the top of the blue column is below, say, 5,000 individuals, partnering with other communities will likely be necessary.

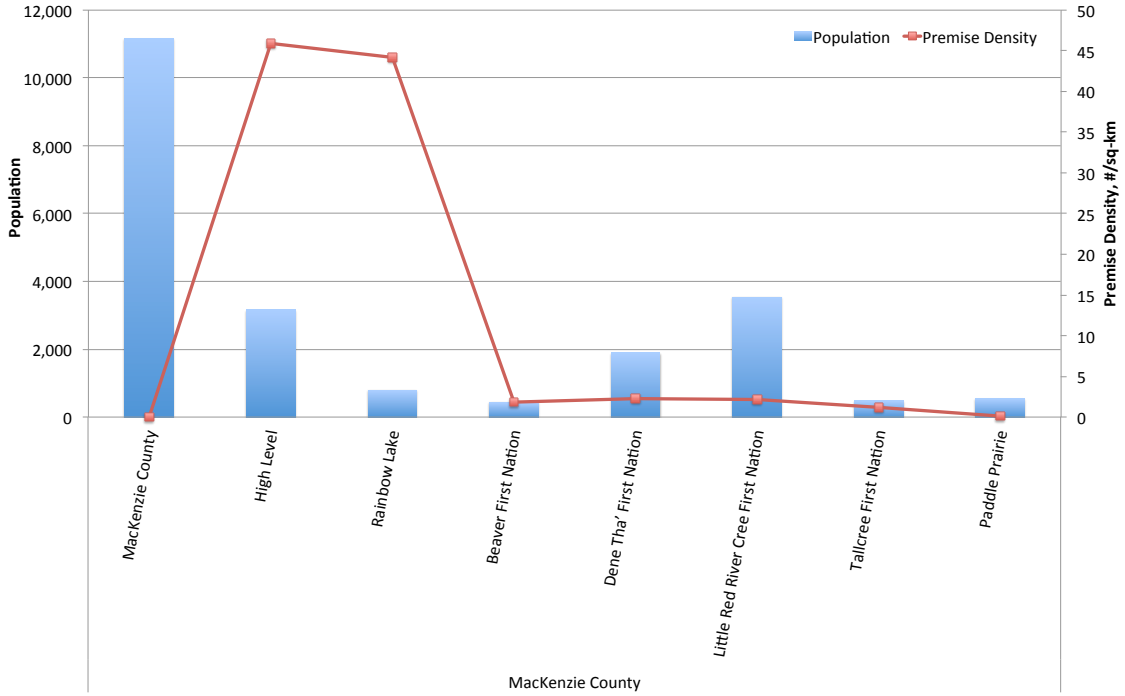


Figure 13 – REDI premise densities.

With larger populations and negligible densities, the county will have the biggest issue with fibre deployment and unless significant grant funding or novel financing arrangements become available, wireless or hybrid fibre/wireless solutions will be needed. At the municipal level, none of the municipalities in the region are large enough to support a fibre deployment on their own – collaboration with other communities or private industry will be needed.

1.8.2 Plans for Broadband

Within the Regional Economic Development Initiative for Northwest Alberta (REDI) the communities that have the greatest near-term broadband aspirations (likely a community hybrid fibre/fixed wireless solution) are the Town of High Level and the First Nations' communities of Dene Tha', Beaver First, Little Red River Cree, and Tall Cree.

1.8.3 Utility Networks in REDI

Each of the communities in REDI has access to SuperNet and the existing fibre routes do pass close to a number of fixed wireless towers. If the communities were interested in establishing an open-access utility network operation to enhance Internet services in the County, it'd likely be best to focus on Fibre-to-the-premise (FTTP) solutions in the communities and fibre to the towers to improve rural coverage. As of this writing the plans for SuperNet 2.0 had not been released so it will be assumed that the existing SuperNet connection sites will remain available and that the terms of their use are likely to become more reasonable. With this approach, the more communities, hamlets, First Nations, and Métis Settlements involved, the better. As broadband needs increase and priorities evolve, this initial focus on the communities could move to a greater focus on the more rural areas. The high-level financials developed indicate that a community focused FTTP play would be financially sustainable, but only if all communities were involved.

1.9 Available Analyses – In Summary

Figure 14 provides a view of the rural and urban populations and densities for each MD and county in the northern Alberta study region. The blue bars show the population of each MD or county and the organge bars,the aggregate population in the urban areas (cities, towns, and villages). Red squares show the rural premise density within each MD and county. In general, the larger the rural population and the lower the density, the more expensive a fibre deployment will be and the more difficult it will be to produce a financially sustainable operation. Should larger population centres (orange) be present in the area and partner with the MD or county, the increased operational scale will help ensure a sustainable operation for both.

In urban centres with significant density, the larger the population the better – as the scale helps operations and the density reduces the deployment cost. In general, urban populations above 4-5 thousand are required for a sustainable, stand-alone buried fibre-utility operation.

The financials developed for Big Lakes County and the VRRA indicate that regional utility-based fibre networks are possible and would be sustainable in those counties over the longer term. The results bold well for MDs and counties with similar or higher density characteristics, rural populations concentrated in smaller areas of the MD or county, and several urban centres with similar or larger aggregate populations. Without grant funding or aerial deployments, those with both lower densities and fewer population centres will need to rely more on wireless and hybrid fibre/wireless solutions.

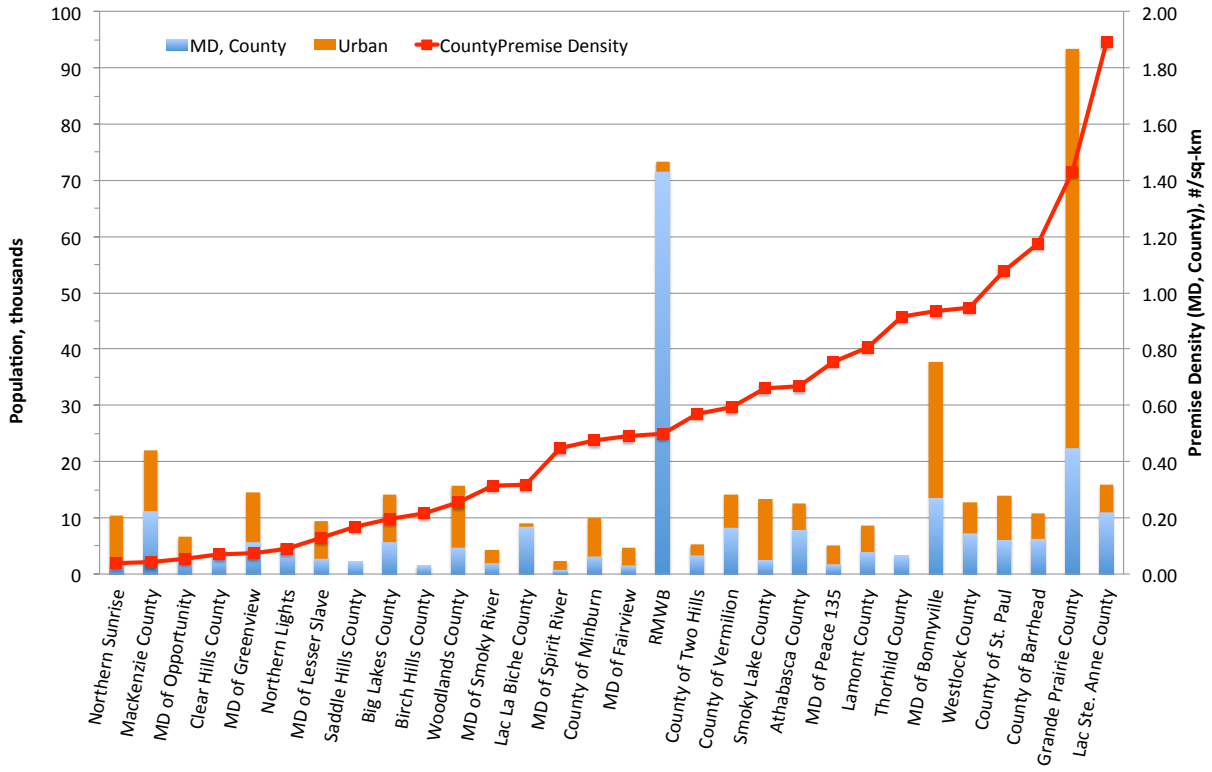


Figure 14 – Population and premise densities in northern Alberta.

Table 7– Analyses Completed for Communities and Regions in Northern Alberta

Report*	**Category**	**County/Community** (Premise Counts)	**Comments**
Alberta HUB	Urban Centres	Bruderheim – 601	High level analysis. To increase operational scale and combined financials with Lamont are also provided.
	MDs, Counties	Lac La Biche	Detailed analysis including capital estimates for the hamlets of Lac La Biche, Plamondon, Beaver Lake, and Rich Lake.
		Vermilion River	Detailed analysis based on the study for the Vermilion River Regional Alliance. In addition to a county network, capital estimates are provided for the town of Vermilion, Dewberry, Kitscoty, Marwayne, Paradise Vallet, and Mannville.
GROWTH Alberta	Urban Centres	Whitecourt – 4,250 Barrhead – 2,000 Swan Hills – 725	Provides an interesting comparative view of the impact of operational scale as community size decreases.
	MDs, Counties	Woodlands	Provides capital estimates to connect several urban centres and ISP towers.
LSLEA	Urban Centres	High Prairie – 1,000	Detailed capital estimate and financials from the Big Lakes Study for the town of High Prairie.
	MDs, Counties	Big Lakes	See PREDA.
NADC	Urban Centres	Athabasca – 1,341	Detailed capital and financial analysis for the Town of Athabasca.
	MDs, Counties	Athabasca	Including capital estimates for the Town of Athabasca and Boyle as well as for Athabasca County.
		Regional Municipality of Wood Buffalo	In fall, 2013, the now defunct Oil Sands Leadership initiative had Taylor Warwick complete a planning level conceptual review the options available to improve broadband services within Anzac, Conklin, Fort Chipewyan, Fort MacKay, Gregoire Lake Estates, and Janvier. The options included infrastructure to support mesh WiFi, hybrid fibre/WiFi, and full fibre/WiFi. The detailed study[8] is available on the NADC website.
PREDA	Urban Centres	High Prairie – 1,000	See LSLEA.
	MDs, Counties	Big Lakes	Detailed analysis based on the study for Big Lakes County. As the study is inclusive of the urban centres of High Prairie, Swan Hills, Enilda, Foust, Gift Lake, Grouard, Joussard, Kinuso, and area around Kinuso, capital estimates for each of these centre is provided.
		Smoky River	Detailed study Including capital estimates for Fahler, McLennan, and Donnelly.
REDI	Urban Centres	Mackenzie County	High level analysis Including High Level, Rainbow Lake, La Crete, Fort Vermilion, and Zama City.
The estimates provided are based on a common 'default' set of assumptions. Specifically, the assume a fully buried, air blown, home-run fibre network funded through a 25 year ACFA loan and operated on an open access basis as a utility. Depending on the choices made by individual communities and local conditions such as the availability of power poles, these numbers may change significantly. *All analyses appear in the NADC report. [9]			

[8] Dobson, C.; *Infrastructure Options for Rural Villages in the RMWB*; Oil Sands Leadership Initiative; 2013-09-14.

[9] Dobson, C.; *Northern Alberta Broadband Preparedness Project – NADC*; Taylor Warwick; 2017-09-15.

1.10 Next Steps

This document provides a starting place for communities, sub-regions, and regions across northern Alberta looking to enhance the availability and quality of broadband services in their areas. A range of options, from staying with the status quo, to negotiating with private enterprise, to establishing a fibre utility are presented and discussed. For the latter options, illustrative financials are presented.

While regional and municipal options do involve more responsibilities and risks than simply transferring control to private enterprise, they come with significant advantages. As well, to manage the level of their involvement, close to turn-key options do exist and can be easily incorporated into regional, sub-regional, and community deployment programs – once the community has decided upon the business and governance structure, operational arrangements, and financing.

Some areas, such as Big Lakes County and the Vermilion River Regional Alliance have already chosen a direction and are evaluating their direction further. The initial next step for those communities not there yet, is to work with key stakeholders and determine if something beyond the status quo is required and, if so, which of the many options available to enhance broadband infrastructure, is most appropriate. Once consensus on a direction has been reached, the direction will need to be verified based on negotiation, feasibility studies, or businesses case development as appropriate.

Whether or not cities, towns, villages, First Nation communities, Métis settlements, counties and MDs elect to move (or, for those that already are, continue moving) forward with broadband now or not, in order to position for future broadband planning and expansion, the following interim straightforward and inexpensive approaches to enabling significant future cost-savings should be considered:

Municipal Planning:

- Work with your community, sub-region, or REDA to leverage planning/policy and financial resources;
- Develop a Broadband Services Strategic plan specific to your community;
- Embed fibre network requirements in internal IT planning processes; and
- Accelerate currently planned IT infrastructure deployment.

Leverage Planned Civil Works:

- Develop a policy for including installation of fibre conduit as part of applicable and appropriate town and county infrastructure projects, such as road (re)construction and water / wastewater projects.

Position for the future:

- Require that the inclusion of fibre conduit be a mandatory requirement in all applications for new residential and businesses development permits; and
- Adopt an inside wiring standard with Cat-5 wiring as the minimum standard.

1.11 Conclusions

Whereas wealth creation in the industrial era required significant physical resources, access to raw materials, manpower, and efficient transportation, wealth creation in knowledge-based economies is largely independent of place, local resources, and physical assets. In contrast, wealth now arises from human ingenuity, intellectual property, and novel business models. With growth and development timeframes in the new economy largely unconstrained by the building of physical infrastructure and the movement of goods and services, knowledge-based businesses often grow exponentially. As a foundational cornerstone of these emerging systems of wealth creation, access to information and communications technology has become critical to sustainable economic development in virtually every community and society on the planet.

Through this work, REDA members (and non-members) are now in a better position to weigh their options and select those that best align with each's vision for the future of their area. Enhancing broadband has the potential to set the stage to dramatically and positively impact the fabric of life throughout the region by helping to enable exceptional network services; learn-in-place, work-in-place, and age-in-place opportunities for all generations; innovation and diversification in every economic sector; and positioning the region's brand as dynamic, progressive and relevant to the future.

As shown, the financial sustainability of stand-alone urban utility fibre operations is largely a function of size and the options a community decides to go with. In general, centres with populations of 4-5 thousand or greater can do what they wish. Smaller communities are typically more constrained and will require access to grant funding or other communities to partner with to make things work.

With very small and uneven densities, generalizations are more difficult when evaluating MDs and counties. In general, the sustainability of MD or county-based, fibre-utility operations is a function of rural and municipal population and density and their variation across the study region. Scale, as in partnering with neighbouring communities helps.

To accommodate both present and future economic development needs, facilitate full citizen inclusion, and help eliminate any digital divides within the NADC region, regional- or municipal-driven, utility-based, fibre-to-the-premise deployments capable of enabling symmetric access up to and beyond 1 Gb/s to all is recommended. The hybrid fibre wireless infrastructure suggested will cost-effectively scale to meet all future bandwidth requirements, minimize cost to all potential clients, and enable the region to maintain control of critical civic infrastructure.