

EQUITY | RESEARCH

# Wireless and Tower Overview

January 2018

**RBC Capital Markets, LLC**

**Jonathan Atkin** (Analyst) (650) 218-8653 [jonathan.atkin@rbccm.com](mailto:jonathan.atkin@rbccm.com)

This report is priced as of market close January 19, 2018.

All values in U.S. dollars unless otherwise noted.

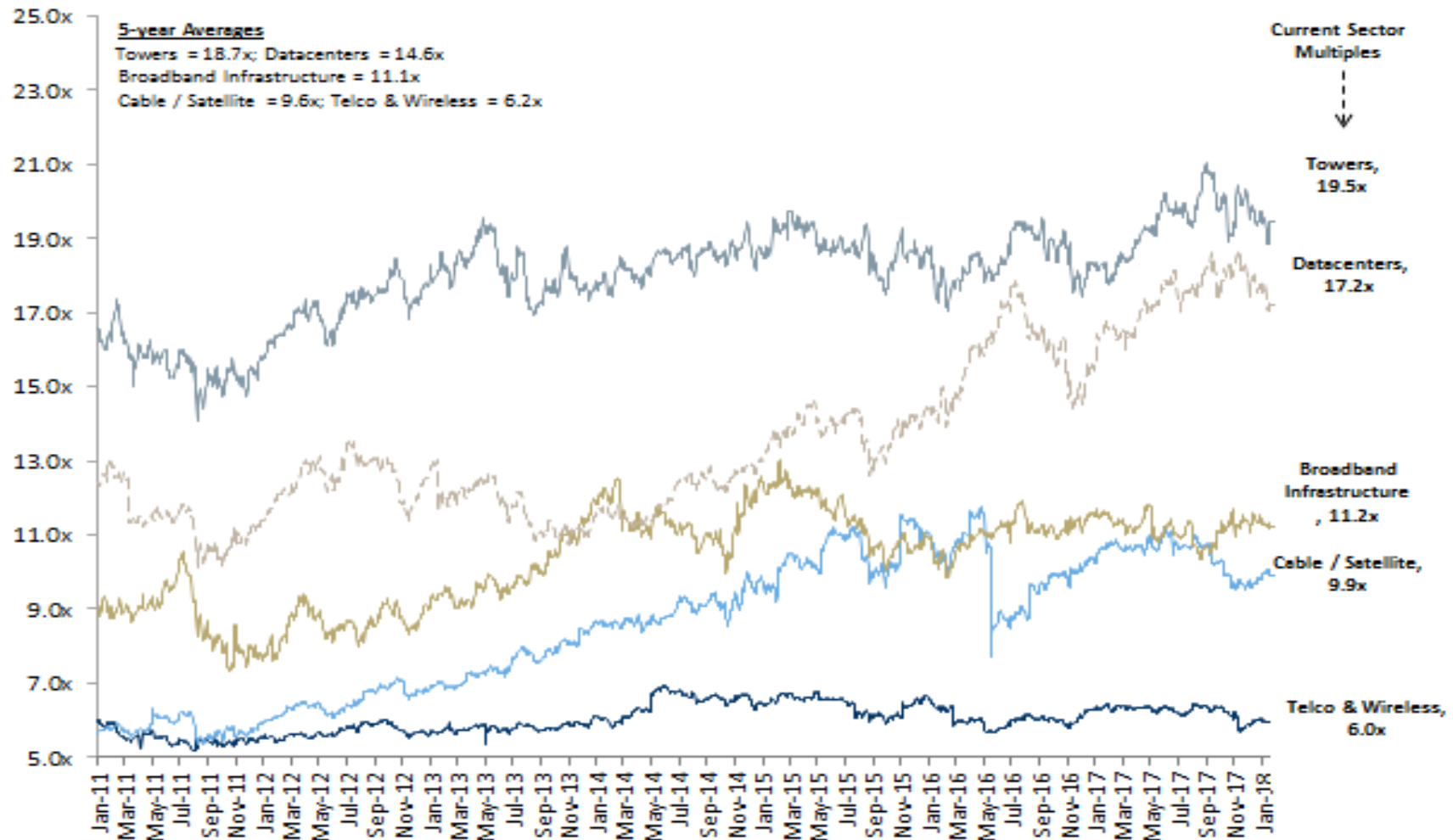
**For Required Conflicts Disclosures, please see page 13.**



**RBC Capital Markets**

## Trading Multiples by Sector

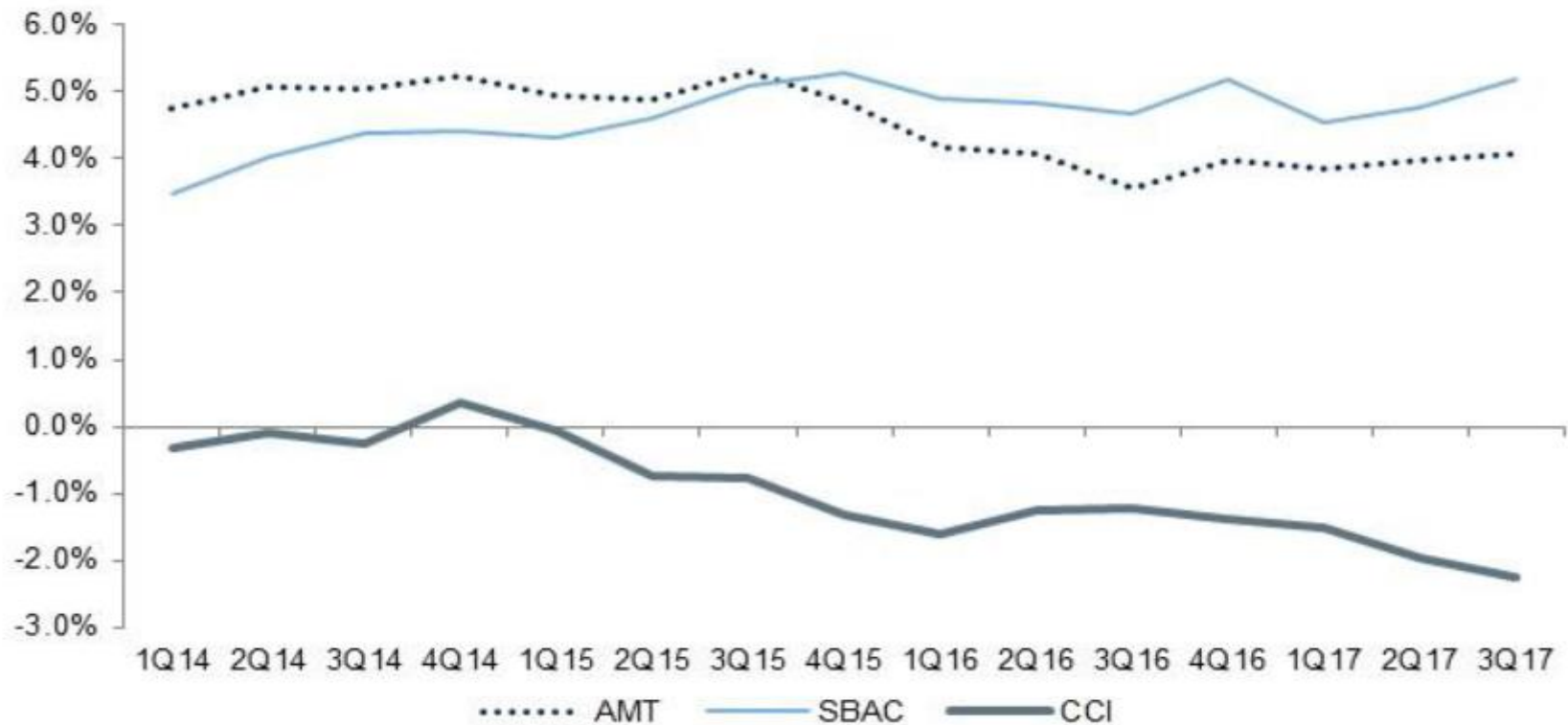
Towers appreciated an average of 40% during 2017 vs. REITs at 6%  
 Towers trade at 20.5x 2018E AFFO vs. REITs at 20.3x.



Source: RBC Capital Markets, S&P Capital IQ

## Tower Net Economic Returns

SBAC leads in net economic-return generation, followed closely by AMT. CCI lags its peers and is trending downwards due to the higher capital intensity of its small-cell activities.



## Wireless Financial Profile (\$M)

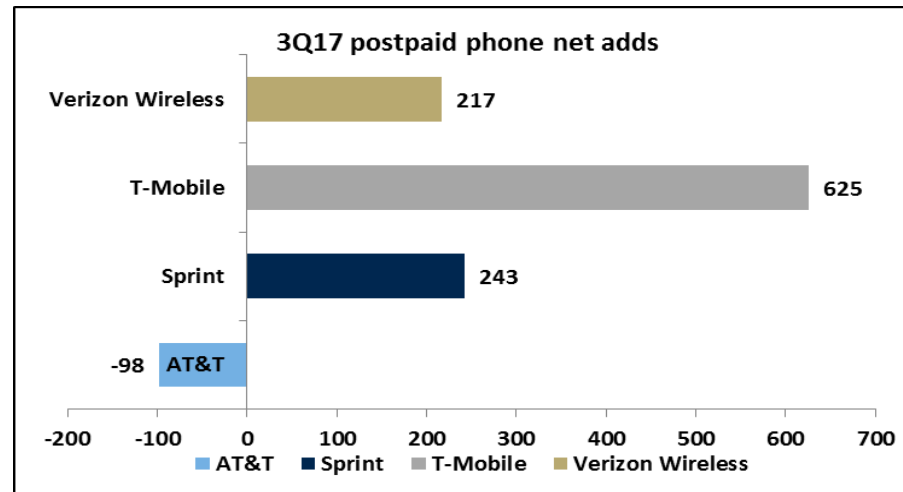
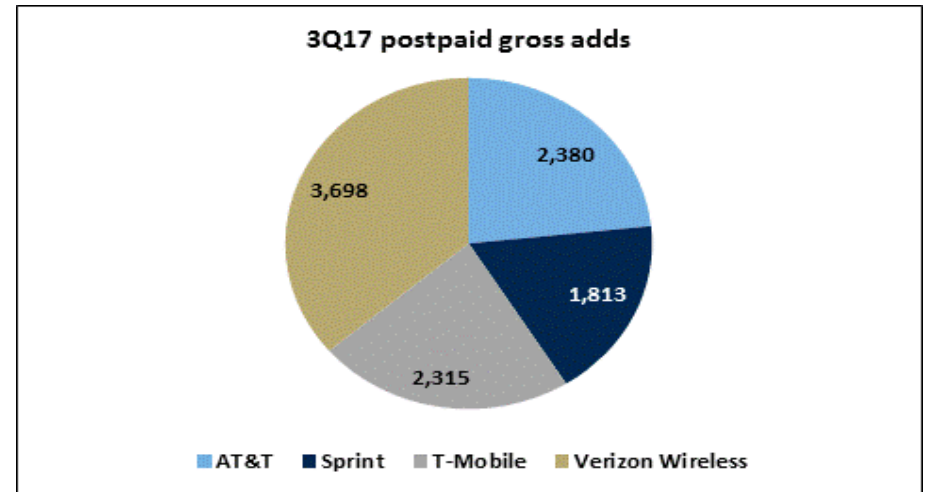
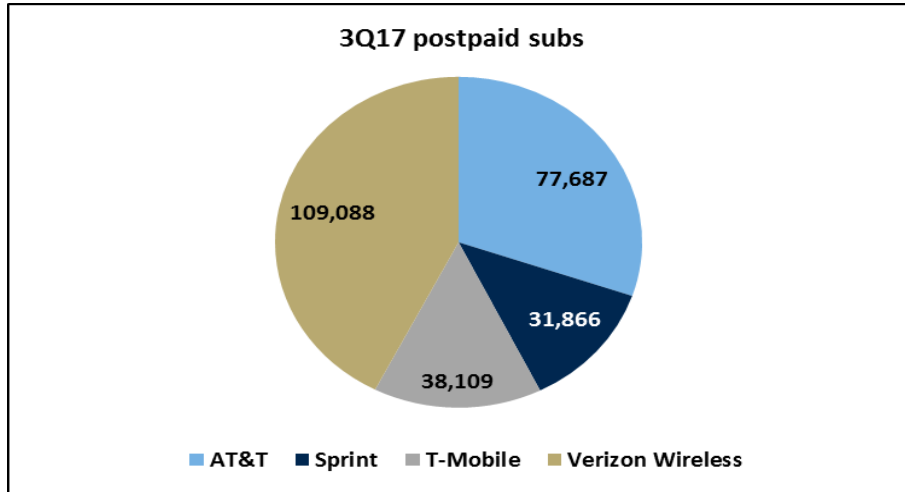
	2018E			
	Total Rev.	EBITDA	Capex	Spectrum Acq.
AT&T	\$72,125	\$28,512	\$10,819	\$0
Sprint	\$32,227	\$11,507	\$5,400	\$200
T-Mobile	\$43,122	\$11,854	\$5,249	\$0
Verizon Wireless	\$86,400	\$37,802	\$11,902	\$0
<b>Sector Total</b>	<b>\$233,875</b>	<b>\$89,675</b>	<b>\$33,370</b>	<b>\$200</b>

	Capex/Total Rev. (w/ spectrum)	EBITDA Margin Total Revenue	Op. FCF (w/ spectrum)	Op. FCF (w/o spectrum)
AT&T	15.0%	39.5%	\$17,693	\$17,693
Sprint	17.4%	35.7%	\$5,907	\$6,107
T-Mobile	12.2%	27.5%	\$6,605	\$6,605
Verizon Wireless	13.8%	43.8%	\$25,900	\$25,900
<b>Sector Total</b>	<b>14.4%</b>	<b>38.3%</b>	<b>\$56,104</b>	<b>\$56,304</b>

Source: RBC Capital Markets estimates based on company reports

# Wireless Subscriber Metrics (subscribers in 000s)

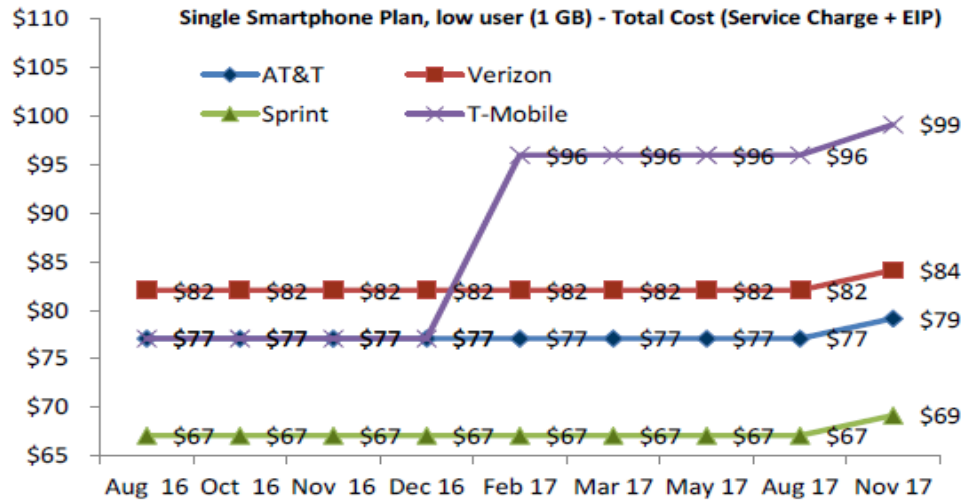


Source: RBC Capital Markets estimates based on company reports

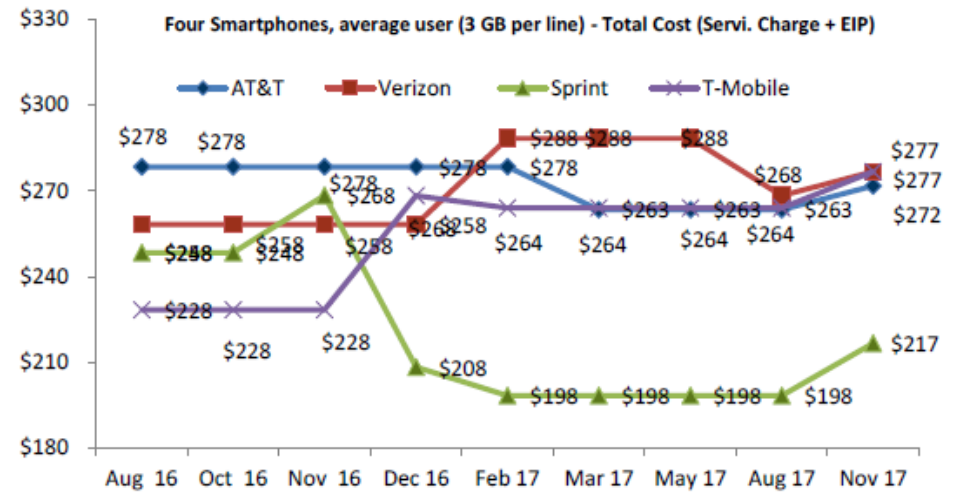
# Rate Plan Comparisons

## Postpaid Rate Plan Comparison – Total Monthly Billings Including Current Promotions (Service plus Device)

**Single Smartphone Plan, low user (1 GB)**



**Four Smartphones, average user (min 3 GB per line)**



Source: RBC Capital Markets, and Company Reports

## Network Quality

	1H-16				2H-16				1H-17				2H-17*			
	VZ	T	S	TMUS	VZ	T	S	TMUS	VZ	T	S	TMUS	VZ	T	S	TMUS
<b>Overall Performance</b>	highest	(1.2)	(3.5)	(1.4)	highest	(1.3)	(3.8)	(2.9)	highest	(0.6)	(3.5)	(1.5)	highest	(1.2)	(4.1)	(1.5)
<b>Reliability Index</b>	highest	(0.6)	(1.2)	(1.1)	highest	(0.8)	(1.0)	(2.3)	highest	(0.4)	(1.2)	(1.3)	highest	(1.2)	(1.8)	(1.6)
<b>Speed Index</b>	highest	(3.5)	(11.6)	(1.7)	highest	(2.4)	(14.4)	(3.4)	highest	(1.2)	(12.1)	(1.2)	highest	(0.5)	(12.2)	(0.2)
<b>Data Performance</b>	highest	(1.7)	(5.5)	(0.9)	highest	(1.2)	(6.7)	(1.6)	highest	(0.6)	(6.0)	(0.8)	highest	(0.5)	(6.0)	(0.4)
<b>Call Performance</b>	highest	(0.9)	(1.1)	(2.3)	highest	(1.6)	(0.1)	(5.0)	highest	(0.8)	(0.4)	(2.5)	highest	(2.2)	(1.9)	(3.2)
<b>Text Performance</b>	(0.6)	highest	(1.2)	(0.3)	(0.1)	highest	(0.4)	(0.0)	(0.2)	highest	(0.5)	(0.7)	(0.0)	highest	(0.5)	(0.2)

The score comparisons are based on 2H-17 (partial) data released for a subset of the top 125 markets to date.

The data are a population-weighted aggregate view across metros to account for metros of different sizes, based on RBC calculations.

RootMetrics' preferred view of the scores is on a metro by metro basis, and is it thus difficult to draw definitive conclusions as to trends in carrier rankings on a national basis using an aggregation of metros.

	1H-16				2H-16				1H-17				2H-17*			
	No. of Metros				No. of Metros				No. of Metros				No. of Metros			
	VZ	T	S	TMUS	VZ	T	S	TMUS	VZ	T	S	TMUS	VZ	T	S	TMUS
<b>Overall Performance</b>	79.0	24.0	2.0	14.0	94.0	17.0	2.0	8.0	76.0	27.0	2.0	14.0	85.0	27.0	2.0	9.0
<b>Reliability Index</b>	75.0	24.0	8.0	13.0	86.0	14.0	11.0	5.0	75.0	28.0	5.0	8.0	95.0	16.0	2.0	6.0
<b>Speed Index</b>	45.0	27.0	5.0	46.0	71.0	17.0	1.0	29.0	55.0	17.0	4.0	42.0	48.0	29.0	2.0	38.0
<b>Data Performance</b>	50.0	27.0	3.0	39.0	82.0	18.0	0.0	16.0	65.0	19.0	3.0	26.0	59.0	28.0	1.0	28.0
<b>Call Performance</b>	59.0	21.0	18.0	11.0	55.0	7.0	39.0	4.0	58.0	19.0	26.0	9.0	88.0	14.0	12.0	5.0
<b>Text Performance</b>	9.0	65.0	0.0	32.0	17.0	45.0	10.0	34.0	31.0	54.0	9.0	11.0	32.0	34.0	3.0	31.0

The score comparisons are based on 2H-17 data released for a subset of the top 125 markets to date.

RootMetrics' preferred view of the scores is on a metro by metro basis, and is it thus difficult to draw definitive conclusions as to trends in carrier rankings on a national basis using an aggregation of metros.

## Tower Growth Comparisons

<b>Gross organic revenue growth (y/y)</b>	<b>1Q15</b>	<b>2Q15</b>	<b>3Q15</b>	<b>4Q15</b>	<b>1Q16</b>	<b>2Q16</b>	<b>3Q16</b>	<b>4Q16</b>	<b>1Q17</b>	<b>2Q17</b>	<b>3Q17</b>
AMT Domestic Towers	8.9%	8.9%	8.7%	8.4%	7.4%	7.2%	7.5%	7.7%	8.5%	8.0%	7.9%
SBAC Domestic Towers	10.8%	9.5%	8.0%	7.5%	7.5%	7.5%	7.6%	7.0%	7.0%	7.0%	6.9%
CCI Domestic Towers (excluding small cells)	6.7%	7.2%	8.2%	7.3%	7.5%	6.8%	7.4%	7.7%	7.6%	6.8%	5.8%

<b>Churn</b>	<b>1Q15</b>	<b>2Q15</b>	<b>3Q15</b>	<b>4Q15</b>	<b>1Q16</b>	<b>2Q16</b>	<b>3Q16</b>	<b>4Q16</b>	<b>1Q17</b>	<b>2Q17</b>	<b>3Q17</b>
AMT Domestic Towers	2.2%	2.3%	2.4%	2.3%	1.5%	1.6%	1.8%	1.9%	2.0%	1.8%	1.6%
SBAC Domestic Towers	3.5%	3.5%	3.0%	5.0%	4.6%	4.3%	4.5%	3.0%	3.4%	3.2%	3.0%
CCI Domestic Towers	4.4%	3.8%	3.5%	3.1%	2.2%	2.5%	2.7%	2.8%	3.5%	3.0%	2.4%

<b>Net organic revenue growth (y/y)</b>	<b>1Q15</b>	<b>2Q15</b>	<b>3Q15</b>	<b>4Q15</b>	<b>1Q16</b>	<b>2Q16</b>	<b>3Q16</b>	<b>4Q16</b>	<b>1Q17</b>	<b>2Q17</b>	<b>3Q17</b>
AMT Domestic Towers	6.7%	6.6%	6.3%	6.1%	5.9%	5.6%	5.7%	5.8%	6.5%	6.2%	6.3%
SBAC Domestic Towers	7.3%	6.0%	5.0%	2.5%	2.9%	3.2%	3.1%	4.0%	3.6%	3.8%	3.9%
CCI Domestic Towers (excluding small cells) <sup>a</sup>	2.4%	3.4%	4.7%	4.2%	5.3%	4.3%	4.6%	4.9%	4.1%	3.8%	3.4%

\*\* RBC Capital Market estimate.

### Notes:

- (1) AMT rates adjust for straight-line revenue, pass-thru revenue, prepaid amortization revenue, other non-run rate revenue (incl. decommissioning revenue) and FX. A small amount of revenue from managed sites and rooftops remains in the run rate.
- (2) Reported SBAC same-store growth rates adjust for straight-line revenue, pass-through expense, augmentation capex reimbursement, rooftop/managed business, and non-recurring items.
- (3) CCI 3Q growth rates account for the expiration of a rent-abatement provision that we believe ended at mid-year 2016, associated with 900 AT&T leases.



## Tenant Composition

	FY2012A	FY2013A	FY2014A	FY2015A	FY2016A
<b>American Tower</b>					
Big Four	51%	56%	56%	63%	56%
- AT&T	18%	18%	20%	24%	21%
- Verizon Wireless	11%	11%	11%	16%	15%
- Sprint	14%	16%	15%	13%	11%
- T-Mobile	8%	11%	10%	10%	9%
Other Domestic	17%	9%	8%	3%	4%
Brazil	7%	6%	8%	9%	9%
India	6%	6%	5%	5%	14%
Africa	6%	7%	6%	7%	8%
Other International	10%	14%	14%	11%	9%
<b>Crown Castle</b>					
Big Four	83%	92%	90%	89%	88%
- AT&T	23%	23%	26%	27%	27%
- Verizon Wireless	17%	17%	18%	21%	22%
- Sprint	28%	28%	25%	19%	16%
- T-Mobile	15%	24%	21%	22%	23%
Other Domestic	12%	8%	10%	11%	12%
Australia	5%	0%	0%	0%	0%
<b>SBA Communications</b>					
Big Four	71%	73%	74%	73%	74%
- AT&T	22%	22%	23%	24%	26%
- Verizon Wireless	16%	12%	12%	14%	15%
- Sprint	22%	25%	23%	20%	16%
- T-Mobile	11%	14%	16%	16%	17%
Other Domestic	27%	25%	12%	15%	10%
Brazil	-	-	12%	11%	11%
Other International	2%	2%	2%	5%	5%

Notes: Totals may not sum to 100% due to rounding.

CCI figures reflect TMUS' acquisition of MetroPCS (April 2013), Sprint's acquisition of Clearwire (July 2013), and AT&T's acquisition of Leap Wireless (March 2014). Figures from 2013-2015 exclude the impact of CCAL.

Source: RBC Capital Markets and 10-K filings

## Tower Lease Expense

---

(\$ millions)	AT&T	Sprint	T-Mobile	Verizon
CY2017E total wireless revenues	\$71,014	\$31,646	\$40,684	\$86,667
Number of towers leased	67,800	55,000	58,598	55,700
CY2017E tower lease expense	\$2,848	\$2,310	\$2,461	\$2,339
CY2017E total wireless cash expense (COGS + SG&A)	\$44,660	\$20,332	\$29,808	\$48,177
<b>Tower lease expense as a percentage of wireless revenues</b>	<b>4.0%</b>	<b>7.3%</b>	<b>6.0%</b>	<b>2.7%</b>
<b>Tower lease expense as a percentage of wireless cash expense</b>	<b>6.4%</b>	<b>11.4%</b>	<b>8.3%</b>	<b>4.9%</b>

Source: RBC Capital Markets estimates, company sources.

## FirstNet Impacts

	AMT	CCI	SBAC	Total
<b>Estimated AT&amp;T sites potentially subject to amendments</b>	<b>8,560</b>	<b>16,246</b>	<b>6,000</b>	<b>30,806</b>
<i>% of total AT&amp;T sites</i>	<i>28%</i>	<i>53%</i>	<i>19%</i>	
<b>Estimated FirstNet Revenue Impact, \$M</b>	\$82	\$156	\$58	
Total Revenue (2018E)	\$7,116	\$5,273	\$1,842	
<b>Estimated Revenue Tailwind</b>	1%	3%	3%	
<b>Estimated AFFO impact, \$M</b>	\$82	\$156	\$58	
<b>Estimated AFFO/share impact</b>	\$0.19	\$0.38	\$0.48	
Diluted shares (2018E)	443.4	408.0	119.0	
AFFO/share (2018E)	\$7.49	\$5.53	\$7.88	
<b>Estimated AFFO/share Tailwind</b>	2%	7%	6%	

### Assumptions:

Amendment revenue/month	<b>\$800</b>
Flow-through to AFFO	<b>100%</b>

### Notes:

- (1) AT&T sites as of mid-2010 for CCI, year-end 2010 for AMT.
- (2) Assuming greater % will fall to the 3 towercos
- (3) Impact of escalators has not been incorporated.

## Discussion Topics

---

- Major Leasing Drivers
  - AT&T/FirstNet
  - T-Mobile
  - Sprint
  - Verizon
  - DISH
- U.S. vs. International
  - Mexico
  - Brazil
  - India
- Master Lease Agreements
- Build to suit activity
- Edge datacenters
- Fiber & small cells
- Corporate tax reform – impacts on tower operators and carriers

## Required Disclosures

---

### Non-U.S. Analyst Disclosure

#### Conflicts Disclosures

The analyst(s) responsible for preparing this research report received compensation that is based upon various factors, including total revenues of the member companies of RBC Capital Markets and its affiliates, a portion of which are or have been generated by investment banking activities of the member companies of RBC Capital Markets and its affiliates.

#### Distribution of Ratings

For the purpose of ratings distributions, regulatory rules require member firms to assign ratings to one of three rating categories - Buy, Hold/Neutral, or Sell - regardless of a firm's own rating categories. Although RBC Capital Markets' ratings of Top Pick/Outperform, Sector Perform and Underperform most closely correspond to Buy, Hold/Neutral and Sell, respectively, the meanings are not the same because our ratings are determined on a relative basis (as described above).

Distribution of ratings RBC Capital Markets, Equity Research As of 31-Dec-2017				
Rating	Count	Percent	Investment Banking Serv./Past 12 Mos.	
			Count	Percent
BUY [Top Pick & Outperform]	868	52.42	281	32.37
HOLD [Sector Perform]	683	41.24	155	22.69
SELL [Underperform]	105	6.34	8	7.62

## Required Disclosures

---

### Conflicts Policy

RBC Capital Markets Policy for Managing Conflicts of Interest in Relation to Investment Research is available from us on request. To access our current policy, clients should refer to <https://www.rbccm.com/global/file-414164.pdf> or send a request to RBC CM Research Publishing, P.O. Box 50, 200 Bay Street, Royal Bank Plaza, 29th Floor, South Tower, Toronto, Ontario M5J 2W7. We reserve the right to amend or supplement this policy at any time.

### Dissemination of research and short-term trade ideas

RBC Capital Markets endeavors to make all reasonable efforts to provide research simultaneously to all eligible clients, having regard to local time zones in overseas jurisdictions. RBC Capital Markets' equity research is posted to our proprietary website to ensure eligible clients receive coverage initiations and changes in ratings, targets and opinions in a timely manner. Additional distribution may be done by the sales personnel via email, fax, or other electronic means, or regular mail. Clients may also receive our research via third party vendors. RBC Capital Markets also provides eligible clients with access to SPARC on the Firm's proprietary INSIGHT website, via email and via third-party vendors. SPARC contains market color and commentary regarding subject companies on which the Firm currently provides equity research coverage. Research Analysts may, from time to time, include short-term trade ideas in research reports and / or in SPARC. A short-term trade idea offers a short-term view on how a security may trade, based on market and trading events, and the resulting trading opportunity that may be available. A short-term trade idea may differ from the price targets and recommendations in our published research reports reflecting the research analyst's views of the longer-term (one year) prospects of the subject company, as a result of the differing time horizons, methodologies and/or other factors. Thus, it is possible that a subject company's common equity that is considered a long-term 'Sector Perform' or even an 'Underperform' might present a short-term buying opportunity as a result of temporary selling pressure in the market; conversely, a subject company's common equity rated a long-term 'Outperform' could be considered susceptible to a short-term downward price correction. Short-term trade ideas are not ratings, nor are they part of any ratings system, and the firm generally does not intend, nor undertakes any obligation, to maintain or update short-term trade ideas. Short-term trade ideas may not be suitable for all investors and have not been tailored to individual investor circumstances and objectives, and investors should make their own independent decisions regarding any securities or strategies discussed herein. Please contact your investment advisor or institutional salesperson for more information regarding RBC Capital Markets' research.

For a list of all recommendations on the company that were disseminated during the prior 12-month period, please click on the following link:

<https://rbcnew.bluematrix.com/sellside/MAR.action>

The 12 month history of SPARCs can be viewed at <https://www.rbcinsightresearch.com/>.

### Analyst Certification

All of the views expressed in this report accurately reflect the personal views of the responsible analyst(s) about any and all of the subject securities or issuers. No part of the compensation of the responsible analyst(s) named herein is, or will be, directly or indirectly, related to the specific recommendations or views expressed by the responsible analyst(s) in this report.

### Third-party-disclaimers

The Global Industry Classification Standard ("GICS") was developed by and is the exclusive property and a service mark of MSCI Inc. ("MSCI") and Standard & Poor's Financial Services LLC ("S&P") and is licensed for use by RBC. Neither MSCI, S&P, nor any other party involved in making or compiling the GICS or any GICS classifications makes any express or implied warranties or representations with respect to such standard or classification (or the results to be obtained by the use thereof), and all such parties hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability and fitness for a particular purpose with respect to any of such standard or classification. Without limiting any of the foregoing, in no event shall MSCI, S&P, any of their affiliates or any third party involved in making or compiling the GICS or any GICS classifications have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) even if notified of the possibility of such damages.

References herein to "LIBOR", "LIBO Rate", "L" or other LIBOR abbreviations means the London interbank offered rate as administered by ICE Benchmark Administration (or any other person that takes over the administration of such rate).

## Disclaimer

---

RBC Capital Markets is the business name used by certain branches and subsidiaries of the Royal Bank of Canada, including RBC Dominion Securities Inc., RBC Capital Markets, LLC, RBC Europe Limited, Royal Bank of Canada, Hong Kong Branch and Royal Bank of Canada, Sydney Branch. The information contained in this report has been compiled by RBC Capital Markets from sources believed to be reliable, but no representation or warranty, express or implied, is made by Royal Bank of Canada, RBC Capital Markets, its affiliates or any other person as to its accuracy, completeness or correctness. All opinions and estimates contained in this report constitute RBC Capital Markets' judgement as of the date of this report, are subject to change without notice and are provided in good faith but without legal responsibility. Nothing in this report constitutes legal, accounting or tax advice or individually tailored investment advice. This material is prepared for general circulation to clients and has been prepared without regard to the individual financial circumstances and objectives of persons who receive it. The investments or services contained in this report may not be suitable for you and it is recommended that you consult an independent investment advisor if you are in doubt about the suitability of such investments or services. This report is not an offer to sell or a solicitation of an offer to buy any securities. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. RBC Capital Markets research analyst compensation is based in part on the overall profitability of RBC Capital Markets, which includes profits attributable to investment banking revenues. Every province in Canada, state in the U.S., and most countries throughout the world have their own laws regulating the types of securities and other investment products which may be offered to their residents, as well as the process for doing so. As a result, the securities discussed in this report may not be eligible for sale in some jurisdictions. RBC Capital Markets may be restricted from publishing research reports, from time to time, due to regulatory restrictions and/or internal compliance policies. If this is the case, the latest published research reports available to clients may not reflect recent material changes in the applicable industry and/or applicable subject companies. RBC Capital Markets research reports are current only as of the date set forth on the research reports. This report is not, and under no circumstances should be construed as, a solicitation to act as securities broker or dealer in any jurisdiction by any person or company that is not legally permitted to carry on the business of a securities broker or dealer in that jurisdiction. To the full extent permitted by law neither RBC Capital Markets nor any of its affiliates, nor any other person, accepts any liability whatsoever for any direct or consequential loss arising from any use of this report or the information contained herein. No matter contained in this document may be reproduced or copied by any means without the prior consent of RBC Capital Markets.

### **Additional information is available on request.**

**To U.S. Residents:** This publication has been approved by RBC Capital Markets, LLC (member FINRA, NYSE, SIPC), which is a U.S. registered broker-dealer and which accepts responsibility for this report and its dissemination in the United States. Any U.S. recipient of this report that is not a registered broker-dealer or a bank acting in a broker or dealer capacity and that wishes further information regarding, or to effect any transaction in, any of the securities discussed in this report, should contact and place orders with RBC Capital Markets, LLC.

**To Canadian Residents:** This publication has been approved by RBC Dominion Securities Inc.(member IIROC). Any Canadian recipient of this report that is not a Designated Institution in Ontario, an Accredited Investor in British Columbia or Alberta or a Sophisticated Purchaser in Quebec (or similar permitted purchaser in any other province) and that wishes further information regarding, or to effect any transaction in, any of the securities discussed in this report should contact and place orders with RBC Dominion Securities Inc., which, without in any way limiting the foregoing, accepts responsibility for this report and its dissemination in Canada.

**To U.K. Residents:** This publication has been approved by RBC Europe Limited ('RBCEL') which is authorized by the Prudential Regulation Authority and regulated by the Financial Conduct Authority ('FCA') and the Prudential Regulation Authority, in connection with its distribution in the United Kingdom. This material is not for general distribution in the United Kingdom to retail clients, as defined under the rules of the FCA. RBCEL accepts responsibility for this report and its dissemination in the United Kingdom.

**To German Residents:** This material is distributed in Germany by RBC Europe Limited, Frankfurt Branch which is regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin).

**To Persons Receiving This Advice in Australia:** This material has been distributed in Australia by Royal Bank of Canada - Sydney Branch (ABN 86 076 940 880, AFSL No. 246521). This material has been prepared for general circulation and does not take into account the objectives, financial situation or needs of any recipient. Accordingly, any recipient should, before acting on this material, consider the appropriateness of this material having regard to their objectives, financial situation and needs. If this material relates to the acquisition or possible acquisition of a particular financial product, a recipient in Australia should obtain any relevant disclosure document prepared in respect of that product and consider that document before making any decision about whether to acquire the product. This research report is not for retail investors as defined in section 761G of the Corporations Act.

**To Hong Kong Residents:** This publication is distributed in Hong Kong by Royal Bank of Canada, Hong Kong Branch, which is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission ('SFC'), RBC Investment Services (Asia) Limited and RBC Investment Management (Asia) Limited, both entities are regulated by the SFC. Financial Services provided to Australia: Financial services may be provided in Australia in accordance with applicable law. Financial services provided by the Royal Bank of Canada, Hong Kong Branch are provided pursuant to the Royal Bank of Canada's Australian Financial Services Licence ('AFSL') (No. 246521).

**To Singapore Residents:** This publication is distributed in Singapore by the Royal Bank of Canada, Singapore Branch, a registered entity granted offshore bank licence by the Monetary Authority of Singapore. This material has been prepared for general circulation and does not take into account the objectives, financial situation, or needs of any recipient. You are advised to seek independent advice from a financial adviser before purchasing any product. If you do not obtain independent advice, you should consider whether the product is suitable for you. Past performance is not indicative of future performance. If you have any questions related to this publication, please contact the Royal Bank of Canada, Singapore Branch. Royal Bank of Canada, Singapore Branch accepts responsibility for this report and its dissemination in Singapore.

**To Japanese Residents:** Unless otherwise exempted by Japanese law, this publication is distributed in Japan by or through RBC Capital Markets (Japan) Ltd. which is a Financial Instruments Firm registered with the Kanto Local Financial Bureau (Registered number 203) and a member of the Japan Securities Dealers Association ("JSDA").

© Registered trademark of Royal Bank of Canada. RBC Capital Markets is a trademark of Royal Bank of Canada. Used under license.

Copyright © RBC Capital Markets, LLC 2018 - Member SIPC

Copyright © RBC Dominion Securities Inc. 2018 - Member Canadian Investor Protection Fund

Copyright © RBC Europe Limited 2018

Copyright © Royal Bank of Canada 2018

All rights reserved