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FEB 15 2013

Federal Communications Commission
Office of the Secretary

February 15, 2013

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Ex Parte

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

EX PARTE OR LATE FILED

Kathy Harris
Mobility Division
Wireless Telecommunications Bureau
Federal Communications Commission
445 12th Street, SW, Rm 6329
Washington, DC 20554

Re: *Applications of GCI Communication Corp., ACS Wireless License Sub, Inc., ACS of Anchorage License Sub, Inc., and Unicom, Inc. For Consent to Assign Licenses to The Alaska Wireless Network, LLC, WT Docket No. 12-187*

Dear Ms. Dortch and Ms. Harris:

On behalf of General Communication, Inc. (“GCI”), the undersigned counsel submits the attached model pursuant to the *Second Protective Order*.¹ As required by the *Order*, we have requested and received written approval to designate a portion of the attached presentation as Highly Confidential. Pursuant to the *Order*, we submit (a) one copy of the filing containing Highly Confidential Information to the Secretary’s Office along with this cover letter; (b) two copies of the filing in redacted form to the Secretary’s Office along with the redacted cover letter; and (c) two copies of the filing containing Highly Confidential information to Kathy Harris, of the Mobility Division of the Wireless Telecommunications Bureau. We will also file a redacted copy of this letter via ECFS.

¹ See *Applications of GCI Communication Corp., ACS Wireless License Sub, Inc., ACS of Anchorage License Sub, Inc., and Unicom, Inc. For Consent to Assign Licenses to The Alaska Wireless Network, LLC, Second Protective Order, DA 12-1060, 27 FCC Rcd. 7484 (2012)*.

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Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "John T. Nakahata". The signature is fluid and cursive, with a prominent initial "J" and "N".

John T. Nakahata
Counsel to General Communication, Inc.

cc: Susan Singer
Paroma Sanyal
Margaret Wiener

Enclosure

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FEB 15 2013

Federal Communications Commission
Office of the Secretary

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
Connect America Fund)
)
Universal Service Reform – Mobility Fund)

WC Docket No. 10-90

WT Docket No. 10-208A

Alaska Mobile Broadband Cost Model

William P. Zarakas
Giulia McHenry

The Brattle Group

February 2013

File of Licenses received 0+1
Lic. # 10001

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I. INTRODUCTION

GCI requested that *The Brattle Group* develop a model that estimated the incremental cost of providing mobile broadband service specifically to residents of the State of Alaska.¹ This request was founded on the understanding that the geography, population and infrastructure of Alaska are unique compared to most, if not all, of the rest of the U.S., consequently more generalized cost models may not be fully applicable to estimating the costs of providing mobile broadband service in Alaska.

By design, cost models that can be applied to multiple regions nationwide are designed so that assumptions and inputs that vary nationwide can be modified to reflect geographically unique circumstances. However, the proposed national model estimates the costs of deploying mobile broadband utilizing two important static conventions that may make good sense for the continental U.S., but which are less applicable to Alaska.² First, the national model uses road miles as an indicator of target census blocks for high speed mobile broadband deployments. Second, the national model assumes that fiber based backhaul is widely and relatively inexpensively available, especially along roadways. These keys modeling assumptions are not applicable to Alaska because the State has a unique distribution of population and roads, and has a much less developed wireline infrastructure than is the case elsewhere in the Lower 48.

The State of Alaska encompasses a very large area (by itself equal to 20% of the land mass of the Lower 48 States combined), is sparsely populated (with roughly 1.2 people per square mile, compared with over 100 people per square mile on average in the Lower 48) and has a limited road system. Many of Alaska's communities are remote, located completely off-road (accessible only by airplane, boat, or snow machine).

¹ For the purposes of this analysis, we consider mobile broadband service to have an average data speed in the cell site of 768 kilobits per second (kbps) downlink and 256 kbps uplink. Some tables included in this report may use a shorthand and refer to these data speeds as "3G/4G" and speeds below this level of service as "2G."

² A prominent national model is the U.S. Ubiquitous Mobility Study, September 21, 2011 developed by CostQuest Associates for the CTIA.

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An equally important consideration is the absence of fiber backhaul in Alaska. This is generally not the case in the Lower 48 where such wireline infrastructure is largely in place. Alternate backhaul options add substantial cost to providing mobile broadband. In many areas in Alaska, backhaul can only be completed over many miles of microwave transport or by satellite, which tend to be considerably more costly than the fiber based options available throughout much of the continental U.S. An additional cost that is incurred by carriers in Alaska is transport to an Internet peering site. Unlike the Lower 48, peering sites are not even in Alaska; instead data must be transported via undersea cable from Alaska to Seattle, Washington, or Portland, Oregon.

The Alaska Mobile Broadband Cost Model estimates the incremental cost of providing mobile broadband service (i.e., at speeds of at least 768 kbps downlink and 256 kbps uplink on average speed in the cell site) to specific areas within the State of Alaska. Roadways as well as local community locations were considered in defining the areas targeted for mobile broadband service. In summary, the cost model:

- Segments the State of Alaska into: 1) areas that currently receive wireless broadband at average speed of 768 kbps down / 256 kbps up; 2) areas that currently receive wireless services at lesser speeds; 3) areas that do not receive any wireless services, but receive a form of wireline communications services; and, 4) areas that currently do not receive any communications services.
- Aggregates detailed census block demographic and geographic data (i.e., population, area, road miles, existing cell sites and backhaul infrastructure) to the borough (the geographic organization of the State of Alaska) and census area level.
- Estimates the capital costs associated with building-out the network and the present value (PV) of five years of operations and management (O&M) costs. Costs are estimated for geographic areas based on the physical network infrastructure currently in place.³ For

³ We used this “brownfield” approach, because the wireless broadband infrastructure is relatively new, built in the last several years in many cases, and additional built-out or upgrades would likely take advantage of the existing infrastructure locations

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instance, absence of any wireless facilities necessitates building-out 768 kbps down / 256 kbps up infrastructure “from scratch.” Where wireless facilities are in place but at less than broadband speeds, costs reflect the incremental investment and O&M expenses associated with upgrading services to reach the average 768 kbps down / 256 kbps up level.

In addition, the Alaska Mobile Broadband Cost Model estimates the PV of five years of backhaul costs, based on the type of backhaul currently accessible for the specific geographic areas considered. The PV of transport costs (from the primary hubs of Juneau, Fairbanks and Anchorage to the aggregation points in Seattle, Washington, or Portland, Oregon) was also estimated. Transport costs are reported separately, and not included in the total cost estimate. The bandwidth associated with backhaul and transport was determined at the borough / census area level to ensure economies of scale and/or volume discounts.

Finally, anticipated incremental annual marginal revenues from new and upgraded services are also estimated. These incremental revenues may be considered to be an offset to the cost requirements associated with deploying mobile broadband services.

This report provides an overview of the Alaska Mobile Broadband Cost Model and summarizes key model results (based on our recommended assumptions, set as default values in the model). Figures included in this report explain the organization of the cost model. This report is also designed to accompany the model in electronic format (i.e., Microsoft Excel). An overview of the cost model from the perspective of a user of the Excel format is provided in Section X.

Section II of the report presents our results from the cost modeling, including the detailed costs for network build-out and operations, cost of undersea transport, and the marginal revenue from updated build-out. Section III describes the cost model methodology, including our assumptions on the scope of build-out, the coverage analysis, and costs. Next, sections IV and V describe our simulation of the existing level of wireless coverage in Alaska, as well as a determination of requirements to build-out infrastructure to provide mobile broadband services. Sections VI and VII describe our estimates cell site costs and backhaul costs, respectively. Section VIII provides an estimate of the cost of undersea transport from points in Alaska to peering points in the Lower

48. (This cost is presented in order to provide full scope of costs associated with deploying mobile broadband, but are not included in the total cost estimate summarized in Section II below.) Section IX provides additional context for the results presented in Section II by estimating the marginal revenue (to carriers) from the new and upgraded services. Finally, Section X provides a brief overview of the Alaska Mobile Broadband Cost Model for prospective model users. Additional details concerning model output is included in an Appendix to the report.

II. SUMMARY OF RESULTS

The cost of providing mobile broadband services in Alaska is a function of: 1) the scope of the geographic areas covered; 2) the costs (capital and O&M) of building new cell towers and upgrading existing cell towers, plus the costs of building out or upgrading common network facilities and satellite ground stations where needed; and, 3) the costs of backhaul.

In this summary, as well as throughout this report, the costs of providing mobile broadband are presented in total, as well as by geographic segment. Specifically, as indicated above, the cost model segments the State of Alaska into: 1) areas that currently receive wireless broadband at average speed of 768 kbps down / 256 kbps up; 2) areas that currently receive wireless services but at lesser speeds; and, 3) areas that do not receive any wireless services, but receive a form of wireline communications services. These three geographic segments cover 17,434 census blocks in Alaska.

These segments can also be compared to the list of potentially eligible areas (i.e., census blocks) that the FCC provided in Mobility Fund Phase I.⁴ The total cost and a break down among a matrix of geographic segments is summarized in the table below.

⁴ In the *Auction 901 Comment Public Notice*, the FCC's Wireless Telecommunications and Wireline Competition Bureaus provided a list of census blocks that would be eligible for Mobility Fund Phase I support based on American Roamer data

Summary of Cost of Providing Mobile Broadband to Targeted Areas

	No Wireline Telecom / No Wireless	Wireline Telecom / No Wireless	Current Service < 768 kbps down / 256 kbps up	Total	%
FCC Eligible List	\$128,339,993	\$59,321,646	\$242,611,442	\$430,273,081	72%
Non-FCC List - Current Service < 768 kbps down / 256 kbps up			\$111,207,657	\$111,207,657	19%
Non-FCC List - No Wireless / Telecom Presence		\$39,754,565		\$39,754,565	7%
Total excl. Common Network Costs	\$128,339,993	\$99,076,211	\$353,819,099	\$581,235,303	97%
Common Network Cost (Satellite iHub + MSC)				\$14,968,708	3%
Total				\$596,204,010	100%
% of Total	22%	17%	59%	100%	

Source: U. S. Census Bureau 2010 Census, GCI Cell Site Data, Carrier Cell Sites from FCC ULS database; Brattle Analysis.

The cost of providing mobile broadband service to all of the targeted areas in Alaska is estimated to be roughly \$596 million. The table indicates that roughly 72% of the estimated total costs involved with providing mobile broadband to these areas of Alaska are associated with the census blocks included in the FCC’s list of potentially eligible areas. Furthermore, 59% of total estimated costs are associated with upgrading areas that currently receive wireless services.

Further breakdown of the cost of deploying mobile broadband services is presented in **Table II-1**, which breaks down the estimated \$596 million into cost components including capital costs (i.e., the costs of building out and upgrading cell sites, common network and satellite ground stations and equipment), the PV of five years of O&M costs and the PV of five years of backhaul costs. The table indicates that common network costs are nearly \$15 million, and another \$430 million are associated with providing mobile broadband services in the census blocks included in the FCC’s list of potentially eligible areas. Roughly 50% of the cost of providing mobile broadband service to the FCC eligible census blocks is associated with backhaul (roughly \$213 million on a present value basis), with the remaining 50% associated with upgrading and building new cell sites (roughly \$217 million).

The table also indicates that the PV of upgrading existing and building new cell sites, and investing in common network elements required for satellite based backhaul and operating this infrastructure for 5 years is approximately \$330 million. The cost for upgrading and building new cell sites, and

operating the cell sites and other non-backhaul equipment in the areas included under the FCC's list of potentially eligible census blocks is estimated to be approximately \$217 million, with the remaining areas estimated to cost slightly less than \$113 million. The total cost of providing backhaul from these cell sites to the carrier's network control points are estimated to be approximately \$267 million for the full scope of targeted areas, with \$213 million alone associated with the census blocks included in the FCC's list of potentially eligible areas.

The cost of providing mobile broadband service in Alaska can also be presented in terms of summary metrics, such as costs per cell site and road mile. These statistics are provided in **Table II-2**.

While **Table II-1** and **Table II-2** summarize the total cost of bringing wireless areas of Alaska, there is an additional cost of transport to connect the Alaska wireless network with the Lower 48 states. The cost of transport, approximately \$47 million on a PV basis, is summarized in **Table II-3**.

For comparison purposes, the PV estimated for the total cost (excluding undersea transport) of bringing mobile broadband to the targeted areas in Alaska of \$596 million exceeds the individual PVs of the Remote Alaska High Cost Support and CETC support in Alaska. The Remote Alaska High Cost Support (at \$78 million per year for five years) has a PV of roughly \$315.6 million, and the PV for the CETC support in Alaska as of October 1, 2013 (at roughly \$105 million per year for five years) is roughly \$426 million.

III. COST MODEL – METHODOLOGY AND PROCESS FLOW

The Alaska Mobile Broadband Cost Model begins with a detailed data set of each of the 45,292 census block in Alaska, which includes demographic data (i.e., population, land area and road miles at the census block level), geographic coordinates for cell towers currently in place, and an indication of the extent (if any) of wireline and/or wireless services currently provided.⁵

⁵ These data are summarized in the cost model (in the "CB" "CB_Cov" and "Sites" tabs)

These data provide the basis for segmenting the State's geographic area into areas that already receive mobile broadband, areas with wireless services but at speeds slower than mobile broadband standards, and other areas that are unserved by wireless carriers. The Alaska Mobile Broadband Cost Model then estimates the cost of providing mobile broadband service (i.e., at least 768 kbps downlink and 256 kbps uplink as the average speed in the cell site) to specific areas within the State of Alaska based on the geographic data, and on historic and projected Alaska-specific costs.

Cost estimates are broken down in terms of major cost areas (capital costs for cell sites, other areas of capital costs, PV of O&M expenses and PV of backhaul costs), and are also summarized by geographic area (at the borough / census area level). Cost estimates are also presented by aggregated geographic segments; e.g., areas that currently receive wireless services at slower than mobile broadband speeds.

The general methodology used in estimating the costs of providing mobile broadband to the targeted areas in Alaska is summarized in schematic form in **Figure III-1**.

A. GEOGRAPHIC SCOPE

The most current data concerning population and other demographics are included in the 2010 Census, conducted and reported by the U.S. Census Bureau. Data is collected at the census block level, the most detailed level of dis-aggregation, which can then be aggregated into census blocks and census tracts or areas.

As presented in **Table III-1**, the U.S. Census Bureau has broken Alaska down into 45,292 census blocks for the 2010 U.S. Census. The State of Alaska divides itself into 18 boroughs (a form of organization similar to counties), which cover much of the more populated areas of the State. The less populated areas are not included within the borough designations, but are divided into an additional 11 census areas defined by the Census Bureau. Overall, the State of Alaska can be segmented into 29 boroughs / census areas.

Census data also include road mileages (developed from TIGER/Line Shapefiles) by category of road.

To estimate the presence and level (i.e. speed) of mobile service currently in Alaska, cell site locations together with reported wireless coverage were considered. Wireless coverage for the State of Alaska by borough / census area, along with associated population and road miles, is included in **Table III-2**. The table indicates that:

- 54% of Alaska's census blocks currently receive some level of wireless service; these cover 97% of the State's population, but only 7% of the State's land area;
- 31% of the State's census blocks currently receive mobile broadband service at 768 kbps down / 256 kbps up average for the cell site; these cover 83% of the population, but only 1% of the land area.

The Alaska Mobile Broadband Cost Model estimates the cost of providing mobile broadband service to defined geographic areas in Alaska, based on groups of census blocks. A breakdown of the census blocks in Alaska, including a comparison of the FCC list of potentially eligible census blocks in Alaska and the census blocks for the State overall, is provided in the table below. In addition to showing the detailed breakdowns described above, the table indicates that approximately 23% of the State's census blocks currently receive wireless services at average speeds of less than 768 kbps down / 256 kbps up.roughly. Meanwhile 9% of census blocks currently receive some type of wireline communications services, but do not receive commercial wireless communication services at broadband or lesser speeds.

Matrix of Alaska Census Blocks

	No Wireline Telecom / No Wireless	Wireline Telecom / No Wireless	Current Service < 768 kbps down / 256 kbps up	Current Service at 768 kbps down / 256 kbps up	Total	%
FCC Eligible List	2,728	1,541	3,798	79	8,146	18%
Non-FCC List - Current Service At 768 kbps down / 256 kbps up				14,152	14,152	31%
Non-FCC List - Current Service < 768 kbps down / 256 kbps up			6,607		6,607	15%
Non-FCC List - No Wireless / Telecom Presence		2,760			2,760	6%
Non-FCC List - No Telecom Presence	13,627				13,627	30%
Total	16,355 36%	4,301 9%	10,405 23%	14,231 31%	45,292 100%	100%

Source: U.S. Census Bureau 2010 Census, GCI Cell Site Data; Carrier Cell Sites from FCC ULS database; Brattle Analysis.

The “target” census blocks in this model are those that may be considered possible recipients of support from the FCC Mobility Fund. These include the census blocks included in the FCC list of potentially eligible census blocks (except for the 79 that appear to already receive mobile broadband services at average speeds of 768 kbps down / 256 kbps up); an additional 6,607 census blocks that are not included in the FCC list, but which currently receive wireless services at levels less than 768 kbps down / 256 kbps up; and the 2,760 census blocks that currently have a non-wireless telecom presence. This breakdown of census blocks is summarized in the table below.

Summary of Census Blocks Included In Cost Analysis

	Census Blocks	%
FCC Eligible List (excluding census blocks currently receiving services at 768 kbps down / 200 kbps up	8,067	46%
Non-FCC List - Current Service < 768 kbps down / 200 kbps up	6,607	38%
Non-FCC List - No Wireless / Telecom Presence	2,760	16%
Total	17,434	100%
Total Census Blocks In Alaska	45,292	
% Included In Cost Analysis	38%	

B. INFRASTRUCTURE REQUIREMENTS

The infrastructure required for carriers to provide mobile broadband service in Alaska was determined through the coverage analysis. The coverage analysis involves determining the number of cell sites (i.e., existing and new) needed to cover the specified geographic areas, and the type of backhaul (e.g., satellite, fiber, microwave, etc.) that is available to connect these cell sites to network facilities.

The number of cell sites needed to cover the selected areas was determined as follows:

- For areas currently receiving mobile wireless service at levels below 768 kbps down / 256 kbps up, existing wireless carrier cell site locations were assumed to be efficient, and were used as the locations for upgraded cell sites. In certain cases multiple carriers had separate cell sites providing service to the same area. When cell sites overlapped, one cell site was assigned in the cost model and the other was dropped from the analysis.⁶

⁶ We received the coordinates for GCI's current cell sites and other locations at which GCI offers other telecom services. To supplement this list, we included the registered locations of other carriers' cellular towers. To estimate the coverage areas around these sites, we assumed each cell site had a 7.5 mile coverage radius

- For areas not currently receiving mobile wireless service, but currently receiving some telecom services from GCI, we assumed that the locations of other telecom services could become efficient locations for the cell sites that would be used to provide mobile broadband service.
- Finally, for areas not currently receiving mobile wireless or other telecom service, coverage ranges for existing cell sites were used as a proxy. Specifically, the number of road miles covered by wireless services per cell site for currently served areas was estimated for each borough / census area. These average road miles per cell site coverage ratios were used to estimate the number of new cell sites needed to cover currently unserved areas, based on road miles, within the same borough / census area.

A schematic of the methodology used to determine cell site requirements is included as **Figure III-2.**

C. COST ELEMENTS

To determine the cost of additional infrastructure requirements, and with the help of GCI, we collected the following cost elements. The cost of providing mobile broadband service includes both the cost of capital investment as well as ongoing O&M expenses. The primary areas of costs for a mobile broadband network in Alaska include cell sites and backhaul from the cell site to the hub points (Fairbanks, Anchorage or Juneau). Costs can be categorized as: capital (i.e., investments in cell sites, common network and satellite ground stations), O&M, and backhaul and transport. There is also an additional cost of the undersea cable transport from the hub points in Alaska to aggregation points in either Seattle, Washington or Portland, Oregon.

Unit costs include the capital and O&M costs required to construct and operate a cell site and to connect it to a carrier's network. Unit costs were developed based on the actual experience and costs incurred by GCI.⁷ The model estimates both one time and ongoing costs over the course of

⁷ Since the GCI wireless network has largely been constructed in the last few years, historical costs and current backhaul lease rates were assumed to be applicable.

service life. Costs are converted to PVs in order to allow estimation of a total cost on a consistent basis. These cost elements are summarized below.

1. Capital Costs – Cell Sites

Cell site related capital costs include upgrades and new construction.

- Existing cell sites (costs to upgrade antennas and shelters from current wireless service levels to 768 kbps down / 256 kbps up levels);
- New cell sites (costs to construct towers and shelters and deploy radio equipment necessary to provide average speeds of 768 kbps down / 256 kbps up);

2. Capital Costs – Network and Satellite

Additional capital costs required to complete a mobile broadband network include:

- Network controls (MSC server);
- Satellite ground station upgrades and new installations for cell sites served by satellite backhaul;
- Satellite costs (HUB iDirect Satellite);

3. O&M Costs

Annual O&M expenses required to operate and maintain cell sites, including the costs of providing backhaul (discussed further below), are also estimated. O&M expenses include electric power, leases and maintenance costs.

4. Backhaul Costs

Backhaul costs were estimated based on the type of backhaul deployed and population covered. Wireline fiber backhaul options are only available in the more densely populated areas of the State. Many communities have low populations and are located off of the road system; options for such less populated areas are limited to microwave or satellite. For this analysis, fiber and microwave

backhaul are considered to be “terrestrial” options. The other option, satellite, is considered separately. Microwave and satellite backhaul are both considered “remote” backhaul options.

Backhaul was assigned to cell sites based on the infrastructure currently in place in Alaska for those regions.⁸ Specifically, the most cost efficient backhaul option was applied to cell site based on throughput requirements and options currently available. Construction of new wireline or microwave backhaul infrastructure was not modeled or considered. Backhaul costs are based on average distance to the hub points at the borough / census area level, and were provided by GCI.

A schematic of the methodology used to determine backhaul costs is included as **Figure III-3**. Backhaul costs are summarized in Section VI and corresponding Tables VI-5 and VI-6 below.

5. Undersea Transport Costs

One additional unique feature of Alaska is that it has no transport aggregation points within the state. Rather, data must be carried by undersea cable from one of the three data hubs in Alaska (i.e., Anchorage, Fairbanks–via–Anchorage, and Juneau) to an aggregation point in the Lower 48 States. Specifically, from these hubs data can be transported over T1 or T3 cables to Seattle, Washington or Portland, Oregon. To estimate the total undersea transport cost, we estimate the total number of cables required based on the cumulative amount of data passing through each hub. Hub points were designated by borough based on the closest proximity. Rates were provided by GCI and based on current published rates.

IV. TARGETED COVERAGE AREAS

The total cost of providing mobile broadband service to portions of the State of Alaska depends on which (and how many) census blocks are targeted for service. We estimated the costs of providing mobile broadband service for the three categories listed below:

⁸ Generally, backhaul was defined by borough. However, for some boroughs with varied terrain, multiple backhaul types were applied based on regional designations.

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- FCC Potentially Eligible Census Blocks – **Table IV-1** indicates that the areas in Alaska eligible for Mobility Fund Phase 1 include 8,146 census blocks of which 3,877 currently have some level of wireless service and 4,269 currently do not receive wireless service.⁹
- Additional Areas Currently Served In Alaska, Not Included As FCC Potentially Eligible Census Blocks – **Table IV-2** indicates that an additional 20,759 census blocks in Alaska already receive some level of mobile wireless service, 14,152 of which are at 768 kbps down / 256 kbps up levels and 6,607 are at 2G levels.¹⁰
- Areas Not Currently Receiving Mobile Wireless Services In Alaska But Covered By Other Telecom Services By Census Block – **Table IV-3** indicates that at least another 2,760 census blocks receive some level of non-wireless telecom service, based on GCI served locations.

Table IV-4 summarizes the breakdown of areas in terms of census blocks covered. In addition to the breakdown summarized above, the table references two additional groupings of census blocks:

- 14,152 census blocks are not eligible for FCC support and already receive mobile broadband service and would not need to upgrade (unless to upgrade to levels above 768 kbps down / 256 kbps up). As discussed below and shown in **Table IV-1**, there are also another 79 census blocks on FCC's potentially eligible list that have already receive average service at 768 kbps down / 256 kbps up;
- 13,627 census blocks are not targeted for coverage, because they do not fall into the FCC's list of potentially eligible areas or currently receive wireless or wireline services.

⁹ Wireless service includes data speeds at and below 768 kbps down / 256 kbps up on average in the cell site, and services by other carrier assumed to be below 768 kbps down / 256 kbps up. According to GCI representatives, there are no locations at which services at 768 kbps down / 256 kbps up is offered by another carrier and not GCI. Census blocks not served by wireless services include census blocks with some GCI non-wireless telecom presence and are not currently served by other wireless carriers.

¹⁰ Since no upgrade is necessary, areas already served by mobile broadband are excluded from the cost analysis.

As shown in Table IV-5, this “untargeted” area covers a sizable portion of Alaska’s total land area (201,339 out of a total of 570,641 square miles (see Table III-1) but only a very small percentage of the State’s population (roughly 0.3% or 1,867 people).

V. CELL SITE REQUIREMENTS

We estimate that there are currently 647 cell sites in Alaska, as of Q2 2012, as is summarized in Table V-1. The table shows that 222 cell sites are located within the FCC eligible census blocks and 291 cell sites provide service outside of this area. Also, the table indicates that an additional 134 cell sites already provide mobile broadband services in the more populated areas within Alaska.

The service breakdown of these 647 cell sites is also shown in Table V-2.¹¹ There are 511 cell sites (220 FCC eligible + 291 additional areas) with service at levels below 768 kbps down / 256 kbps up and 134 cell sites provide service at the 768 kbps down / 256 kbps up level. The table indicates that 220 cell sites that are located within the FCC’s eligible census blocks currently provide service at levels below 768 kbps down / 256 kbps up and 136 cell sites located in Alaska currently provide service at the 768 kbps down / 256 kbps up level.¹² These 647 cell sites cover the 24,636 census blocks (54% of total Alaska census blocks), 688,978 people (97% of the State’s population) and 42,154 square miles (7% of the State’s land area).¹³

Existing cell sites were used to estimate coverage for upgrading existing services that are below the 768 kbps down / 256 kbps up level to mobile broadband levels.¹⁴

¹¹ In this table, we make an adjustment to the cell sites located within the FCC eligible census blocks because we estimate that 2 cell sites have already been upgraded to provide service at the 768 kbps down / 256 kbps up level.

¹² Table IV-1 indicates that 222 cell sites are located within the FCC eligible census blocks, and that 134 additional cell sites provide 3G/4G service. We estimate that 2 cell sites, covering 79 FCC eligible census blocks have been upgraded to provide 3G/4G service. Thus, 220 of the 222 cell sites located within the FCC eligible census blocks currently provide 2G service. Furthermore, these 2 3G/4G cell sites can be added to the 134 3G/4G cell sites that are located outside of the FCC eligible census blocks, for a total of 136 cell sites in Alaska that are used to provide 3G/4G service.

¹³ GCI currently provides wireless service to 23,181 of the 24,636 census blocks that currently receive wireless services. The remaining 1,455 are served by at least one other wireless carrier.

¹⁴ According to GCI representatives, there are no 3G/4G locations in which GCI does not offer 3G/4G service and another carrier does.

- To estimate the additional cell sites required to cover the unserved census blocks included in the FCC's list of potentially eligible census blocks, we calculated the average road miles covered per existing cell site for each borough / census area. We applied this average to the total unserved road miles located within each borough / census area. Road miles were calculated by using the GIS coordinates for roads included in the 2010 census.¹⁵ A summary of road miles by borough / census area is included in **Table V-3**. Based on this road mile analysis, as indicated in **Table V-4**, we estimate that an additional 168 cell sites will be required to provide mobile wireless service to the 2,728 census blocks that are included in the list of the FCC's potentially eligible census blocks and that do not currently receive any telecom service (see **Table IV-1** for a breakdown of the FCC's list of potentially eligible census blocks).
- Cell sites required to cover the areas that currently receive some non-wireless service were based on engineering and planning analysis conducted by GCI. We then compared the GCI cell site planning analysis with cell site coverage provided by other carriers to remove any duplicative cell sites. We estimate that 153 additional cell sites will be needed to fully serve these areas. **Table V-5** compares GCI's estimate to the final cell site requirements, once the coverage analysis was completed, by borough / census area,

In total, there are another 321 cell sites that must be built to bring mobile broadband coverage to the FCC potentially eligible areas and select other locations. A breakdown of the new sites required by borough / census area is shown in **Table V-6**. With these additional cell sites, 832 new and upgraded cell sites are required to provide mobile broadband service to the areas targeted in Alaska, as is summarized in **Table V-7**.

Based on these cell site requirements, cost estimates are developed for:

¹⁵ The 2010 census provides road data in TIGER/Line Shapefiles which provide the line layer of roads in Alaska. We input these data into a geographic information system (GIS) mapping software (TransCAD) to determine the location and distances of roads for each census block in Alaska.

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- Upgrading 511 existing cell sites (220 of which are located in FCC eligible census blocks, and 291 of which are located in non-FCC eligible census blocks);
- Building an additional 321 new cell sites (168 of which would be located in FCC eligible census blocks, and 153 of which would be located in non-FCC eligible census blocks that currently receive some non-wireless telecom service).

These 832 cell sites (511 upgrades + 321 new sites) are in addition to the 136 existing cell sites that already receive wireless service of 768 kbps down / 256 kbps up.¹⁶ The total number of cell sites in Alaska needed to provide mobile broadband service (excluding those that already provide mobile broadband service) would thus be 968 (511 upgrades + 321 new sites + 136 existing cell sites).

VI. UNIT COSTS

Determining the total costs to provide mobile broadband service for the targeted areas is accomplished by multiplying the costs per unit by the number of units. The costs involved in providing mobile broadband service includes capital costs as well as ongoing expenses associated with operations and maintenance:

- Cell site capital costs include the one time investments necessary to: upgrade existing cell sites to 768 kbps down / 256 kbps up levels; and, to construct new mobile broadband cell sites. Related capital costs also include investments in network controls (e.g., MSC servers).
- Backhaul capital costs include the costs associated with remote VSAT ground stations and the cost for a central hub point (i.e., HUB iDirect Satellite).

¹⁶ These cell sites are not included in the estimate of cost to provide mobile broadband service to the targeted areas in Alaska, but would need to be if an estimate of providing services at levels greater than 768 kbps down / 256 kbps up were to be developed