

Exhibit I – NOFA #008 (“NOFA”)
Quick Current – Iowa Responses

Wireless projects must demonstrate infrastructure deployed as a function of the Project contains adequate backhaul capabilities to Facilitate Covered Speeds to the entire coverage area listed in Exhibit B. Accordingly, the Office is requesting additional information from Applicant’s proposing wireless projects to confirm these capabilities.

Wireless Applicant’s must include the following information. Attach the requested information to a signed copy of this Worksheet and upload as a single PDF file to the Iowa Grants System consistent with the Instructions set forth in NOFA #008 section 2.2.6.8. **NOTE: Applicants proposing wireline Projects are NOT required to complete this Exhibit.**

1. Technology for Last Mile Deployment

1.1. Identify the Model of antennas (tower and users) - point to point or point to multi-point

Response:

Tower Antennas – Skylark Faros V2-FNB-OFDMA Point-to-Multipoint - NLOS

User Antennas – Skylark Faros V2 Fixed Wireless Access Unit - Point-to-Point

1.1.1. What is the range and capacity of the antennas? (miles and bandwidth)

Response:

Band 41 – Range is 8 Mi. Bandwidth 40MHz (100/100 Mbps per User)

Band 48 – Range is 4 Mi. Bandwidth 40MHz (100/100 Mbps per User)

1.1.2. What are the power levels used? (decimal loss)

Response:

1dB of loss margin in our calculations

1.1.3. What are the antenna heights used to facilitate services to subscribers?

Response:

Band 41 Area – 26M tower height

Band 48 Area – 60M tower height

User Location – 4M antenna height

1.1.4. Is Line of Sight required? (Line of Sight (LOS), Near Line of Sight (nLOS), Non Line of Sight (NLOS))

Response:

Non-Line of Sight (NLOS)

1.2. Specify the coverage calculation method used

1.2.1. Tower Radius (specify units for height and distance)

Response:

The tower height for the 3 towers within our Band 41 county is 26 meters.

The tower coverage radii used for these towers is 5 miles. The tower height for the 1 tower in the Band 48 county is 60 meters with a coverage radius of

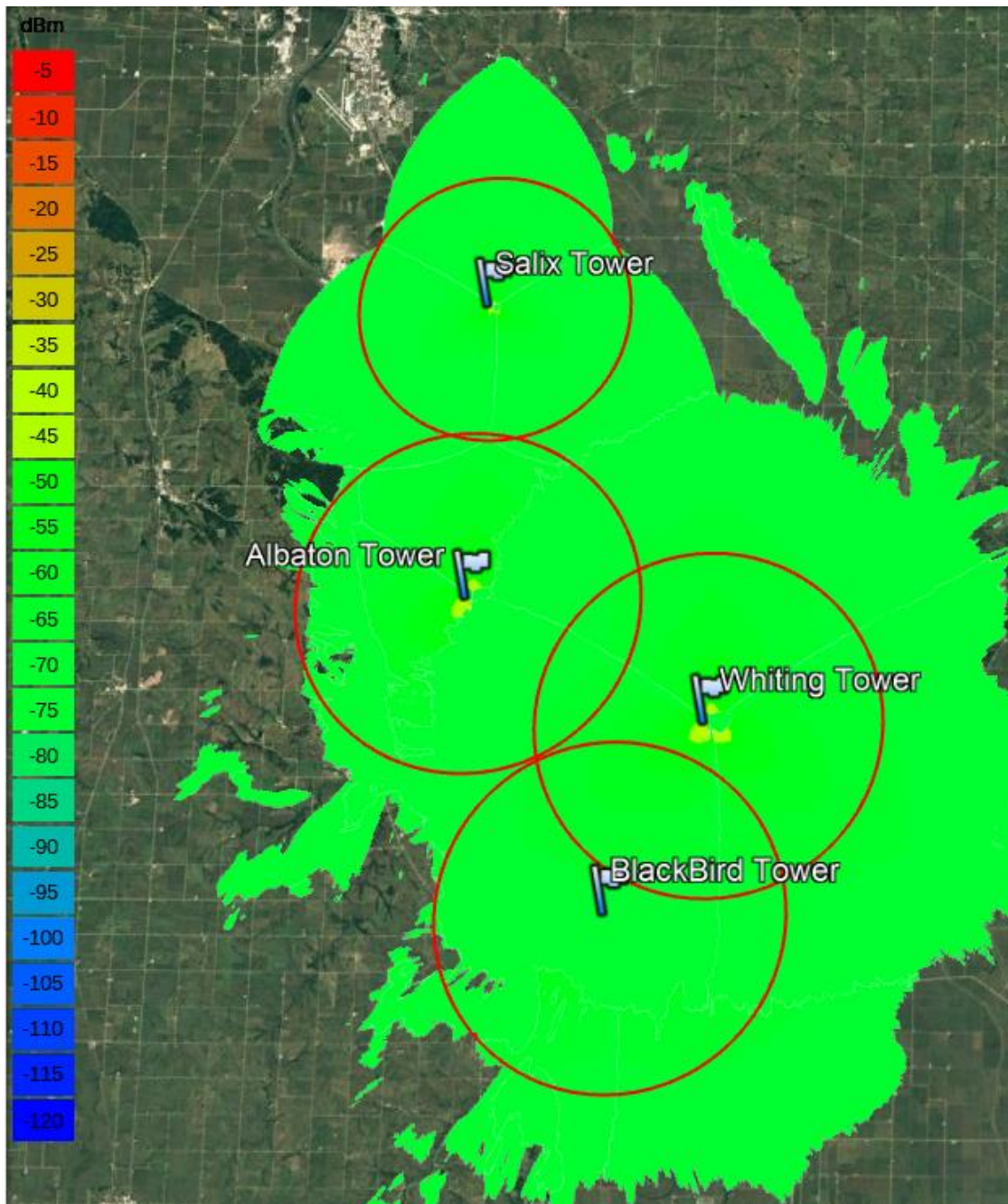
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4 miles. As such, the 100/100 Mbps speeds required for the project are achievable for each location specified.

1.2.2. Propagation Map (The tower locations need to be labeled consistent with 4.1)

Response:

See propagation map below.



1.2.2. Propagation Map

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1.2.3. Combination of materials that demonstrate project’s propagation area

Response:

Inputs: We used a CSV file containing tower data and a KMZ file containing locations along with other supplementary information to run through the

Propagation Engine: CloudRF (accessed through command line API)

Output: KMZ file of propagation/coverage simulations

1.3. Specify spectrum frequency(ies) utilized 1.3.1. Licensed or Unlicensed?

1.3.1. Licensed or Unlicensed?

Response:

Licensed: Band 41, Band 48

1.3.2. Frequencies owned/utilized

Response:

Band 41 C1 – Monona County, Owned

Band 48 GAA – Woodbury County, Licensed through SAS

2. Identify Tower Antenna Configurations and Capacities

2.1. Omni (User count at facilitated speed specified in application and distance away from the tower)

Response:

Not Applicable

2.2. Each Directional Sector (User count at facilitated speed specified in application and distance away from the tower)

Response:

All towers have 3 directional sectors with azimuths of 0, 120, and 240 degrees. All users to be served from the Band 41 towers at facilitated speeds are located no further than 5 miles from the tower. All users to be served from the Band 48 tower at facilitated speeds are located no further than 4 miles from the tower. Specific distances for each individual user can be determined from the KMZ files submitted with this application.

The link budget for this proposed deployment is as follows:

Downlink

BS Transmit Power per Radio	27 dBm
BS Total Transmit Power (per polarization)	40 dBm
BS Antenna Gain	14 dBi
BS Cable and Connector Loss	<1 dB
BS Beamforming Gain (21 Radios per polarization)	13 dBi
BS EIRP (Regulation Limited)	53 dBm
Maximum Path Loss	138.5 dB
CPE Cable and Connector Loss	<1 dB
CPE Antenna Gain	24 dBi
Received Signal Power	-62.5 dBm
Noise Floor (40 MHz)	-95 dBm
Fade Margin	10 dB
Signal to Noise Ratio (SNR)	22.5 dB
Modulation and Coding Rate	64-QAM 5/6 dual spatial streams
Throughput	104 Mbps

Uplink

CPE Transmit Power	27 dBm
CPE Antenna Gain	24 dBi
CPE Cable and Connector Loss	<1 dB
CPE EIRP	50 dBm
Maximum Path Loss	138.5 dB
BS Antenna Gain	14 dBi
BS Cable and Connector Loss	<1 dB
Received Signal Power per Radio	-75.5 dBm
BS Beamforming Gain (21 Radios per polarization)	13 dBi
Received Signal Power	-62.5 dBm
Noise Floor (40 MHz)	-95 dBm
Fade Margin	10 dB
Signal to Noise Ratio (SNR)	22.5 dB
Modulation and Coding Rate	64-QAM 5/6 dual spatial streams
Uplink Throughput	104 Mbps

The above Link Budget Calculation demonstrates that we will meet the received power requirements in the designed network to support minimum 64 QAM, 5/6 coding rate at all served locations. While a maximum number of 567 subscribers may be served by each

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tower in the network design while meeting the performance requirements of the program as shown below, our towers will operate at ~1/3 of the maximum capacity to support this project:

	Variable	Equation	Downlink	Unit	Uplink	Unit
Channel Bandwidth	A	parameter	40	MHz	40	MHz
Percent Channel Time	B	parameter	50%	percent	50%	percent
Spectral Efficiency per Stream	C	parameter	2.6	bps/Hz	2.5	bps/Hz
Number of Spatial Streams	D	parameter	21	streams	21	streams
Total Throughput of Sector	E	$A*B*C*D$	1092.0	Mbps	1050.0	Mbps
Maximum Individual Throughput	F	$A*B*C*2$	104.0	Mbps	100.0	Mbps
Target Individual Throughput	G		100	Mbps	100	Mbps
Max Users @ 1:1 Oversubscription	H	E/G	10.9	users	10.5	users
Max Users @ 1:18 Oversubscription	K	$H*18$	196.6	users	189.0	users
Number of Sectors per Tower	L	parameter	3	sectors	3	sectors
Simultaneous Users per Tower	M	$L*K$	589.7	users	567.0	users

2.3. Stacking Ability in Frequency Range (functional increase percentage per sector)

Response:

Our calculations for coverage and total throughput capacity only require 40MHz of frequency located within one band. Additionally, the equipment can be operated in channel configurations of 10, 20, 30, and 40 MHz. As well, with additional equipment at the user site, we can bond non-contiguous channels. Functional increase percentage per sector is 100% for each additional 10MHz channel added.

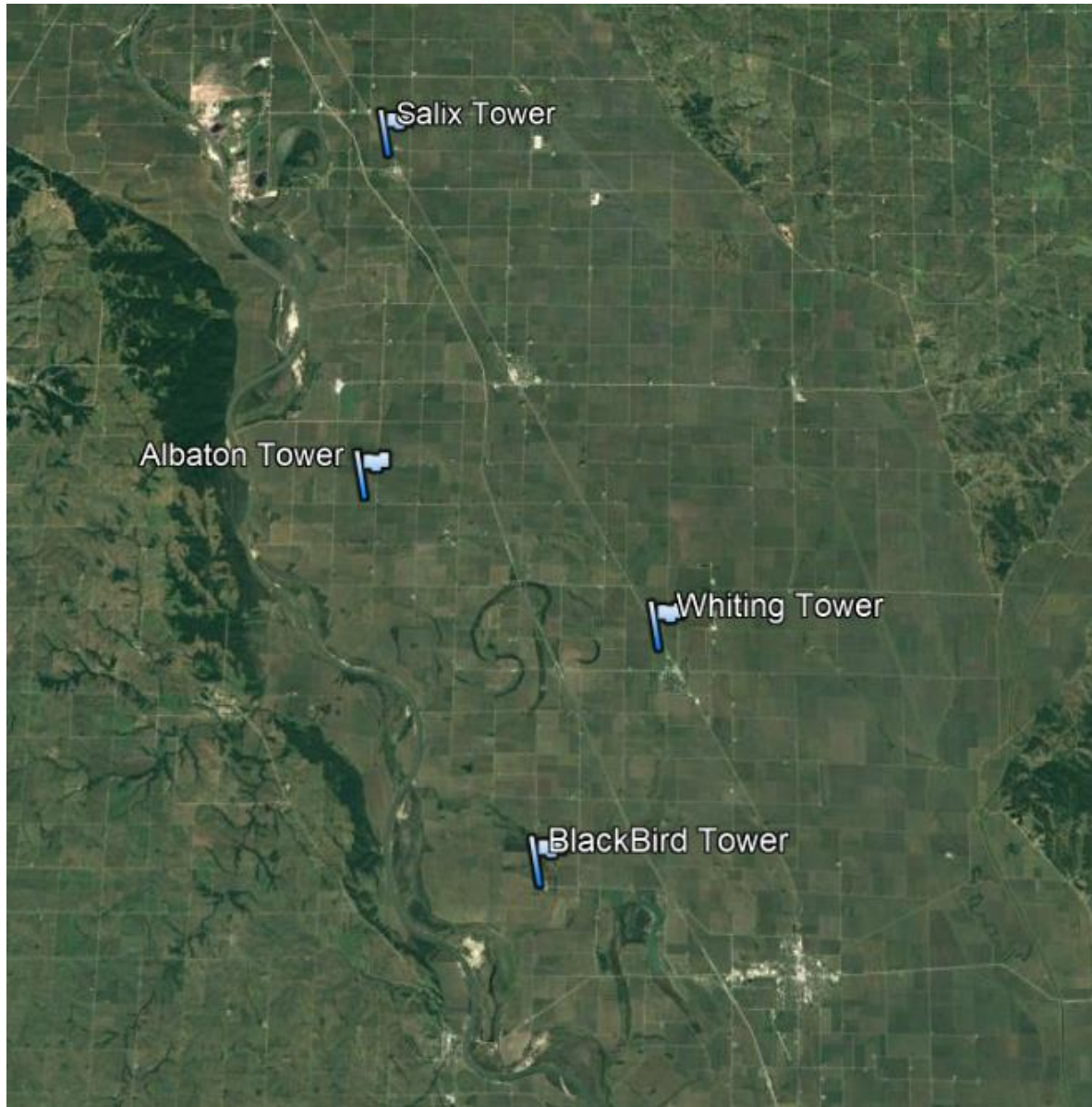
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3. Map of Tower Locations

3.1. Specify the locations of the towers on a map with identifier

Response:

See maps below.



3.1.a. Tower Locations

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3.1.b. Salix Tower Location

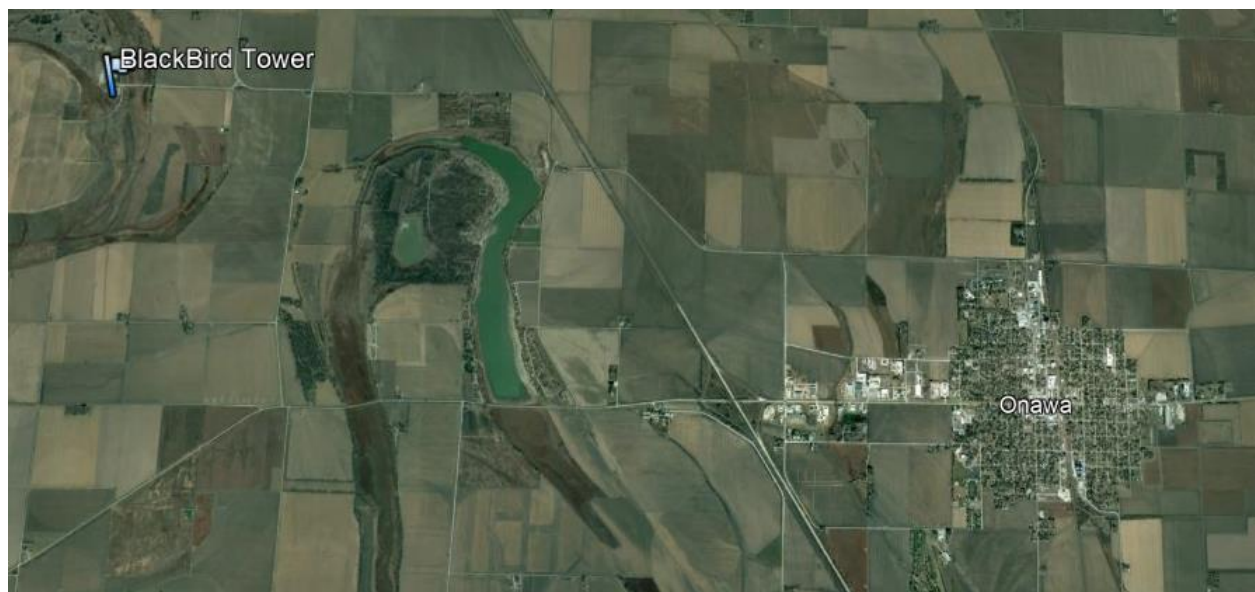


3.1.c. Albaton Tower Location

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3.1.d. Whiting Tower Location



3.1.e. BlackBird Tower Location

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4. Tower Data Set (excel chart)

Response:

4.1. Tower Identifier	4.2. Location Latitude	4.2. Location Longitude	4.3. Tower Type	4.4. Tower Height (m)	4.5. Sector Count	4.6. Number of Stacked Frequencies Used	4.7 Potential Service Feeds
Albaton Tower	42.185489	-96.292276	4.3.1. Erected for Project	26	3	1 - Band 41 C1, 49.5MHz	Fiber Circuit Builds
BlackBird Tower	42.054251	-96.208132	4.3.1. Erected for Project	26	3	1 - Band 41 C1, 49.5MHz	Fiber Circuit Builds
Salix Tower	42.312193	-96.287680	4.3.1. Erected for Project	60	3	1 to 4 - Band 48 GAA, 10 MHz each	Fiber Circuit Builds
Whiting Tower	42.133324	-96.155967	4.3.1. Erected for Project	26	3	1 - Band 41 C1, 49.5MHz	Fiber Circuit Builds

5. Backhaul Map

Response:

The two fiber diagrams below show the planned infrastructure connecting the towers to be constructed for this project. This backhaul network is being built as per another Quick Current – Iowa project that is underway. The planned network will consist of fiber rings that provide route diversity and multiple circuit pathways to Internet Drain locations in Sioux City, IA and Carter Lake, IA. The goal of this backhaul network is that no single fiber cut causes an outage for an end user.

5.1. Specify connections among tower and to drain locations (latitude and longitude)

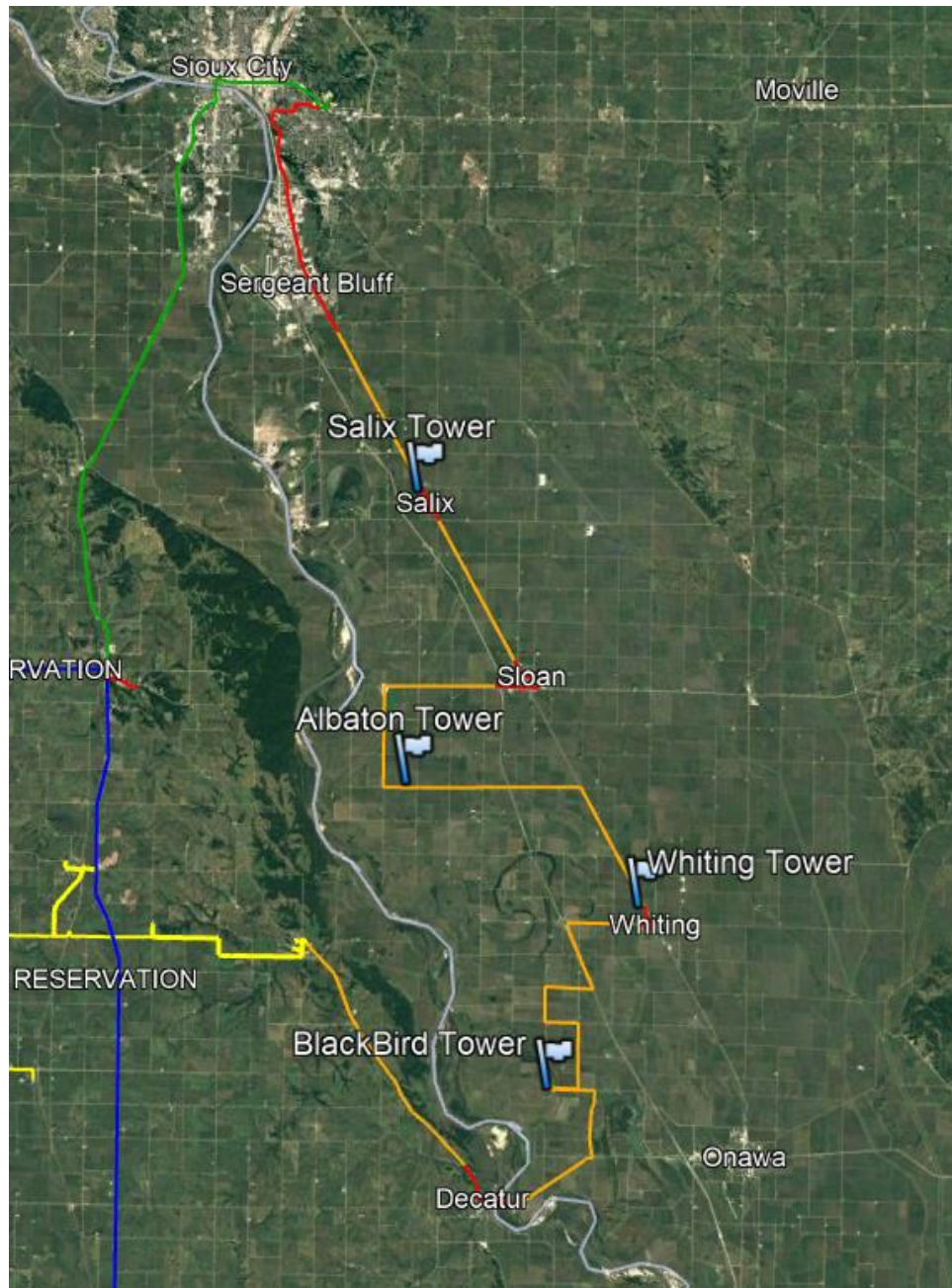
Response:

Tower latitude and longitude are specified in 4. above. Internet Drain locations will be:

Sioux City: Western Iowa Tech Community College Data Center at 42.483943, -96.346382

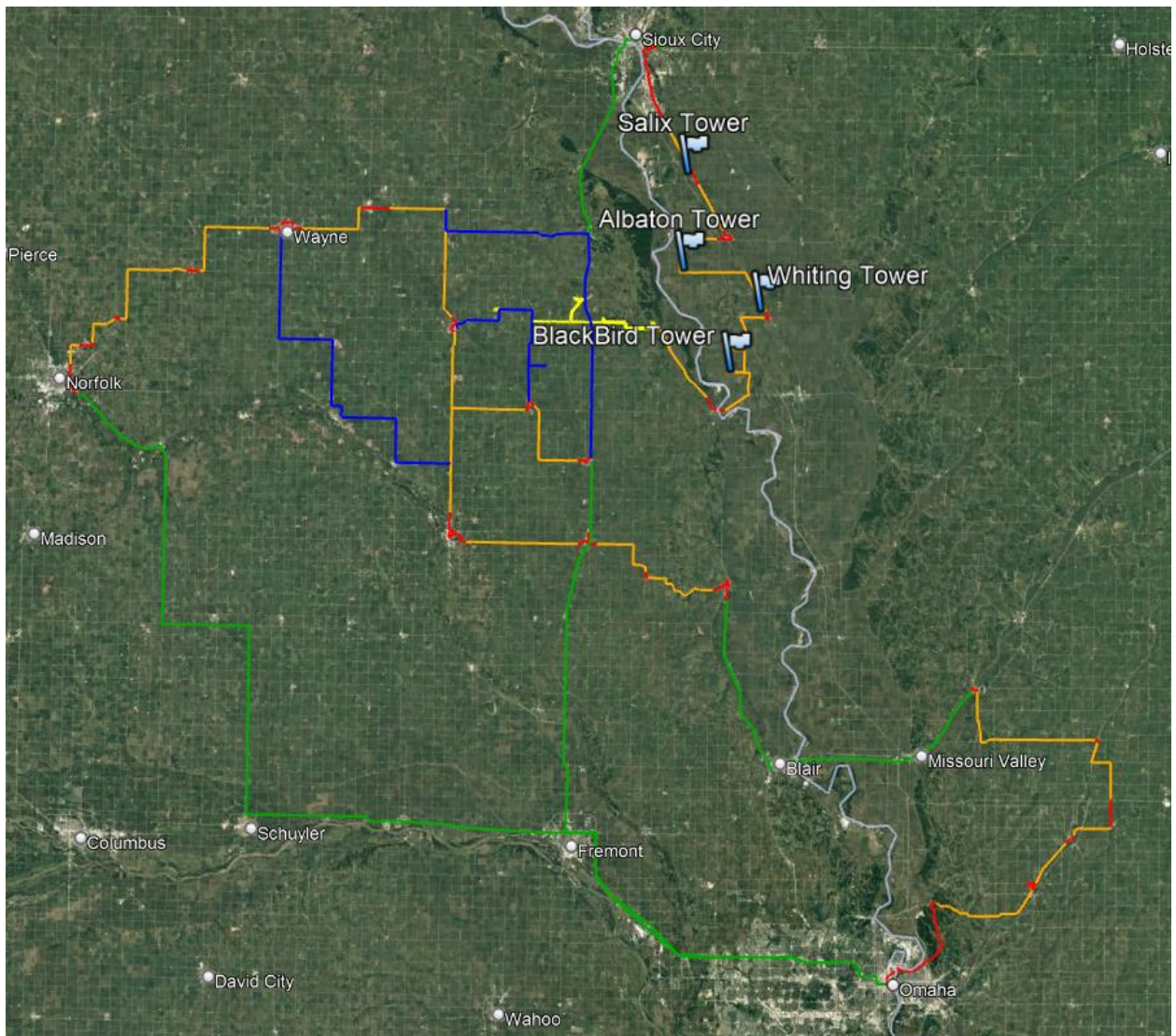
Carter Lake: Quick Current Carter Lake Data Center to be constructed at 41.28266, -95.913109

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5.2.a. and 5.3.a. Backhaul Map – Sioux City Fiber Ring

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5.2.b. and 5.3.b. Backhaul Map – Entire Quick Current Fiber Ring Architecture

6. Backhaul Data Per Tower

6.1. Max backhaul capacity required based on homes and businesses served

Response:

515 locations * 100Mbps = 51.5 Gbps max possible bandwidth required if all users were maxed out at 100Mbps.

6.2. Backhaul aggregations

Response:

Per the fiber maps in section 5 above, backhaul aggregation points will be at several places throughout the network in order to provide a multi-ring architecture. Most notable

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aggregation points will be at data centers in Sioux City (IA), Carter Lake (IA), and Walthill (NE).

6.3. Backhaul destinations

Response:

Backhaul fiber routes will take traffic to either Sioux City, IA or Carter Lake, IA

6.4. Backhaul type

Response:

Fiber

6.5. Backhaul Capacity

Response:

100Gbps

6.6. Oversubscription Rate

Response:

With a 100Gbps backhaul ring architecture network, there will be no oversubscription.

7. Internet Drain Data

7.1. Indicate drain

Response:

We will have 10Gbps BGP connections to multiple Internet providers at data centers in Sioux City, IA and Carter Lake, IA.

7.2. Indicate drain oversubscription value

Response:

With multiple paths to get to the BGP connections in Sioux City and Carter Lake, the effective Internet capacity for this network will be 20Gbps. Therefore, the oversubscription a value will be $1/(20000\text{Mbps}/100\text{Mbps per Customer} / 515 \text{ Customers}) = 2.575$ to 1. In the event of a complete failure of a data center, that value goes to 5.15 to 1.

8. Locational Contingencies

8.1. Describe your approach to resolving issues such as:

8.1.1. Selected build location unavailable

Response:

We have the option to build towers within a mile of each planned tower location along the fiber backhaul route. As well, we have flexibility in the fiber route to be built. The combination of these things will allow us to find a suitable location that can be purchased within what is budgeted for each location.

8.1.2. Tower site intended for lease has no capacity

Response:

Not Applicable. We are building new tower facilities for this project.

8.1.3. Geographic disparity during detailed design

Response:

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As can be seen by the Propagation Map of 1.2.2. above, the geography of the area is a non-factor due to both the relative flatness of the area as well as the non-line-of-sight nature of the equipment to be used.

9. Certification of Compliance.

I certify on behalf of the Applicant that I will comply with the terms, conditions, and requirements of Iowa Code section 8B.11, Iowa Admin. Code ch. 129—22, and this NOFA.

In addition to any criminal penalties authorized by Iowa Code section 720.2 that may result from any false statements of material fact made herein or any other remedies available at law, equity, or otherwise, an Applicant that is subsequently determined to have made a statement, representation, warranty, certification, or attestation in an Application, or any attachments or enclosures associated therewith, that is later proven untrue in any material respect shall be obligated to repay the Office the entire amount of any grant funds previously distributed by the Office to the Applicant.

Sincerely,


Authorized Representative's Signature

8/24/2023
Date

Lowell Feldman
Name (Printed)

Manager
Title

Quick Current-Iowa LLC
Entity

#008 (Application #526596)
NOFA Number