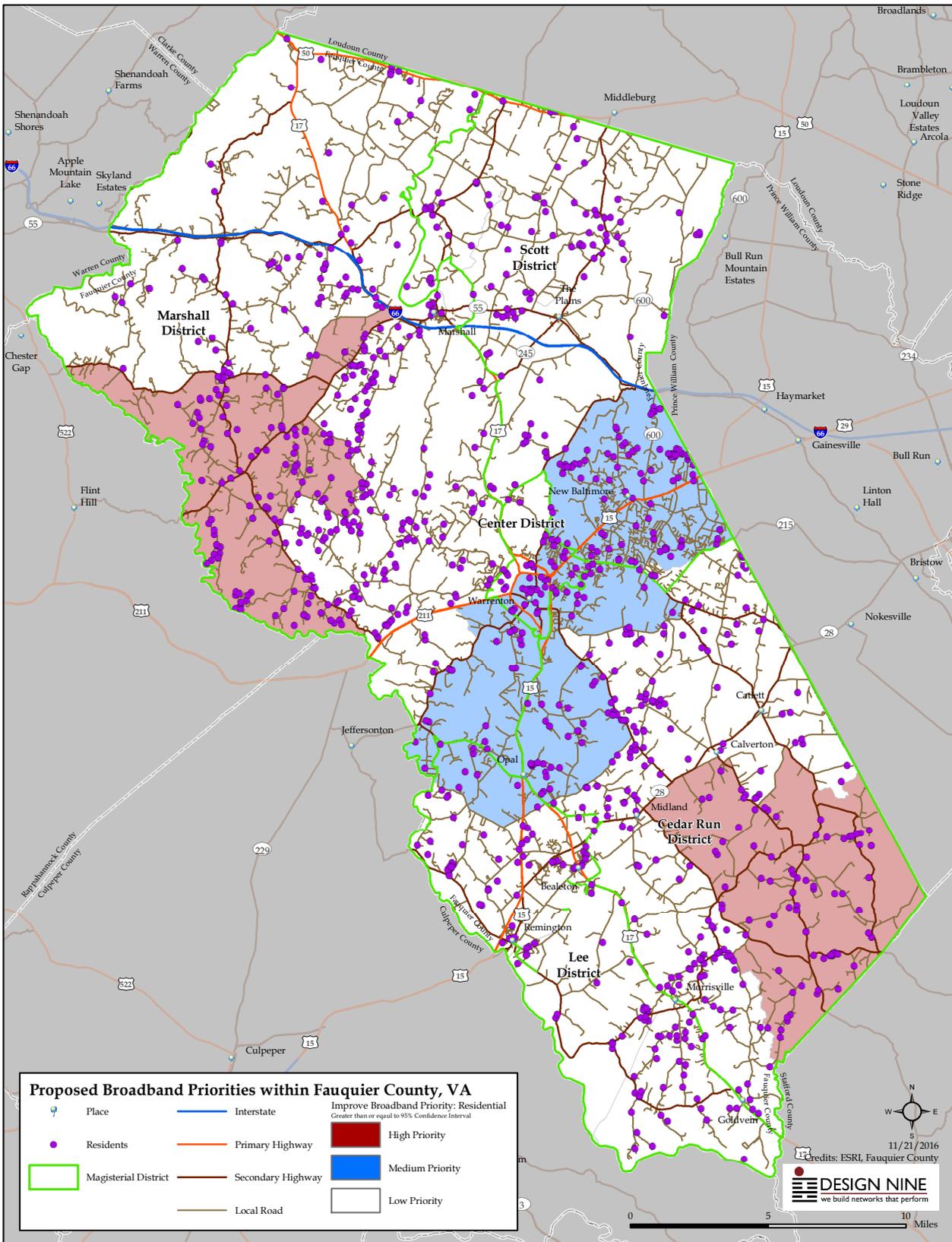


Fauquier County Broadband Demand Analysis

The Residential Broadband Survey Response map on the next page identifies clusters of residential responses within Census block groups which indicate statistically significant limited Internet availability. There were not enough business responses received to perform a similar analysis for businesses in the county.

The three color shades on the map provide suggestions for setting priorities on where to improve broadband in Fauquier County. Census block groups with high clusters of residential responses were identified by performing a Hot Spot analysis for each survey dataset collected from an online and paper-based survey conducted by the County in late summer and early fall (2016). The survey asked respondents to provide the kind of Internet technology, e.g., Cellular Wireless, DSL, T1 Line, Dial-up, wireless broadband, or fiber broadband they were currently using.

Areas in red, with at least 95% confidence, are clusters of high responses within block groups indicating limited broadband options. Areas in blue, with at least 95% confidence, are clusters of low responses within block groups indicating broadband options are not as limited in the block groups that are red. "Limited" includes commonly-known limitations of the Internet service whether it be reliability, availability capacity and/or speed.



Cedar Run Magisterial District

Overview

A pronounced cluster of responses within block groups were found to be limited in Internet availability. Three hundred and sixty-one residents replied to the Residential Broadband Survey and twenty-two businesses replied to the Business Broadband Survey. There are two separate maps to identify areas of proposed broadband improvements based on residential and business survey responses. Areas in red, with at least 95% confidence, are high clusters of survey responses within block groups indicating limited broadband options. Areas in blue, with at least 95% confidence, are low clusters of survey responses within block groups indicating broadband options are not as limited as the areas in red. Improving broadband availability for high and/or medium priority block groups will have the highest impact because those block groups contain the highest clustering of responses from the residential and business surveys. The district also contains many residents who reported using the Internet for school at least once a month. Residents and businesses indicated a combination of limited service capacity, service availability, and/or service affordability. 100% of businesses that responded to the survey in the district indicated that "Internet is essential to my business."

Broadband Challenges

The K12 school within the district is H.M. Pearson Elementary. Twenty-two businesses within the district replied to the business survey. Most of the businesses commented they could not perform a required action in their business due to the lack of available broadband options and/or no options at all. In particular, respondents asked for more reliable and faster Internet to increase productivity. Other respondents indicated that they would prefer better cell coverage and more competition for Comcast in the area.

Existing broadband assets

Two towers utilized by the County reside within the district as well as sixteen cell towers not utilized by County and one FCC registered tower. The County Board of Supervisors owns the one tower located within the district. Fiber cable routes within the district are owned by Zayo and Paetec Fiber. These are long haul fiber routes that were not engineered for local residential and business access.

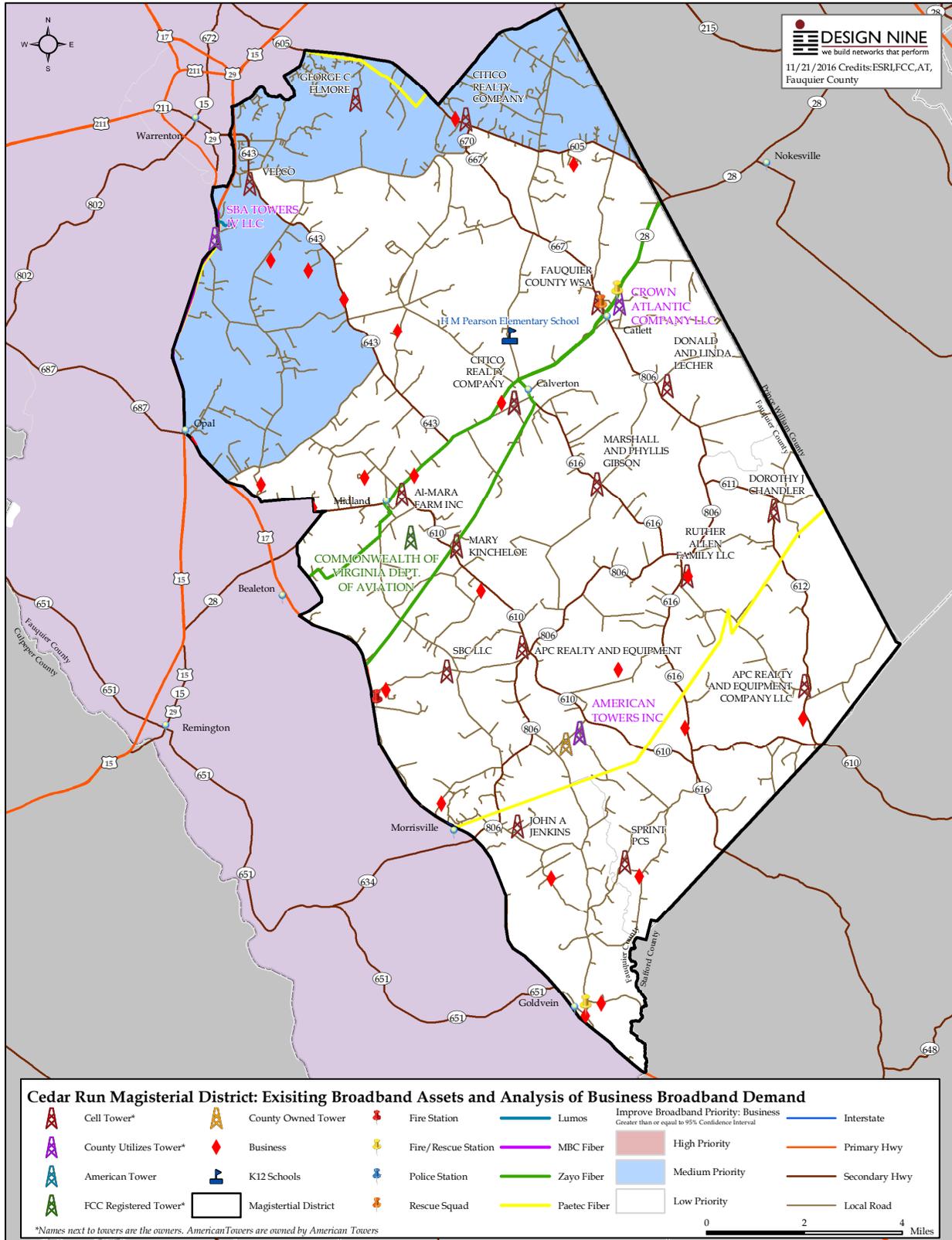
Potential solutions

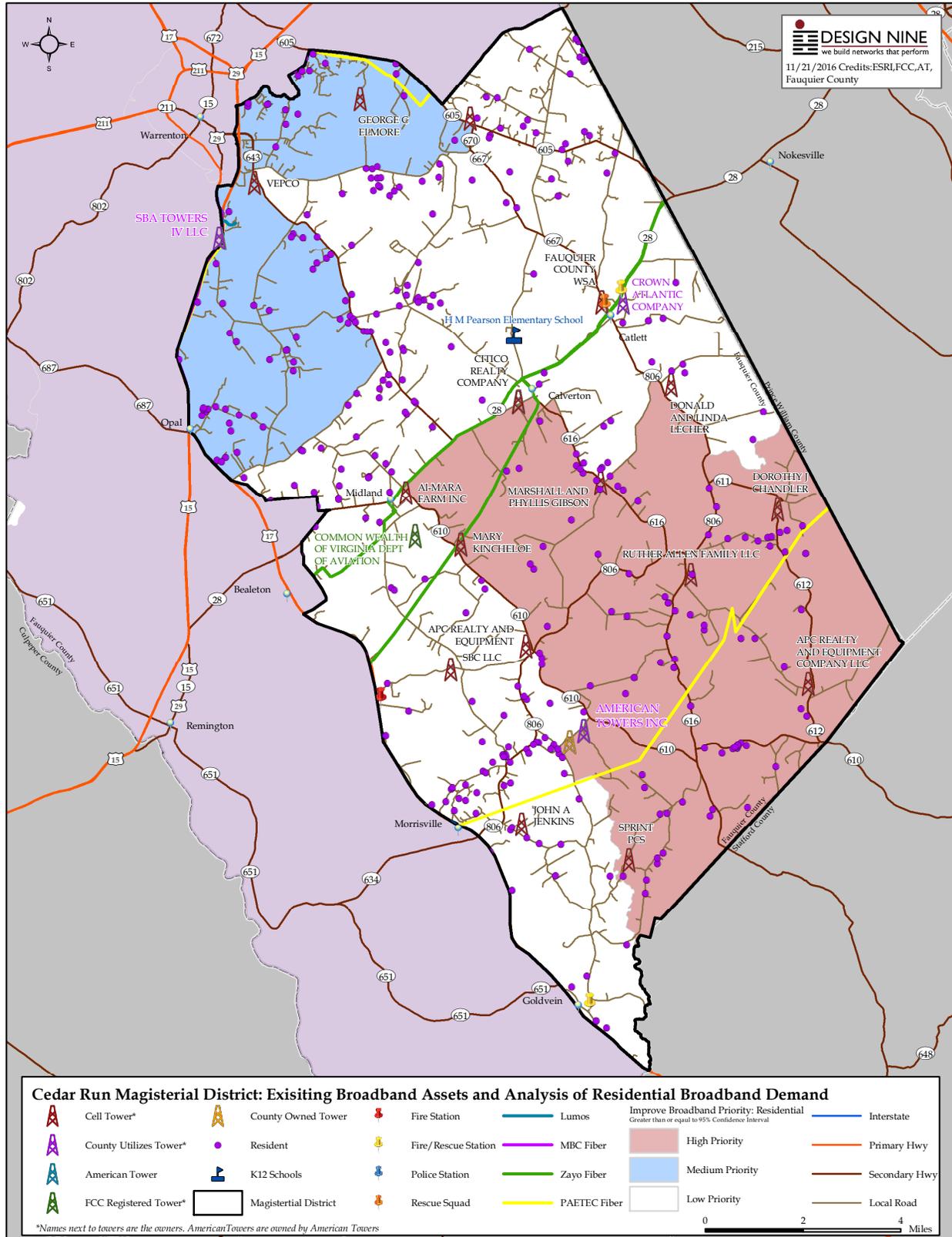
Providing access to Wireless Internet Service Providers (WISPs) on the existing county tower in the district would provide substantially improved access to a large part of the county. A viewshed study in the full report shows the kind of coverage that could be expected.

Costs

Upgrading the existing county tower to provide tower space to one or two wireless Internet providers would cost in the range of \$20,000 to \$25,000. If a new tower were located in the district, it would cost approximately \$135,000 and could be located at the Mary Walter Elementary School. The estimated road mileage within the highest priority residential cluster is 83.55 miles, or about 24% of the total road mileage within the district. The estimated road mileage within the highest priority business cluster is 65.83 miles, or about 19% of the total road mileage within the district.

Fiber deployments within the district would have to be designed carefully, given the large rural road mileage and the relatively high cost of fiber compared to wireless broadband. Fiber could be deployed incrementally based on additional market studies to identify pockets of guaranteed demand (i.e. residents and businesses agreeing to purchase Internet services from the new fiber infrastructure). A hybrid wireless-fiber network design will be the most economical approach.





Marshall Magisterial District

Overview

A pronounced cluster of responses within block groups were found to be limited in Internet availability. Four hundred and eighty-eight residents replied to the Residential Broadband Survey and forty-two businesses replied to the Business Broadband Survey. There are two separate maps to identify areas of proposed broadband improvements based on residential and business survey responses. Areas in red, with at least 95% confidence, are high clusters of survey responses within block groups indicating limited broadband options.

Areas in blue, with at least 95% confidence, are low clusters of survey responses within block groups indicating broadband options are not as limited as the areas in red. Improving broadband availability for high and/or medium priority block groups will have the highest impact because those block groups contain the highest clustering of responses from the residential and business surveys. The district also contains many residents who reported using the Internet for school at least once a month. Residents and businesses indicated a combination of limited service capacity, service availability, and/or service affordability. 100% of businesses that responded to the survey in the district indicated that "Internet is essential to my business."

Broadband Challenges

There are no K12 schools within the district and there are forty-two businesses within the district that replied to the survey. Most of the businesses commented that they could not perform a required action in their business due to the lack of available broadband options and/or no options at all. In particular, some respondents indicated that they wanted both better cell service and better landline service. Also, some respondents indicated they struggled with Internet reliability and had to buy Internet service from more than one provider to have reliable service.

Existing broadband assets

In the district, the County leases space on three towers. There are no County-owned towers in the district. There are fourteen cell towers within the district. Fiber lines within the district are owned by Lumos and Paetec Fiber.

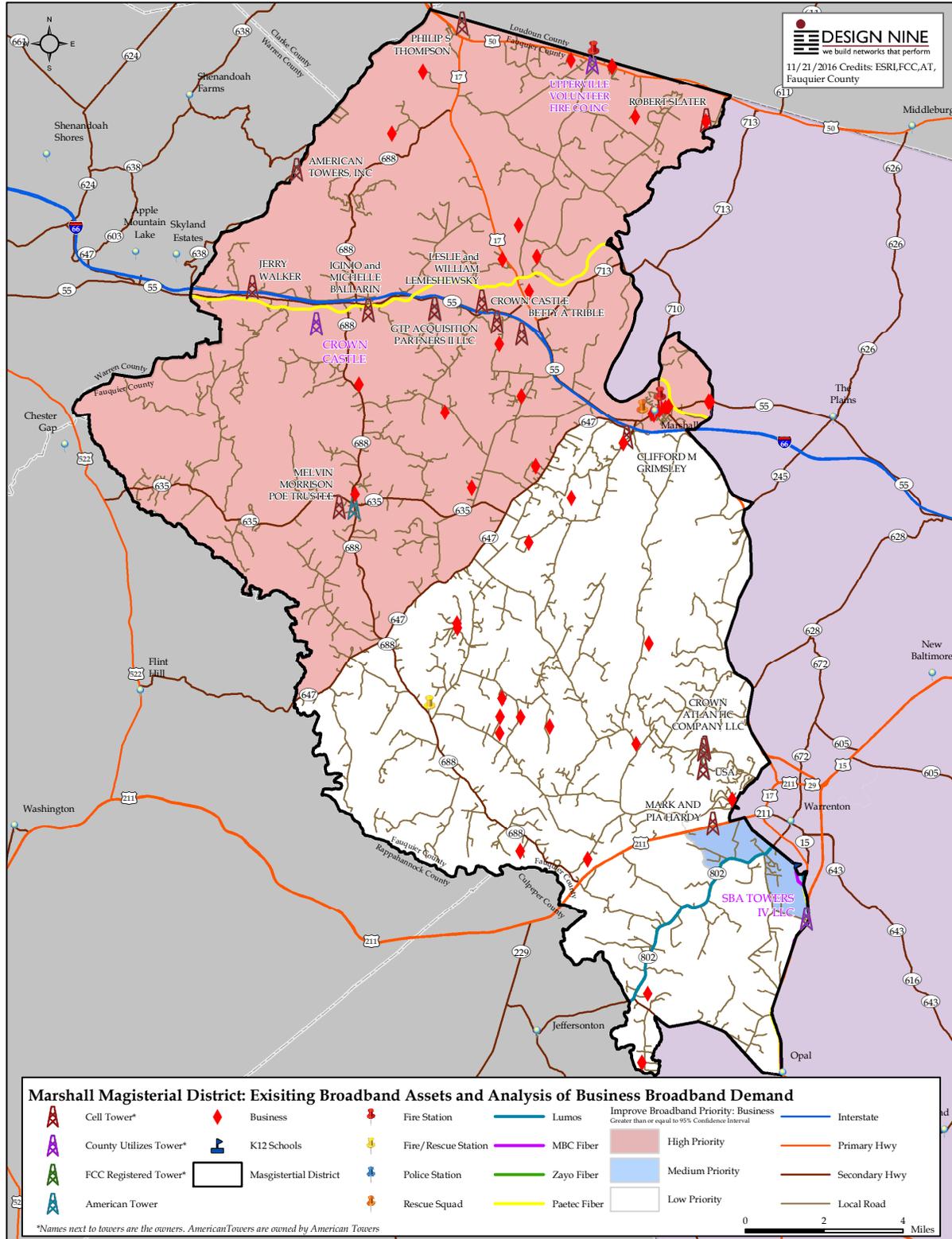
Potential solutions

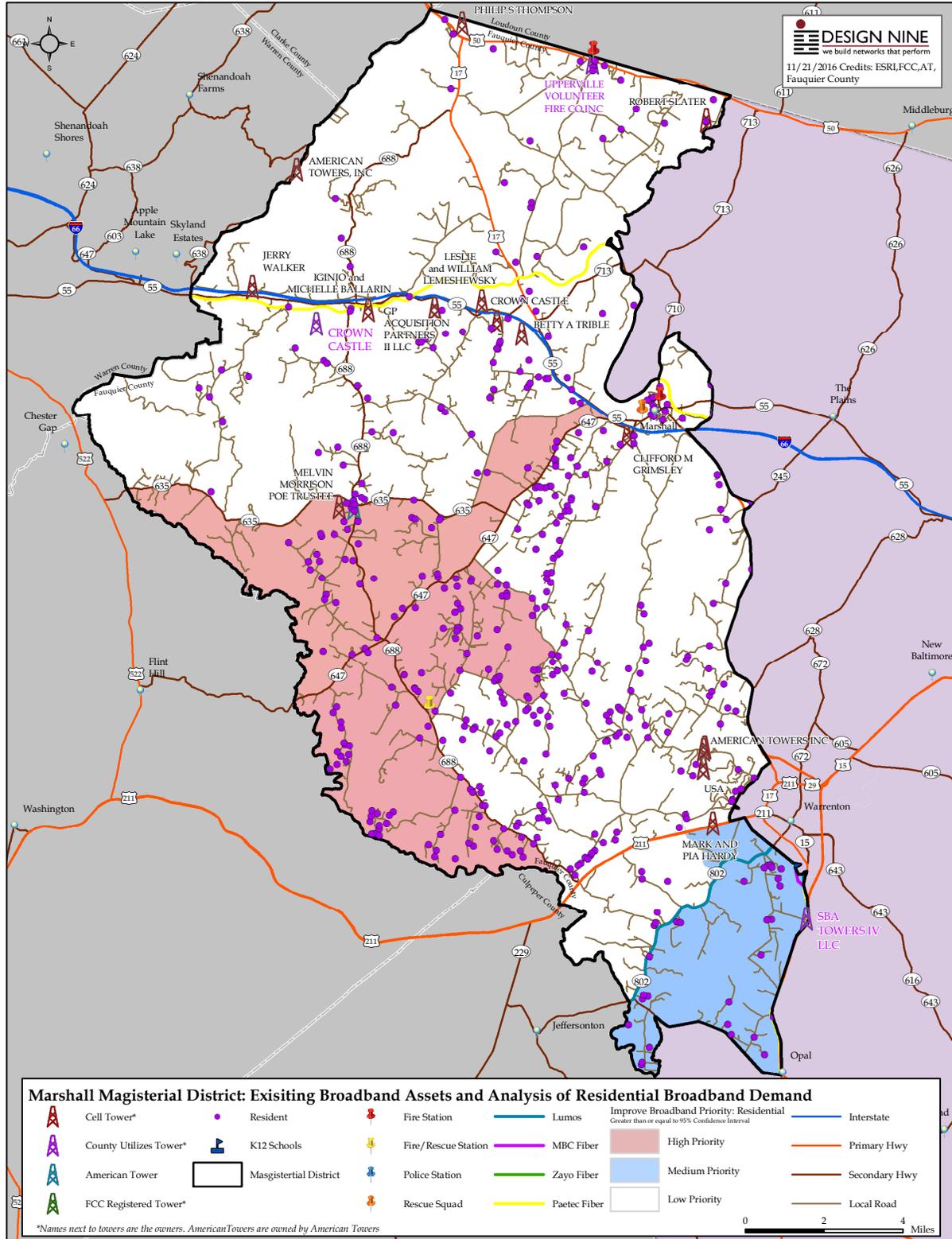
There are no county-owned towers in this district. At least two new towers are recommended to provide improved wireless broadband service in this district. A viewshed study in the full report shows the kind of coverage that could be expected. A proposed new tower site for this district is Orleans Volunteer Fire and Rescue Department which would improve broadband availability within the proposed high priority block group for residential responses.

Costs

One new tower would cost an estimated \$125,000 to \$135,000, for a total of about \$270,000 in capital expense. Some modest revenue would be expected from wireless Internet providers using those towers. A candidate tower location could include the Orleans Fire and Rescue Station. The estimated road mileage within the highest priority residential cluster is 94 miles, or about 17% of the total road mileage within the district. The estimated road mileage within the highest priority business cluster is 250.40 miles, or about 46% of the total road mileage within the district.

Fiber deployments within the district would have to be designed carefully, given the large rural road mileage and the relatively high cost of fiber compared to wireless broadband. Fiber could be deployed incrementally based on additional market studies to identify pockets of guaranteed demand (i.e. residents and businesses agreeing to purchase Internet services from the new fiber infrastructure. A hybrid wireless-fiber network design will be the most economical approach.





Center Magisterial District

Overview

A pronounced cluster of responses within block groups were found to be limited in Internet availability. Eighty residents replied to the Residential Broadband Survey and nineteen businesses replied to the Business Broadband Survey. There are two separate maps to identify areas of proposed broadband improvements based on residential and business survey responses. Areas in red, with at least 95% confidence, are high clusters of survey responses within block groups indicating limited broadband options.

Areas in blue, with at least 95% confidence, are low clusters of survey responses within block groups indicating broadband options are not as limited as the areas in red. Improving broadband availability for high and/or medium priority block groups will have the highest impact because those block groups contain the highest clustering of responses from the residential and business surveys. The district also contains many residents who reported using the Internet for school at least once a month. Residents and businesses indicated a combination of limited service capacity, service availability, and/or service affordability. 100% of businesses that responded to the survey in the district indicated that "Internet is essential to my business."

Broadband Challenges

There are four K12 schools as seen on the maps within the district and there are nineteen businesses within the district that replied to the survey. Most of the businesses commented that they would like more Internet options available within the district. In particular, some respondents indicated that they wanted both better cell service and better Internet service. Also, some respondents indicated that better Internet options would attract other businesses to the district.

Existing broadband assets

In the district, there are no County-owned or County-leased towers in the district. There are five towers within the district. Three towers are FCC registered, one is owned by American Towers and one is an unknown owner. Fiber lines within the district are owned by Lumos, Paetec Fiber, and Zayo.

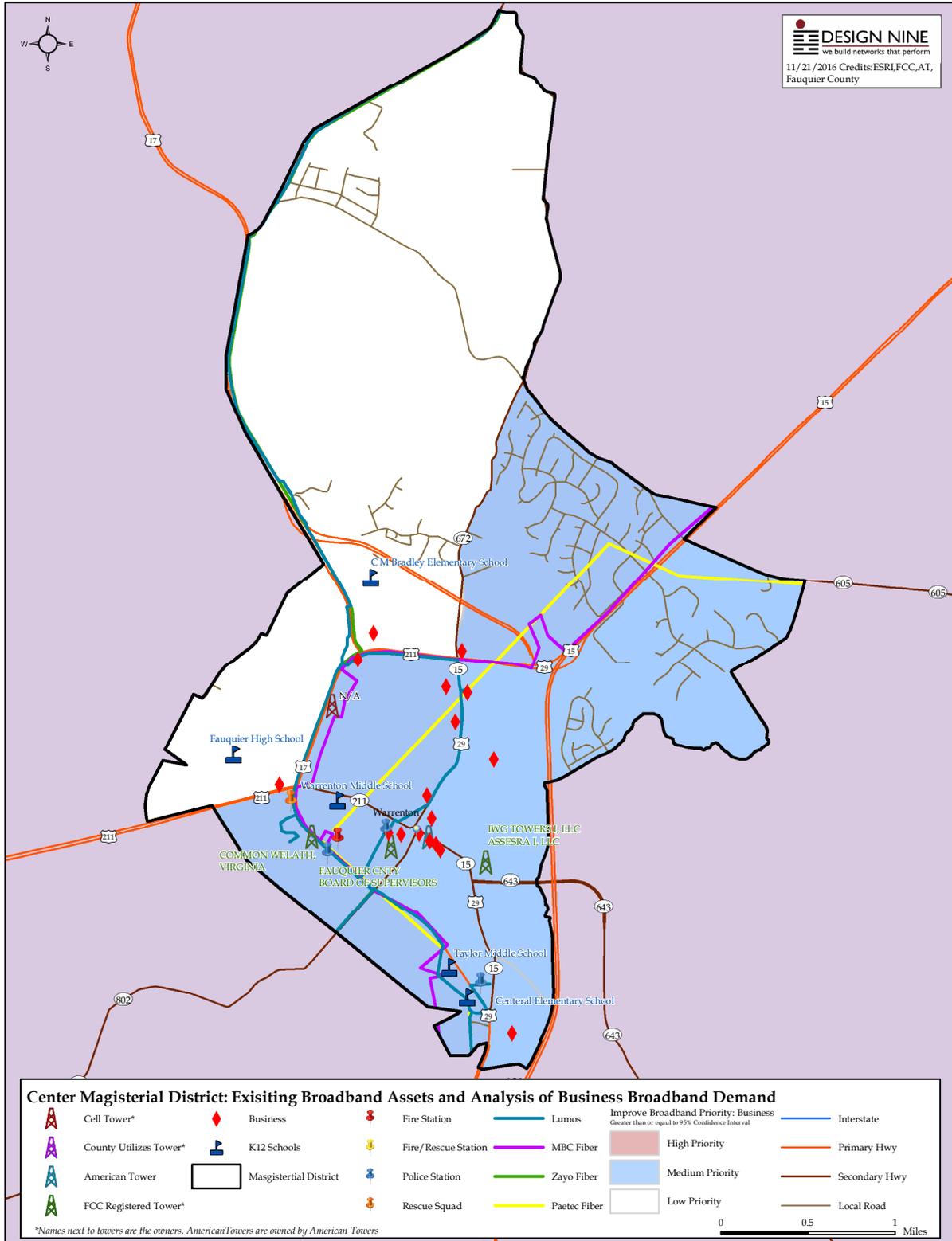
Potential solutions

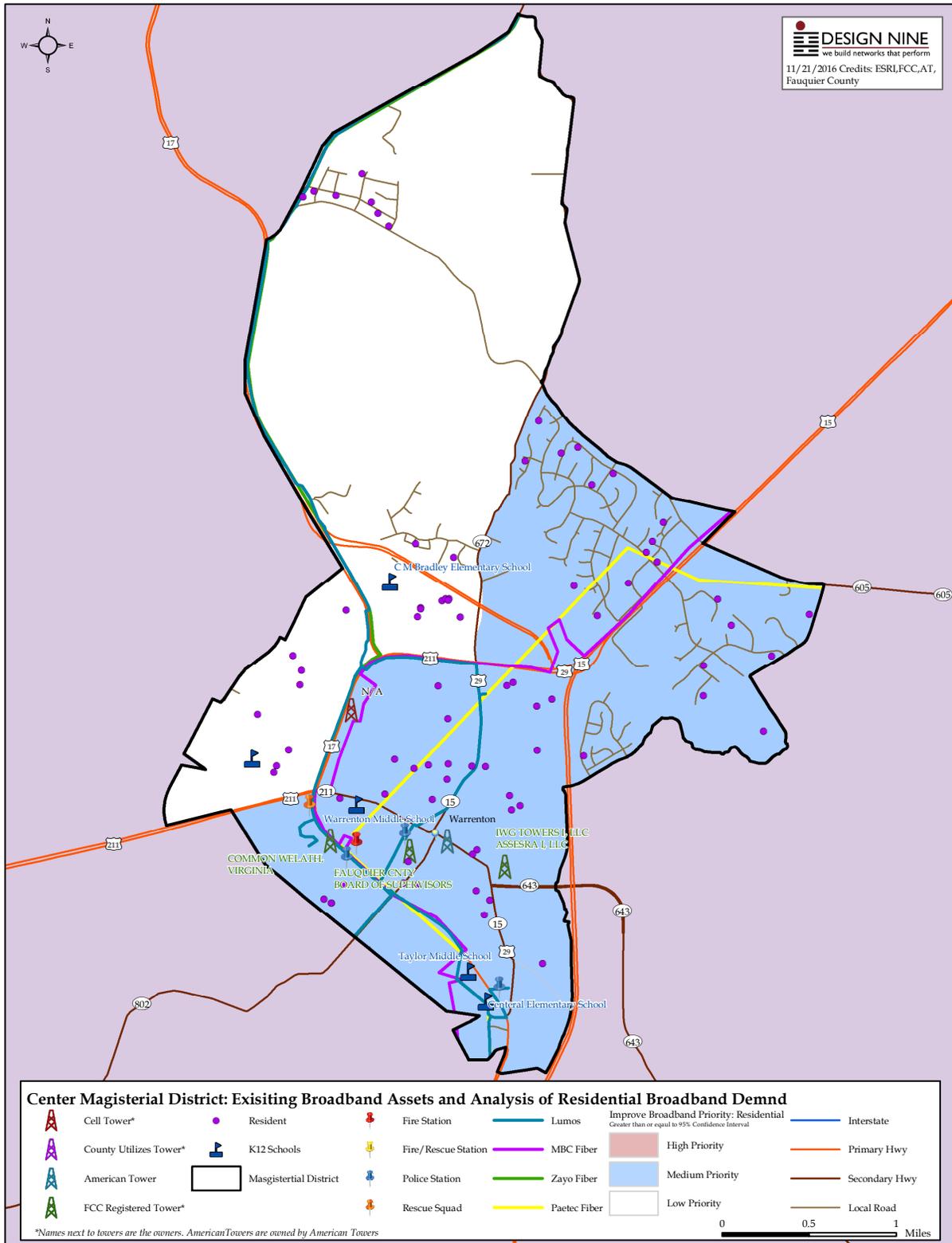
There are no county-owned towers in this district. At least two new towers are recommended to provide improved wireless broadband service in this district. A viewshed study in the full report shows the kind of coverage that could be expected. There are no proposed tower sites within this district at the current moment.

Costs

The estimated road mileage within the highest priority residential cluster is 14.345 miles 17% of the total road mileage within the district. The estimated road mileage within the highest priority business cluster is also 14.35 miles 17% of the total road mileage within the district.

Fiber deployments within the district would have to be designed carefully, given the large rural road mileage and the relatively high cost of fiber compared to wireless broadband. Fiber could be deployed incrementally based on additional market studies to identify pockets of guaranteed demand (i.e. residents and businesses agreeing to purchase Internet services from the new fiber infrastructure). A hybrid wireless-fiber network design will be the most economical approach.





Lee Magisterial District

Overview

A pronounced cluster of responses within block groups were found to be limited in Internet availability. One hundred and seventy-three residents replied to the Residential Broadband Survey and ten businesses replied to the Business Broadband Survey. There are two separate maps to identify areas of proposed broadband improvements based on residential and business survey responses. Areas in red, with at least 95% confidence, are high clusters of survey responses within block groups indicating limited broadband options. Areas in blue, with at least 95% confidence, are low clusters of survey responses within block groups indicating broadband options are not as limited as the areas in red. Improving broadband availability for high and/or medium priority block groups will have the highest impact because those block groups contain the highest clustering of responses from the residential and business surveys. The district also contains many residents who reported using the Internet for school at least once a month. Residents and businesses indicated a combination of limited service capacity, service availability, and/or service affordability. 100% of businesses that responded to the survey in the district indicated that "Internet is essential to my business."

Broadband Challenges

There are four K12 schools within the district as seen on the maps below and there are ten businesses within the district that replied to the survey. Most of the businesses commented they wanted better cell phone service and faster Internet service. In particular, a business commented they would like fiber optics while another business commented they are researching other areas to move to for better Internet service.

Existing broadband assets

In the district, the County leases space on three towers. There are no County-owned towers in the district. There are seven cell towers within the district. Fiber lines within the district are owned by Zayo, Paetec and MBC Fiber.

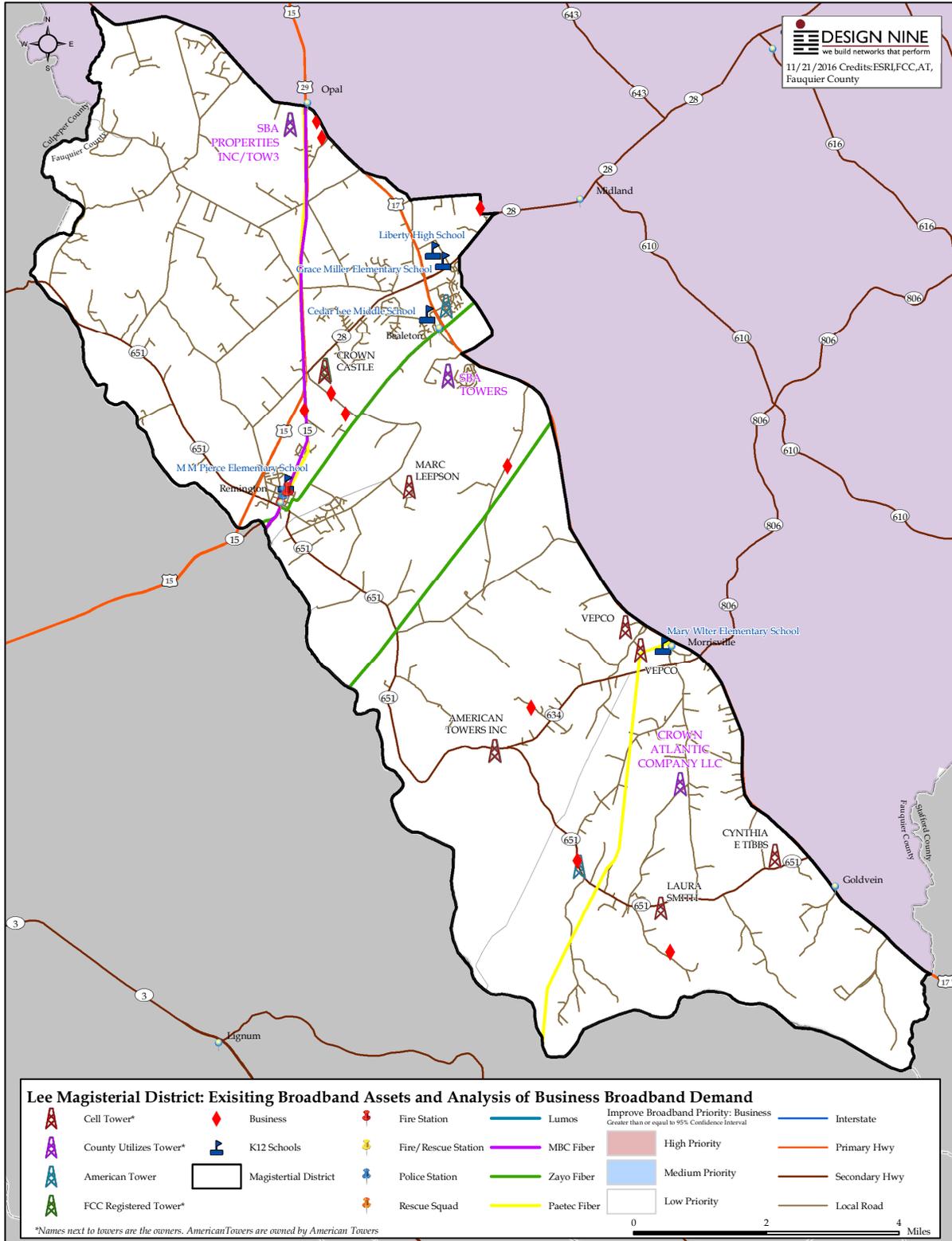
Potential solutions

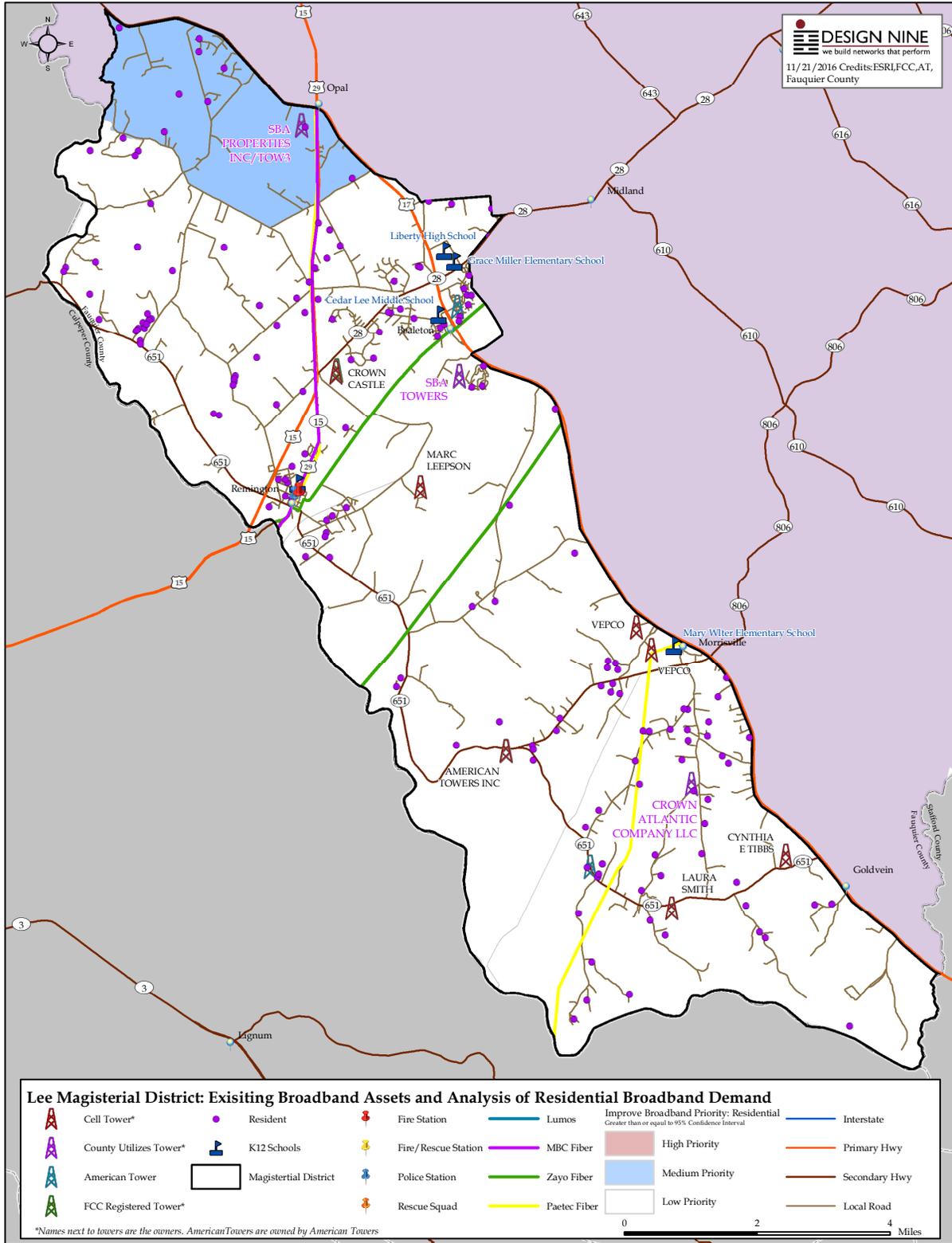
There are no county-owned towers in this district. At least two new towers may be needed to provide widely improved wireless broadband service in this district. A viewshed study in the full report shows the kind of coverage that could be expected. The proposed new tower sites are at Mary Walter Elementary School and Liberty High School

Costs

One or two new towers would cost an estimated \$125,000 to \$135,000, for a total of about \$270,000 in capital expense. Some modest revenue would be expected from wireless Internet providers using those towers. Two Candidate tower locations could include the Mary Walter Elementary School and/or Liberty High School. The estimated road mileage within the highest priority residential cluster is 14.35 miles 6% of the total road mileage within the district. There are no high priority business cluster within the district.

Fiber deployments within the district would have to be designed carefully, given the large rural road mileage and the relatively high cost of fiber compared to wireless broadband. Fiber could be deployed incrementally based on additional market studies to identify pockets of guaranteed demand (i.e. residents and businesses agreeing to purchase Internet services from the new fiber infrastructure. A hybrid wireless-fiber network design will be the most economical approach.





Scott Magisterial District

Overview

A pronounced cluster of responses within block groups were found to be limited in Internet availability. Two hundred and forty-one residents replied to the Residential Broadband Survey and sixteen businesses replied to the Business Broadband Survey. There are two separate maps to identify areas of proposed broadband improvements based on residential and business survey responses. Areas in red, with at least 95% confidence, are high clusters of survey responses within block groups indicating limited broadband options. Areas in blue, with at least 95% confidence, are low clusters of survey responses within block groups indicating broadband options are not as limited as the areas in red. Improving broadband availability for high and/or medium priority block groups will have the highest impact because those block groups contain the highest clustering of responses from the residential and business surveys. The district also contains many residents who reported using the Internet for school at least once a month. Residents and businesses indicated a combination of limited service capacity, service availability, and/or service affordability. 100% of businesses that responded to the survey in the district indicated that "Internet is essential to my business."

Broadband Challenges

There are five K12 schools as seen on the maps within the district and there are sixteen businesses within the district that replied to the survey. Most of the businesses commented they wanted more affordable and faster Internet. In particular, businesses would like fiber optics for faster speed and more competition in the area.

Existing broadband assets

In the district, the County leases space on five towers. There are no County-owned towers in the district. There are five cell towers within the district. Fiber lines within the district are owned by Paetec.

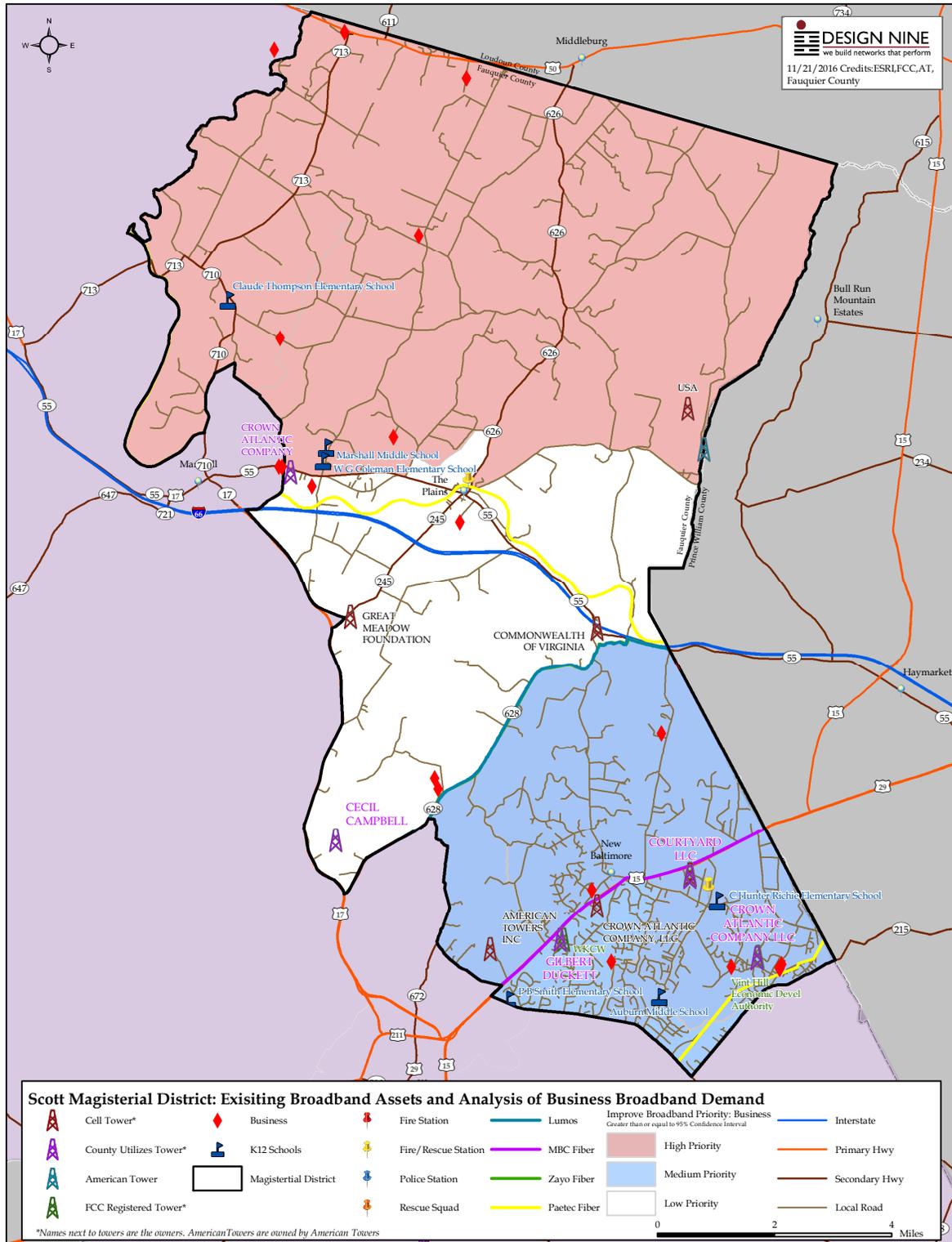
Potential solutions

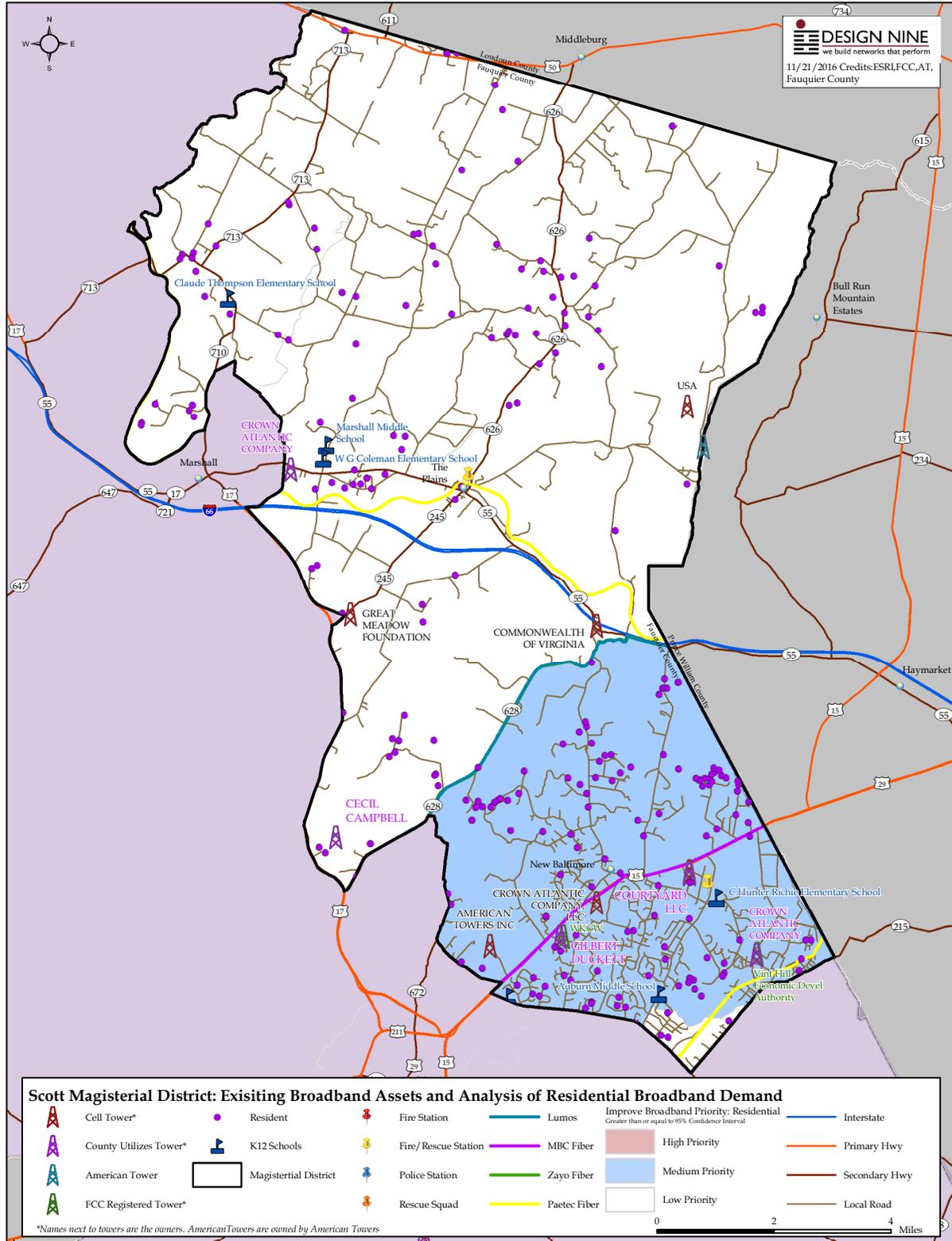
There are no county-owned towers in this district. There is one recommended new tower location at Claude Thompson Elementary School. A viewshed study in the full report shows the kind of coverage that could be expected.

Costs

One or two new towers would cost an estimated \$125,000 to \$135,000, for a total of about \$270,000 in capital expense. Some modest revenue would be expected from wireless Internet providers using those towers. The estimated road mileage within the highest priority business cluster is 123.13 miles 40% of the total road mileage within the district. The estimated road mileage within the highest priority residential cluster is 244.34 miles 80% of the total road miles within the district.

Fiber deployments within the district would have to be designed carefully, given the large rural road mileage and the relatively high cost of fiber compared to wireless broadband. Fiber could be deployed incrementally based on additional market studies to identify pockets of guaranteed demand (i.e. residents and businesses agreeing to purchase Internet services from the new fiber infrastructure. A hybrid wireless-fiber network design will be the most economical approach.





Wireless Propagation Analysis

The wireless propagation studies on the next two pages provide an analysis of how broadband Internet coverage in the county could be improved by making more space available to WISPs (Wireless Internet Service Providers) on county-owned towers.

The first map illustrates potential coverage if the customer receiving antenna is mounted approximately twenty feet above ground level (e.g. at the peak of the roof).

The second map shows potential coverage if the customer receiving antenna is mounted on a wooden utility pole seventy feet above the ground. In this instance, coverage is substantially improved.

Not every home or business in rural parts of the county would necessarily have to install a private utility pole. Where there are clusters of homes along a rural road, a single utility pole could provide much improved broadband access to any home or business within line of sight of the pole for wireless access, and for rural subdivisions, this could be an even more efficient approach, serving many homes within a neighborhood.

These utility poles, therefore, could be used in three ways:

- A single utility pole is mounted on a business or residential property with line of site to one of the larger towers. In this approach, the single pole provides service to a single customer, with bandwidth available at a minimum 5-10 Meg symmetric. This would be a substantial improvement over poor DSL or satellite, and would support many common work from home or business from home services that perform poorly over low speed DSL (e.g. Skype, Webex, GoToMeeting, VoIP phone service). Higher speeds for more specialized business needs would also be possible.
- A “community” utility pole could be installed on public right of way, a common space (e.g. local park, fire station, etc.) or on private property with permission of the property owner. This pole would have a point to point connection to one of the larger towers. Service providers could install local access radios that would provide wireless Internet service to any customers with good line of sight to the utility pole (as far away as a mile or more).
- A “community” utility pole could be installed on public right of way, a common space (e.g. local park, fire station, etc.) or on private property with permission of the property owner. This pole would have a point to point connection to one of the larger towers. A cabinet at the base of the pole would contain a fiber switch, and fiber could be deployed locally from that tower.

