

Chapter 4

Appalachian Access to Opportunity

4.0 Access Evaluations

This section describes the process employed in quantifying access to/from the Appalachian region. “Access” in this context is measured at the county level. While not intended as a “county by county” ranking, it is a relative measure of the transportation connectivity of the county to the global marketplace. It can be viewed as broadly estimating the relative attractiveness of the various counties for starting a new business, or improving and expanding an existing one with global reach. Typically, these businesses would be import or export related. The access measure also helps to highlight counties where transportation enhancements could make an improvement in the global competitiveness of business in that county. In addition, the measure proved to be a valuable tool in the regional workshops helping participants focus on the variables affecting access.

Various factors are considered when establishing a new business, most of which fall under the classical “Site Selection Criteria” that are used in site selection studies. These can be broadly classified into 4 groups:

- I. Business and Operating Conditions: This addresses issues such as transportation and utility infrastructure, access to market, workforce availability, capability and scalability.
- II. Geographically Variable Costs: These refer to costs associated to work force wages & salaries, taxes, real estate, incentives.
- III. Real Estate/Site: within a specific geographic area, real estate considerations include availability, fit, access, supporting infrastructure and lease terms.
- IV. Risks: Risk factors are always taken into account when starting a new business or expanding one. These factors include natural disaster, political environment, social/safety issues and economic/currency concerns.

However, it is important to note that each study is unique and may consider only some factors. Within the selected factors, the decision makers will look at a subset of those factors more closely than others. That is, some factors will have more weight (importance) than others within the context of the relevant study.

For the Network Appalachia Access measure, factors that have been used to quantify access have included only proximity measure to transportation link and nodes. These include proximity to:

- a) **Interstate Highway** – These are the primary links to move freight to/from global gateways (Ocean & River Ports, ICTFs etc)

- b) **ADHS/ National Highway** – Also important are the ADHS and National Highway System routes that provide connections to the Interstate.
- c) **Intermodal (Container) Rail Terminals** – This designates the Class I terminals that offer international intermodal services between ocean ports and ICTFs.
- d) **Multimodal Rail Terminals** – This includes the short line railroads and the Class I railroads excluding the intermodal routes.
- e) **Inland Waterway Port** – A well established navigable river system serves the western and northern part of the Appalachian Region. Distances to selected waterway ports on this system were included in quantifying the access of the region.
- f) **Intermodal - Interstate Intersection** – These are locations where developable land is available close to both an intermodal rail line and an interstate highway, which is assumed to have potential to establish a new business, such as a transload facility or a warehouse. As such, proximity measures to these locations were included in the analyses.
- g) **Coastal Ports** – The proximity to major coastal ports is an important factor in describing the transportation access. Relatively small distances to inland markets can be served by trucks, whereas larger distances are better served by rail and barge. In either case, smaller distances from inland markets to coastal ports are deemed to be more cost effective, not only in terms of transportation costs but also in transporting goods of time sensitive value.

Other demographic and trade related factors are also important in assessing the desirability of siting decisions. While not used in determining access, these factors are important when planning for development opportunities. These factors include:

- Population density
- Workforce Availability
- Workforce Development Capability
- Wage Rate
- Import/Export Demand
- Production Density
- Warehousing Density (# of Establishments)
- Developable Land
- Utilities
- Energy Costs
- Telecommunications – Broadband Internet & Cellular Phones

4.1 Access Definition

As mentioned in 4.0, seven proximity measures were used to quantify the access ranking. A brief methodology is presented in this section that documents the ranking process.

In general, the ranking process requires estimating the distances from each county within the Appalachian region to each of the ranking factors. Once the distances are established, the data generated was then normalized to depict comparable numbers for individual data ranges. More on this will be covered in section 4.2. The next step carried out was applying weights to each of the factors. These weights introduce a relative importance hierarchy for the criteria. Once the weights are established, the final step is to compute a weighted sum of the proximity measures to produce the access ranking for each county. A three category classification was then used to produce presentation maps.

4.2 Proximity

Distances from each county to the seven other factors were measured by a number of ways. All methods required zip codes to be established as origins and destinations, as zip to zip distances are relatively simple to compute. The first step was to establish a representative zip code for each county. First, the geographical centroid of each county polygon were found. Following that, the 5-digit postal code closest to the centroid was found. This zip code, referred to as *centroid zip* in this report, was then used as an origin to measure distances from the said county. Figure 4.1 shows the zip codes selected for each county.

Depending on the potential business being assessed, its optimal location within a county may be best positioned close to populated zones, in a rural setting with considerable land availability, or anywhere in-between. For counties with large areas, there could be a significant bias in measuring distances using the centroid zip. However, for the purposes of this study, with a view of keeping methodologies uniform, the centroid zips have been used throughout. For future, more detailed studies, zip code points may be manually selected to better represent the business case study.

In subsequent sections, these centroid zips will be referred to as the origins for distance calculations.

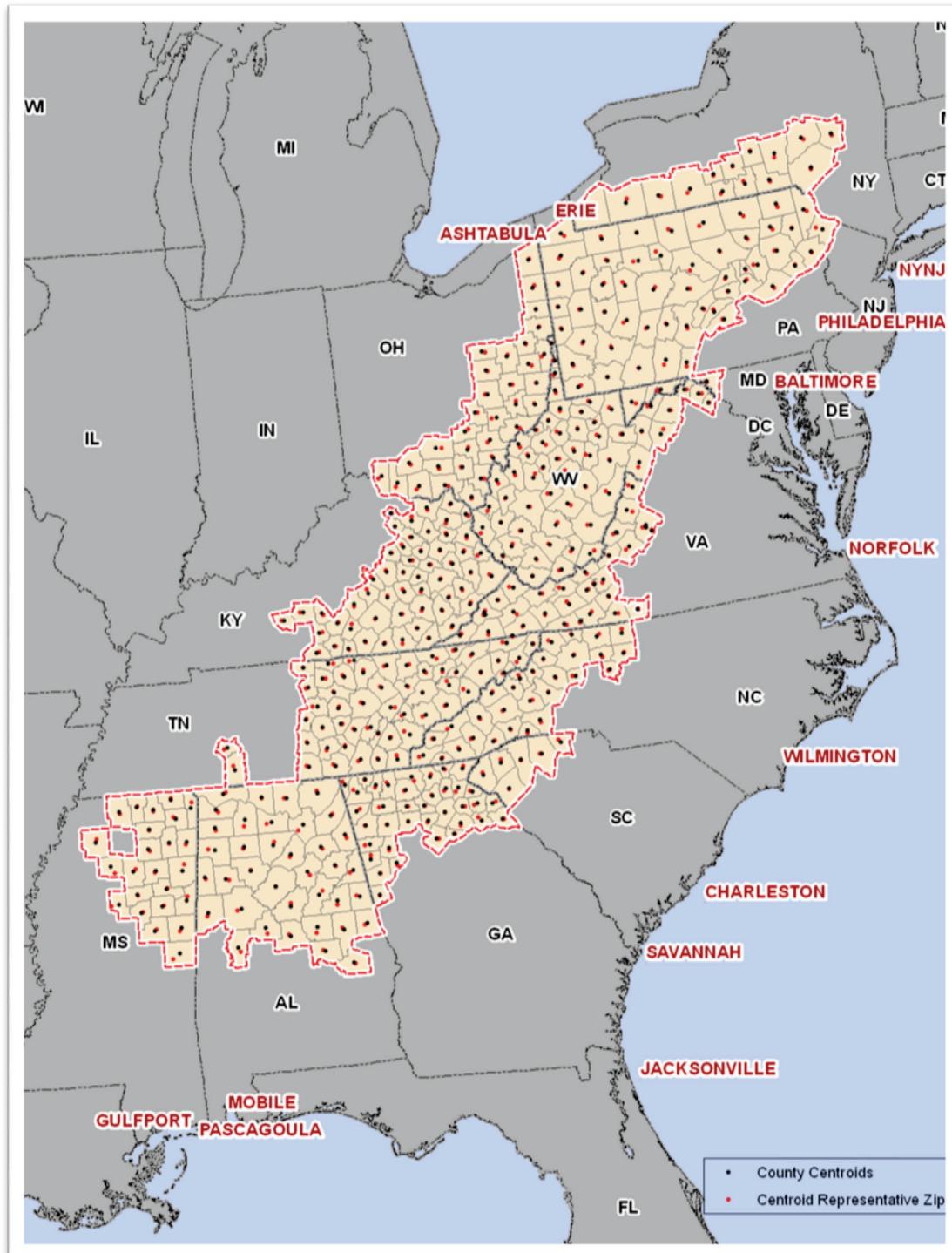


Figure 4.1: ARC Counties showing Geographic Centroids (Blue) and its closest 5-Digit Zip Code (Red)

4.2.1 Interstates

One of the key measures is the “closest distance” from a county to an interstate. PC*Miler was used to establish these distances. PC*Miler is an industry standard road routing software. Through visual inspection, a number of entry/exit ramps close to the centroid of each county were selected. PC*Miler was then run on each of the origin (county centroid) – destination (entry/exit ramps) pairs and the minimum distance was selected. This distance was then attributed to that county’s closest distance to an Interstate. The Interstate network was obtained from the National Highway Planning Network. Figure 4.2 shows the Interstate network used in this study.

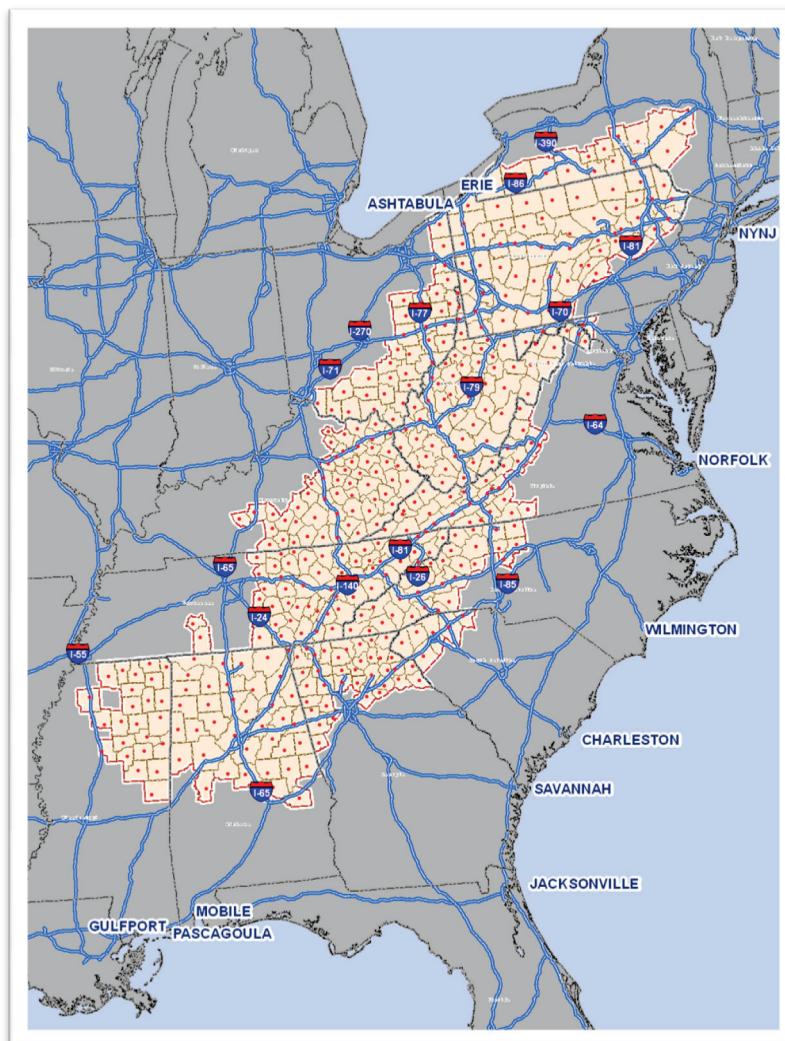


Figure 4.2: National Highway Planning Network Version 2005.08

4.2.2 ADHS/ National Highway

Many of the newer ADHS links are being built to interstate standards. The availability of the ADHS or state highways within a county provides a better access in reaching the interstate. While most of the ADHS is complete and open to the public, some reaches are yet to be completed. For the purposes of this study, distances to the ADHS were computed, even if the section was not open to the public at the time of the study. This is a forward looking approach, assuming that the sections would be completed by the time any business plan was ready to be implemented. Figure 4.3 shows the ADHS Network as of 2007. The distances to the ADHS links were established in the same way as the interstates.

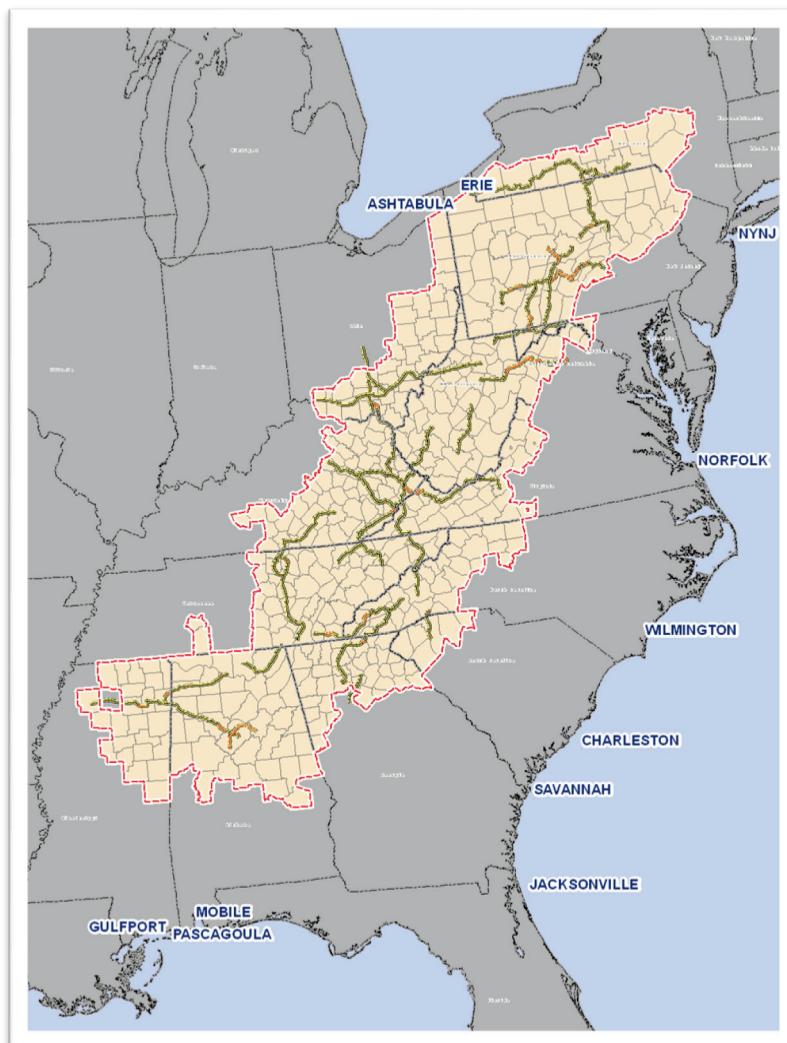


Figure 4.3: The ADHS network (2007)

4.2.3 Intermodal (Container) Rail Terminals

Rail is very efficient in moving freight to and from an ocean port over large distances. Thus access to intermodal rail vastly expands the regions reach in terms of trade. Intermodal rail provides services between ICTFs. Containerized boxes are delivered to and picked up from ICTFs by trucks. As such, access to intermodal rail was measured as road distances from county centroid zips to published ICTFs. Figure 4.4 shows the ICTF network within and at the periphery of the Appalachian region.

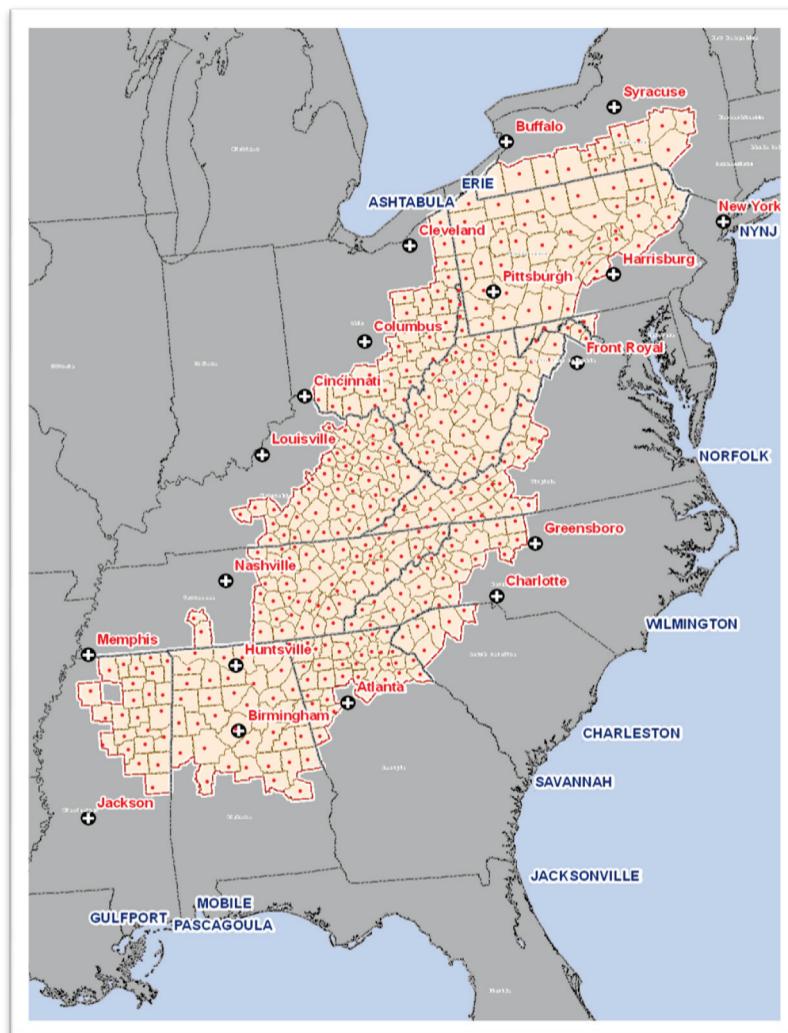


Figure 4.4: The ICTF terminals used in the study

4.2.4 Multimodal Rail Terminals

There are a number of rail freight terminals in the Region in addition to the ICTF's served by the Class I railroads. These terminals which handle a variety of types of freight other than containers may also be served by shortline and regional rail lines that serve specific locations and whose scheduling is more flexible than the published schedules of Class I railroads. Bureau of Transportation Statistics (BTS) Freight Rail Network was used in this study. This database was based on the requirements from the Commodity Flow Survey and with the different modes of DOT, supervised by RITA/BTS. Distance computation to these nodes was identical to the method used in the previous section. The Multimodal Freight Rail Network used in this study is presented in figure 4.5

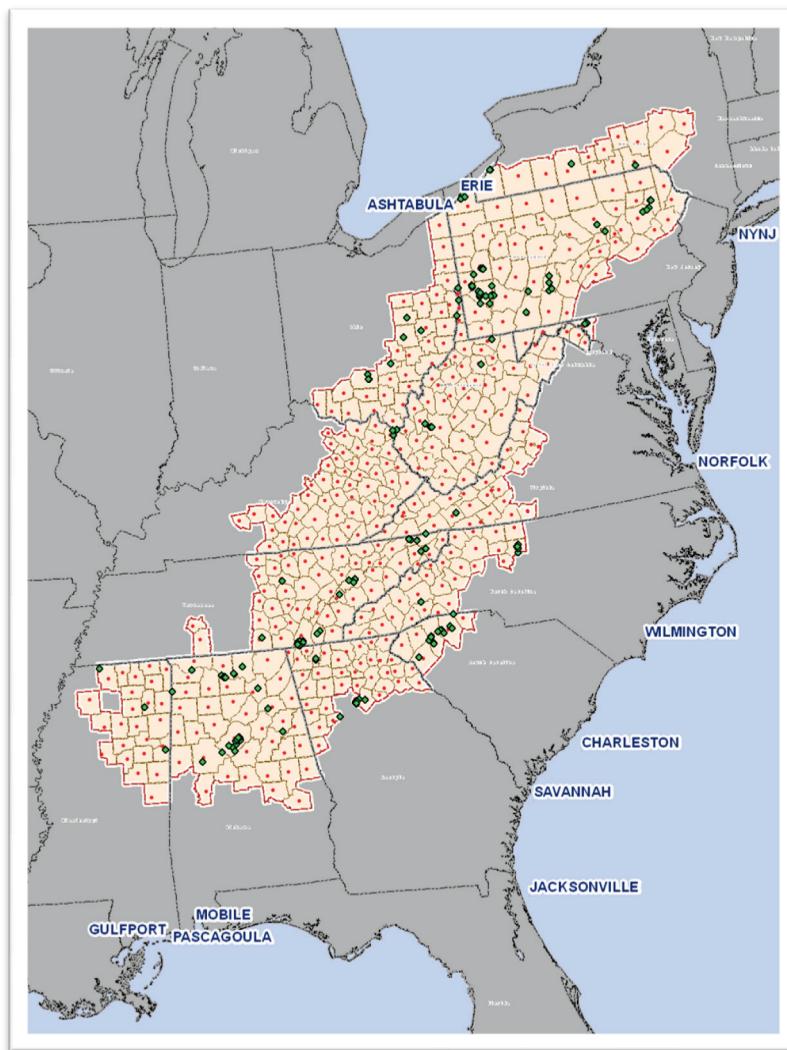


Figure 4.5: The Multimodal Freight Rail Terminals

4.2.5 Inland Waterway Terminals

A well established inland waterway system in the study region allows transportation of freight by barge along a roughly north-south direction. Commodities best suited to move on barge include heavy bulk, break bulk or goods that have delivery periods that are not time sensitive, such as perishables. This network data was obtained from the U.S. Army Corp of Engineers. The data contains numerous facilities along the waterways having multiple ports within a single zip code. For analysis purposes, a subset of the facilities was selected representing multi-user and public access facilities. Distances from each county centroid zip to each of the facilities in the sampled data was computed. This distance was then rounded off to the nearest 10 mile increment. The facilities selected for the analysis are shown in figure 4.6.

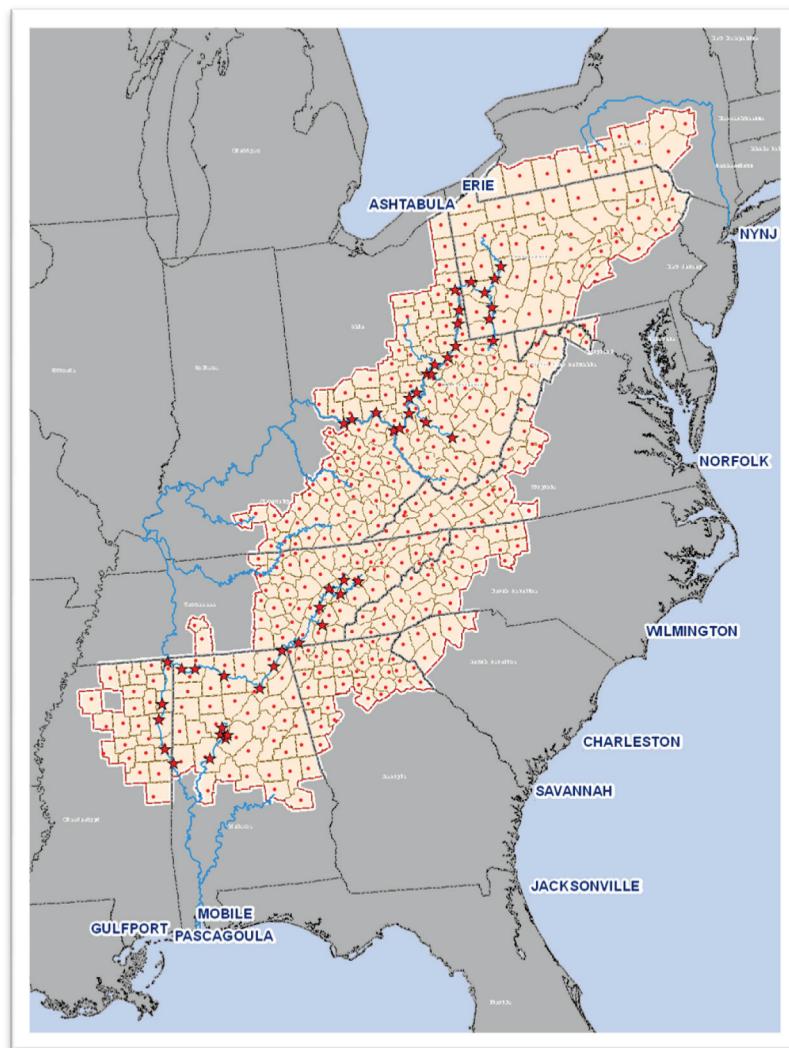


Figure 4.6: Selected Inland Waterway Ports

4.2.6 Intermodal Rail – Interstate Highway Intersection

There are locations where rail lines run close to interstates or even intersect each other. All factors being equal, these are promising locations for rail terminals, warehouses or transload operations. In order to incorporate this factor, aerial and satellite imagery were scanned to locate places where rail and interstates were close by. Similar to previous operations, distances to each of these points were gathered and used in the computation. Figure 4.7 shows the locations of the selected Rail-Interstate intersections.

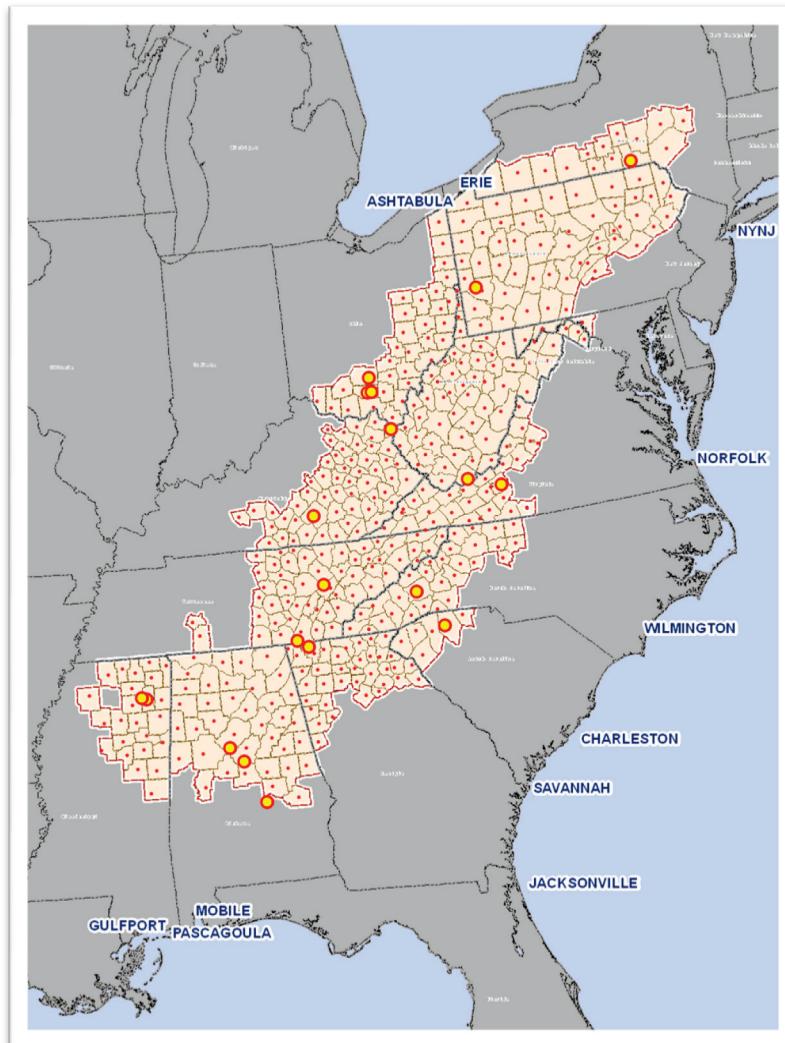


Figure 4.7: Selected Rail – Interstate Intersection Locations

4.3 Data Compilation and Normalization

Once all the data for the 428 counties (including some independent cities of Virginia State) were obtained, it was compiled in a tabular format, a portion of which is shown in Table 4.1.

State	County	Interstate Highway	ADHS/ National Highway	Freight Rail Network	ICTF	Rail - Truck Intersection	Inland Waterway Port	Coastal Port
Alabama	Bibb	23.7	0.5	40	52	29	40	188
Alabama	Blount	18.6	2.4	30	43	63	30	300
Alabama	Calhoun	12.3	1.5	10	72	88	70	322
Alabama	Chambers	15.3	0.0	70	101	86	130	249
Alabama	Cherokee	17.0	1.4	30	85	69	50	340
Alabama	Chilton	8.4	0.6	50	48	16	70	215
Alabama	Clay	33.9	25.0	40	77	73	100	248
Alabama	Cleburne	10.2	0.5	20	69	100	90	318
Alabama	Colbert	50.2	2.2	40	73	95	10	374
Alabama	Coosa	24.7	0.7	70	67	46	90	214

Table 4.1: Compiled Data

To ensure that the minimum and maximum values in each data column (Interstate, ADHS/National Highway etc) reflected the same effects, the data had to be normalized.

As an illustration, in table 4.1 the minimum distance from a county to the closest interstate ramp was 8.4 miles. Similarly, the minimum distance from a county to the closest ICTF on the Intermodal Rail Network was 43 Miles. These two minimums need to reflect the same effect (advantage or disadvantage). This was done by normalizing the data between 0 (minimum) and 1 (maximum). Once again, taking table 4.1 and the data fields as an illustration, for the data column “Interstate”, 8.4 miles was transformed to 0 where as the maximum of 50.2 miles was transformed to 1 and all values in-between were scaled accordingly. The normalized data corresponding to table 4.1 is presented in table 4.2.

4.4 Weighting and Ranking

Not all of the seven criteria are deemed to offer the same advantages to businesses. Through a dialog amongst the study team, the following weights were attributed to the criteria. The weights in table 4.3 signify that the distances to Interstates, ICTFs (within the intermodal Freight Rail Network) and the proximity to Rail-Road intersections were the most important at 100%. The access to the ADHS and local/regional freight rail network were given a slightly lesser weight at 90%. The Inland waterway ports were weighted at 80%.

State	County	Interstate Highway	ADHS/ National Highway	Freight Rail Network	ICTF	Rail - Truck Intersection	Inland Waterway Port	Coastal Port
Alabama	Bibb	0.24	0.00	0.22	0.21	0.13	0.10	0.23
Alabama	Blount	0.19	0.02	0.17	0.17	0.29	0.07	0.47
Alabama	Calhoun	0.12	0.01	0.06	0.29	0.40	0.17	0.51
Alabama	Chambers	0.16	0.00	0.39	0.40	0.39	0.31	0.36
Alabama	Cherokee	0.17	0.01	0.17	0.34	0.31	0.12	0.55
Alabama	Chilton	0.09	0.00	0.28	0.19	0.07	0.17	0.29
Alabama	Clay	0.34	0.20	0.22	0.31	0.33	0.24	0.36
Alabama	Cleburne	0.10	0.00	0.11	0.27	0.46	0.21	0.50
Alabama	Colbert	0.51	0.02	0.22	0.29	0.44	0.02	0.62
Alabama	Coosa	0.25	0.01	0.39	0.27	0.21	0.21	0.28

Table 4.2: Normalized Distances

The final step in the computation was to apply the weights to their corresponding criteria and generate a weighted sum. Thus the “Access” for any county was computed as

$$Access = \sum_{i=1}^n di * \frac{1}{wi}$$

Where n is the number of criteria included in the study, d_i is the distance from any county centroid to criteria i and w_i is the weight assigned to criteria i . The reason of using the reciprocal of the weight is to produce a larger “access” value for smaller weights. In the approach applied, smaller distances are more advantageous than larger distances. The final “access” values for each county are then displayed using a GIS presentation with three classes, green, yellow and gray. Counties colored green are classified to having strong access, yellow denotes medium access and gray signifies low access. This is shown in figure 4.8.

Interstate Highway	ADHS/ National Highway	Freight Rail Network	Intermodal Freight Rail Network	Intermodal - Interstate Intersection	Inland Waterway Port	Coastal Port
100%	90%	90%	100%	100%	80%	100%

Table 4.3: Criteria Weights

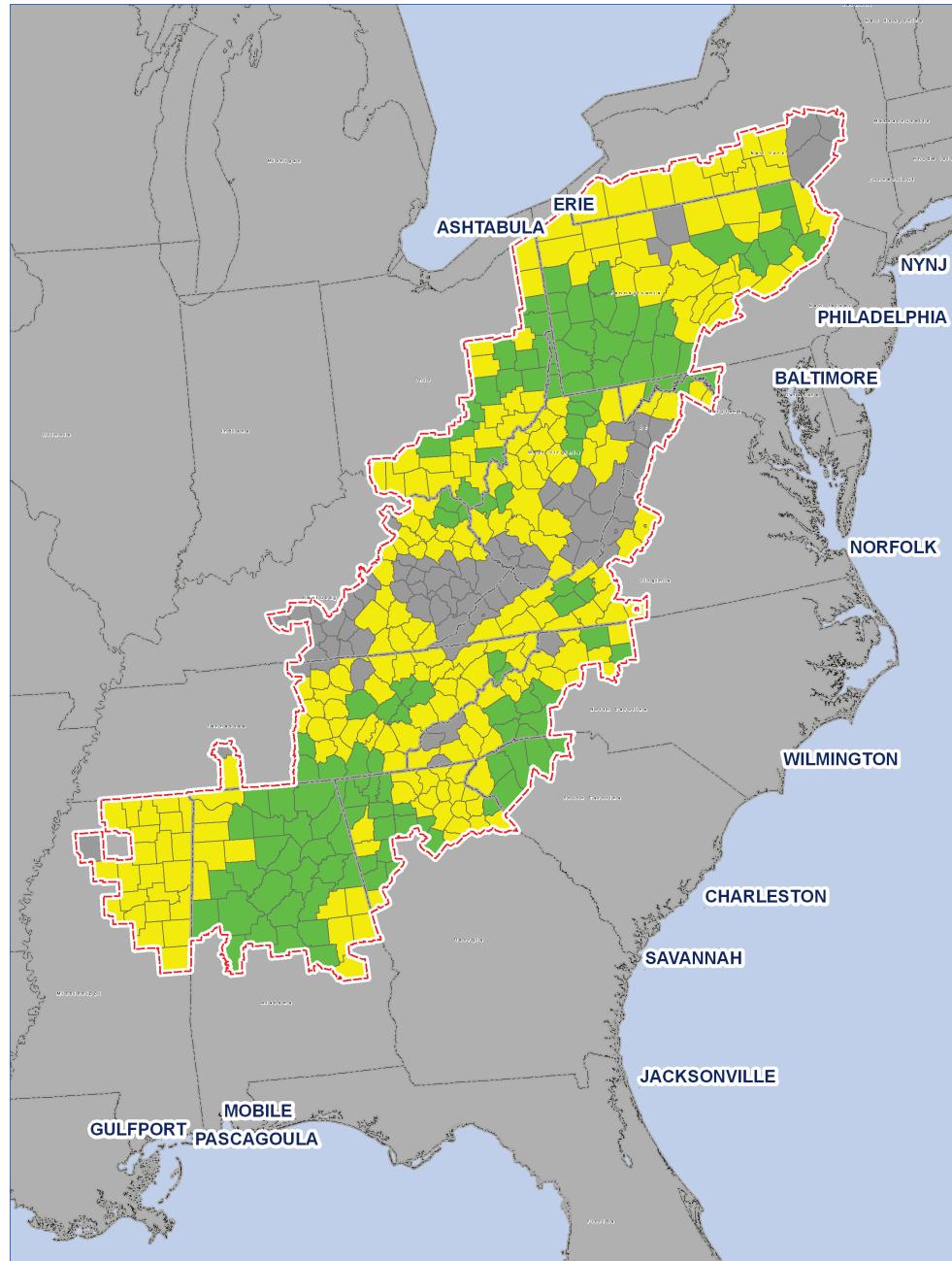


Figure 4.8: Access Evaluation Map