Study of US 43 and US 80 Corridor Potential to Attract New Automotive Suppliers Based on Highway Improvements

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Project Type: Access to support changing land use within a rural area.

Project Objectives: Quality of life improvement. Facilitate changing character of employers. Business investment likely. Tax base effects. Higher wage employment. Diversification of employers.

Outcomes Metric: Attraction of new auto suppliers, primarily small (<200 employees) manufacturing plants that would supply larger facilities. This will lead to increased employment and investment in rural areas.

Economic Environment: Rural

Economic History: Declining population and high unemployment.

Distinguishing Features: The corridors traverse the "Black Belt" region that is generally very depressed across the socio-economic spectrum and regarded to be a center of poverty for the State and the region.

I. Existing Conditions

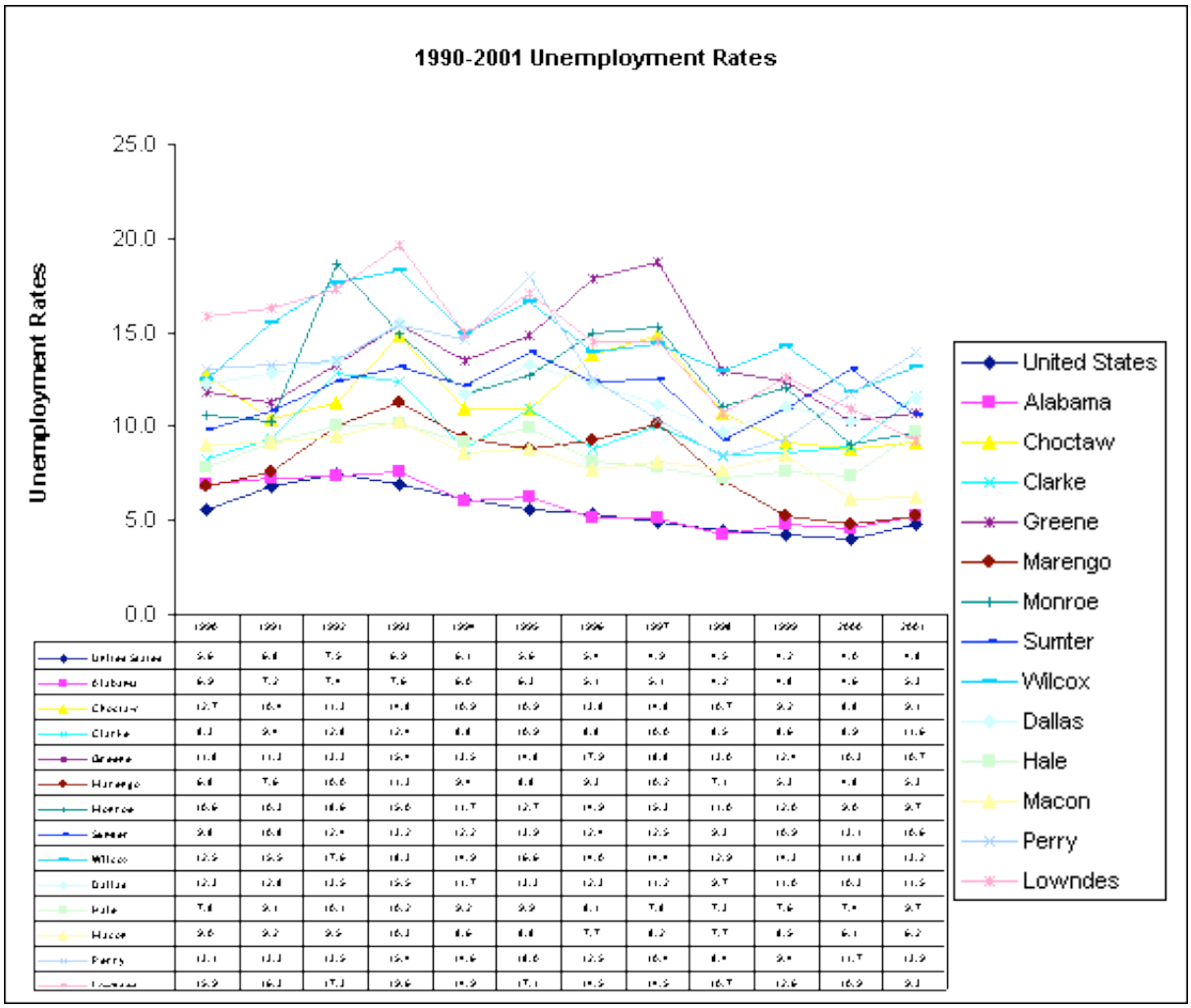
Both the US 43 and US 80 corridors traverse the heart of the "Alabama Black Belt". [1] US 43 corridor Black Belt counties include Choctaw, Clarke, Greene, Marengo, Monroe, Sumter and Wilcox counties. US 80 Black Belt counties include Dallas, Hale, Lowndes, Macon, and Perry counties. The population of the twelve-county study area is shrinking; the combined population was 244,195 in 1990, decreasing to 241,596 in 2000.

The stagnant to declining populations across the twelve individual counties provides a perspective to view a similar situation for employment. Total employment in the US 43 region was 51,356 in 1990 and declined to 49,096 by 2000. The US 80 region employment was 51,550 in 1990 increasing to 52,585 in 2000.

Exhibit 1 contains 1990 to 2001 unemployment rates for the US, Alabama and the twelve counties. The data indicate that from 1990 to 2001 the average unemployment rate in Alabama was generally higher than the national average unemployment rate. Furthermore, unemployment rates in the twelve counties are considerably higher than both the US and Alabama statistics for the same period.

Although unemployment rates in the US reached a peak in 1992 and declined gradually afterwards, unemployment rates have generally remained higher in the corridor counties over the time series. Towards the end of the period, the rates in Clarke, Dallas, Greene, Sumter, Perry and Wilcox County unemployment rates remained nearly double the US and Alabama unemployment rates.

Exhibit 1: Unemployment Rates for the US, Alabama, and the US 43 and US 80 Counties



Source: Alabama's Comprehensive Labor Market Information System. http://www2.dir.state.al.us/aclmis/

II. Highway Project

Improvements to US 43 and US 80 would replace and/or upgrade the existing right of way to four-lane standards. The project would promote access to auto assembly plants that have located in Alabama and that are seeking suppliers.

Exhibit 2 contains a map of the US 43 corridor between I-20/I-59 near Eutaw (west of Tuscaloosa) and I-65 at Mobile, a distance of 143 miles and the US 80 corridor from Mississippi to Georgia a distance of 213 miles. Except for Montgomery and lesser population centers at Demopolis, Selma, Tuskegee and Phenix City the area traversed is predominantly rural. Land use is primarily agriculture for pasture and forestry. Exhibit 2 identifies the major auto assembly plant sites in Alabama for Mercedes (Vance, AL), Honda (Lincoln, AL) and Hyundai (Hope Hull, AL). Not shown is the Nissan facility in Canton, MS north of Jackson.

Exhibit 2: US 43 Corridor and Major Highways and Interstates in Alabama

Source: AECOM Consult Inc.

III. Objectives of the Projects

The primary objective of the corridor improvements is to provide four-lane accessibility in the study area, making the region more competitive. Alabama is expected to attract a number of auto suppliers in association with two new auto assembly plants opening in Alabama (Hyundai) and neighboring Mississippi (Nissan). Suppliers could also come to the state as existing Honda and Mercedes operations expand. By improving the highways in the study area, this economically distressed area has a greater chance of sharing in the state's future manufacturing expansion.

Currently the Interstate highway system serves the state and the emerging auto corridors within Alabama. However, much of the black belt is beyond reasonable reach of the nearest Interstate. Thus, to date only two auto suppliers have located west of Montgomery in the Black Belt region[2] . The lack of four-lane and or interstate highway accessibility is viewed as a primary cause.

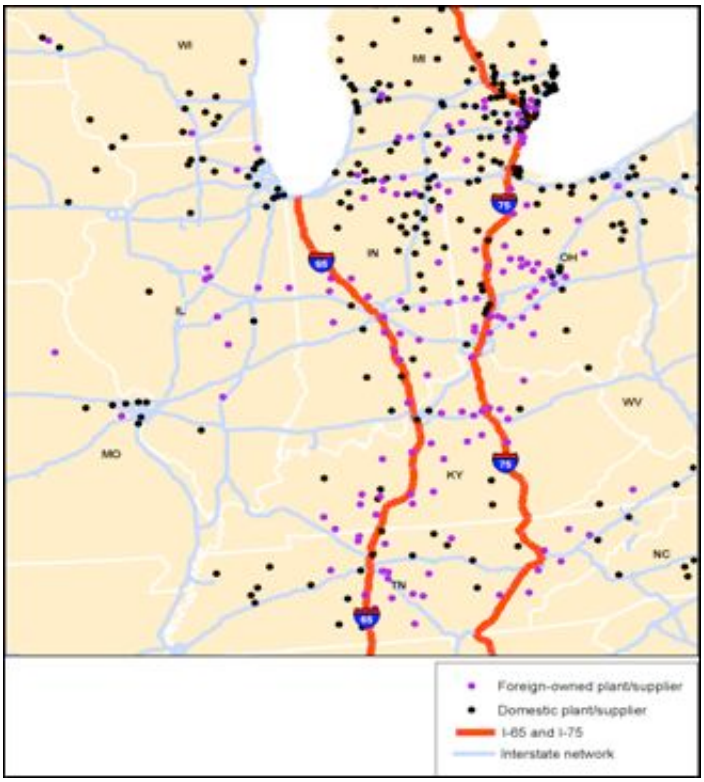
IV. Coordination with Other Economic Development Strategies

The US 43 and US 80 Advisory Committees (there was no separate advisory committee for this study) identified the automakers' expansion in the state as a possible industry to target. Improve both highways to four-lane would potentially capitalize the auto industry's on-going migration from its traditional base to the South. In particular, the industry has chosen locations along Interstate highways 65 and 75 (I-65 & I-75) as it has moved out of the Midwest.

Since 1985 large auto supplier clusters have developed sites along I-65 and I-75, collectively forming what is now known as the "Southern Automotive Corridor," which embraces multiple states south of Michigan, including, Ohio, Kentucky, and Tennessee. Studies of agglomeration (cluster) effects for auto plants and suppliers have found that proximity to urban areas is not important. However, an interstate highway connection linking suppliers to major markets is crucial, highlighting the importance of timely delivery of shipments in an environment of just-in-time production. This study examines whether and how the study corridor economy might benefit from the auto expansion in the state, focusing primarily on original equipment manufacturers (OEM) suppliers. Based on a comprehensive analysis of spatial locations among Tier I, II and other supplier plants, the primary importance of four-lane highway access to attracting auto industry affiliates was confirmed. Tier I suppliers are large-scale manufacturing operations that employ over 200 employees, occupy facilities exceeding 20,000 square feet and deal directly with auto assemblers. Tier II (50-200 employees) and Tier III (less than 50 employees) supply the lower Tier firms.

Based on industry research, location distinctions were noted between Tier I suppliers for the Big Three and the Japanese-Owned assembly plants along the I-65 and I-75 corridors. In each case, the assembly plants and associated suppliers indicated a clear preference for four-lane highway access. Exhibit 3 plots both foreign and domestic assembly and supplier locations along the I-65/I-75 corridor.

Exhibit 3: Auto Manufacturing Locations Along the I-65/I-75 Corridors



Source: AECOM Consult Inc. map from state and industry sources

Most auto manufacturers are clustered within the I-65 – I-75 corridor boundaries in Michigan, Indiana and Ohio. However, a steady southern migration of auto clusters forming in Kentucky and Tennessee was noted. While the assembly sites in Kentucky (Ford Motor in Louisville, General Motors in Bowling Green and Toyota in Georgetown) and Tennessee (Nissan in Smyrna) did not produce the same level of supplier clusters as seen in the northern corridor states, the plants are well served by their proximity to I-65 and I-75.

To better understand the Southern industry trend, Tier I, II and III suppliers currently operating in Alabama, Georgia, Kentucky and Mississippi were identified and their distances from four-lane interstate and US highways were noted. The following Exhibit summarizes auto supplier locations in the four states.

Exhibit 4: Supplier Distances from 4-Lane Highways

Observed Auto Supplier Distances from 4-Lane Highways					
	< 5 miles	**6-10 miles**	**11-15 miles**	**16-20 miles**	**> 20 miles**
	Alabama				
No. of Firms	24	27	10	1	7

% of Firms	35%	39%	14%	1%	10%
	Georgia				
No. of Firms	60	9	11	2	18
% of Firms	60%	9%	11%	2%	18%
	Kentucky				
No. of Firms	27	5	1	2	11
% of Firms	59%	11%	2%	4%	24%
	Mississippi				
No. of Firms	40	2	1	4	29
% of Firms	53%	3%	1%	5%	38%
	All Four States				
No. of Firms	151	43	23	9	65
% of Firms	52%	15%	8%	3%	22%

Source: AECOM Consult Inc. from state and industry sources

Over 52 percent of suppliers operating in the selected states located within five miles of a four-lane highway, while

nearly 70 percent of included suppliers located within ten miles of a four-lane highway. Exceptions were noted especially in Mississippi and Kentucky in which many firms, established prior to 1988 and/or preceded the southern auto migration, located beyond twenty miles from a four-lane highway and typically employed less than ten employees. These firms tended to serve very specific client-based needs and operated free of JIT and other assembler-supplier requirements.

Auto suppliers that moved into the study area after 1989 exhibited clear preferences for four-lane interstate highways. By comparing supplier location trends inside the study area, three recurring themes were noted, including: (1) evolving investment trends among foreign and domestic auto assemblers and suppliers present tremendous opportunities for southern states sharing close proximity to the I-65/I-75 corridors; (2) auto firms employ a strict series of site location criteria when considering competing locations, foremost being proximity to four-lane infrastructure; and (3) auto suppliers generally avoid communities that lack four-lane highway access.

V. Methodology

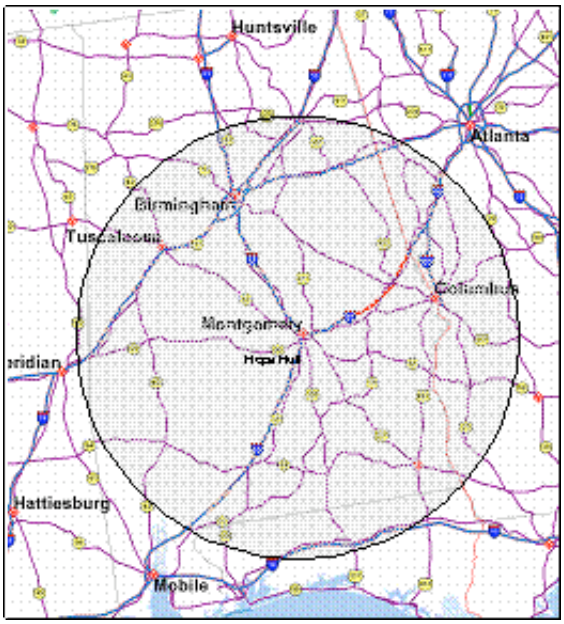
To project whether and how the auto industry would expand in Alabama and in the study corridor in the future, the study focused on auto supplier location trends following auto assembly plant openings:

- Toyota in Georgetown, Kentucky (1985)
- DaimlerChrysler in Vance, Alabama (1993)
- Honda Motor Company in Lincoln, Alabama (1999)

The auto industry location experiences generated by these firms were applied to the upcoming assembly plant openings for Nissan in Canton, Mississippi (scheduled for 2004) and Hyundai in Hope Hull, Alabama (scheduled for 2005). That is, the past pattern of development was used to project the likely future pattern of supplier locations associated with these new plants.

The southern corridor analysis was focused around Alabama counties that attracted auto suppliers supporting the DaimlerChrysler, Honda and upcoming Hyundai assembly plant openings. County-level supplier developments were analyzed for the entire study area with the aim of identifying overarching location trends. Hyundai's supplier demands were employed as a mechanism for analyzing supplier location requirements in order to confirm the importance of highway proximity. After Hyundai selected Hope Hull, Alabama as the site of its first US assembly plant, company officials said it would use 120 suppliers located inside a 150-mile radius of Hope Hull. Exhibit 5 presents a map of Alabama and a 150-mile marker overlaid with Hope Hull as the central point, indicating the geographic impact of Hyundai's announcement. As the map shows, the supplier radius encompasses over 75 percent of Alabama, a small eastern portion of Mississippi and several West Georgia counties that successfully attracted several Honda suppliers. Moreover, it encompasses the US 43 and US 80 study area.

Exhibit 5: Hyundai 150-Mile Supplier Radius



Source: AECOM Consult Inc.

There is a clear regional impact to Hyundai's announcement; moreover, Alabama communities will likely compete against one another (in addition to non-state regions) to lure Hyundai suppliers. Additionally, Mississippi and Tennessee communities exceed the 150-mile radius and may lose consideration by Hyundai suppliers. It was observed that nearly all of Honda and DaimlerChrysler suppliers located within 10 to 20 miles of an interstate highway. Furthermore, several recent Hyundai supplier announcements confirm the importance of continuous four-lane highway proximity.

Counties comprising the 150-mile radius and lacking continuous four-lane highway access could expect very little auto sector development. Moreover, discussions with the auto sector in Alabama as well as other states indicated that four-lane highway access was in most cases a necessary condition to attract auto suppliers. However, highway access cannot be used to compensate for lack of labor, quality of life and other considerations used by auto suppliers that seek rural areas and lower labor costs.

Linear regression analysis was used to test the importance of four-lane highway proximity in predicting auto supplier location and to project the number of new suppliers that might locate in the study corridor if four-lane access was provided. A time series of supplier establishments was created for transportation equipment (SIC 2369, 3089 and 371) in counties comprising the study area between 1989 and 2002[3] . The analysis indicated that there were substantial increases in Tier I, II and III auto suppliers between 1994 and 2000 that followed the DaimlerChrylser and Honda plant openings. The results of linear regressions yielded high positive statistical correlations between the number of auto suppliers in each county and the route miles of four lane highways. Alabama counties displayed the strongest relationship (Adjusted R-square values[4]) between four-lane highway route miles and number of auto suppliers (0.88), followed by Georgia (0.85), Kentucky (0.72) and Mississippi (0.41). All beta coefficients were statistically significant at the 95% confidence level[5] .

The beta coefficients from the regression were applied to determine the number of suppliers that would be expected in each county located within the 150-mile Hope Hull supplier radius based upon county four-lane highway route miles. To test the relevance of this approach, the model was adapted to project supplier distributions for Georgia and Kentucky counties as well. Mississippi was excluded due to the comparatively poor fit of the model.

The statistical analyses suggested that Alabama counties are "eligible" to attract Hyundai suppliers, as are several west Georgia counties, based on distance (proximity) given four-lane continuous access to Hope Hull (Hyundai location).

VI. Results

The regression model predicted potential county-level distributions of auto suppliers along Alabama's US 43 and US 80 highway corridors based on the existing four-lane access and that which would result from the proposed highway

improvement. In particular, the analysis examines the number of suppliers that would move to the study corridor in association with Hyundai's assembly plant opening in Hope Hull (Montgomery County) under the two scenarios: with and without highway improvements.

A critical element to calculating supplier distributions along the US 43 and US 80 corridors was the assumption that suppliers serving Hyundai would require *continuous* four-lane connectivity to Hope Hull (or to other suppliers more closely located to Hyundai's assembly operations). US 80 represented the most direct access route between eligible US 43 corridor communities and Hope Hull. Nevertheless, the lack of connectivity to Hyundai's assembly plant was considered essential to the supplier-based distribution analysis; and it stood to reason that suppliers would choose US 43 only if sufficient eastbound four-lane infrastructure (viz US 80) existed to support JIT supply requirements.

The regression analysis reflected the stipulation that auto suppliers require close proximity to continuous four-lane highways. For example, US 43's discontinuity, highlighted by a 65-mile two-lane segment between Clarke and Greene Counties, is assumed to have limited the corridor's ability to attract any appreciable number of suppliers. This is seen in the following Exhibit, which shows, that although the US 43 corridor counties support four-lane highway route miles, (1) the highway does not offer continuous uninterrupted four-lane access and (2) the corridor lacks connectivity to a continuous four-lane highway capable of reaching Montgomery County. Supplier eligibility for US 43 counties was calculated by multiplying existing total highway miles by the regression multiplier.

Exhibit 6: US 43 Corridor – Current Highway Conditions

Alabama Counties	Total Hwy Miles	Total Continuous Hwy Miles	Supplier Model Allocation	Reallocation Based on Connectivity
Greene	25	25	2.5	0
Marengo	15	0	1.5	0
Clarke	35	35	3.5	0
Washington	30	30	3.0	0
Total	105	90	10.5	0

Source: AECOM Consult Inc. calculations

Exhibit 6 illustrates a strict interpretation of the regression model that assumes counties possessing continuous four-lane highways are more likely to attract auto suppliers. Accordingly, the model determined that four US 43 counties were eligible for auto suppliers. However, since no continuous four-lane connections exist, the model reallocated supplier distributions based on the absence of connectivity thereby eliminating all eligibility for new auto suppliers.

Similarly, several US 80 corridor counties reported multiple four-lane highway miles but counties west of I-65 lacked connectivity to Montgomery County. Counties east of I-65 can rely on I-85 for direct highway access into Montgomery County. Exhibit 7 presents supplier allocations for the US 80 corridor:

Exhibit 7: US 80 Corridor – Current Highway Conditions

Alabama Counties	Total 4-Ln Hwy Miles	Total Continuous Hwy Miles	Supplier Model Allocation	Reallocation Based on Connectivity
Sumter	34	34	3.4	0.0
Marengo	20	0	2.0	0.0
Dallas	40	5	4.0	1.0
Lowndes	45	45	4.5	4.5
Macon	30	30	3.0	3.0
Russell	15	0	0.0	0.0
TOTAL	184	114	16.9	8.5

Source: AECOM Consult Inc. calculations

As indicated, all US 80 corridor counties support four-lane highway access but counties west of I-65 lack continuous highway infrastructure serving Montgomery County. In determining supplier eligibility, the Corridor was divided into two segments: the west segment which included counties between Mississippi and Montgomery County and the east segment which included counties between Montgomery County and Georgia. The model determined supplier eligibilities for both segments assuming current highway conditions. US 80 is presented as a combined corridor including the relevant counties comprising the east and west segments. Based on total four-lane highway route miles, the entire corridor is eligible for 17 suppliers. However, due to the lack of continuous four-lane highway miles, the supplier allocation was recast and the corridor's eligibility was reduced to nine (8.5) suppliers. The potential supplier eligibility foregone for US 80 was eight suppliers. Although US 80 currently supports more four-lane highway mileage than US 43, its two-lane highway segments east of Demopolis (Marengo County) and Selma (Dallas County) will more than likely to deter auto suppliers from locating here.

Counties comprising the 150-mile radius and lacking continuous four-lane highway access could expect very little auto sector development. Moreover, discussions with the auto sector in Alabama as well as other states indicated that four-lane highway access was in most cases a necessary condition to attract auto suppliers. However, highway access cannot be used to compensate for lack of labor, quality of life and other considerations used by auto suppliers that seek rural areas and lower labor costs. As a consequence, the corridor counties have yet to realize the existing development potential (as estimated and presented in Tables 6 and 7); at present there are only two suppliers in the study corridor.

The US 43 & US 80 supplier distributions were recast assuming continuous four-lane highway access along US 43 between I-65 and I-20/I-59, and on US 80 between the Mississippi and Georgia state lines. Exhibit 8 presents the following important developments assuming fully connected, four-lane highway expansion in both Corridors. By making US 43 a fully continuous four-lane highway and assuming four-lane connectivity to Montgomery County via US 80, the US 43 corridor becomes eligible for 17 new suppliers. Assuming that the State expands all of US 80 to four-lanes between Mississippi and Georgia, the Corridor's supplier eligibility increases from nine (rounded value, 8.5 from Exhibit 7) to 25 suppliers. Assuming that the State expands the US 43 and US 80 corridors and fully addresses auto supplier

highway connectivity requirements, the supplier distributions were recast *(Reallocation Based on Connectivity)*:

Exhibit 8: US 43 & US 80 Corridors – Supplier Allocations Assuming Connectivity

Alabama Counties	Total Hwy Miles	Total Continuous Hwy Miles	Supplier Model Allocation	Reallocation Based on Connectivity
	US 43 CORRIDOR			
Greene	55	55	5.5	5.5
Marengo	45	45	4.5	4.5
Clarke	40	40	4.0	4.0
Washington	30	30	3.0	3.0
Subtotal	170	170	17.0	17.0
	US 80 CORRIDOR			
Sumter	50	50	5.0	5.0
Marengo	25	25	2.5	2.5
Dallas	45	45	4.5	4.5
Lowndes	45	45	4.5	4.5
Macon	50	50	5.0	5.0
Russell	35	35	3.5	3.5
Subtotal	250	250	25.0	25.0

GRAND TOTAL	420	420	42.0	42.0

Source: AECOM Consult Inc. calculations

Exhibit 8 reaffirms the finding that uninterrupted four-lane connectivity between both corridors and a high correlation between number of auto suppliers and four-lane highway miles increased supplier eligibility for US 43 and US 80 communities. US 43 could attract up to 17 suppliers (17 more than the current conditions warrant) and US 80 is could attract up to 25 suppliers (16.5 more than the current conditions warrant) producing a grand total of 42 suppliers. Thus, highway improvements would increase the development potential of the study corridor. Realizing this potential, however, will require other factors to be in place as well, such as a skilled labor force (or training incentives sufficient to develop skilled workers from the existing labor pool).

Assuming continuous and fully connected highway access, the US 43 and US 80 corridor communities would attract predominately Tier II and III auto suppliers that normally employ between 25 to 100 employees and occupy 10,000 to 100,000 square foot facilities.[6] Taking an approximate mean number of employees per supplier (50), the US 43 Corridor would attract up to 850 jobs and US 80 would attract another 1,250 jobs totaling 2,100 total supplier related jobs for both corridors. These figures represent the total development potential of the corridor (existing + net gain due to highway improvement).

The allocation of the *net* gain in firms and jobs attributable to the highway improvement among the counties that comprise the corridor is shown in Exhibit 9. The highway expansion programs affecting both corridors would increase the development potential of the study corridor from 9 supplier firms to 42, a net gain of over 33 firms. Assuming 50 jobs per supplier, the potential employment gain associated with this increase is 1,675 (33.5 firms times 50 workers).

Exhibit 9: US 43 & US 80 Corridors – Net New Suppliers and Jobs

Assuming Highway Expansion

Alabama Counties	Reallocation Based on Connectivity	New Supplier Jobs
US 43 CORRIDOR		
Greene	5.5	275
Marengo	4.5	225
Clarke	4.0	200
Washington	3.0	150
Subtotal	17.0	850

US 80 CORRIDOR		
Sumter	5.0	250
Marengo	2.5	125
Dallas	3.5	175
Lowndes	0.0	0
Macon	2.0	100
Russell	3.5	175
Subtotal	16.5	825
GRAND TOTAL	33.5	1,675

Source: AECOM Consult Inc. calculations

VII. Summary & Conclusions

While Alabama counties east of I-65 have begun to attract new suppliers, counties west of I-65 and south of I-20/I-59 face strong competition for suppliers especially as Hyundai and affiliated suppliers have communicated a strong preference for highway accessible regions. The analysis found that without uninterrupted four-lane connectivity between both corridors, Alabama's US 43 and US 80 Corridor counties would not attract any appreciable number of Hyundai suppliers. With such access, however, the region could attract suppliers in sufficient number to add over 1,600 well-paid jobs to its employment base.

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[1] Although there is no official designation the "Black Belt" region of Alabama is normally identified with the poorest counties in the south and western parts of the state typically consisting of: Bullock, Butler, Choctaw, Clarke, Dallas, Hale, Greene, Lowndes, Macon, Marengo, Perry, Pickens, Sumter, Washington and Wilcox counties.

[2] Spann, Mary. May 2003. "Tracking the Growth of Alabama's Automotive Manufacturing Industry," Alabama Automotive Manufacturing Association.

[3] Compiled from County Business Patterns data, state reports on the auto industry, as well as industry directories and sources.

[4] R square is also known as the coefficient of determination and is the square of the correlation coefficient. The R square value indicates how well the regression model approximates the real data points. The value can range from 0 to 1, where the higher value indicates a better fit.

[5] The Beta coefficients measure the association between the explanatory variable (in this case, miles of highway) and the variable to be predicted (in this case, number of auto supplier firms). The beta does not imply causation, only statistical association. The coefficient can take on either sign--it is the magnitude that matters. In this application, the hypothesis is that more highway miles are positively associated with more auto suppliers. The estimated beta coefficient was positive. Because the beta coefficient is a statistical estimate, it is usually reported along with the results of the t-statistic, which provides a measure of the confidence we can place in the estimated parameter for the explanatory variable. A t-statistic of 1.96 implies 95% percent confidence that the estimated beta coefficient accurately describes the relationship between highway mileage and number of auto suppliers. Significance at the 95% level means that there is less than a 5% chance that the correlation is due to chance and is frequently used as a "rule of thumb" when evaluating regression results.

[6] Typical auto supplier plant sizes and employment figures were taken from data provided by the Alabama Industrial Directory, DaimlerChrylser, Honda Motor Company, the Kentucky Cabinet for Economic Development and the Mississippi Development Authority.

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