ECONOMIC IMPACTS OF I-49 COMPLETION

Inner City Connector

for

Northwest Louisiana Council of Governments

by

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Executive Summary

This document reports the findings of our investigation of the economic impacts of the completion of I-49 in Shreveport. The economic impacts that were calculated consist of travel time and vehicle operation cost savings, differentials in economic output from real estate development, and impacts from differentials in agglomeration economies.

Taimerica examined two scenarios which we term the "Inner City Build Alternatives" (Build Alternatives 1-4) and Build Alternative 5. The Inner City Alternatives consists of the completion of I-49 from its junction with I-220 to the current junction of I-49 and I-20. The geographic area impacted by the Inner City Alternatives is referred to as the PSA in this document.

The savings of vehicle operation costs and time value grows from $1.37 million/year in 2011 to $1.44 million in 2018 and to $1.56 million in 2030 for the Inner City Connectors Build Alternatives (over the Build Alternative 5). The aggregate savings for the first 20 years of the Inner City Build Alternatives is $45 million. The Build Alternative 5 scenarios does not offer savings in vehicle operations costs and travel times.

In terms of real estate development opportunities, our conclusions are that the Primary Study Area (PSA) adjacent to the Inner City Build Alternatives will support growth and expansion of office, light industry, wholesale/distribution, recreation and movie production. The PSA has a high probability of capturing at least its historic share of these activities. Our assessment is that the Build Alternative 5 is unlikely to experience significant new real estate development activity for the activities identified in the Scope of Work for this project.

On the supply side of the real estate market, the completion of the Inner City Build Alternatives would provide better opportunities for commercial development in a large portion of the PSA. The portion of such activity attracted to the PSA is likely to match, if not exceed, the historic pattern. The amount of economic activity will likely increase if a second interchange is established on the Inner City Build Alternatives at Hearn Blvd.

The estimated annual economic impact in the Primary Study Area of the Inner City Build Alternatives is $802 million. These impacts could increase from the development of multiple interchanges on the Inner City Build Alternatives. The estimated total economic impacts along the Build Alternative 5 are $446 million. The conclusion drawn from this analysis is that the potential economic impacts from the Inner City Build Alternatives is likely to be about double those of the potential economic impacts of Build Alternative 5. The differential is substantial at $356 million (44%) per year of incremental output.

The economic explanation for the differential is that the Primary Study Area is the major employment center for the region and is likely to remain so at least through the next decade. The Inner City Build Alternatives provides an opportunity to substantially enhance highway accessibility to the northern section of the PSA, as well as to the area of Shreveport north of I-220. The Build Alternative 5 does not provide new opportunities for enhancing the competiveness of Shreveport for business development.

Increasing the speed of travel in the transportation network drives the expansion of the labor market. Increasing speeds by 10 percent has an effect of increasing labor productivity by 2.9 percent (Prud'homme and Lee 1999). Our analysis suggests that travel times for commuters are reduced throughout the Caddo Parish portion of the network from the completion of the Inner City Build Alternatives. The estimated agglomeration economies from this network change are approximately $60 million per year. The agglomeration calculations are based on wages in 2011 of $6.4 billion within the metro area. Alternate calculations using just the Caddo Parish payroll and Caddo Parish portion of the network are similar at $62 million.

The design of the Inner City Build Alternatives involves decisions about the number of interchanges that provide the best economic return. The analysis of travel times and distances in this study suggests that an interchange at LA 3094 has the highest utility for commuters. An additional interchange at LA 173 will not lower travel times for most commuters and is unlikely to materially affect commuting preferences but it could in fact have a material impact on real estate development opportunities in the Primary Study Area.

In summary, the Inner City Build Alternatives provide superior economic impacts to Build Alternative 5. The completion of the Inner City Build Alternatives provides improved transportation connectivity over the Build Alternative 5. The Inner City Build Alternatives reduces travel time and cost and provides a boost in labor productivity of

about 1% due to agglomeration economies from reduced travel times for commuters. The Primary Study Area, consisting of the expanded downtown of Shreveport, is likely to receive a substantially larger portion of the future economic growth in the metro region than the interchanges along the Build Alternative 5. The differential in potential economic impacts is about $293 million annually. The differential in output favors the Inner City Build Alternatives.

The combination of these three forms of economic impacts suggests that the Inner City Build Alternatives is the alternative that is likely to provide the larger economic impact on the Shreveport-Bossier metro area.

Table of Contents

Introduction

This document reports the findings of our investigation of the economic impacts of the completion of I-49 in Shreveport. Taimerica examined two scenarios which we term the "Inner City Build Alternatives" and "Build Alternative 5" (see Maps 1 and 2). The Inner City Build Alternatives consists of the completion of I-49 from its junction with I-220 to the current junction of I-49 and I-20. The term "Inner City Build Alternatives" is used because the route is adjacent to downtown Shreveport. The plural form is used because the route could have 1 of 4 alignments. While the actual alignment chosen has some impact on construction costs, the 4 alternatives are so close in geographic proximity that the economic impact does not vary by alignment.

The Build Alternative 5 consists of improvements to I-220 and LA-3132 from the junction of I-49 and I-20 to the current junction of I-49 and LA-3132. The "Inner City Build Alternatives" are approximately 5 miles in length and could be configured with either 1 or 2 interchanges to provide new access to downtown Shreveport. The Build Alternative 5 is approximately 14 miles in length. It is currently a divided highway with 7 existing interchanges and the preliminary design does not anticipate the addition of interchanges on the route.

We are assuming the impact assessments at Build Year +4. The economic estimates assume a trendline expansion of the Shreveport-Bossier economy from 2011 to 2014. A further project assumption is that the spatial economy in Shreveport has 4 years to adapt to changes in transportation accessibility from the completion of I-49.

In each of the six sections of the document, we present our findings. The methodology used to make the estimates has been moved to an appendix. The methodology appendix is important for documenting the assumptions and calculations but is technical and unlikely to be of interest to readers looking for facts to inform engineering design or policy development.

Data Sources and Time Period of Analysis

The data used in the report is the most current available as of December 2013. The Census Bureau LODES origin-destination data and residential and work block data used in the travel time and agglomeration calculations are for 2011. County Business

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Patterns and Louisiana Workforce Commission data are used to estimate future jobs and economic activity for 2018, which is the assumed Build Year+4. The real estate inventory data (LSUS and Coleman Companies) are for 2011 and 2013 respectively. The development constrains data (utility infrastructure, parcel boundaries, ownership & vacancy, zoning classifications, and wetlands determinations) are for 2013. The field work component of the data was collected in October and November 2013. The estimates assume a Shreveport metro economy in 2018.

Study Area Definitions

The Inner City Build Alternatives study area (also called Primary Study Area throughout this document) consists of downtown block groups that are proximate to downtown Shreveport. The Build Alternative 5 Study Area consists of 2 mile by 1 mile areas surrounding the 7 interchanges on the Build Alternative 5 (See Map 2). The downtown or Primary Study Area contains 57 percent of the office space in the Shreveport-Bossier metro area (LSUS 2011). A significant share of the rentable industrial space in the metro area (approximately 1 million sf of the 7.6 million rentable area) is also located within the PSA (LSUS 2011). The primary study area is approximately 11 square miles in size.

Downtown Shreveport continues to be one of the primary employment centers for the metro area. The downtown study area has a daytime population in 2011 of 15,000 (LODES 2013) and a nighttime or residential population of 4500.

The interchanges on the Build Alternative 5 are a mixture of residential and work centers (See Table 1). The study areas on the Build Alternative 5 overlap geographically but total 16.65 square miles, or 50 percent larger than the Primary Study Area. Bert Kouns Industrial Blvd, Mansfield Rd. and I-49/ LA 3035 intersection are significant employment centers but the balance of the intersections are dominated by residential populations. All of the interchanges on the Build Alternative 5 study areas have municipal water and sewer service. Most interchanges on the Build Alternative 5 are fully developed, having little vacant land (See Table 2). Further analysis about the development constraints and development opportunities on the Build Alternative 5 interchanges are discussed in the development constraints section of this report.

Economic Impact Assessment

Taimerica examined three forms of economic impacts in its assessment. The first impact is reductions in travel time and cost. The second impact is from the creation of real estate development opportunities due to enhanced highway access. The third impact is from agglomeration economies due to economic efficiencies from faster travel and improved accessibility. Each of these impacts is discussed in the following sections of this report.

Travel Time and Cost Estimates

Highways are a critical infrastructure for connecting workers with their workplaces. A significant portion of household budgets in the United States are spent on commuting costs. The avoidance of travel costs therefore has an economic impact that should be modeled in choosing road alternatives. The savings from shorter commutes is equivalent to an increase in household incomes.

Commuting time is an economic "bad" that the majority of Americans want to avoid. Enhanced road infrastructure that lowers commuting times therefore has an economic utility to American households. Economic models have been developed to measure the monetary value of lowered commuting times (Small and Verhoef 2007). The U.S. Department of Transportation provides guidance on this modeling. The savings in travel time due to new road construction has a marginal utility of half of the average wage in a region (DOT 1997). For 2012, that wage is $19.65/hour for the Shreveport-Bossier MSA (LADOW 2013), meaning the marginal utility of commuting time is $10.00/hour.

The travel time and cost of the alternatives for I-49 were modeled for this report by Taimerica using two GIS models: 1) the 2015 travel model developed for the Northwest Louisiana Council of Governments (NLCOG 2013) for the current network; and 2) The Stantec model for the 2030 configuration with the I-49 Inner City Build Alternative for future travel times and distances.

The Build Alternative 5 will not materially change either travel times or travel costs in the metro region. The route over I-220 and LA-3132 is presently configured with driving speeds of 60 mph so interstate construction will not materially increase travel speeds. The travel cost and time model calculations in this report therefore estimate the savings with the Inner City Build Alternatives over the Build Alternative 5. The Inner City Build Alternatives only impact travel in a north-south direction. East-west travel is not impacted (see Map 3) by either the Inner City Build Alternatives or the Build Alternative 5.

In addition to daily commuters, the completion of I-49 will impact truck traffic and passenger traffic traveling through Shreveport in a north-south direction. The NW LA COG has estimates of this through traffic based on traffic counts. The 2015 estimate of north-south through traffic is 235 vehicles/day or 86,000 vehicles/year. The Inner City Build Alternatives is a shorter route for through traffic than the Build Alternative 5. The differential is 2.56 miles.

Although the individual travel distance and time savings are minor, they add to substantial distances over the course of a year because of the large number of commuters that work in the Primary Study Area in 2018 (see Table 4).

The combined savings of vehicle operation costs and time value grows from $1.37 million/year in 2011 to $1.44 million in 2018 and to $1.56 million in 2030 (See Tables 3-5). The aggregate savings for the first 20 years of the Inner City Build Alternatives is $45 million. For a discussion about the assumption behind these calculations, see the methodology appendix.

This simple analysis underestimates the total travel time savings from the Inner City Build Alternatives as it does not include network effects that accrue to the regional, national and state transportation system from enhanced connectivity and accessibility (the network effects are modeled in a later section of the report). The analysis also excludes savings that could accrue from an enhanced warehouse and distribution sector in Shreveport that is likely to develop once the region becomes an interchange for North-South and East-West interstate highways. The economic impacts from that scenario are modeled in the economic impact section of the report.

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Real Estate Development Opportunities on the Alternative Routes

Highway construction that provides enhanced accessibility also provides real estate development opportunities that can stimulate economic growth. Those opportunities are governed by the future demand for real estate, as well as by the future supply of real estate.

The following sections discuss our findings in terms of the economic impacts from real estate development along the Build Alternative 5. The sequence of the section are: 1). Discussion of the forecast of overall future activity in the region; 2). Identification of development constraints that could impede real estate development within the Primary Study Area; 3). Same constraints for the Build Alternative 5; and 4). A comparison of alternatives in terms of their potential economic impact, as measured by economic output.

Future demand for real estate in the Shreveport MSA

The completion of I-49 will have an incremental impact on economic activity within the metro area by enhancing highway accessibility for distribution centers. As Shreveport-Bossier will be the only metro area on I-20 between Dallas and Jackson with connectivity on a North-South interstate, we expect the distribution sector to grow significantly after completion of I-49. Currently, the Shreveport-Bossier area has less than half of the national concentration of warehousing and logistics center jobs.

The level of future investments in either the Primary Study Area or along the Build Alternative 5 hinge on overall economic trends in the Shreveport-Bossier economy. Recent trends are the best data for forecasting future levels of economic activity.

This section of the report provides Taimerica's estimate of future economic impacts from the alternate routings. The economic impacts consist of the likely output within the Primary Study Area and along the Build Alternative 5 from increased business activity in the Shreveport-Bossier economy through 2022. The estimates of economic impact are probabilistic estimates and not deterministic estimates. The impact numbers assume that the location of new economic activity will mirror current activity levels within

the Primary Study Area and along the Build Alternative 5. The distribution of employment by industry sector is the variable used to allocate future economic activity to the two alternatives, subject to identified development constraints within each of the 2 alternatives.

The expert forecast of employment changes that combines the three sources of data is presented in Table 8. To simplify the table interpretation for the reader, industries that are not forecast to exhibit employment growth of more than 100 jobs during the forecast period have been eliminated. The LWC and shift-share methods provide similar estimates of overall employment growth of about 10 -13 percent over the decade.

The forecast was adjusted to reflect changes that occurred between 2001-11 from the development of the Haynesville shale which are unlikely to occur in the coming decade. Among these changes are lower growth in employment in Business Services, Support for Oil and Gas Operations, Specialty Freight Trucking and Commercial Machinery Rentals.

The Role of Development Constraints on Real Estate Development

It is important to evaluate development constraints within the Primary Study Area and on the Build Alternative 5 interchanges to assess the constraints on new economic opportunities along each of the alternative routes. As the potential impacts within the Primary Study Area differ from those along the Build Alternative 5 (because of differences in daytime/residential populations), each of the alternatives is evaluated with a different methodology.

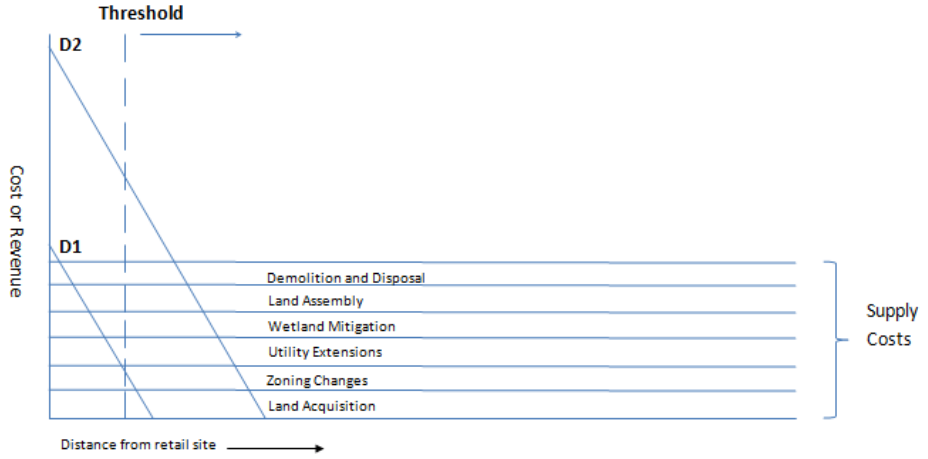
Investment decisions are conditioned by the supply and demand for specific types of real estate at specific locations. For commercial uses, the degree of accessibility and the size of the market are the key drivers of demand. Highway improvements that lower the cost and time involved in reaching a commercial location will increase the demand for commercial real estate development. Whether development occurs, however, also depends on the supply of real estate. Development occurs where developers and their tenants expect to make profits. In other words, development occurs where development costs are below rents.

If raw land has significant constraints on development, the cost of development can exceed rents. Figure 1 provides an illustration of the concept. Enhanced accessibility can raise demand but real estate development still doesn't happen if the development

constraints are too high. The principal constraints on development, besides raw land cost, are the cost of utility improvements, zoning changes, wetlands mitigation, demolition and disposal of existing structures, and the cost of land assembly. (For commercial projects requiring large footprints, the cost of land assembly can be substantial).

Figure 1: Real Estate Development

Decisions are determined by the combination of demand and supply conditions



Increasing demand to beyond the threshold via a highway improvement is needed to justify real estate development. The gap between demand and supply determines profit, which must be beyond the threshold level. If supply costs are too high, development will not occur, even with the transportation improvement.

Unless improvements in highway accessibility raise demand beyond the threshold value (illustrated in the diagram as a shift from curve D1 to D2), real estate development still will not occur.

The demand factors that most interest real estate developers are access to disposable income from consumers with unmet needs for products. The success of a retail development is based on providing a service or retail product closer to the residents of an area than the alternatives they currently have available.

Developers typically find the best opportunities in areas with brisk residential growth with a supply of rooftops large enough to support the market, but in locations that are removed from established retail centers. In other words, the best opportunities are located in proximity to concentrations of new residential growth.

Development Constraints on the Build Alternative 5

The scope of this assignment is limited to an investigation of motels, wholesale, medial, retail and suburban office at the interchanges on the Build Alternative 5. Based on historic trends, these are the activities most likely to generate new economic activity within this study area. For the Build Alternative 5 study interchanges, most of the likely impacts will occur in 'indirect' activities such as motels, wholesale trade, medical services, retail and suburban office activities tied to residential development. These activities typically locate within neighborhood or community shopping centers.

Retail centers are classified into 3 categories by the International Council of Shopping Centers: neighborhood, community and regional Centers. The characteristics that govern the location of centers, such as market populations and sizes, are shown in Table 9.

Several key attributes are critical to the viability of interchange locations for economic activity. Highway access is the principal factor for the activities to be investigated in this study, followed by the availability of municipal water and wastewater lines, followed by land costs and land subdivision.

Economic activities within the scope of this assignment require large site footprints. A motel requires a minimum footprint of 2.5 acres. Medical offices and personal services and retail are almost exclusively done in shopping center projects. The investigation of development constraints on the Build Alternative 5 therefore is an investigation of the likelihood of additional shopping center development on the Build Alternative 5.

A minimum size footprint for a convenience or strip center is 3 acres, while a neighborhood center with 5-20 stores will require a footprint of 5-10 acres (See Table 9). Regional distribution centers typically are at least 20 acres in size and are sensitive to land acquisition and development costs.

If land has already been subdivided at interchange locations, developers have to acquire multiple parcels to make a project viable. As commercial projects in Louisiana cannot use eminent domain laws for site assembly due to a recent constitutional change,

developers are unlikely to find an interchange location as a viable site if the land has been subdivided into small parcels or if land is already occupied. Vacant sites with utility service in close proximity to interchanges is the first screening criterion for assessing future commercial potential. The second critical screening criterion is access to rooftops to provide a market for these activities. This factor is not an absolute criterion but is judged relative to alternative locations. For this study, the context is accessibility to population relative to other interchange alternatives.

The interchanges on the Build Alternative 5 vary in their development constraints (See Table 10). The interchanges with the highest demand in terms of 3 mile market populations face a lack of vacant space and require the most expense in terms of land assembly. The interchanges with vacant parcels of development size lack the population density to support neighborhood retail centers that would house medical offices, personal services or new retailing.

Map 4 shows the location of current office space in the metro region. Map 5 shows the location of recent office construction. A comparison demonstrates that the new office space in the region is being built downtown or in more suburban locations. The likelihood of additional office space at the interchanges on the Build Alternative 5 are low.

Map 6 shows the location of retail space within the metro area while Map 8 shows the location of retail space completed since 2000. The same pattern is apparent in retailing. New retailing is located in suburban locations near the periphery where new subdivisions are located. The dot pattern in Map 4 shows the location of new residents since 2002 and the pattern clearly shows that the largest concentrations in Caddo Parish are east of I-49. The interchanges on the Build Alternative 5 are within older residential concentrations that are declining or stable in population. Moreover, as shown on Map 4, significant existing space exists at the Mansfield Road interchange.

W-ZHA specifically assessed retail development potential in their work on the Shreveport Master Plan (W-ZHA memo of April 15, 2010). Their assessment was that Mansfield Rd. near Bert Kouns was a better corridor for retail development than the Mansfield Rd. and LA-3132 interchange within the Build Alternative 5. They concluded that the former location could support an additional 100,000 square feet of community center space. For comparison shopping goods, the Youree Drive intersection at East 70th Street was the best location within the metro region. These findings by W-ZHA concur

with our analysis of the opportunities for development of the economic activities identified in the scope of this assignment.

Map 9 shows the locations of industrial and warehouse projects completed since 1999 in the metro area. In the case of warehouse space, the pattern shows more of it concentrated along I-20 West but in suburban locations where land costs are probably lower. Map 10 shows the distribution of industrial space of all ages. Most of the space is located along Mansfield Road North of LA 3132 or along the SW quadrant of Caddo Parish along LA 526.

In conclusion, our assessment is that Build Alternative 5 is unlikely to experience significant new economic activity by the study year of Build +4 for the economic activities identified in the Scope of Work for this project. We expect that the level of new economic activity will not exceed the historic portion of metro absorption.

Development Constraints in the Primary Study Area

The relevant framework for evaluating economic impacts within the Primary Study Area is to look at development constraints for the following types of activities: office, medical, industrial, wholesale/distribution, recreational and movie studios. Some retail related activity is possible in the PSA, but this possibility hinges largely on the success of attracting new downtown residents. A recent study commissioned by the Shreveport Planning Commission for the master plan suggested that 22% of 4100 new households to the region would be interested in urban living but that only 140-410 new households were possible downtown between 2008-2013, or perhaps 25-80 new households per year (W-ZHA March 5, 2010). Without a subsidy program to lower development costs, rents would exceed market rents downtown. Taimerica interprets these findings as evidence that the potential for impacts within the Primary Study Area from retail and personal services are limited between now and Build Year+4. Office related activities are more likely to locate within the Primary Study Area since the downtown still is home to the majority of office activities in the metro region. The W-ZHA memo concurs and notes that 56% of office related functions are still in the downtown core of Shreveport.

Downtowns throughout the United States are re-emerging as centers for entertainment and recreation activities that serve the entire metro region. Successful downtowns characteristically capture 5-15% of the eating and drinking revenues within

the metro region (W-ZHA March 5, 2010). The figures for the Primary Study Area are approximately 2% of eating dollars and 15% of drinking dollars. Part of the discrepancy stems from the dominance of casinos in the metro's entertainment mix. We concur with the analysis of W-ZHA that the Primary Study Area provides a geographic area that can provide a larger share of the arts, entertainment and recreational needs of the metro region.

An additional finding of relevance for our forecast of economic activities is that medical services within this metro are not provided today within the confines of the Primary Study Area. The concentration of medical services within the Williston-Knighton-LSU Health Sciences Center corridor on Kings Highway is the dominant center for medical services within the metro area. Taimerica does not forecast significant new medical services growth within the Primary Study Area during the period of this study.

Movie production is a recent industry within the metro area and one in which the Primary Study Area predominates. We expect this scenario to continue within the PSA during the study period.

The portion of the PSA north of downtown has a concentration of industrial and wholesale space currently. Approximately 21% of the region's employment in mining support activities is located within the PSA, together with 11% of its manufacturing jobs and 19% of its wholesale/distribution jobs (LODES 2011). These numbers demonstrate that the PSA has the characteristics to support further expansion within these industries and economic sectors.

In summary, our conclusions are that the Primary Study Area will support growth and expansion of office, light industry, wholesale/distribution, recreation and movie production. The PSA has a high probability of capturing at least its historic share of these activities. Most of the indirect (business-to-business transactions) and induced impacts (personal services and retail) are unlikely to locate within the Primary Study Area.

While the existing base of commercial office and industrial space in the PSA provides a platform for some expansion of economic activity, the PSA also needs to be evaluated as a location for new investment in these target activities. The area has a significant amount of vacant space (See Map 4). Excluding vacant wetlands, the PSA still has significant amounts of vacant land with utility service that provide potential development sites for the target activities.

The completion of the Inner City Connectors would provide substantially better highway access for commercial development in a large portion of the PSA. Moreover, the PSA has a plethora of adjudicated space owned by the City of Shreveport that should be redeveloped and brought back into commerce. The significant constraints on development are costs for raw land and for land assembly. The later constraint is due to the subdivision of the PSA into residential lots that must be assembled for commercial and industrial projects. This constraint could be reduced with a concerted effort to acquire and redevelop land within the PSA. Our conclusion, based on project site selection experience, is that PSA provides sufficient developable land for meeting the needs of future economic activities. Our assessment is that development constraints will not limit the attraction of new economic activity to the PSA. The portion of such activity attracted to the PSA is likely to match, if not exceed, the historic pattern. The amount of economic activity will likely increase if a second interchange is established on the Inner City Build Alternatives at Hearn Blvd.

Comparison of Economic Impacts Within the PSA and Build Alternative 5 From Real Estate Development

This assessment provides a probabilistic rather than deterministic forecast. In other words, our opinion is that the activities defined in this scope are likely to occur within the PSA and at the interchanges along the Build Alternative 5 Study Area, not that they are certain to occur. We can, however, assign probabilities to these events using current location patterns.

The conclusion drawn from this analysis is that the potential economic impacts in the Primary Study Area are likely to be about double of the potential economic impacts on the Build Alternative 5. The differential is substantial at $356 million per year of incremental output. Over 80% of the differential is in direct rather than indirect and induced impacts.

The economic explanation for the differential is that the Primary Study Area is the major employment center for the region and is likely to remain so at least through the next decade. While the Primary Study Area faces challenges in land assembly and development needed to increase its share of metro economic activity, the development constraints are less severe in this zone than along the Build Alternative 5. The Inner City Build Alternatives provides an opportunity to substantially enhance highway accessibility to the northern section of the PSA, as well as to the area of Shreveport north of I-220.

The selection of the Build Alternative 5 does not provide the same opportunities for enhancing the competiveness of Shreveport for business development.

The estimated annual economic impact in the Primary Study Area is $802 million (Table 13). The share of direct employment within the target industries varies from 0% to 100%. Direct employment generates about 2/3 of the total annual impacts. The metro share of indirect impact is 12% and the share of induced impact is 3 percent. These impacts could increase from the development of multiple interchanges on the Inner City Build Alternatives. We believe that the methodology used to allocate impacts provides a lower limit rather than an average figure.

The estimated total economic impacts along the Build Alternative 5 are $446 million (Table 14). Direct impacts vary from 0-28% of metro impacts while indirect impacts are 6% and induced impacts are 7% of metro totals. The estimated direct annual impact of $210 million is far lower than the $510 million in the Primary Study Area. With prepared business park sites in place, the Build Alternative 5 Study area could support investments in the target industries of medical labs, some wholesaling and business services. Because of higher populations, the Build Alternative 5 has the potential to support more of the induced impacts.

Economic Impacts from Network Effects & Agglomeration Economies

Economists have recently recognized network effects and agglomeration economies as important factors driving metropolitan growth. The growth of new technologies since the 1980's have demonstrated the importance of network effects on production costs and output (Varian 2008). Highways are an infrastructure asset with network effects. Traffic congestion is the most widely identified network effect in transportation networks. When the demand for highway space exceeds the supply, the network becomes congested, which increases the cost of using the network for all users. The classic measurement of congestion is speed of travel or travel time between points (Small and Verhoef 2007). Improvements that speed up travel times eliminate congestion. If the improvements are within central nodes of a network, they can improve the efficiency within the entire network.

The measurement of the network effects from transportation improvements is through the calculation of agglomeration economics. Agglomeration economies are a third important concept to model in an economic impact study of a transportation

network change. Transportation economists began to estimate agglomeration effects in transportation system improvements around the new millennium (Prud'homme and Lee 1999 and Shefer and Aviram 2005).

Recent research published by Taimerica demonstrates that agglomeration economies provide a better explanation of metropolitan economic growth over the last decade than operating cost differentials (See our December 2012 newsletter story on the Taimerica website: www.taimerica.com). The effects of agglomeration economies has been estimated in a number of academic studies since 1973 (see table below). A doubling of regional size results in increasing labor efficiencies within the economy between 3-6%. As an example, the efficiency of labor within a region of 1 million population will be 3-6% higher than would be expected in a region the size of Shreveport-Bossier. The way that smaller regions overcome agglomeration economies is to reduce wages to compensate for differences in labor productivity.

Empirical Investigations of the Size of Agglomeration Economies

Source	Percentage increase with doubling of size
Shefer (1973)	5%
Nakamura(1985)	3%
Ciccone and Hall (1996)	6%
Quigley (1998)	3-8%

Remy Prud'homme and Chang-Woon Lee (1999) published a study of agglomeration effects within 23 French cities due to differences in their transportation infrastructure. This study is the basis of the methodology used by Taimerica for estimating the differences in agglomeration effects from the Inner City Build Alternatives and Build Alternative 5 options. The team used multivariate statistical and econometric models to estimate the relationships between the transportation infrastructure and agglomeration effects. Their results were statistically significant overall and the model explained between 88-89% of the variance in agglomeration between the 22 cities. The transportation variables that explained these differences were labor market size, urban sprawl and transportation network speed.

Decreasing traffic congestion or increasing travel speeds has the effect of increasing the size of the labor market for employers. As workers are less inclined to work at longer distances from home (an effect known in geography and regional economics as the distance decay effect), increasing speed and highway access has the

effect of increasing the supply of workers to companies. Prud'homme and Lee found that increasing the effective size of the labor pool by 10 percent had a 4 percent effect on labor force productivity. This effect is more pronounced in large cities such as Paris or Seoul, Korea where employers can only access a fraction of the regional workforce. The metric for gauging this effect is the percent of the regional workforce that can travel to an employer's location within 30 minutes. In the case of the Shreveport-Bossier labor market, this effect is not likely to be substantial.

The analysis suggests that travel times for commuters are reduced throughout the Caddo Parish portion of the network from the completion of the Inner City Build Alternatives. The reductions are between 7-26% for six of the seven employment nodes modeled. The calculations show a slight reduction in travel speed to the LSU-Williston employment node, which is probably due to measurement error in the models or in the GIS algorithms.

The estimated agglomeration economies from the network change is approximately $60 million per year (see Table 15). The agglomeration calculations are based on wages in 2011 of $6.4 billion within the metro area. Alternate calculations using just the Caddo Parish payroll and Caddo Parish portion of the network are similar at $62 million.

The analysis also suggests that agglomeration economies from increasing the effective size of the regional labor market are insignificant. The transportation network configuration in 2011 provides access to more than 78% of the regional labor market in all of the employment nodes, with percentages of 94% for Christus Health Center and the LSU Health Sciences Center- Williston-Knighton Health Center on Kings Highway. We conclude that the Inner Loop Build Alternatives will not have a material effect on labor productivity due to expanding employer access to the regional workforce.

The impact of agglomeration economies will increase as the size of the workforce in the metro area grows. The forecast methods used to estimate the baseline growth in regional employment suggest that annual growth rates of 1 percent are likely during the time horizon of this study. As real wages increase over time, as demonstrated earlier in the study, the total agglomeration economies will increase as well. Unlike financial flows, agglomeration effects should not be discounted to present values. The table below shows the estimated agglomeration economies at various years.

YEAR	Growth factor @ 1% annual increase	Annual Agglomeration Economies ($)
2011	1.00	$59,810,000
2018	1.07	$63,997,000
2022	1.12	$66,987,000
2030	1.21	$72,370,000

The cost of construction of the Inner City Build Alternatives of $660 million is equivalent to 10 years of agglomeration economies. In other words, savings from labor productivity in the metro area over a decade from construction of the Inner City Build Alternatives are equal to the construction cost.

Interchange Scenarios

The design of the Inner City Build Alternatives involves decisions about the number of interchanges that provide the best economic return. The analysis of travel times and distances in this study suggests that an interchange at LA 3094 has the highest utility for commuters. An additional interchange at LA 173 will not lower travel times for most commuters and is unlikely to materially affect commuting preferences but it could in fact have a material impact on real estate development opportunities in the primary study area. Our final recommendations on the number of interchanges will be made after the calculations of potential economic impacts.

Conclusions

This study looked at 3 economic impacts from the two alternate routings of I-49 in the Shreveport metro region. The Inner City Build Alternatives provide superior economic impacts to the Build Alternative 5. The completion of the Inner City Build Alternatives provides better transportation connectivity for the current employment core over the Build Alternative 5. The Inner City Build Alternatives reduces travel time and cost and provides a boost in labor productivity of about 1% due to agglomeration economies from reduced travel times for commuters. The Primary Study Area, consisting of the expanded downtown of Shreveport, is likely to receive a substantially larger portion of the future

economic growth in the metro region than the interchanges along the Build Alternative 5. The differential in potential economic impacts is about $356 million annually. The combination of these three forms of economic impacts suggests that the Inner City Build Alternatives is the alternative that is likely to provide a much larger economic impact on the Shreveport-Bossier metro area than the Alternative Route.

APPENDIX

METHODOLOGY USED FOR ESTIMATES

Travel Time Calculations and Methodology

For purposes of estimating travel times and distances, the downtown study area was divided into 4 quadrants. A central node in each of the quadrants was used to model times and distances. Commuter numbers for each of the block groups in the quadrants varies from 880 to 8800+, as shown in the table below. The locations of the nodes are as follows:

Node # Location (#Daily commuters)

- #1 LA 3094 at Aero Drive (2028)
- #2 LA 3036 at US 71 (3021)
- #3 US 71 and US 80 (8826)
- #4 LA 3194 between US 71 and McCain Circle North of I-220 (880)

The fourth node is located North of I-220 since our accessibility index suggested that this area would be the most impacted by changes in travel time and distances from the Inner City Build Alternatives (Table 3). The remainder of the block groups in the downtown study area were not modeled as they have small daytime populations of commuters which are marginal in determining the overall travel savings. None of the downtown study area block groups has a large residential population that could be material in determining overall travel savings.

Travel time bands in the GIS modeling consist of five minute increments and travel distance bands consist of 5 mile increments. As the GIS algorithms did not provide a

means of estimating mileage differentials of less than 5 miles, the consultants used an alternative method for calculating these differentials. We used the number of commuters from the block groups south of downtown with a preference for the I-49 route to model travel distances from the Inner City Build Alternatives configuration (see Map 3). We estimated the distance savings for these commuters to 4 downtown nodes using routing tools in the GIS system for the current network and future Inner City Build Alternatives configurations (see Table 4). The distance differentials are minor for all of the nodes except for Node #1. The travel and time savings are largest for those nodes which are north of the downtown core.

The total time and vehicle cost savings is adjusted for estimated increments in the number of commuters to the Primary Study Area at the build year. The data for this trend comes from the change in downtown daytime employment between 2002-11 for the block groups in the Primary Study Area. Census Bureau OD statistics indicate that the day time population in the downtown block groups declined by 2.4 percent while metro employment grew by 7.2 percent during the period (LODES 2002 & 2011 and BLS 2013). The trendline suggests an annual decline rate of 0.26% per year in the downtown or a net decline of 1.5% to the 2018 study year and a 4.3% decline through 2030. Through traffic as well as other commuters are expected to increase during the interim at the annual growth rate of metro employment of 0.7% per year or an aggregate increase of 4.7% through 2018 and 15.3% through 2030.

The combined savings of vehicle operation costs and time value grows from $1.37 million/year in 2011 to $1.44 million in 2018 and to $1.56 million in 2030 (See Tables 3-5). The aggregate savings for the first 20 years of the Inner City Build Alternatives is $45 million. The future cost of vehicle operation is assumed to equal the IRS mileage rate for 2013. In other words, we are assuming no change in real costs of vehicle operation for the study year. We assume, however, that annual time savings will increase at the same rate as real per capita incomes have increased in the Shreveport-Bossier MSA over the last decade. Nominal per capita income increased by 4.61 percent per year between 2002-12 (BEA 2013). As consumer prices are the best economic measure for estimating marginal utilities for consumers, we use the CPI index to calculate real per capita increases. The compound annual rate of increase in the CPI for all urban consumers for the same years is 3.19% (BLS 2013), suggesting that the real marginal utility of travel time savings will increase by a net rate of 1.42% per year (4.61% - 3.19%) during the period of this analysis.

This simple analysis underestimates the total travel time savings from the Inner City Build Alternatives as it does not include network effects that accrue to the regional, national and state transportation system from enhanced connectivity and accessibility (the network effects are modeled in a later section of the report). The analysis also excludes savings that could accrue from an enhanced warehouse and distribution sector in Shreveport that is likely to develop once the region becomes an interchange for North-South and East-West interstate highways. The economic impacts from that scenario are modeled in the economic impact section of the report.

Economic Forecast Methodology

Three data sources were used for estimating the size and composition of the future economy of the Shreveport-Bossier metro area. The ultimate forecast combines the three sources into a single expert forecast. The three sources used for the expert forecast are the employment projections of the Louisiana Workforce Commission, project announcements by Louisiana Economic Development and a shift-share analysis of employment growth for the Shreveport-Bossier economy between 2001-2011. Each of these sources is discussed below.

The Louisiana Workforce Commission contracted with a well-recognized demographer in 2010 to produce projections of future employment in the Shreveport-Bossier metro area. That forecast provides a reasonable estimate of future growth in the region (see Table 7). Based on the LWC modeling, the regional economy is expected to grow by 12.5% over the decade. Among the industries expected to increase their employment are primary metals, transportation equipment, professional and technical services, company management and administration, health care and accommodation-food services.

Announced projects by Louisiana Economic Development provide an additional source of information on how the economy of the Shreveport-Bossier metro is changing over time. The region has witnessed a number of investments over the last 4 years that

are likely to reshape economic activity in the future. Among the major projects from an economic impact standpoint are the following:

Company	Product	# of Jobs	Amount in $
Pratt Industries	Paper board	120	$133 MM output
Benteler Steel/Tube (2013)	Steel pipe	675	NA
Moonbot Studios (2011)	Movie animation	NA	NA
Twin Engine Labs (2011)	Software	NA	NA
Embera NeuroTherapeutics	Pharma R&D	NA	NA

Many of these announced investments are not captured by projections of past economic activity in the shift-share method or by the Louisiana Workforce Commission. They are added in the expert forecast projection.

The final source of information for modeling the future economy is a Shift-Share forecast of future employment. The method constructs a forecast of future employment based on trends in employment at the industry or 4-digit NAICS level. The Shift-Share method has been used frequently over the last 40 years as a tool for modeling regional economic growth (Selting 1992). It breaks growth into two components, called Shift and Share. Expected growth from industry expansion (The Share component) assumes that industrial growth in the region will parallel national growth trends in the same industry. An industry that is expected to grow by 10 percent nationally over a decade would also be expected to grow by 10 percent regionally. Some regions, however, grow faster or slower than the national trend because of shifts in the region's competitiveness for the industry. A growing or declining share of the national industry within a region (Called the Shift) indicates that future growth in that industry within the region is likely to be faster or slower than the national average. Past shifts in the concentration of the industry within a region are used to forecast the Shift component of growth. The industry growth trend is a combination of the shift and share components of industry growth. The summation of these industry level forecasts comprises the regional forecast.

The Shift-Share forecast of the Shreveport-Bossier economy uses two primary data sources: County Business Patterns data for 2001 and 2011 for the metro region from the Census Bureau; and the forecast of national industry growth through 2022 produced by the Bureau of Labor Statistics. Data missing because of disclosure in the CBP data was estimated using the median value within the employment range. In a 2013 unpublished study, Taimerica found this method provided an estimated value within 0.5 percent of the actual employment value of the industry at a county level for over 100,000 industry-county pairs, versus an error of 15 percent for the mid-point estimate traditionally used for estimating missing data.

Real Estate Methodology

We use the Census Bureau's Workplace Area Characteristics Data for 2011 as a framework for assigning probabilities (WAC 2011). This new database provides a count of employees within each of 20 sectors for every block group in the metro area. We assign probabilities of new location of the target industries within each interchange and within the PSA based on the current distribution of these activities (See Table 11). We modify some assumptions based on other sources of information, such as prior analysis by W-ZHA.

The framework for our forecast of activities is the estimated number of new jobs and new outputs within target industries identified using the three sources of information discussed in the prior section of this report entitled: Future Size and Characteristics of the Shreveport-Bossier Economy. The eighteen industries so identified are collectively expected to generate nearly 17,000 new direct jobs during the study period and a total impact of nearly 31,000 (see Table 8). The economic output that these industries will generate is expected to total nearly $10 billion (Table 12).

Impacts are estimated using multipliers furnished by the Bureau of Economic Analysis at the U.S. Department of Commerce. Multipliers consist of two types: Indirect + Induced or Type II and Indirect or Type I. Type I multipliers consist of the direct impacts from projects within the target industry plus impacts from business-to-business transactions. The Type II multipliers include the Type I impacts but add in the spending from new payrolls resulting from the Type I impacts. Multipliers for output are different from employment multipliers, as is apparent from a comparison of Tables 8 and 12.

Not all of these activities will occur within either the PSA or within the Build Alternative 5 Interchanges, as noted in the Potential Venues column of Table 8. The aggregate impact that will occur in each of the study areas depends on the locational needs of the industry and the locational attributes of the area. We assume that the presence of similar industries in 2011, as documented by the Census LODES data, indicates a high probability that the area will experience future investment by similar industries.

We therefore use the LODES data to allocate future impacts. For the direct impacts, we assume that each of the alternative study areas will attract investment in the industry in proportion to its current share of metro employment in the industry sector. For the indirect impacts, we assume that they will be distributed in proportion to the study area's current share of overall employment. For the induced impacts, which are generated by consumer spending, we assume that impacts are proportional to the study area's share of residential population in 2011.

Agglomeration Economies Methodology

Increasing the speed of travel in the transportation network drives the expansion of the labor market. Effects on productivity from increasing travel speeds are independent of effects from expanding the size of the workforce. In essence one is looking at the demand side effects with travel speeds while looking at supply side effects from increasing the size of the potential workforce to employers. Increasing speeds by 10 percent has an effect of increasing labor productivity by 2.9 percent (Prud'homme and Lee 1999).

The size of the current labor market in the Shreveport-Bossier metro area was estimated using calculated straight line distances from every residential block group within the metro area to every work location (see Figure 3). Almost 90 percent of the workforce lives within 20 miles of its place of work.

The Prud'homme methodology and estimates of elasticity were combined with LODES O/D data for the metro region to calculate travel times to the 30 minute labor market and median travel speeds for the major employment centers in the metro area. GIS travel time algorithms were used to calculate the size of workforce by travel bands for the current network and for the network with the completed Inner City Build Alternatives. The NW LA COG and Standec transportation models were the sources of the

travel times for the respective network configurations. The median travel times were calculated from the distribution of workers by band and the median travel time per band.

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TABLES

Table 1

Daytime and Nighttime Populations in PSA & at Build Alternative 5 Interchanges

	Daytime Population	Nighttime Population	Ratio (Daytime/Nighttime) Population
Downtown (PSA)	14720	4482	3.28
BUILD ALTERNATIVE 5			
Airport	2074	935	2.22
Bert Kouns Blvd	6491	3187	2.04
Business Park interchange	9	431	0.02
I220-North #1	447	1325	0.34
I220-North #2	551	1138	0.48
I49 and LA 3132 interchange	3571	2212	1.61
Mansfield Road	2743	3035	0.90
Market Road	1259	1567	0.80
Youree Road	568	360	1.58

Source: Derived from Census Bureau LODES block group information

File Name: Daytime to Nighttime Ratios.xlsx

Table 2

Vacant Land

Interchange Map ID	Vacant	Total	Percent Vacant	Location
A	155	640	24%	Airport
B	452	640	71%	Business Park
B-C	452	2080	22%	Business Park-Walker Rd
D-E	280	2074	14%	Walker Rd-Mansfield Rd.
F-G	0	2266	0%	I-49 & Bert Kouns Blvd
H	360	640	56%	Youree Road
I-J	553	2320	24%	North of I-20

Source: Compiled from various GIS databases

File:Vacant Land Table

Table 3
Travel Cost and Time Savings in 2011

	Trips		Inner City Build Alternatives Savings(Annual)			
	Daily	Annual	Miles	Hours	Vehicle	Time Value
Through traffic	235	85,928	219,976	3666	$ 124,286	$ 35,471
Commuters to N of I220	884	229,840	588,390	9807	$ 332,441	$ 94,878
Commuters from N of I220	650	169,000	432,640	7211	$ 244,442	$ 69,763
Downtown Node 1	253	65,732	308,941	6,792		$ 65,716
Downtown Node 2	427	110,989	95,450	12,307		$ 119,067
Downtown Node 3	1562	406,162	-	2401		$ 23,226
Downtown Node 4	880	228,800	141,856	3813		$ 36,894
Downtown All Nodes	1840	478,400	392,288	25313	$ 221,643	$ 244,903
TOTAL 2011			**2,179,542**	**45996**	**$ 922,811**	**$ 445,015**

Table 4
Travel Cost and Time Savings in 2018

	Trips		Build Alternative 5			
	Daily	Annual	Miles	Hours	Vehicle	Time Value
Through traffic	246	85,928	219,976	3666	$ 124,286	$ 38,569
Commuters to N of I-220	926	240,642	616,045	10267	$ 348,065	$ 108,013
Commuters from N of I-220	681	176,943	452,974	7550	$ 255,930	$ 79,421
Downtown Node 1	249	64,812	304,616	6697		$ 70,455
Downtown Node 2	421	109,435	94,114	12307		$ 129,466
Downtown Node 3	1540	400,475		2401		$ 25,255
Downtown Node 4	868	225,597	139,870	3813		$ 40,116
Downtown All Nodes	1840	478,400	392,288	25218	$ 221,643	$ 265,292
TOTAL 2018			**2,219,883**	**46701**	**$ 949,925**	**$ 491,296**

Table 5
Travel Cost and Time Savings in 2030

	Trips		Build Alternative 5			
	Daily	Annual	Miles	Hours	Vehicle	Time Value
Through traffic	271	85,928	219,976	3666	$ 124,286	$ 41,979
Commuters to N of I-220	1016	264,225	676,417	11274	$ 382,176	$ 129,083
Commuters from N of I-220	747	194,283	497,366	8289	$ 281,012	$ 94,914
Downtown Node 1	242	62,868	295,477	6496		$ 74,383
Downtown Node 2	408	106,152	91,291	12,307		$ 140,911
Downtown Node 3	1494	388,461		2401		$ 27,488
Downtown Node 4	842	218,829	135,674	3813		$ 43,663
Downtown All Nodes	1784.8	464,048	380,519	25017	$ 214,993	$ 286,444
TOTAL 2030			**2,296,720**	**48246**	**$ 1,002,467**	**$ 552,420**

Table 6

Changes in Travel Distances and Time from Completion of Build Alternatives

		Distance in miles		Time in minutes	
	Location	Now	After	Now	After
Downtown Node 1	LA 3094 @ Aero Dr.	5.1	2.75	6	2.9
Downtown Node 2	LA3036 @ US 71	2.78	2.35	4.01	3.99
Downtown Node 3	US 71 @ US 80	2.01	2.01	2.9	2.9
Downtown Node 4	LA3194 @ McCain Circle	3.81	3.5	4.64	4.64

Source: Calculated using GIS algorithms

Table 7

LA Workforce Commission Economic Forecast to 2020

2020 Projected Employment by Industry
Revised June 18, 2013
(All sectors & industries with >100 new jobs)

Industry Sectors	NAICS CODE	2010 Average Employment	2020 Projected Employment	Employment Change 2010 - 2020	Percent Change 2010 - 2020
TOTAL, All Industries		250,984	282,250	31,266	12.5%
Agriculture, Fishing, Forestry, and Hunting	11	2,807	2,601	-206	-7.3%
Mining	21	7,530	7,580	50	66.4%
Support activities for mining	213	6,030	6,141	111	1.8%
Utilities	22	1,521	1,599	78	5.1%
Construction	23	11,764	12,446	682	5.8%
Manufacturing	31-33	17,680	19,008	1,328	7.5%
Paper manufacturing	322	1,804	1,925	121	6.7%
Chemical manufacturing	325	1,319	1,514	195	14.8%
Primary metal manufacturing	331	243	675	432	177.8%
Fabricated metal product manufacturing	332	1,792	1,800	8	0.4%
Transportation equipment manufacturing	336	1,416	2,390	974	68.8%
Wholesale Trade	42	8,240	10,238	1,998	24.2%
Merchant wholesalers, durable goods	423	4,517	5,610	1,093	24.2%
Merchant wholesalers, nondurable goods	424	2,890	3,836	946	32.7%
Retail Trade	44-45	28,216	31,323	3,107	11.0%
Transportation and Warehousing	48-49	8,203	9,321	1,118	13.6%
Water transportation	483	3,115	3,695	580	18.6%
Postal service	491	663	772	109	16.4%
Warehousing and storage	493	346	398	52	15.0%
Information	51	3,674	3,698	24	0.7%
Motion picture and sound recording industries	512	571	621	50	8.8%
Telecommunications	517	1,898	2,143	245	12.9%
Finance and Insurance	52	6,173	6,514	341	5.5%
Credit intermediation and related activities	522	3,797	4,053	256	6.7%
Real Estate and Rental and Leasing	53	3,344	3,758	414	12.4%
Professional, Scientific, and Technical Services	54	6,911	8,705	1,794	26.0%
Management of Companies and Enterprises	55	1,703	2,045	342	20.1%
Management of companies and enterprises	551	1,703	2,045	342	20.1%
Administrative and Waste Services	56	10,975	13,742	2,767	25.2%
Administrative and support services	561	9,966	12,522	2,556	25.6%
Waste management and remediation service	562	1,009	1,220	211	20.9%
Educational Services	61	23,168	25,142	1,974	8.5%
Educational services	611	23,168	25,142	1,974	8.5%
Health Care and Social Assistance	62	42,380	50,965	8,585	20.3%
Ambulatory health care services	621	9,361	11,801	2,440	26.1%
Hospitals	622	20,185	23,107	2,922	14.5%
Nursing and residential care facilities	623	7,286	8,722	1,436	19.7%
Social assistance	624	5,548	7,335	1,787	32.2%
Arts, Entertainment and Recreation	71	6,140	6,495	355	5.8%
Amusements, gambling, and recreation	713	5,843	6,175	332	5.7%
Accommodation and Food Services	72	20,560	25,332	4,772	23.2%
Accommodation	721	3,555	3,978	423	11.9%
Food services and drinking places	722	17,005	21,354	4,349	25.6%
Other Services, Except Public Administration	81	19,280	20,284	1,004	5.2%
Repair and maintenance	811	2,268	2,483	215	9.5%
Self-Employed Workers		17,012	17,801	789	4.6%
Government		17,755	19,238	1,483	8.4%
Local Government, Excluding Education and Hospitals		10,729	12,333	1,604	15.0%

**** Employment figure suppressed to prevent disclosure of a dominant firm.***

File Source: LWC 2011 and 2020 projections

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Table 8: Expert Forecast Table

Table 8: Forecast of Estimated Job Growth within PSA and at Build Alternative 5 Interchanges to 2022

NAICS	Name	Forecast	New Direct Jobs	MSA Concentration in 2011	Potential Venues	Indirect + Indusced Jobs Multiplier	Indirect Jobs Multiplier	Indirect Jobs	Induced Jobs	Total Jobs
2131	Support Activities for Mining	T	1882	990%	PSA and industrial parks	2.53	1.65	1223	1656	4761
6241	Individual and Family Services	T	1005	168%	PSA	1.32	1.31	312	10	1327
7211	Travel accomodations	T	837	355%	PSA/Bossier	1.59	1.26	218	276	1331
5614	Business Support Services	T	372	204%	PSA & Business Parks	1.93	1.19	71	275	718
6215	Medical Labs	T	300	150%	PSA/Medical/Business Parks	1.85	1.34	102	153	555
7113	Promoters of Performing Arts, Sports & Other Events	T	115	319%	PSA	1.39	1.11	13	32	160
3221	Paper Manufacturing	LWC	121	471%	Port	4.62	1.84	102	336	559
3241	Chemical Manufacturing	LWC	195	221%	Port	3.26	3.28	445	-4	636
3312	Primary Metal Manufactuing	LWC	432	190%	Port	2.63	1.56	242	462	1136
3361	Transportation Equipment Man.	LWC	974	382%	GM Complex	1.69	1.29	282	390	1646
421	Merchant Wholesalers durable goods	LWC	1093	100%	PSA & I-49 & I-20	2.01	1.39	426	678	2197
422	Merchant Wholesalers, nondurable goods	LWC	946	100%	PSA & I-49 & I-20	2.01	1.39	369	587	1901
5121	Motion Picture and sound recording	LWC	50	36%	PSA	1.8	1.36	18	22	90
522	Credit intermediation	LWC	256	115%	PSA	2.06	1.52	133	138	527
5416	Professional and scientific services	LWC	1794	39%	PSA-Medical Centers	2.08	1.23	413	1525	3732
7220	Food Services and Drinking Estab.	LWC	4349	133%	Includes PSA	1.33	1.14	609	826	5784
	Local government	LWC	1604	72%	Includes PSA	1.7	1.15	241	882	2727
4930	Warehousing and storage	T	502	43%	Includes PSA	1.725	1.3	151	213	866
	TOTAL		16827					5367	8458	30653

NOTES
T-Taimerica from CBP 2011; LWC=Louisiana Workforce Commission
Multipliers from BEA RIMS II program for 2011
Likelihood ratios based on % of 2011 employment within the PSA and Outer Loop (LODES data)

File Source: Growth Forecasts

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Table 9

Commercial Center Characteristics

Commercial Center Characteristics

	Regional	Community	Neighborhood	Convenience Strip
Size in SF	400-800,000	125-400,000	30-125,000	<30,000
Size in Acres	40 to 100	10 to 40	5 to 10	<3
# stores	40 to 80	15 to 40	5 to 20	
Trade area	5-15 miles	3-6 miles	3 miles	1 mile
Trade area population	150,000+	40-150,000	3-40,000	<3,000
Uses				
Retail	X	X	X	X
Personal Services				X
Office				X
Medical				X
Entertainment		X	X	X

Sources: Urban Land Institute & ICSC

Table 10

Retail Potential Characteristics

Retail Potential Characteristics

		<20 acres Vacant	Utilities	Zoning	Land Assembly	Population 1	3	5
A	Airport	3	X	X	L	2,511	23,237	58,156
B	Dean	2	X	X	L	1,658	30,432	51,080
C	Walker	2	X	X	L	5,533	35,670	51,497
D		0	X		H	4,919	42,308	61,869
E	Mansfield Road	0	X	X	H	5,928	41,221	64,772
F	I-49S	0	X	X	H	3,878	51,373	74,656
G	Bert Kouns	0	X	X	H	3,500	49,769	70,251
H	Youree	0	X	X	H	6,391	38,829	69,271
I	Lakeshore	6	X		L	2,413	27,268	54,113
J	Jefferson Paige	2	X		L	1,470	25,723	51,107

Table 11

Employment Share by Industry by PSA

Explanation	Total MSA	Primary Study Area	Lakeshore Interchange	Airport Interchange	Kingston Road	Jefferson Paige Intersection	I-49South	Bert Kouns and Youree Road	Build Alternative 5 Route Total
Total number of jobs	161591	12%	0%	2%	1%	0%	3%	5%	11%
Number of jobs in NAICS sector 11 (Agriculture, Forestry, Fishing, and Hunting)	392	0%	0%	0%	2%	0%	4%	9%	15%
Number of jobs in NAICS sector 21 (Mining, Quarrying, and Oil and Gas Extraction)	5475	21%	0%	0%	0%	0%	1%	1%	2%
Number of jobs in NAICS sector 22 (Utilities)	1291	36%	0%	0%	0%	0%	0%	0%	1%
Number of jobs in NAICS sector 23 (Construction)	7814	10%	1%	1%	3%	0%	4%	5%	14%
Number of jobs in NAICS sector 31-33 (Manufacturing)	9951	11%	0%	0%	0%	0%	8%	8%	16%
Number of jobs in NAICS sector 42 (Wholesale Trade)	6991	19%	0%	1%	1%	0%	5%	4%	11%
Number of jobs in NAICS sector 44-45 (Retail Trade)	21627	3%	0%	0%	1%	0%	4%	4%	10%
Number of jobs in NAICS sector 48-49 (Transportation and Warehousing)	4349	11%	0%	23%	0%	0%	3%	3%	28%
Number of jobs in NAICS sector 51 (Information)	2951	15%	0%	1%	0%	0%	0%	3%	4%
Number of jobs in NAICS sector 52 (Finance and Insurance)	4323	19%	0%	2%	0%	0%	3%	7%	12%
Number of jobs in NAICS sector 53 (Real Estate and Rental and Leasing)	3021	19%	1%	3%	1%	0%	3%	10%	19%
Number of jobs in NAICS sector 54 (Professional, Scientific, and Technical Services)	5204	36%	0%	3%	0%	0%	2%	5%	11%
Number of jobs in NAICS sector 55 (Management of Companies and Enterprises)	1868	29%	0%	0%	0%	0%	4%	2%	6%
Number of jobs in NAICS sector 56 (Administrative and Support and Waste Management and Remediation Services)	12541	17%	2%	2%	0%	0%	2%	4%	10%
Number of jobs in NAICS sector 61 (Educational Services)	6523	1%	0%	0%	0%	0%	0%	1%	1%
Number of jobs in NAICS sector 62 (Health Care and Social Assistance)	35222	3%	0%	1%	2%	1%	2%	8%	13%
Number of jobs in NAICS sector 71 (Arts, Entertainment, and Recreation)	6139	46%	0%	0%	0%	0%	2%	3%	5%
Number of jobs in NAICS sector 72 (Accommodation and Food Services)	16567	5%	0%	3%	0%	1%	1%	4%	9%
Number of jobs in NAICS sector 81 (Other Services [except Public Administration])	4955	11%	0%	5%	1%	1%	2%	5%	14%
Number of jobs in NAICS sector 92 (Public Administration)	4387	33%	0%	0%	0%	0%	1%	1%	2%

Table 12

Estimated Output from Growth Industries

Table 12: Estimated Output from Growth Industries

NAICS	Industry	Avg Pay($000)	Output/Pay Ratio	Type I Output Multiplier*	Type II Output Multiplier*	Direct	Indirect	Induced	Total
2131	Support Activities for Mining	$ 71.17	3.69	1.39	1.76	$ 494,256	$ 192,760	$ 182,380	$ 869,396
6241	Individual and Family Services	$ 15.67	2.53	1.30	1.80	$ 39,801	$ 11,940	$ 19,737	$ 71,479
7211	Travel accomodations	$ 15.39	3.88	1.27	1.63	$ 49,990	$ 13,497	$ 18,116	$ 81,603
5614	Business Support Services	$ 24.10	2.62	1.3	1.73	$ 23,461	$ 7,038	$ 10,095	$ 40,595
6215	Medical Labs	$ 55.62	3.08	1.3	1.84	$ 51,415	$ 15,425	$ 27,913	$ 94,753
7113	Promoters of Performing Arts, Sports & Other Events	$ 72.46	5.45	1.34	1.70	$ 45,431	$ 15,447	$ 16,464	$ 77,342
3221	Paper Manufacturing	$ 63.16	10.16	1.57	1.84	$ 77,672	$ 44,273	$ 21,337	$ 143,282
3241	Chemical Manufacturing	$ 98.07	91.21	1.51	1.72	$ 1,744,381	$ 889,634	$ 361,261	$ 2,995,276
3312	Primary Metal Manufactuing	$ 46.29	10.22	1.36	1.61	$ 204,388	$ 73,580	$ 50,382	$ 328,350
3361	Transportation Equipment Man.	$ 74.46	19.33	1.29	1.52	$ 1,402,146	$ 406,622	$ 319,829	$ 2,128,597
423	Merchant Wholesalers durable goods	$ 36.83	14.01	1.23	1.61	$ 564,037	$ 129,729	$ 211,796	$ 905,562
424	Merchant Wholesalers, nondurable goods	$ 26.88	25.78	1.23	1.61	$ 655,538	$ 150,774	$ 246,155	$ 1,052,467
5121	Motion Picture and sound recording	$ 23.00	5.47	1.22	1.51	$ 6,288	$ 1,383	$ 1,815	$ 9,487
522	Credit intermediation	$ 26.34	7.43	1.29	1.61	$ 50,066	$ 14,519	$ 15,971	$ 80,556
5416	Professional and scientific services	$ 39.12	2.56	1.25	1.75	$ 179,494	$ 44,874	$ 89,209	$ 313,576
7220	Food Services and Drinking Estab.	$ 10.53	3.48	1.31	1.69	$ 159,504	$ 49,446	$ 60,245	$ 269,196
	Local government	$ 43.58	1.00	1.16	1.79	$ 69,896	$ 11,183	$ 44,034	$ 125,114
4930	Warehousing and storage	$ 36.93	0.86	1.31	1.79	$ 15,920	$ 4,935	$ 7,662	$ 28,518
	TOTAL					$ 5,833,685.8	$ 2,077,059.72	$ 1,704,403.30	$ 9,615,149

*Output Multipliers are different from Employment Multipliers shown in previous tables; Type I represent Direct + Indirect Impacts; Type II +Type I + Induced Impacts

Source:Payroll CBP 2011 for Shreveport Metro
Output/Payroll ratio from Census Economic Census:Industry Snapshots
Manufacturing payrolls are US averages for 2007 from above source
Multipliers from BEA RIMS Program-Shreveport MSA for 2010

Table 13

Estimated Economic Impact in PSA

Table 13:Estimated Economic Impact in Primary Study Area

NAICS	Industry	Share of Direct in PSA	Share of Indirect in PSA	Share of Induced in PSA	Direct Impact	Indirect Impact	Induced Impact	Total Impact
2131	Support Activities for Mining	21%	12%	3%	$ 103,794	$ 23,131	$ 5,471	$ 132,396
6241	Individual and Family Services	3%	12%	3%	$ 1,194	$ 1,433	$ 592	$ 3,219
7211	Travel accomodations	5%	12%	3%	$ 2,499	$ 1,620	$ 543	$ 4,663
5614	Business Support Services	17%	12%	3%	$ 3,988	$ 845	$ 303	$ 5,136
6215	Medical Labs	3%	12%	3%	$ 1,542	$ 1,851	$ 837	$ 4,231
7113	Promoters of Performing Arts, Sports & Other Events	46%	12%	3%	$ 20,898	$ 1,854	$ 494	$ 23,246
3221	Paper Manufacturing	0%	12%	3%	$ -	$ 5,313	$ 640	$ 5,953
3241	Chemical Manufacturing	0%	12%	3%	$ -	$ 106,756	$ 10,838	$ 117,594
3312	Primary Metal Manufactuing	0%	12%	3%	$ -	$ 8,830	$ 1,511	$ 10,341
3361	Transportation Equipment Man.	0%	12%	3%	$ -	$ 48,795	$ 9,595	$ 58,390
423	Merchant Wholesalers durable goods	19%	12%	3%	$ 107,167	$ 15,567	$ 6,354	$ 129,088
424	Merchant Wholesalers, nondurable goods	19%	12%	3%	$ 124,552	$ 18,093	$ 7,385	$ 150,030
5121	Motion Picture and sound recording	100%	12%	3%	$ 6,288	$ 166	$ 54	$ 6,508
522	Credit intermediation	65%	12%	3%	$ 32,543	$ 1,742	$ 479	$ 34,764
5416	Professional and scientific services	36%	12%	3%	$ 64,618	$ 5,385	$ 2,676	$ 72,679
7220	Food Services and Drinking Estab.	5%	12%	3%	$ 7,975	$ 5,934	$ 1,807	$ 15,716
	Local government	33%	12%	3%	$ 23,066	$ 1,342	$ 1,321	$ 25,729
4930	Warehousing and storage	11%	12%	3%	$ 1,751	$ 592	$ 230	$ 2,573
	TOTAL				$ 501,877	$ 249,247	$ 51,132	$ 802,256

*Output Multipliers are different from Employment Multipliers shown in previous tables; Type I represent Direct + Indirect Impacts; Type II +Type I + Induced Impacts

Table 14

Estimated Economic Impact on Build Alternative 5

Table 14:Estimated Economic Impact on Build Alternative 5

NAICS	Industry	Share of Direct along Build Alternative 5	Share of Indirect along Build Alternative 5	Share of Induced along Build Alternative 5	Direct Impact	Indirect Impact	Induced Impact	Total Impact
2131	Support Activities for Mining	2%	6%	7%	$ 9,885	$ 11,566	$ 12,037	$ 33,488
6241	Individual and Family Services	13%	6%	7%	$ 5,174	$ 716	$ 1,303	$ 7,193
7211	Travel accomodations	9%	6%	7%	$ 4,499	$ 810	$ 1,196	$ 6,505
5614	Business Support Services	10%	6%	7%	$ 2,346	$ 422	$ 666	$ 3,435
6215	Medical Labs	13%	6%	7%	$ 6,684	$ 925	$ 1,842	$ 9,452
7113	Promoters of Performing Arts, Sports & Other Events		6%	7%	$ -	$ 927	$ 1,087	$ 2,013
3221	Paper Manufacturing	0%	6%	7%	$ -	$ 2,656	$ 1,408	$ 4,065
3241	Chemical Manufacturing	0%	6%	7%	$ -	$ 53,378	$ 23,843	$ 77,221
3312	Primary Metal Manufactuing	0%	6%	7%	$ -	$ 4,415	$ 3,325	$ 7,740
3361	Transportation Equipment Man.	0%	6%	7%	$ -	$ 24,397	$ 21,109	$ 45,506
423	Merchant Wholesalers durable goods	11%	6%	7%	$ 62,044	$ 7,784	$ 13,979	$ 83,806
424	Merchant Wholesalers, nondurable goods	11%	6%	7%	$ 72,109	$ 9,046	$ 16,246	$ 97,402
5121	Motion Picture and sound recording	0%	6%	7%	$ -	$ 83	$ 120	$ 203
522	Credit intermediation	12%	6%	7%	$ 6,008	$ 871	$ 1,054	$ 7,933
5416	Professional and scientific services	11%	6%	7%	$ 19,744	$ 2,692	$ 5,888	$ 28,325
7220	Food Services and Drinking Estab.	9%	6%	7%	$ 14,355	$ 2,967	$ 3,976	$ 21,298
	Local government	2%	6%	7%	$ 1,398	$ 671	$ 2,906	$ 4,975
4930	Warehousing and storage	28%	6%	7%	$ 4,458	$ 296	$ 506	$ 5,259
	TOTAL				$ 208,705	$ 124,624	$ 112,491	$ 445,819

*Output Multipliers are different from Employment Multipliers shown in previous tables; Type I represent Direct + Indirect Impacts; Type II +Type I + Induced Impacts

Table 15

Calculation of Agglomeration Economies from Build Alternatives Completion

Cumulative Labor Accessibility by Band without Build Alternative 5 in 2011

Band(Minutes)	Downtown	N of Downtown	Airport	Mansfield Rd	I49S	ChristusHC	LSU-Williston
0-5	18984	7220	9249	18361	19506	9561	16350
5-10	68787	55250	24977	60845	67439	54215	59648
10-15	113725	105977	73914	98355	99647	90403	98293
15-20	137209	128244	121640	113819	115757	112225	117994
20-25	144110	136226	134057	128603	132281	154387	154222
Avg Speed	10.7	11.6	13.9	11.2	11.1	13.9	13.0
Percent of LM	88%	83%	81%	78%	80%	94%	94%

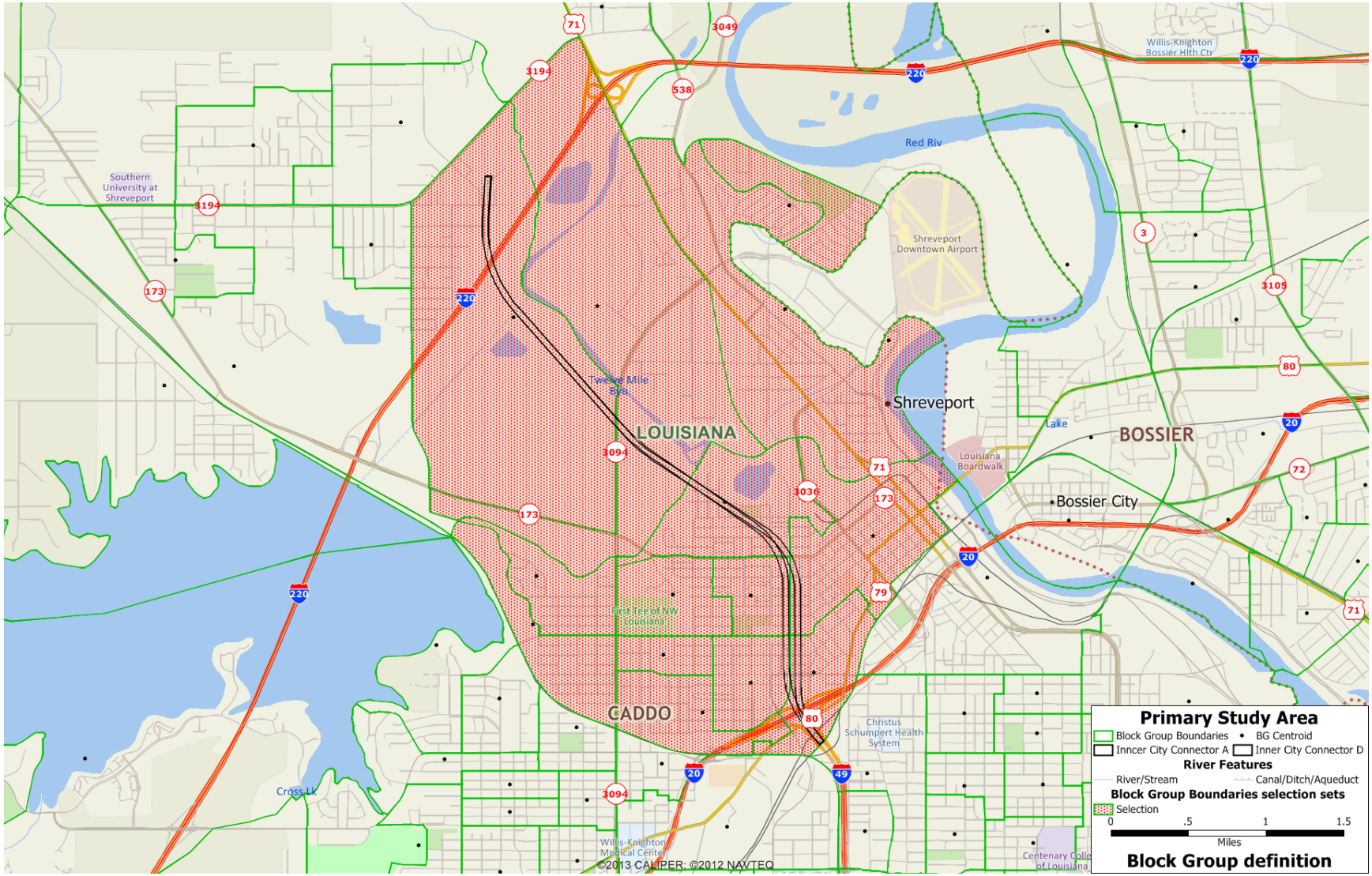
Cumulative Labor Accessibility with Build Alternative 5 in 2011

Band(Minutes)	Downtown	N of Downtown	Airport	Mansfield Rd	I49S	ChristusHC	LSU-Williston
0-5	35555	23917	22374	23661	28555	35953	14126
5-10	93180	87285	74021	75677	79990	86269	55450
10-15	122655	122327	112903	105397	113054	114565	95842
15-20	134319	135692	129017	127247	129946	131697	107080
20-25	140315	140824	138233	137046	139447	159636	153017
Avg Speed	8.8	9.4	10.3	10.4	9.9	11.0	13.6
Percent of LM available	85%	86%	84%	83%	85%	97%	93%
Travel Time Reduction %	19%	19%	26%	7%	11%	21%	-4%

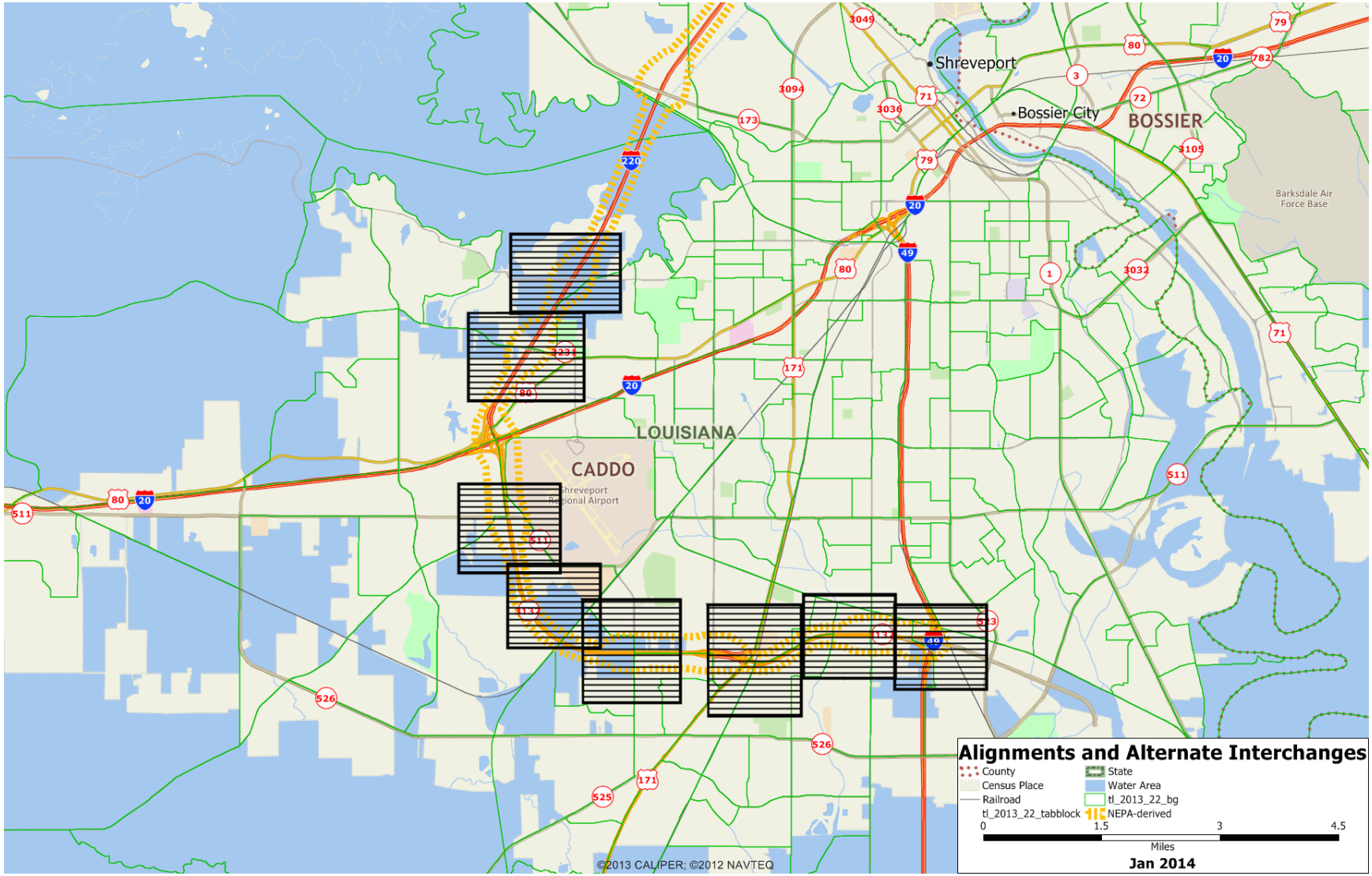
Weights (Daytime jobs)	8826	5229	5922	2752	5114	4556	12400
Weighted Avg Reduction	11.9%	11.9%					
Network Weighted Avg	3.2%	4.4%					
Agglomeration Effect in %	0.9%	1.3%					
Metro (Caddo) Payroll in 2011	$ 6,426,055,761	$ 4,822,736,898					
Agglomeration Effect in $	$ 59,809,639	$ 62,118,727					

File Source: Labor Accessibility by zone Prudhomme method

MAP 1: PSA BLOCK GROUPS



MAP 2: Interchanges along the Build Alternative 5



Map 3: downtown Commuters with I-49 Preference

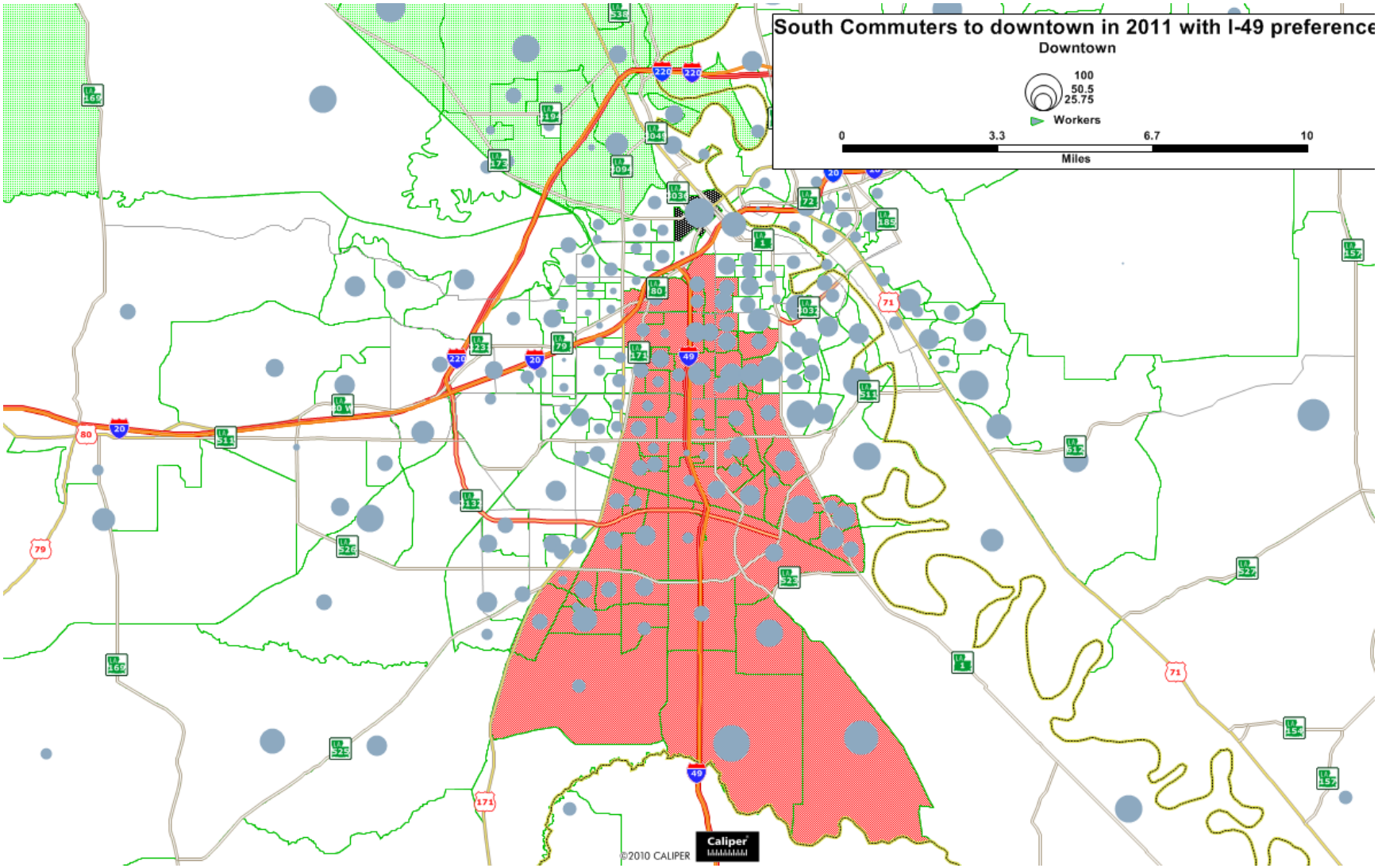
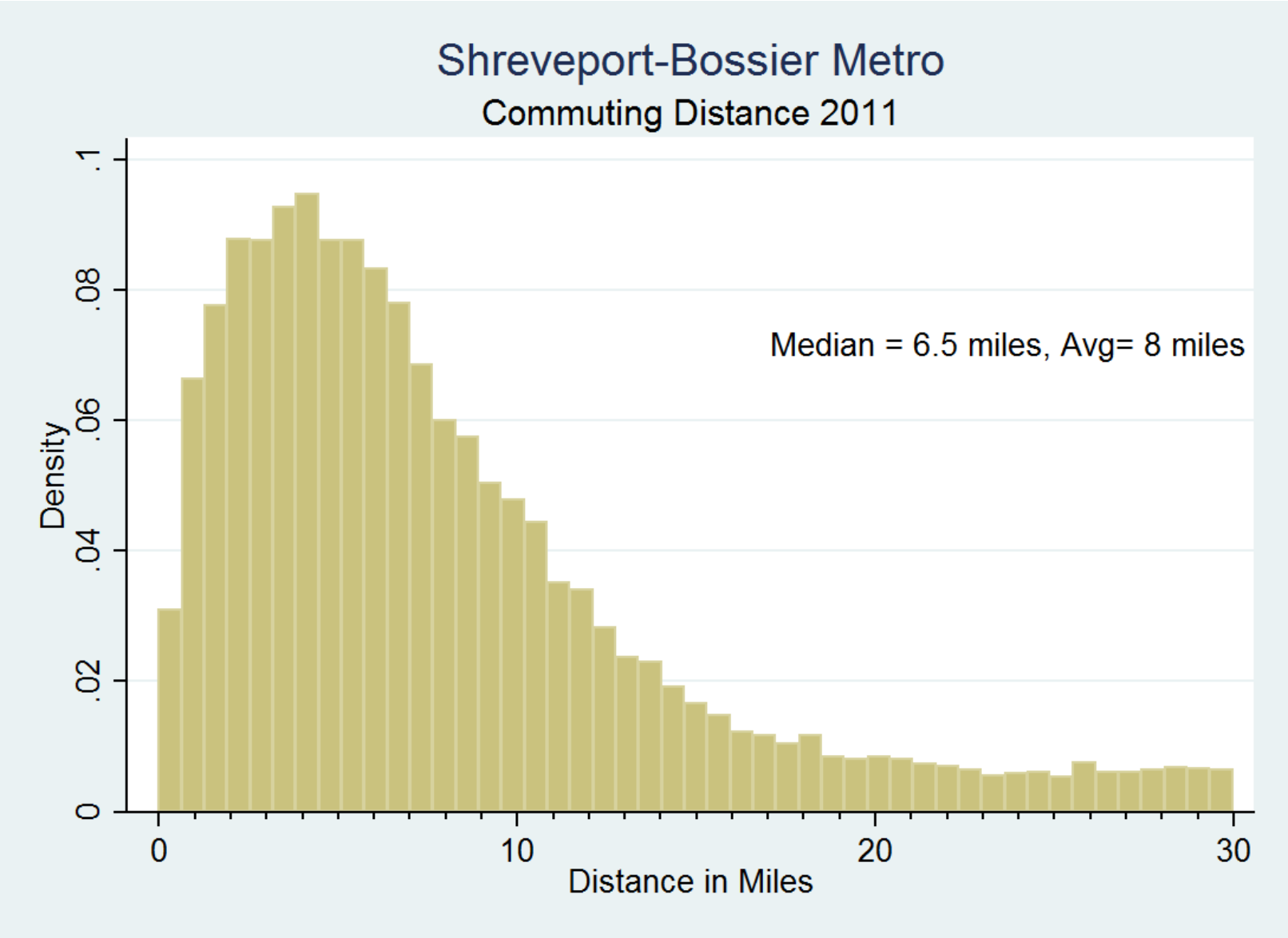
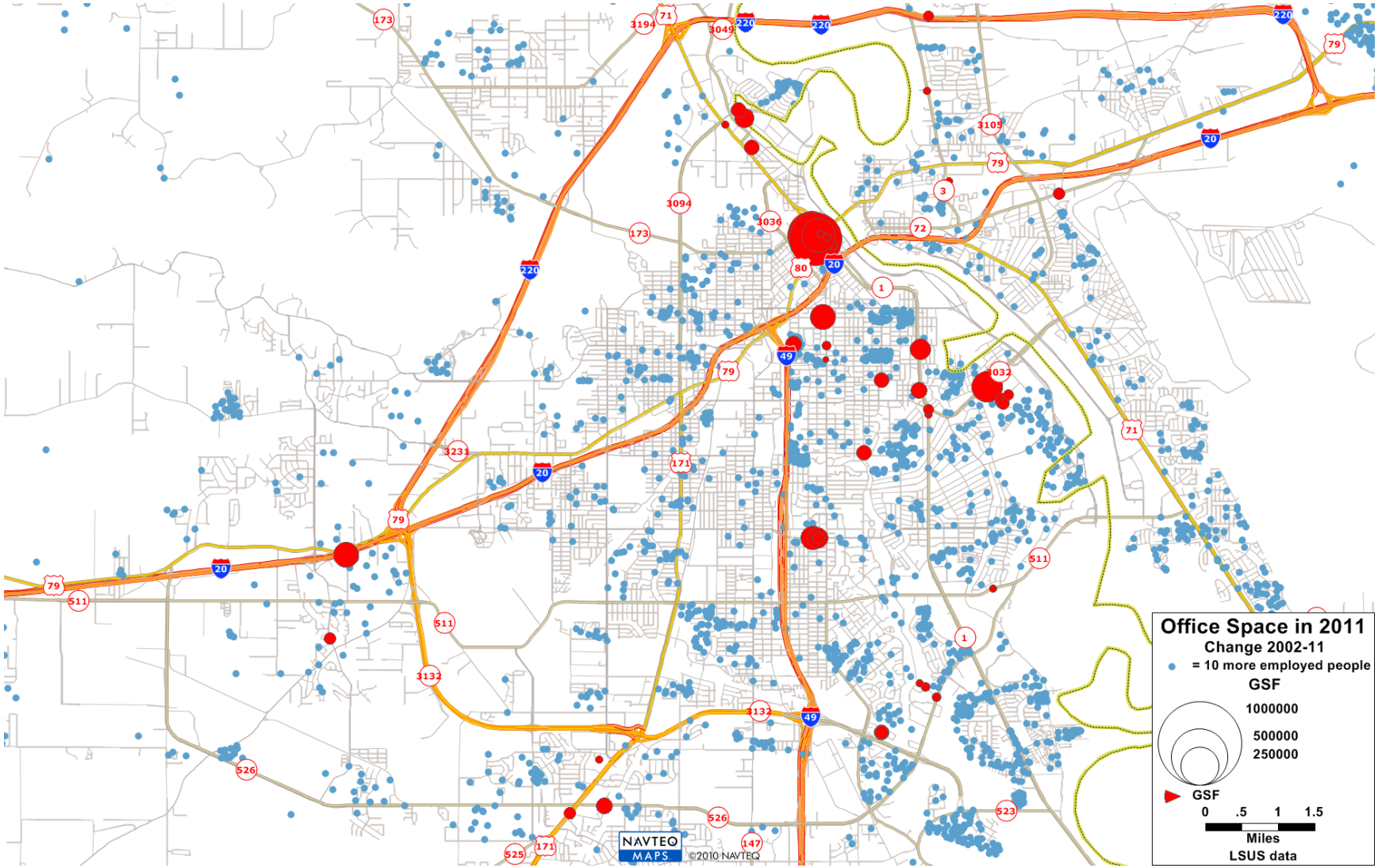


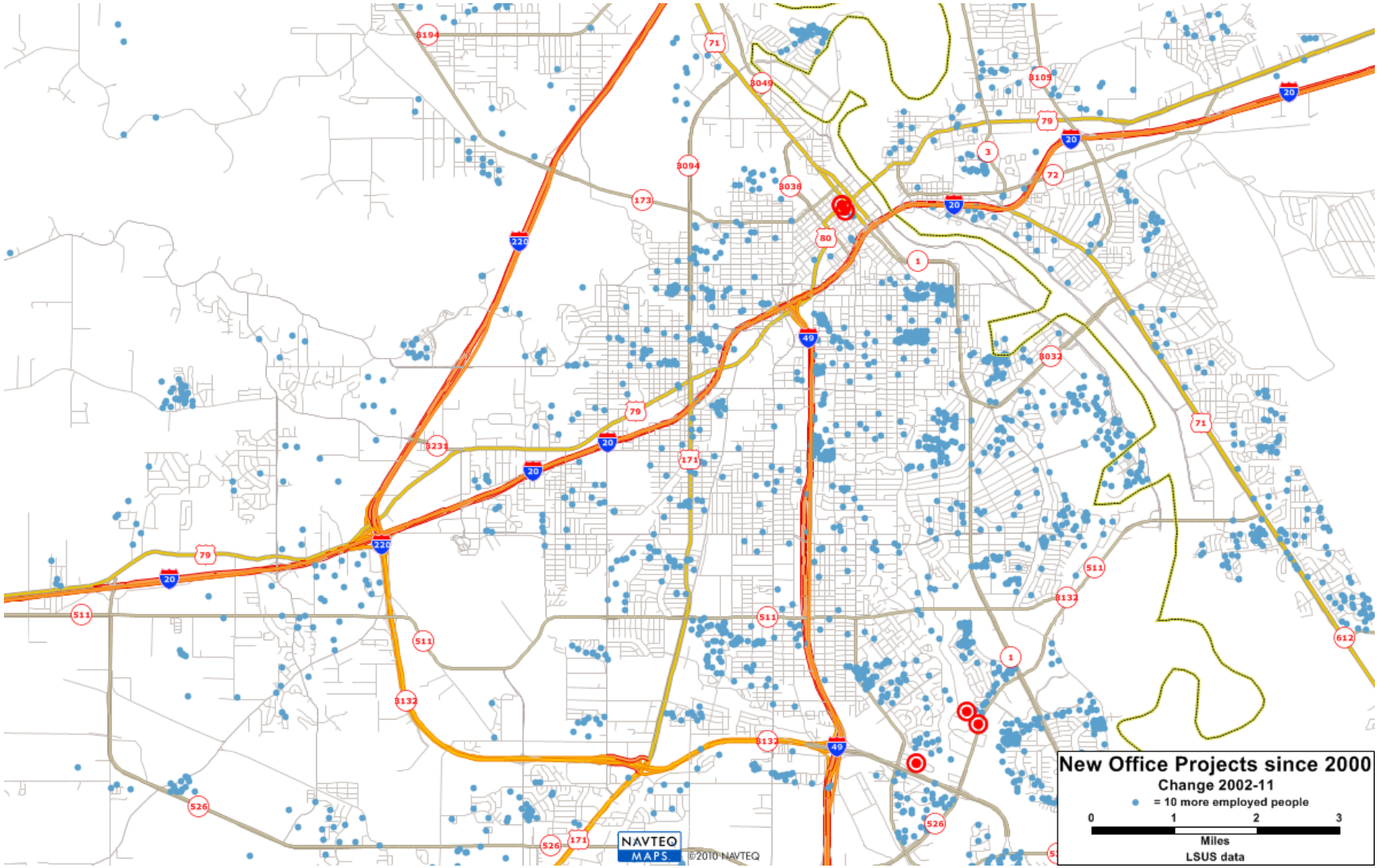
Figure 3


Shreveport-Bossier Metro
Commuting Distance 2011
Median = 6.5 miles, Avg= 8 miles
Density
0
.02
.04
.06
.08
.1
0
10
20
30
Distance in Miles

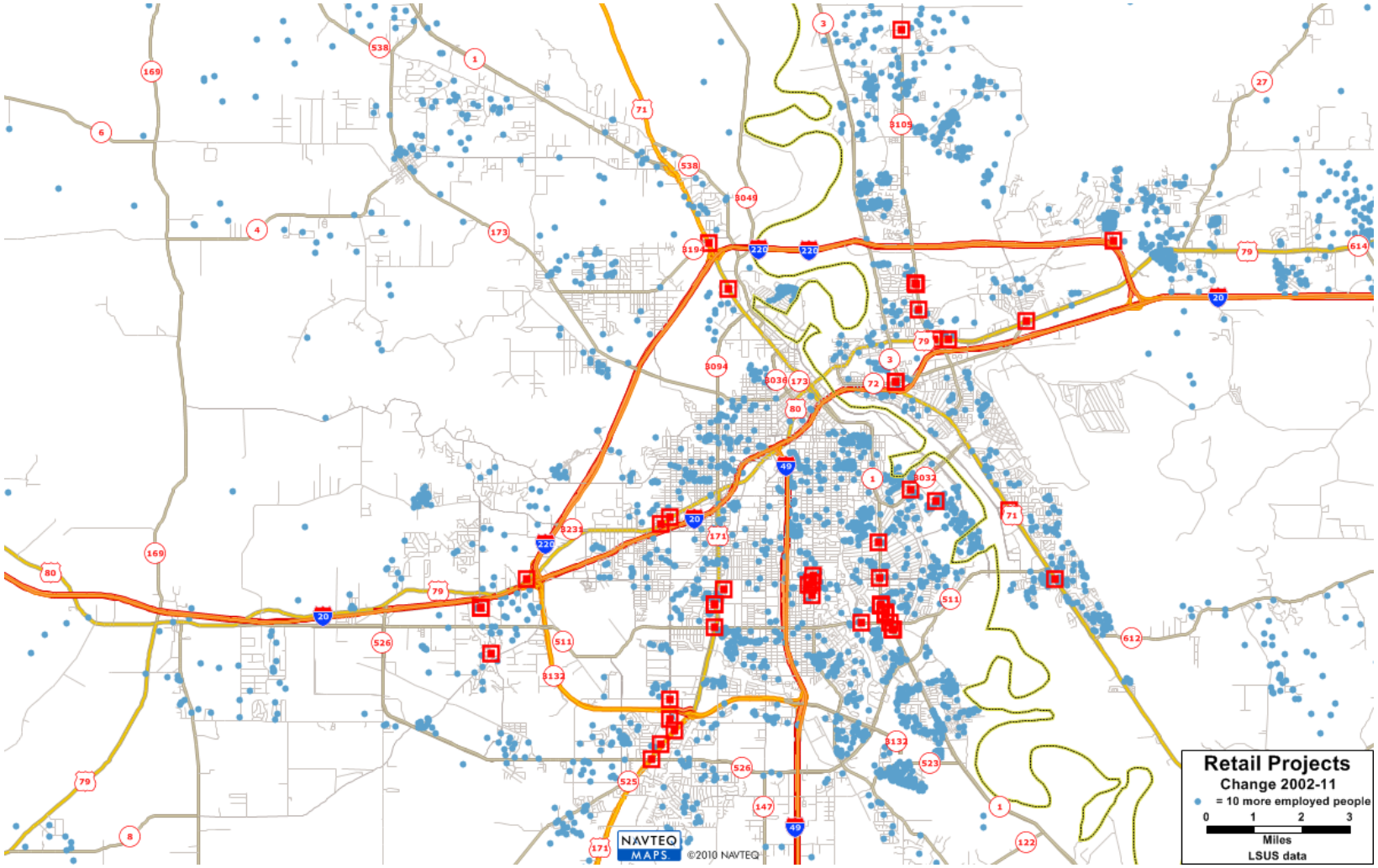
MAP 4: CURRENT OFFICE SPACE



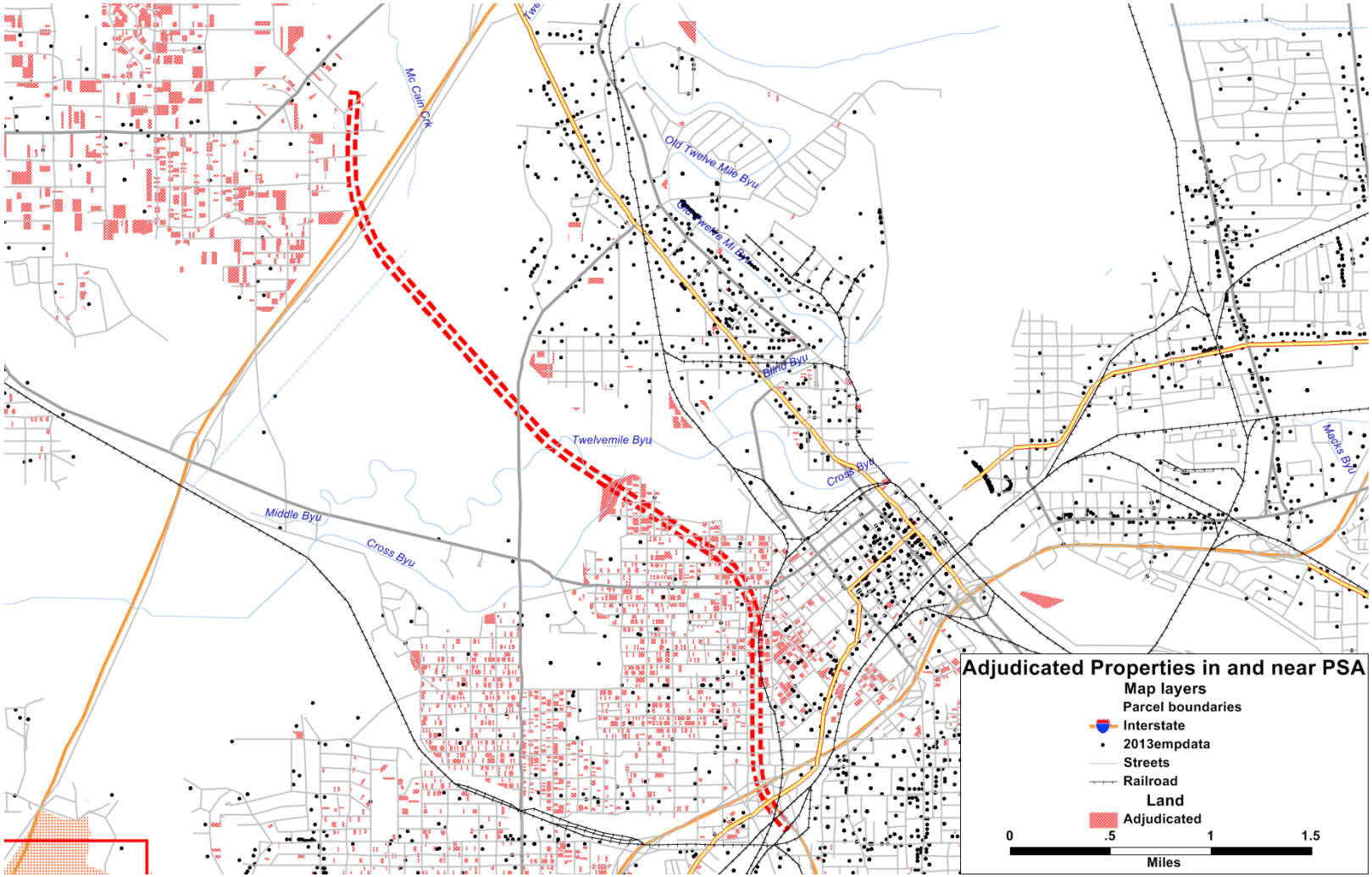
MAP 5: RECENT OFFICE SPACE



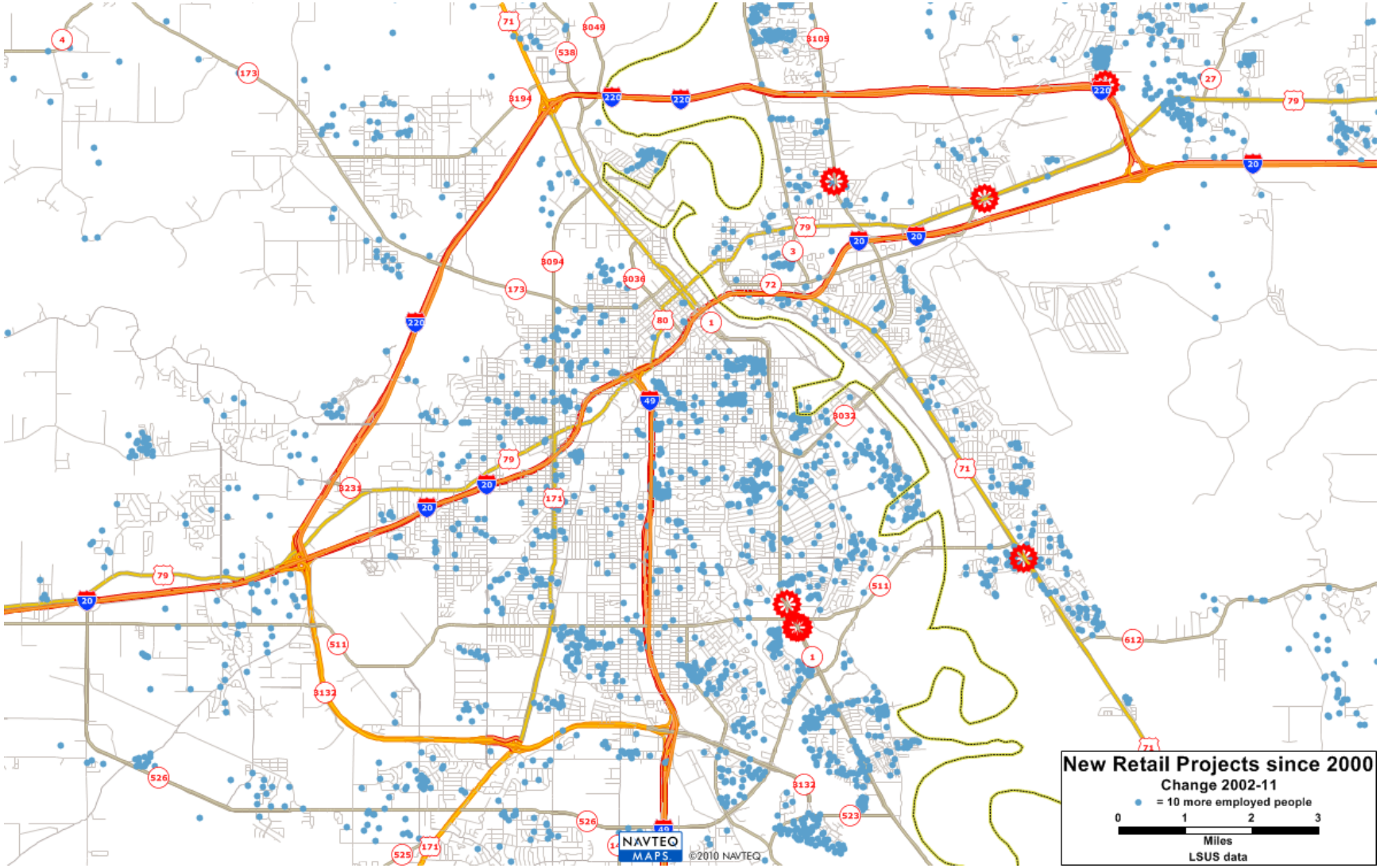
MAP 6: CURRENT RETAIL SPACE



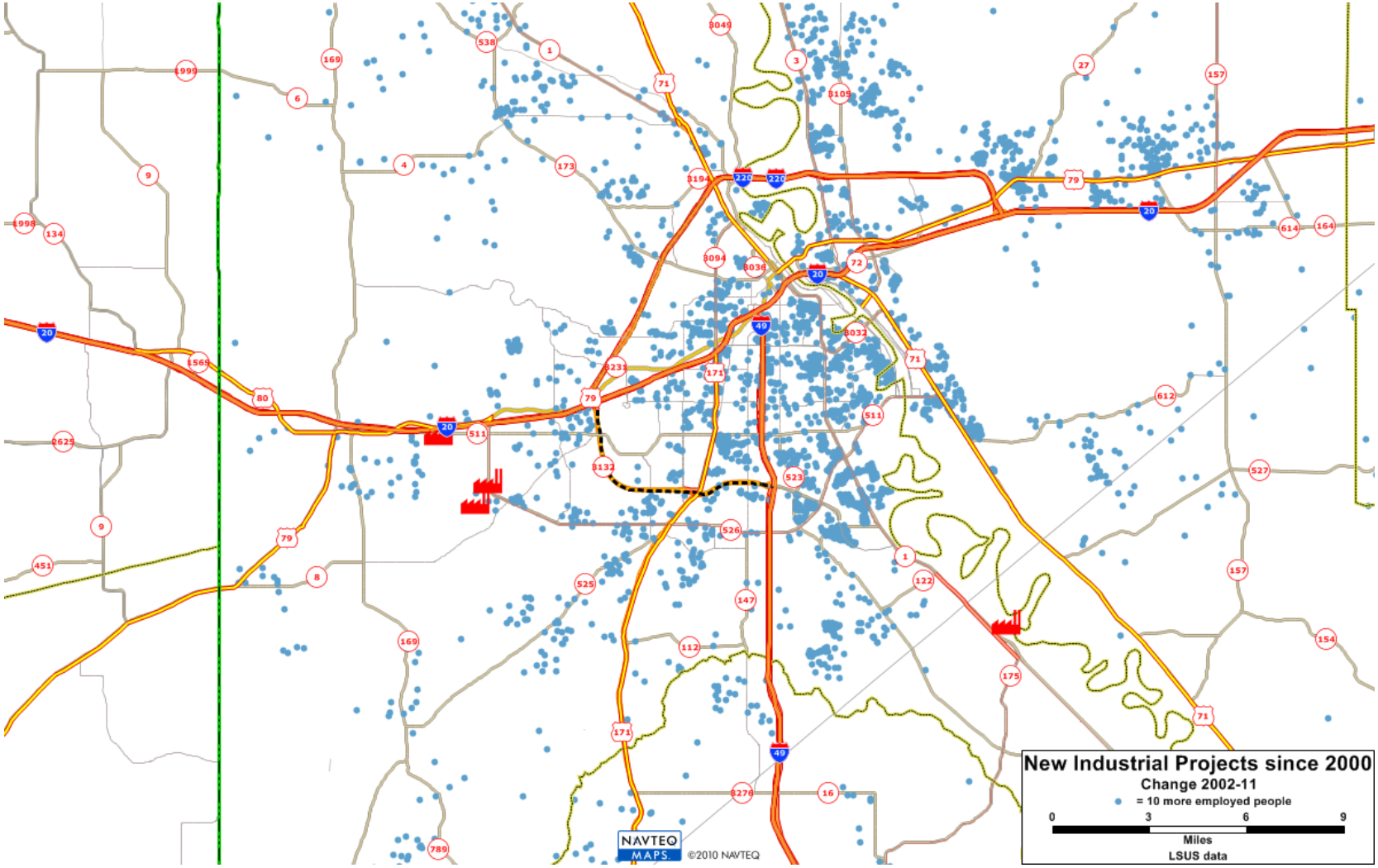
MAP 7: ADJUDICATED PROPERTIES IN OR NEAR PSA



MAP 8: RETAIL SPACE COMPLETED SINCE 2000



MAP 9: INDUSTRIAL AND WAREHOUSE PROJECTS COMPLETED SINCE 1999



MAP 10: INDUSTRIAL SPACE DISTRIBUTION