

A GREATER WACO

*Preparing for future growth in Waco through
infrastructure investments*

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THE

PERRYMAN GROUP

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Executive Summary

In recent years, Waco has seen significant growth and building momentum in the area of economic development. The City of Waco is taking many important steps in order to foster economic growth in the city and surrounding region, transforming Waco into an increasingly attractive destination for new businesses, tourists, and workers looking to relocate.

Waco has much to offer businesses and potential residents such as (among many other amenities):

- quality higher education options;
- available land for development including numerous business parks;
- a variety of incentives for business growth;
- parks and other recreational activities;
- a historic downtown district which hosts events throughout the year; and
- future undertakings including the upcoming riverfront development.

The Perryman Group expects the Waco Metropolitan Statistical Area to expand by some 59,100 residents by 2040, for a total population of 323,000. The economy is likely to double in size as measured by output (Real Gross Product), and could accelerate more through effective planning and strategic investments. This expansion will generate a need for additional infrastructure of all types.

Investments which enhance the attractiveness of Waco as a site for business activity can materially impact future growth in a positive manner. As cities have become increasingly strategic towards economic development and now aggressively compete for new activity, many municipalities view proactive infrastructure investment as an essential part of preparing for future growth.

The Perryman Group estimates that the multiplier for the Building Waco capital investment program construction process will be 3.13, that is, **every \$1.00 in direct infrastructure spending brings \$3.13 in total local spending**. The resulting total economic benefits include an estimated **\$470.5 million in gross product and 5,726 person-years of employment**. Moreover, **the program can reasonably be expected, at maturity, to support approximately \$100 million per year in additional activity in the Waco area**.

The City of Waco is taking many necessary and coordinated steps in order to support future growth in the area. Without infrastructure improvements, quality of life in the city could decline and momentum for economic growth could be interrupted. Investments now in Waco's infrastructure will help to continue expansion that can benefit the entire city and region.

Introduction to Waco, Texas

The City of Waco is located in central Texas along the I-35 corridor between Dallas-Fort Worth and Austin. The location is within 200 miles of all major Texas metropolitan markets, which account for more than 82 percent of the state's population.¹ The City of Waco covers 101.3 square miles and is surrounded by many other central Texas cities that have an effect on the local economy, including Bellmead, Woodway, Hewitt, Robinson, Lorena, McGregor, Gatesville, and China Spring.

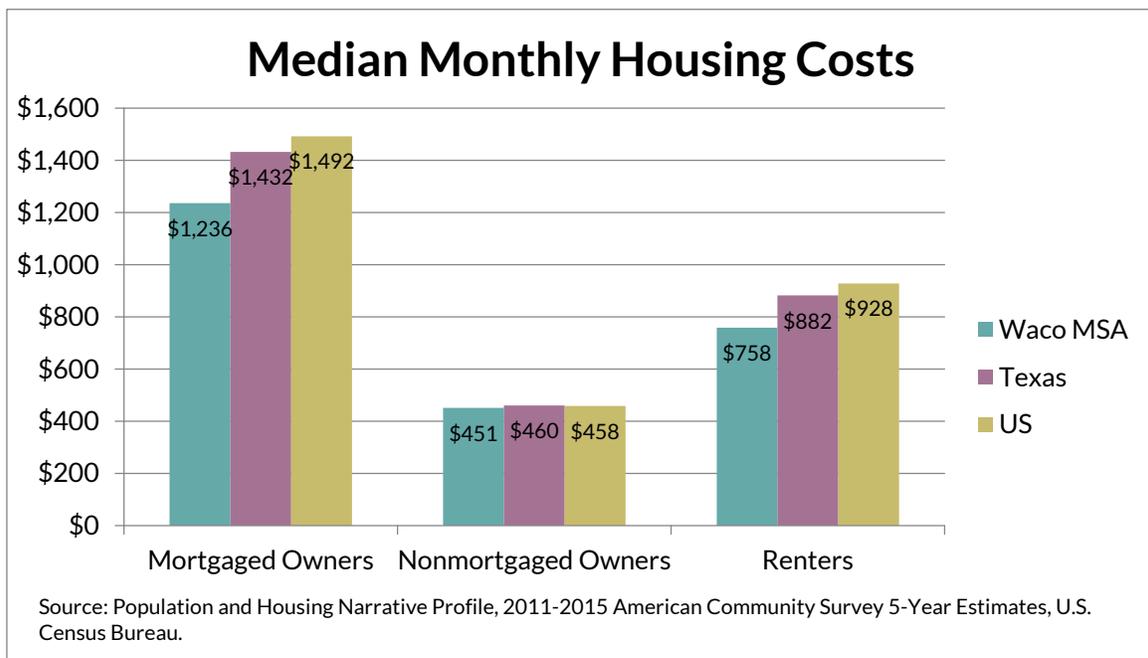
Waco was originally settled in the 1830s and 1840s on the site of a former Huaco Indian village (from hence came the city's name).² The city was officially incorporated in 1856.³ Following the economic devastation brought on by the end of the Civil War, Waco became an important stop on the Chisholm Trail, the major route for livestock out of the state, especially following completion of the Suspension Bridge (pictured right)



which was the first bridge built across the Brazos River.⁴ The steel and cabling for the bridge were acquired from John A. Roebling, who would later gain fame for many such projects, most notably the Brooklyn Bridge in New York.⁵ In 1871, the railroad reached Waco, adding to the city's appeal as a popular trade center.⁶ The city soon became one of the world's leading producers of cotton and was also known for its insurance industry.⁷ By the 1950s, the city had grown to become the sixth largest industrial center in Texas, with more than 250 factories producing a wide range of products such as cotton, tires, glass, and furniture.⁸ However, on May 11, 1953, a tornado came through downtown Waco and decimated its industrial core, destroying or damaging beyond repair close to 600 business buildings.⁹ The city was slow to recover and was the target of Texas' first Urban Renewal project in 1964.¹⁰ Following an economic downturn in the 1980s, the city began to target tourists in the 1990s with attractions such as the Cameron Park Zoo, Texas Sports Hall of Fame, and Dr. Pepper Museum.¹¹ In recent years, Waco has seen a lot of growth and momentum in the area of economic development.

In 2015, the City of Waco had a population of over 132,300.¹² The city’s population has grown 5.5% over the past five years, slower than the 8.8% rate at which the Texas population grew but still outpacing the national growth rate of 3.9% over that time period.¹³ Waco is the largest city in the Waco Metropolitan Statistical Area (MSA), which includes Falls and McLennan counties and had a total population of over 262,400 in 2015.¹⁴ The MSA has grown by 11.2% over the past five years, significantly outpacing both the state and nation in terms of population growth. In 2014, approximately 67.7% of people employed in the City of Waco live outside the city limits, most commuting from other parts of the MSA.¹⁵ On the other hand, 51.1% of people who live in the City of Waco work outside the city limits.¹⁶ Over the 2011-2015 period, the average commute time for those working in the MSA was 19 minutes.¹⁷

According to the most recent US Census Bureau estimates,¹⁸ approximately 16,700 people moved to Waco in 2014. Over 75% of those individuals moved from other metropolitan areas in the US. The largest proportion of movers (17.5%) came from the Dallas-Fort Worth-Arlington MSA, with which the Waco MSA has a positive net migration (meaning that more people moved to Waco from the Dallas area than moved to the Dallas area from Waco). Other major originating metropolitan areas for new residents were the Houston-The Woodlands-Sugar Land, Killeen-Temple, Austin-Round Rock, and San Antonio-New Braunfels MSAs. Approximately 4.4% of those moving to Waco in 2014 were from abroad.



In 2015, approximately 65.8% of the MSA population is of a working age, commonly defined as 15 to 64 years old.¹⁹ The median age is 34.1 years.²⁰ Over

2011 to 2015, families made up 66% of households in the MSA and 33% of all households have children (at least one person under the age of 18).²¹ The median household income was \$42,231 and approximately 22% of people were living in poverty.²² However, the cost of living in Waco has been estimated to be about 12-19% lower than the national average, particularly due to housing costs.²³ The median monthly housing cost was \$1,236 for mortgaged owners, \$451 for nonmortgaged owners, and \$758 for renters.²⁴ A comparison between median monthly housing costs in Waco, Texas, and the nation is shown in the chart above. Among the occupied housing units in the MSA, 59% were owner occupied and 41% were renter occupied.²⁵

About 77.1% of the population identified themselves as White, 15.1% as Black or African American, and 1.5% as Asian.²⁶ Furthermore, 24.6% of the population identified themselves as Hispanic or of Latino origin.²⁷ About 92% of the people living in the Waco MSA were born in the US and 73% were born in Texas.²⁸ Among people at least 5 years of age, 19% spoke a language other than English at home.²⁹ Of these individuals, 87% spoke Spanish and 13% spoke a different language; 47% indicated that they did not speak English “very well.”³⁰

There were 76,200 total students in the Waco MSA in 2015.³¹ Approximately 7,600 students (10.0%) were enrolled in nursery school or kindergarten and another 42,700 (56.0%) were enrolled in elementary to high school.³² Around 84.4% of Waco MSA residents 25 years and over have at least a high school degree, slightly above the statewide percentage of 82.4%.³³



There were 25,900 students enrolled in college or graduate school in the Waco MSA in 2015.³⁴ Around 54.8% of the population 25 years or older in the Waco MSA has had at least some college and 22.5% have a bachelor's degree or higher.³⁵ The MSA contains three institutions of post-secondary study: Baylor University, McLennan Community College (MCC), and Texas State Technical College (TSTC).

Though enrollment at MCC and TSTC has fallen over recent years (as is typical with an improving economy), enrollment at Baylor has grown steadily year-to-year, with undergraduate enrollment increasing by 14.1% from 2011 to 2016.³⁶

The latest employment estimates for the Waco MSA show a current labor force of nearly 122,000 and an unemployment rate of 3.9% for December 2016, well below the state and U.S. rates.³⁷ Total nonfarm employment increased by 3,000 net jobs over the past 12 months to 119,500 in December, for an annual growth rate of 2.6 percent (the fourth highest among MSAs in Texas).³⁸ The largest private sectors of employment in the MSA are trade, transportation, and utilities (18% of nonfarm employment); education and health services (17%); and manufacturing (14%).³⁹ The government sector, which includes employers such as the City of Waco, McLennan County, and the U.S. Department of Veterans Affairs, employs an additional 16% of the nonagricultural labor force.⁴⁰



According to the Greater Waco Chamber of Commerce, the largest employers in Waco are Baylor University, Waco ISD, Providence Healthcare Network, Baylor Scott & White Hillcrest Medical Center, and L-3 Platform Integration.⁴¹

Recently the growth in the Waco economy has been getting national attention, as reflected in upgrades to the city's bond ratings. In 2016, Standard & Poor's (S&P) Ratings Services raised its long-term and underlying ratings of Waco's general obligation bond from AA to AA+, its second highest available rating.⁴² The upgrade reflects S&P's "opinion of Waco's improved economic indicators and sustained financial stability," recognizing that "Waco will continue to remain what [S&P] consider[s] to be a broad and diverse MSA, and that it will continue to experience steady growth."⁴³ Moody's, another rating agency, also recently upgraded the city's bonds from Aa2 to Aa1, its second highest rating, citing "an expanding economy supporting solid gain in assessed values, and a consistent history of strong operating performance."⁴⁴ The upgrade also reflects "the city's size and regional importance which should sustain stable economic and financial trends."⁴⁵

Economic Momentum in Waco

The City of Waco is taking many important steps in order to foster economic growth in the city and surrounding region, transforming Waco into an increasingly attractive destination for new businesses, tourists, and workers looking to relocate. Though any city can unilaterally take steps to encourage growth in their area, both the private and public sectors must work together in order to generate sustainable economic growth. Waco currently has many key initiatives in place which, combined with the city's unique characteristics, have great potential to produce sustained growth in the area.

Attracting New Businesses to Waco

Waco has much to offer to businesses looking to locate in the city and surrounding area. New businesses to an area are important as these can be important sources of new jobs for both workers already living in an area and those who would relocate for a position.

The presence of Baylor University, MCC, and TSTC has the potential to provide an educated workforce in both technical and professional fields. Furthermore, Waco is located in the middle of the future educated workforce, with approximately 345,000 students enrolled in four-year institutions and 220,000 enrolled in two-year institutions within a 200-mile radius of the city.⁴⁶ Waco's central location is one of its greatest assets, from prospective labor pools to ease of access to the state's major metropolitan centers.

Another asset that Waco has to offer, like much of the rest of Texas, is available land for development. While having available, reasonably-priced land is not the only factor that businesses look at when considering expanding or locating in a specific area, the lack of ready real estate and infrastructure can be detrimental. In order to stimulate economic growth, the Waco area has eleven business parks sponsored by cities, private individuals, and non-profits such as the Waco Industrial Foundation.⁴⁷

One business park is the Texas Central Park, which covers 3,000 acres along I-35, Texas Highway 6, and US Highway 84.⁴⁸ The park is served by the Union Pacific Railroad and is home to approximately 75 companies which employ over 8,600 workers.⁴⁹ Furthermore, the Waco International Aviation Park near TSTC offers over 1,000 acres at and near the TSTC airport for development and is currently home to L-3 Integrated Communications, Sanderson Farms, and Dr. Pepper

Bottling.⁵⁰ Another business park that has an aerospace focus is the McGregor Industrial Park, which encompasses over 9,600 acres (partially in Western McLennan County) and currently houses SpaceX and Ferguson Enterprises.⁵¹

One recent addition that also seeks to promote new business opportunities in Waco is the Baylor Research and Innovation Collaborative (BRIC) located within the Central Texas Technology and Research Park.⁵² BRIC is a research discovery park and business incubator with over 300,000 square feet of laboratory and office space and seeks to encourage local



innovation and spur economic development, citing studies that for every job in a research park, another 2.57 jobs are created.⁵³ BRIC is a partnership between Baylor University, the City of Waco, the City of Bellmead, Greater Waco Chamber, McLennan County, Waco Foundation, Cooper Foundation, and TSTC.⁵⁴ The center not only seeks to offer office and research space, but also workforce training opportunities through TSTC.

In addition, the city offers a wide variety of incentives for business, such as tax abatements, business grants, and a bond financing program.⁵⁵ There are also specific incentives for businesses locating or renovating property within certain locations, such as Enterprise Zones, the Foreign Trade Zone, the Downtown Overlay District, Tax Incremental Financing (TIF) Zone, the Public Improvement District Number One (PID1), and the Brazos River Corridor Overlay.⁵⁶ State development funds and loan programs are also available for those starting a business in Waco.⁵⁷

Incentive packages offered by cities and the state have played a major role in persuading businesses to locate in the area and often provide benefits in the form of new jobs and additional capital investments well beyond the initial incentive offered.⁵⁸ In a 2014 study, The Perryman Group estimated that **every one dollar in local incentives for location, retention, or expansion over the past 25 years generated \$10.84 annually in economic activity (gross product) in the state of Texas.**

Recently, there have been several businesses that have chosen to either locate or expand current operations in Waco. For example, Channel Control Merchants,

LLC, who operates the Dirt Cheap brand, acquired a 200,000 square foot building and will invest an additional \$1,050,000 in capital improvements and hire nearly 120 employees.⁵⁹ Furthermore, Polyglass USA, Inc. also announced plans to establish a manufacturing operation in Waco. The company plans to invest \$19 million in a 145,000 square-foot facility and will create 45 full-time jobs within the first three years.⁶⁰ In addition, Allergan recently broke ground on a \$200 million expansion to its Waco facility that will add 322,000 square feet of manufacturing space and is expected to add from 100 to as many as 250 full time jobs.⁶¹ Another \$5.8 million expansion by Time Manufacturing, a truck-mounted hydraulic lift manufacturer, will add over 120 jobs over the next four years.⁶² Caterpillar, an equipment manufacturer who has multiple locations in Waco and has invested over \$50 million in the area over the past 20 years, installed \$6.3 million in additional machinery in 2013 and committed to creating an additional 60 full-time jobs by the end of 2015.⁶³

Attracting New Talent to Waco

While measures to attract new businesses are important, many economic developers are seeing them as only secondary measures compared to strategies that focus on the fundamental characteristics of an area, such as its ability to attract talented workers to the area, knowing that businesses will follow the talent pool. In order for an area to grow, a location needs to be a place where people want to live. One important strategy for improving the desirability of a location is placemaking, or place-based economic development, which refers to planning, creating, and maintaining public spaces and amenities in order to increase the quality of life in a locale so that people will want to live there. This strategy relies on identifying and utilizing the unique assets of a city in order to help foster a unique and authentic character to create a competitive locale.



One major aspect of creating livable and desirable communities is the presence of parks. There is overwhelming research that points towards the economic and psychological value of parks and valuable open spaces. Parks can increase the aesthetic value of a community, provide valuable

recreational opportunities, increase property values, and attract new workers and homebuyers.⁶⁴ Waco offers five city-sponsored community centers and over 30 parks with various amenities.⁶⁵ The largest and most well-known of these is Cameron Park, a 400-acre park that borders the Brazos and Bosque Rivers.⁶⁶ The park includes nearly 20 miles of trails for walking, running, biking, and horseback riding; three playgrounds; disc golf courses; cliff-side views; numerous pavilions; and the Cameron Park Zoo.⁶⁷

Another major focus of placemaking strategies is often the downtown area of a city. Downtowns are a major aspect of the character of a city, from historic buildings to cultural experiences. Although development patterns in recent decades have diminished their traditional role, a renaissance is now underway. Downtowns are again representing the core of a city's professional and cultural spheres, providing a place for people to come together for all aspects of life. Downtown areas, as opposed to suburban areas where space is desired, typically follow the mantra *more is better*. The more activity that happens in a downtown, both business and leisure, the more people will want to live, work, play, and interact there.



Downtown Waco has been a major focus of development in recent years. According to the Greater Waco Chamber, more than \$750 million in private development activity in the downtown area has been announced since 2007.⁶⁸ In 2013, Waco was named a “Texas Main Street City” by the Texas Historical Commission, a designation that recognizes the architectural heritage of a city and opens it to free consulting services from the historical commission as well as



potential future grants and investment.⁶⁹ The designated area includes much of the west side of downtown that is also listed in the National Register of Historic Places,

but also includes parts of East Waco, including Elm Avenue.⁷⁰ In 2016, the Texas Commission on the Arts approved the Waco Downtown Cultural District, which also covers downtown and parts of East Waco which contain entertainment venues, museums, art galleries, public art, and local restaurants, bars, and shops.⁷¹ The designation, which can produce greater access to funding and promotion, recognizes the important role the arts play in the economic and cultural life of Waco.⁷²

There are numerous successful events and destinations downtown that are aiding in establishing the local character of the city and making it into a popular location. For example, the Waco Downton Farmer's Market offers a range of products from over 60 local farmers, artisans, and food vendors, accumulating around \$500,000 in gross sales per year.⁷³ The market draws 2,000 to 3,000 visitors every Saturday in its peak season and is a noted gathering event for citizens of Waco as well as tourists.⁷⁴ The recently constructed McLane Stadium attracts numerous visitors to Waco during football season, and, due to its proximity, increases foot traffic and activity downtown. The stadium, together with other improvements along I-35, also serves as an aesthetic focal point for the area. Other events in downtown throughout the year also draw large crowds, including the Texas Food Truck Showdown, the Brazos Nights concert series, and the holiday celebration Waco Wonderland. These events attract thousands of people to downtown to experience Waco and help build momentum for continued investment and growth.⁷⁵



One large catalyst for downtown momentum has been the Magnolia Market and Silos, the retail destination for HGTV's "Fixer Upper" stars Chip and Joanna Gaines. The venue, which includes a home décor store, bakery, local food trucks, and outdoor space, is located near downtown and draws, on average, 20,000 visitors to Waco every week.⁷⁶ The company reported that it had

hosted 1.2 million visitors during 2016 as of November.⁷⁷ The surge of tourism in Waco associated with the local attraction contributed to a 19 percent growth in hotel revenues and a record 1.9 million visits to major Waco attractions in 2016 as of November, which is three times the number for all visits in 2015.⁷⁸ In addition to

drawing tourists to their store, the Silos have also produced a lot of positive national attention for the city that showcases multiple local business and attractions in addition to the Magnolia spots.⁷⁹

The growth in downtown activity is spurring further investment and development. One particularly anticipated downtown enhancement is the Brazos Promenade, a riverfront development that will extend along University Parks and the Brazos River from Jackson Avenue to I-35. The development seeks to “enhance the unique elements Waco offers and connect the downtown area to the Brazos riverfront.”⁸⁰ The plans include retail, restaurant, and office space as well as a boutique hotel and a plaza designed for use by the local farmer’s market.⁸¹ The City of Waco is set to begin clearing the site in February 2017, with construction beginning in the summer.⁸²

Economic Outlook for Waco, TX

The Waco MSA economy is expected to experience growth at a healthy pace over an extended time period, though business cycles in intervening years are likely. The Perryman Group’s baseline forecast indicates that output (real gross product--RGP) in the area will likely rise at a 3.30% annual pace through 2040, resulting in an increase of close to \$12.1 billion and ultimately more than doubling in size from the current (2016) level.

The population of the area is projected to expand by approximately 59,100 by 2040 and bring the number of residents to nearly 323,000. Employment is forecast to grow 1.48% yearly through 2040, resulting in almost 51,000 net new jobs. Real personal income and real retail sales are projected to increase by 3.64% and 3.71% per year, respectively, a pace that will support modest increases in overall living standards.

For the purpose of comparison, the rate of growth for output (RGP) in Texas is forecast to be 3.25% annually through 2040, with employment in the state expanding at a pace of 1.70% per year.

Economic Outlook for Waco MSA 2016 - 2040				
Key Indicator	2016 Level	Projected 2040 Level	Projected Growth Rate*	Projected Increase
Real Gross Product*	\$10.246 billion	\$22.322 billion	3.30%	\$12.075 billion
Population	263,833	322,960	0.85%	59,127
Wage & Salary Employment	121,033	172,028	1.48%	50,996
Real Personal Income*	\$8.914 billion	\$21.027 billion	3.64%	\$12.113 billion
Real Retail Sales*	\$3.334 billion	\$7.989 billion	3.71%	\$4.655 billion

*Compound Annual Growth Rate, meaning that it reflects changes in the base from which growth is calculated. Real Gross Product and Real Retail Sales are computed in 2009 dollars. Real Personal Income by place of residence, in 2009 dollars. 'Projected Increase' may differ from the difference of the table values due to rounding. See the Appendices for further information.

Growth in Employment by Sector

Following the pattern typical throughout the US, the services sector is projected to generate a significant share of the net new jobs through 2040, with a gain of more than 31,200 over the period. The wholesale and retail trade sector is also projected to grow markedly, expanding by close to 6,500 jobs. Other significant areas of growth will be in the government, manufacturing, and construction sectors, as shown in the table below.

Projected 2016 - 2040 Waco MSA Employment and Output (RGP) Growth by Sector				
Sector	Projected Employment Change	Projected Growth Rate*	Projected Output Change	Projected Growth Rate*
Agriculture	45	0.23%	\$0.054 billion	1.82%
Mining	92	1.42%	\$0.073 billion	2.75%
Construction	2,477	1.18%	\$0.404 billion	2.26%
Total Manufacturing	3,769	0.90%	\$4.622 billion	4.22%
Durable Mfg.	3,004	1.09%	\$3.416 billion	4.89%
Nondurable Mfg.	765	0.53%	\$1.206 billion	3.07%
Trade	6,465	1.34%	\$1.486 billion	3.20%
TWU*	833	0.94%	\$0.325 billion	2.63%
Information	62	0.20%	\$0.264 billion	2.73%
FIRE*	1,805	0.98%	\$1.138 billion	2.82%
Services	31,233	2.09%	\$3.005 billion	3.49%
Government	4,214	0.82%	\$0.704 billion	1.88%
TOTAL	50,996	1.48%	\$12.075 billion	3.30%

*Compound Annual Growth Rate, meaning that it reflects changes in the base from which growth is calculated. TWU is Transportation, Warehousing, & Utilities; FIRE is Finance, Insurance, & Real Estate. See Appendices for more information.

The manufacturing sector, particularly durable manufacturing, leads the pace of RGP growth through 2040, with compound annual expansion over the period forecast at a 4.22% annual rate (4.89% per year for durable manufacturing). Several other sectors are expected to see notable growth rates during the period,

including services (3.49% growth per year); wholesale and retail trade (3.20%); and finance, insurance, and real estate (2.82%).

The forecast methodology used by The Perryman Group as well as definitions of economic terms are explained in the Appendices to this report. It should be noted that the “baseline” forecast is predicated on currently expected patterns in terms of relative competitiveness of the area. Investments which enhance the attractiveness of Waco as a site for business activity can materially impact future growth in a positive manner.

Future Demand for Real Estate in Waco

Growth in the various sectors of Waco’s economy leads to the need for additional real estate, whether for office or retail or other uses. The Perryman Group performed an analysis which makes use of its proprietary US Multi-Regional Real Estate Absorption System in order to estimate the future demand for additional real estate, whether through repurposing existing buildings or adding new developments. This system essentially translates detailed estimates of economic growth from The Perryman Group’s Texas Econometric Model into additional space needs. The largest needs over the long-term horizon are for additional office and industrial space, followed by additional hospitals or health facilities and retail spaces. The demand for additional real estate in the Waco MSA is shown in the table below.

The Demand for Occupied Real Estate in Waco (In Millions of Square Feet)			
Category	2016	2040	Net Change
Office	15.185	21.964	6.779
Retail (including Food Service)	7.240	10.203	2.964
Industrial	16.985	21.359	4.374
Warehouse/ Wholesale	6.782	8.954	2.172
Hospitals/ Health Facilities	4.737	8.208	3.471
Amusements/ Motion Pictures	1.190	1.795	0.605
Hospitality	1.176	2.181	1.005
SOURCE: Texas Multi-Regional Real Estate Absorption System, The Perryman Group.			

Need for Infrastructure Development

Further investments in infrastructure are needed in order to support future growth in Waco, particularly as a growing economy will demand new real estate developments. Infrastructure refers to the “fundamental facilities and systems that are essential to enable, sustain, and/or enhance living conditions and the economy in an area.”⁸³ These structures often include roads and bridges; water treatment, storage, and distribution; and sewers and wastewater treatment.⁸⁴ These underlying structures are absolutely necessary for everyday life but by their very nature are often hidden and therefore go unnoticed most of the time unless there is a problem.⁸⁵ In the past, many cities have been merely reactive to city growth and the need for infrastructure improvements, only adding additional facilities and structures as deficiencies become apparent. However, as cities have become increasingly strategic towards economic development and now aggressively compete for new activity, many municipalities view proactive infrastructure investment as an essential part of preparing for future growth.⁸⁶

In order to meet the growing needs of the Waco community, the City of Waco has embarked on a 10-year Capital Improvement Project (CIP) that will renew and expand essential parts of Waco’s infrastructure.⁸⁷ Specifically, the program looks to invest \$139 million in wastewater projects, \$131 million in water projects, and \$50 million in street improvements.⁸⁸ The main goals of the CIP are to “maintain Waco’s quality of life, foster economic growth and increase long-term sustainability.”⁸⁹

The City of Waco currently serves the water needs of more than 131,000 residents and seeks to be able to serve the estimated additional 40,000 residents over the next 25 years.⁹⁰ Planning has also taken into account growing business developments by ensuring that large non-residential users were also a part of future projections.⁹¹ This approach is particularly vital as many of the people who work in the City of Waco live outside city limits but will nevertheless contribute to water-use through personal and business activities during the day.

Waco, unlike many Texas cities, is well positioned with regard to future water supplies due to the availability of water from Lake Waco, a major asset to the region. The city has also recently expanded and updated both its water treatment and wastewater treatment facilities in order to increase overall capacity. However, in some segments, Waco’s current infrastructure is 50 to 100 years old and now requires replacement or updating.⁹² Much of the CIP involves updating parts of the distribution system such as water lines, pump stations, and storage tanks in

order to ensure that areas will have the coverage they require. The City seeks to pay for the CIP through modest increases in water and wastewater rates that will average about \$10 a month for residents and \$25 a month for a typical business customer.⁹³

There are also plans to update other areas of Waco's infrastructure in order to support current needs and projected growth in the area. Recently, the Texas Transportation Commission proposed a commitment of \$115 million to rebuilding and upgrading the stretch of I-35 that runs through Waco, a project which will ultimately cost \$300 million and could start in two years should the proposed funds be approved.⁹⁴ Much of the Waco section of I-35 is close to 50 years old and the project could be instrumental in helping traffic flows to the major sections of town, including to and from the industrial sectors along I-35, including the Texas Central Park and Robinson Business Park located near the I-35 and Highway 6 junction.⁹⁵ Waco Transit also has plans to reorganize the bus system in Waco through utilizing a "bus rapid transit" system that would cut down the crosstown travel times. A feasibility study is currently underway and the new system, if funding is obtained, could be operational as early as 2022 and could serve those without access to automobiles as well as those who would not typically utilize public transit.⁹⁶

Economic Benefits

Any economic stimulus, whether positive or negative, generates multiplier effects through the economy. As the City of Waco invests in infrastructure, for example, there will be opportunities for various local vendors of goods and services to work on the project. As these firms purchase necessary inputs and employ local workers, additional economic activity is generated.

These multiplier (or spinoff) effects were measured using The Perryman Group's input-output assessment model (the US Multi-Regional Impact Assessment System, which is described in further detail in the Appendices to this report) developed by the firm more than 30 years ago and consistently maintained and updated since that time. The model has been used in hundreds of analyses for clients ranging from major corporations to government agencies. It has been peer reviewed on numerous occasions. It uses a variety of data (from surveys, industry information, and other sources) to describe the various goods and services (known as resources or inputs) required to produce another good/service.

This process allows for estimation of the total economic impact (including multiplier effects) of the infrastructure investments. The model used in the current

analysis reflects the specific industrial composition and characteristics of the Waco MSA economy.

Total economic effects are quantified for key measures of business activity:

- **Total expenditures** (or total spending) measure the dollars changing hands as a result of the economic stimulus.
- **Gross product** (or output) is production of goods and services that will come about in each area as a result of the activity. This measure is parallel to the gross domestic product numbers commonly reported by various media outlets and is a subset of total expenditures.
- **Personal income** is dollars that end up in the hands of people in the area; the vast majority of this aggregate derives from the earnings of employees, but payments such as interest and rents are also included.
- **Job gains** are expressed as person-years of employment because of the transitory nature of any construction project.

The Perryman Group estimates that the multiplier for the Building Waco capital investment program construction process will be 3.13, that is, **every \$1.00 in direct infrastructure spending brings \$3.13 in total local spending**. The resulting total economic benefits include an estimated **\$470.5 million in gross product and 5,726 person-years of employment**. (For results by detailed industrial sector, see Appendix C.)

The Total Impact of Construction and Related Activity Associated with the Building Waco Capital Improvement Plan on Business Activity in the Waco Area	
(Monetary Values in Millions of Constant 2016 Dollars)	
Total Expenditures	\$999.448
Gross Product	\$470.471
Personal Income	\$320.707
Employment (Person-Years)	5,726
SOURCE: The Perryman Group	

Prior research by The Perryman Group indicates that well designed and implemented infrastructure generates an ongoing annual return of about 30%.

Thus, the program can reasonably be expected, at maturity, to support approximately \$100 million per year in additional activity in the Waco area.

The City of Waco is taking many necessary and coordinated steps in order to support future growth in the area. The lack of proactive infrastructure improvements not only risks the quality of life in the city, but can also interrupt the momentum for economic growth. Investments now in Waco's infrastructure will help to continue expansion that can benefit the entire city and region.

Conclusion

Waco is well positioned for future growth. Advantages include basic characteristics such as location and cornerstone industries such as higher education and health care. In addition, other industries continue to develop, including tourism and knowledge-based industries. The area combines the natural beauty of the Brazos River and other assets with important placemaking initiatives and redevelopment of key public spaces.

The Perryman Group expects the Waco Metropolitan Statistical Area to expand by some 59,100 residents by 2040, for a total population of 323,000. The economy is likely to double in size as measured by output (RGP), and could accelerate more through effective planning and strategic investments. This expansion will generate a need for additional infrastructure of all types.

By proactively working to ensure an orderly upgrade of major infrastructure such as water systems to meet future needs, the City of Waco can better avoid disruptions and other problems in the years to come. Planning and investing now will enable Waco to both better maintain quality of life for current residents and attract desirable economic development.

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Appendix A: About The Perryman Group

The Perryman Group (TPG) is an economic research and analysis firm based in Waco, Texas. The firm has more than 30 years of experience in assessing the economic impact of corporate expansions, regulatory changes, real estate developments, public policy initiatives, and myriad other factors affecting business activity. TPG has conducted hundreds of impact analyses for local areas, regions, and states throughout the United States. Impact studies have been performed for hundreds of clients including many of the largest corporations in the world, governmental entities at all levels, educational institutions, major health care systems, utilities, and economic development organizations.

Dr. M. Ray Perryman, founder and President of the firm, developed the US Multi-Regional Impact Assessment System (USMRIAS—used in this study) in the early 1980s and has consistently maintained, expanded, and updated it since that time. The model has been used in hundreds of diverse applications and has an excellent reputation for reliability.

The Perryman Group has analyzed the economic and fiscal aspects of a broad range of corporate locations, infrastructure projects, mixed-use real estate developments, and regulatory changes.

In addition, The Perryman Group maintains an extensive set of proprietary models and systems which allow for unique evaluations of competitive strengths and weaknesses, impact assessments, occupational patterns, effective targets for future locations, and other aspects of the economic development process. Dr. M. Ray Perryman, founder and president of the firm, pioneered many of the techniques for economic development analysis now routinely used throughout the world. He is the author of “The Market for Prosperity,” a widely used primer on economic development that is used throughout the US. He is also the author of “Texas, Our Texas,” the comprehensive plan that led to most of the major incentive programs in the state. He has been the keynote speaker at the International Economic Development Conference, *Site Selection* Annual Conference, Institute for Supply Management (ISM) Conference, Canadian Economic Development Forum, and many other major economic development venues and has been cited by the American Planning Association for outstanding economic development analysis. He is presently collaborating with the Institute for Strategy and Competitiveness at Harvard University on a project to define next-generation economic development practices.

The Perryman Group has also been involved in research and modeling of the Waco area for more than 30 years. TPG produces a regular subscription forecast for the area and has performed numerous economic analyses ranging from economic development studies to impact assessments to public policy studies. Examples include studies of major proposed mixed-use developments, the development of the BRIC, the construction and ongoing operations of Baylor Stadium, a detailed economic development study, and several analyses related to impacts, programs, and funding of Texas State Technical College. The firm also has performed hundreds of studies related to education, health care, energy, transportation, infrastructure, tourism, and many other sectors that are relevant to the current analysis.

Appendix B: Forecast Methodology and Economic Terms

Texas Econometric Model

Overview

The Texas Econometric Model was developed by Dr. M. Ray Perryman, President and CEO of The Perryman Group (TPG), more than 30 years ago and has been consistently maintained, expanded, and updated since that time. It is formulated in an internally consistent manner and is designed to permit the integration of relevant global, national, state, and local factors into the projection process. It is the result of more than three decades of continuing research in econometrics, economic theory, statistical methods, and key policy issues and behavioral patterns, as well as intensive, ongoing study of all aspects of the global, US, Texas, and Texas metropolitan area economies. It is extensively used by scores of federal and State governmental entities on an ongoing basis, as well as hundreds of major corporations. It is employed in the current analysis to project future economic and demographic patterns in the Waco Metropolitan Statistical Area (McLennan and Falls Counties) and to provide essential inputs to the real estate absorption analysis. It is also used to define the representative mix of office and retail workers to occupy the newly developed space.

This section describes the forecasting process in a comprehensive manner, focusing on both the modeling and the supplemental analysis. The overall methodology, while certainly not ensuring perfect foresight, permits an enormous body of relevant information to impact the economic outlook in a systematic manner.

Model Logic and Structure

The Texas Econometric Model revolves around a core system which projects output (real and nominal), income (real and nominal), and employment by industry in a simultaneous manner. For purposes of illustration, it is useful to initially consider the employment functions. Essentially, employment within the system is a derived demand relationship obtained from a neo-Classical production function. The expressions are augmented to include dynamic temporal adjustments to changes in relative factor input costs, output and (implicitly) productivity, and technological progress over time. Thus, the typical equation includes output, the

relative real cost of labor and capital, dynamic lag structures, and a technological adjustment parameter. The functional form is logarithmic, thus preserving the theoretical consistency with the neo-Classical formulation.

The income segment of the model is divided into wage and non-wage components. The wage equations, like their employment counterparts, are individually estimated at the 3-digit North American Industry Classification System (NAICS) level of aggregation. Hence, income by place of work is measured for approximately 90 production categories. The wage equations measure real compensation, with the form of the variable structure differing between “basic” and “non-basic.”

The basic industries, comprised primarily of the various components of Mining, Agriculture, and Manufacturing, are export-oriented, i.e., they bring external dollars into the area and form the core of the economy. The production of these sectors typically flows into national and international markets; hence, the labor markets are influenced by conditions in areas beyond the borders of the particular region. Thus, real (inflation-adjusted) wages in the basic industry are expressed as a function of the corresponding national rates, as well as measures of local labor market conditions (the reciprocal of the unemployment rate), dynamic adjustment parameters, and ongoing trends.

The “non-basic” sectors are somewhat different in nature, as the strength of their labor markets is linked to the health of the local export sectors. Consequently, wages in these industries are related to those in the basic segment of the economy. The relationship also includes the local labor market measures contained in the basic wage equations.

Note that compensation rates in the export or “basic” sectors provide a key element of the interaction of the regional economies with national and international market phenomena, while the “non-basic” or local industries are strongly impacted by area production levels. Given the wage and employment equations, multiplicative identities in each industry provide expressions for total compensation; these totals may then be aggregated to determine aggregate wage and salary income. Simple linkage equations are then estimated for the calculation of personal income by place of work.

The non-labor aspects of personal income are modeled at the regional level using straightforward empirical expressions relating to national performance, dynamic responses, and evolving temporal patterns. In some instances (such as dividends, rents, and others) national variables (for example, interest rates) directly enter the

forecasting system. These factors have numerous other implicit linkages into the system resulting from their simultaneous interaction with other phenomena in national and international markets which are explicitly included in various expressions.

The output or gross area product expressions are also developed at the 3-digit NAICS level. Regional output for basic industries is linked to national performance in the relevant industries, local and national production in key related sectors, relative area and national labor costs in the industry, dynamic adjustment parameters, and ongoing changes in industrial interrelationships (driven by technological changes in production processes).

Output in the non-basic sectors is modeled as a function of basic production levels, output in related local support industries (if applicable), dynamic temporal adjustments, and ongoing patterns. The inter-industry linkages are obtained from the input-output (impact assessment) system which is part of the overall integrated modeling structure maintained by The Perryman Group. Note that the dominant component of the econometric system involves the simultaneous estimation and projection of output (real and nominal), income (real and nominal), and employment at a disaggregated industrial level. This process, of necessity, also produces projections of regional price deflators by industry. These values are affected by both national pricing patterns and local cost variations and permit changes in prices to impact other aspects of economic behavior. Income is converted from real to nominal terms using Texas Consumer Price Index, which fluctuates in response to national pricing patterns and unique local phenomena.

Several other components of the model are critical to the forecasting process. The demographic module includes (1) a linkage equation between wage and salary (establishment) employment and household employment, (2) a labor force participation rate function, and (3) a complete population system with endogenous migration. Given household employment, labor force participation (which is a function of economic conditions and evolving patterns of worker preferences), and the working age population, the unemployment rate and level become identities.

The population system uses Census information, fertility rates, and life tables to determine the “natural” changes in population by age group. Migration, the most difficult segment of population dynamics to track, is estimated in relation to relative regional and extra-regional economic conditions over time. Because evolving economic conditions determine migration in the system, population changes are allowed to interact simultaneously with overall economic conditions. Through this process, migration is treated as endogenous to the system, thus

allowing population to vary in accordance with relative business performance (particularly employment).

Real retail sales is related to income, interest rates, dynamic adjustments, and patterns in consumer behavior on a store group basis. It is expressed on an inflation-adjusted basis. Inflation at the state level relates to national patterns, indicators of relative economic conditions, and ongoing trends. As noted earlier, prices are endogenous to the system.

A final significant segment of the forecasting system relates to real estate absorption and activity. The short-term demand for various types of property is determined by underlying economic and demographic factors, with short-term adjustments to reflect the current status of the pertinent building cycle. In some instances, this portion of the forecast requires integration with the Multi-Regional Industry-Occupation System which is maintained by The Perryman Group. This system also allows any employment simulation or forecast from the econometric model to be translated into a highly detailed occupational profile.

The overall Texas Econometric Model contains numerous additional specifications, and individual expressions are modified to reflect alternative lag structures, empirical properties of the estimates, simulation requirements, and similar phenomena. Moreover, it is updated on an ongoing basis as new data releases become available. Nonetheless, the above synopsis offers a basic understanding of the overall structure and underlying logic of the system.

Model Simulation and Multi-Regional Structure

The initial phase of the simulation process is the execution of a standard non-linear algorithm for the state system and that of each of the individual sub-areas. The external assumptions are derived from scenarios developed through national and international models and extensive analysis by The Perryman Group. The US model, which follows the basic structure outlined above, was used to some extent in the current analysis to define the demand for domestically produced goods on a per capita basis.

Once the initial simulations are completed, they are merged into a single system with additive constraints and interregional flows. Using information on minimum regional requirements, import needs, export potential, and locations, it becomes possible to balance the various forecasts into a mathematically consistent set of results. This process is, in effect, a disciplining exercise with regard to the individual regional (including metropolitan and rural) systems. By compelling equilibrium across all regions and sectors, the algorithm ensures that the patterns in state

activity are reasonable in light of smaller area dynamics and, conversely, that the regional outlooks are within plausible performance levels for the state as a whole.

The iterative simulation process has the additional property of imposing a global convergence criterion across the entire multi-regional system, with balance being achieved simultaneously on both a sectoral and a geographic basis. This approach is particularly critical on non-linear dynamic systems, as independent simulations of individual systems often yield unstable, non-convergent outcomes.

It should be noted that the underlying data for the modeling and simulation process are frequently updated and revised by the various public and private entities compiling them. Whenever those modifications to the database occur, they bring corresponding changes to the structural parameter estimates of the various systems and the solutions to the simulation and forecasting system. The multi-regional version of the Texas Econometric Model is re-estimated and simulated with each such data release, thus providing a constantly evolving and current assessment of state and local business activity.

The Final Forecast

The process described above is followed to produce an initial set of projections. Through the comprehensive multi-regional modeling and simulation process, a systematic analysis is generated which accounts for both historical patterns in economic performance and inter-relationships and best available information on the future course of pertinent external factors. While the best available techniques and data are employed in this effort, they are not capable of directly capturing “street sense,” i.e., the contemporaneous and often non-quantifiable information that can materially affect economic outcomes. In order to provide a comprehensive approach to the prediction of business conditions, it is necessary to compile and assimilate extensive material regarding current events and factors both across the state of Texas and elsewhere.

This critical aspect of the forecasting methodology includes activities such as (1) daily review of hundreds of financial and business publications and electronic information sites; (2) review of major newspapers and online news sources in the state on a daily basis; (3) dozens of hours of direct telephone interviews with key business and political leaders in all parts of the state; (4) face-to-face discussions with representatives of major industry groups; and (5) frequent site visits to the various regions of the state. The insights arising from this “fact finding” are analyzed and evaluated for their effects on the likely course of the future activity.

Another vital information resource stems from the firm's ongoing interaction with key players in the international, domestic, and state economic scenes. Such activities include visiting with corporate groups on a regular basis and being regularly involved in the policy process at all levels. The firm is also an active participant in many major corporate relocations, economic development initiatives, and regulatory proceedings.

Once organized, this information is carefully assessed and, when appropriate, independently verified. The impact on specific communities and sectors that is distinct from what is captured by the econometric system is then factored into the forecast analysis. For example, the opening or closing of a major facility, particularly in a relatively small area, can cause a sudden change in business performance that will not be accounted for by either a modeling system based on historical relationships or expected (primarily national and international) factors.

The final step in the forecasting process is the integration of this material into the results in a logical and mathematically consistent manner. In some instances, this task is accomplished through "constant adjustment factors" which augment relevant equations. In other cases, anticipated changes in industrial structure or regulatory parameters are initially simulated within the context of the Multi-Regional Impact Assessment System to estimate their ultimate effects by sector. Those findings are then factored into the simulation as constant adjustments on a distributed temporal basis. Once this scenario is formulated, the extended system is again balanced across regions and sectors through an iterative simulation algorithm analogous to that described in the preceding section.

US Multi-Regional Impact Assessment System

In order to estimate the total economic effects of the infrastructure improvement program (including multiplier effects), The Perryman Group utilized its US Multi-Regional Impact Assessment System (USMRIAS).

The basic modeling technique used in this segment of the analysis is known as dynamic input-output analysis. This methodology essentially uses extensive survey data, industry information, and a variety of corroborative source materials to create a matrix describing the various goods and services (known as resources or inputs) required to produce one unit (a dollar's worth) of output for a given sector. Once the base information is compiled, it can be mathematically simulated to generate evaluations of the magnitude of successive rounds of activity involved in the overall production process.

There are two essential steps in conducting an input-output analysis once the system is operational. The first major endeavor is to accurately define the levels of direct activity to be evaluated. In this instance, The Perryman Group utilized construction cost estimates provided by the City of Waco.

The second major phase of the analysis is the simulation of the input-output system to measure overall economic effects of the projects facilitated by the sales tax for economic development. The present study was conducted within the context of the USMRIAS which was developed and is maintained by The Perryman Group. This model has been used in hundreds of diverse applications across the country and has an excellent reputation for accuracy and credibility. The system used in the current simulations reflects the unique industrial structures and characteristics of the Waco MSA.

The USMRIAS is somewhat similar in format to the Input-Output Model of the United States and the Regional Input-Output Modeling System, both of which are maintained by the US Department of Commerce. The model developed by TPG, however, incorporates several important enhancements and refinements. Specifically, the expanded system includes (1) comprehensive 500-sector coverage for any county, multi-county, or urban region; (2) calculation of both total expenditures and value-added by industry and region; (3) direct estimation of expenditures for multiple basic input choices (expenditures, output, income, or employment); (4) extensive parameter localization; (5) price adjustments for real and nominal assessments by sectors and areas; (6) measurement of the induced impacts associated with payrolls and consumer spending; (7) embedded modules to estimate multi-sectoral direct spending effects; (8) estimation of retail spending activity by consumers; and (9) comprehensive linkage and integration capabilities with a wide variety of econometric, real estate, occupational, and fiscal impact models. Moreover, the model uses specific local taxing patterns to estimate the fiscal effects of activity on a detailed sectoral basis. The model used for the present investigation has been thoroughly tested for reasonableness and historical reliability.

The impact assessment (input-output) process essentially estimates the amounts of all types of goods and services required to produce one unit (a dollar's worth) of a specific type of output. For purposes of illustrating the nature of the system, it is useful to think of inputs and outputs in dollar (rather than physical) terms. As an example, the construction of a new building will require specific dollar amounts of lumber, glass, concrete, hand tools, architectural services, interior design services, paint, plumbing, and numerous other elements. Each of these suppliers must, in turn, purchase additional dollar amounts of inputs. This process continues through

multiple rounds of production, thus generating subsequent increments to business activity. The initial process of building the facility is known as the *direct effect*. The ensuing transactions in the output chain constitute the *indirect effect*.

Another pattern that arises in response to any direct economic activity comes from the payroll dollars received by employees at each stage of the production cycle. As workers are compensated, they use some of their income for taxes, savings, and purchases from external markets. A substantial portion, however, is spent locally on food, clothing, health care services, utilities, housing, recreation, and other items. Typical purchasing patterns in the relevant areas are obtained from the *ACCRA Cost of Living Index*, a privately compiled inter-regional measure which has been widely used for several decades, and the *Consumer Expenditure Survey* of the US Department of Labor. These initial outlays by area residents generate further secondary activity as local providers acquire inputs to meet this consumer demand. These consumer spending impacts are known as the *induced effect*. The USMRIAS is designed to provide realistic, yet conservative, estimates of these phenomena.

Sources for information used in this process include the Bureau of the Census, the Bureau of Labor Statistics, the Regional Economic Information System of the US Department of Commerce, and other public and private sources. The pricing data are compiled from the US Department of Labor and the US Department of Commerce. The verification and testing procedures make use of extensive public and private sources.

Impacts were measured in constant 2016 dollars to eliminate the effects of inflation.

The USMRIAS generates estimates of the effect on several measures of business activity. The most comprehensive measure of economic activity used in this study is **Total Expenditures**. This measure incorporates every dollar that changes hands in any transaction. For example, suppose a farmer sells wheat to a miller for \$0.50; the miller then sells flour to a baker for \$0.75; the baker, in turn, sells bread to a customer for \$1.25. The Total Expenditures recorded in this instance would be \$2.50, that is, $\$0.50 + \$0.75 + \$1.25$. This measure is quite broad, but is useful in that (1) it reflects the overall interplay of all industries in the economy, and (2) some key fiscal variables such as sales taxes are linked to aggregate spending.

A second measure of business activity frequently employed in this analysis is that of **Gross Product**. This indicator represents the regional equivalent of Gross Domestic Product, the most commonly reported statistic regarding national economic performance. In other words, the Gross Product of Texas is the amount

of US output that is produced in that state; it is defined as the value of all final goods produced in a given region for a specific period of time. Stated differently, it captures the amount of value-added (gross area product) over intermediate goods and services at each stage of the production process, that is, it eliminates the double counting in the Total Expenditures concept. Using the example above, the Gross Product is \$1.25 (the value of the bread) rather than \$2.50. Alternatively, it may be viewed as the sum of the value-added by the farmer, \$0.50; the miller, \$0.25 ($\$0.75 - \0.50); and the baker, \$0.50 ($\$1.25 - \0.75). The total value-added is, therefore, \$1.25, which is equivalent to the final value of the bread. In many industries, the primary component of value-added is the wage and salary payments to employees.

The third gauge of economic activity used in this evaluation is **Personal Income**. As the name implies, Personal Income is simply the income received by individuals, whether in the form of wages, salaries, interest, dividends, proprietors' profits, or other sources. It may thus be viewed as the segment of overall impacts which flows directly to the citizenry.

The fourth measure, **Retail Sales**, represents the component of Total Expenditures which occurs in retail outlets (general merchandise stores, automobile dealers and service stations, building materials stores, food stores, drugstores, restaurants, and so forth). Retail Sales is a commonly used measure of consumer activity.

The final aggregates used are **Permanent Jobs and Person-Years of Employment**. The Person-Years of Employment measure reveals the full-time equivalent jobs generated by an activity. It should be noted that, unlike the dollar values described above, Permanent Jobs is a "stock" rather than a "flow." In other words, if an area produces \$1 million in output in 2014 and \$1 million in 2015, it is appropriate to say that \$2 million was achieved in the 2014-2015 period. If the same area has 100 people working in 2014 and 100 in 2015, it only has 100 Permanent Jobs. When a flow of jobs is measured, such as in a construction project or a cumulative assessment over multiple years, it is appropriate to measure employment in Person-Years (a person working for a year). This concept is distinct from Permanent Jobs, which anticipates that the relevant positions will be maintained on a continuing basis.

US Multi-Regional Industry-Occupation System

The **US Multi-Regional Industry-Occupation System** translates standard data on employment by industry (derived from the Texas Econometric Model or the US Multi-Regional Impact Assessment System) into estimates of occupational categories at a highly detailed level.

The modeling process begins with the industry-occupation coefficients compiled by the US Department of Labor based on extensive surveys of operating patterns in thousands of firms and other secondary sources. As an example, a typical tire plant of a given size requires machinists, mechanics, plant managers, administrative staff, custodial staff, shipping personnel, and numerous other types of workers. By compiling this information across the entire economy, a matrix is created which allows the data on employment by industry (which is regularly compiled) to be translated into employment by occupation.

The US Multi-Regional Industry-Occupation System links this basic structure specifically to the economy of every metropolitan area, region, and county in the US, accounting for productivity and production patterns in each area. It is also regularly updated to reflect evolving patterns. The system can be fully integrated with historical employment data and the projections obtained from the Texas Econometric Model. It can also be linked to results from the US Multi-Regional Impact Assessment System. Thus, the industry-occupation system is a flexible mechanism to allow extensive evaluations of workforce characteristics and patterns. It is highly detailed, providing results for more than 1,000 occupational categories.

In the present study, it was used as a component of the real estate absorption analysis.

US Multi-Regional Real Estate Absorption System

The US Multi-Regional Real Estate Absorption System is a model developed by The Perryman Group which allows such applications as (1) historical characterization of real estate absorption by category (office, industrial, retail, distribution, housing, etc.); (2) projections of future absorption; and (3) measurement of the impact of specific economic activity.

The system is based on the simple notion that economic activity ultimately determines the need for space. Industrial space is needed when production increases; retail space is needed when purchasing expands; office space demands depend on the number of office workers, and housing is required when population

expands. Although real estate is subject to cycles, long-term patterns are highly correlated with business activity.

The first step in the process is to obtain the requisite information on employment by industry. This information may be derived from historical data, forecasts, or an impact assessment. In the present instance, it is based on the long-term forecasts for the Waco MSA (McLennan and Falls Counties) previously described. This information is then simulated for the relevant area to obtain employment by occupation using the relevant submodel of the US Multi-Regional Industry-Occupation System. The results are then linked to estimates of the square footage requirements for various types of occupations and activities obtained from the National Association of Industry and Office Parks and other primary sources. These estimates are frequently updated to reflect changing patterns in space utilization.

With regard to housing, the system links employment and projected population growth to new housing requirements based on local patterns, as well as allocations to single and multi-family categories. In the present analysis, this system provided baseline levels of square footage in the MSA in the future, thus allowing an evaluation of the reasonableness of a project of the relevant magnitude.

Economic Terms

Definitions of Economic Terms

Compound annual growth rate (CAGR): A CAGR differs from a simple growth rate in that it reflects changes in the size of the base used to calculate growth. The idea of compounding is routine in calculating interest; interest for the current period is calculated on the principle plus previously accrued interest.

Nominal and real values: Real variables are adjusted for the effects of inflation; nominal values are not. Real variables are expressed in terms of dollars (or rates, such as interest rates) at a particular point in time (2016 at present); therefore, the pattern in real variables over time removes distortions caused by changes in the value of the dollar (inflation).

Gross area product, real gross area product (RGP): Gross area product, often referred to as output, is the final value of all goods and services produced in an economy during a given period of time. RGP is gross area product adjusted for inflation.

Personal income (by place of residence): Personal income is the total income accruing to households. “By place of residence” denotes where the income-earner resides rather than works. Real personal income is expressed on an inflation-adjusted basis.

Personal income (by place of work): Personal income is total earnings expressed at the location where the earnings occur.

Wage and salary employment: Wage and salary employment is a measure of the number of persons in the workforce excluding proprietors, but including agricultural workers and military personnel.

Population: Population is the total number of persons residing in a specific area.

Real retail sales: Retail sales is the total volume of retail goods sold expressed on an inflation-adjusted basis.

Definitions of Economic Sectors

Agriculture: These establishments are engaged in farming, ranching, commercial fishing, forestry, hunting and trapping, and related services.

Mining: This sector is composed of companies primarily involved in the extraction of minerals occurring naturally. Mining includes quarrying, oil and gas well operations, milling, and other activities which are a part of mining activity. In Texas, this sector is largely oil and gas related.

Construction: Companies in this sector are primarily engaged in construction activities including new work, additions, alterations, and repairs. Construction includes buildings, water systems, highways, utility plants, and other related projects.

Manufacturing: Includes both nondurable manufacturing and durable manufacturing.

Durable manufacturing: Companies in this sector are primarily engaged in the mechanical or chemical transformation of materials or substances into goods typically consumed over a period of several years such as automobiles, washing machines, industrial machinery, and computers.

Nondurable manufacturing: These companies are engaged in the mechanical or chemical transformation of materials or substances into items consumed in a short time period such as paper, bread, chemicals, and clothing.

Trade: Trade establishments are involved in wholesale and retail trade—selling items and rendering services incidental to the sale of goods. Examples include wholesale distributors, food stores, and clothing stores.

Transportation, warehousing, and utilities (TWU): Companies in this sector are engaged in transportation, warehousing, electric, water, and sanitary services (including all establishments of the US Postal Service).

Information: This sector includes those establishments that create, disseminate, or provide the means to distribute information. Industries included in this sector are newspaper, book, and periodical publishers; software publishers; broadcasting and telecommunications producers and distributors; motion picture and sound recording industries; information services; and data processing services.

Finance, insurance, and real estate (FIRE): This sector includes companies in the fields of finance, insurance, and real estate, such as depository institutions, credit institutions, holding companies, insurance carriers, insurance agents, real estate buyers, real estate sellers, real estate agents, and real estate developers.

Services: This sector includes companies that provide services to individuals, businesses, or government entities. Examples include medical services, business services (excluding finance, insurance, and real estate), hotels, and amusements.

Government: All government establishments involved in public administration, including the executive, legislative, judicial, administrative, and regulatory activities of federal, state, local, and international governments are included in this sector. Military activity is also included.

Appendix C: Economic Benefits by Industrial Sector

The Total Impact of Construction and Related Activity Associated with the Building Waco Capital Improvement Plan on Business Activity in the Waco Area

Category	Total Expenditures (2016 Dollars)	Gross Product (2016 Dollars)	Personal Income (2016 Dollars)	Employment (Person-Years)
Agriculture	\$13,895,909	\$4,005,544	\$2,658,351	43
Mining	\$4,085,645	\$1,858,330	\$1,080,761	11
Construction	\$335,512,814	\$143,587,372	\$118,324,939	1,686
Nondurable Manufacturing	\$69,983,168	\$22,871,580	\$12,179,998	225
Durable Manufacturing	\$83,379,530	\$35,351,615	\$21,464,533	346
Transportation and Utilities	\$53,968,915	\$23,813,338	\$14,361,675	173
Information	\$12,474,824	\$7,673,616	\$3,318,359	32
Wholesale Trade	\$33,417,394	\$22,620,441	\$13,043,147	150
Retail Trade (including Restaurants)	\$130,458,289	\$98,195,744	\$57,149,191	1,768
FIRE	\$131,283,656	\$32,863,651	\$13,276,480	142
Business Services	\$44,428,934	\$27,892,943	\$22,753,494	281
Health Services	\$31,098,831	\$21,738,430	\$18,380,042	308
Other Services	\$55,459,710	\$27,998,219	\$22,716,115	560
TOTAL	\$999,447,619	\$470,470,823	\$320,707,085	5,726

SOURCE: US Multi-Regional Impact Assessment System, The Perryman Group