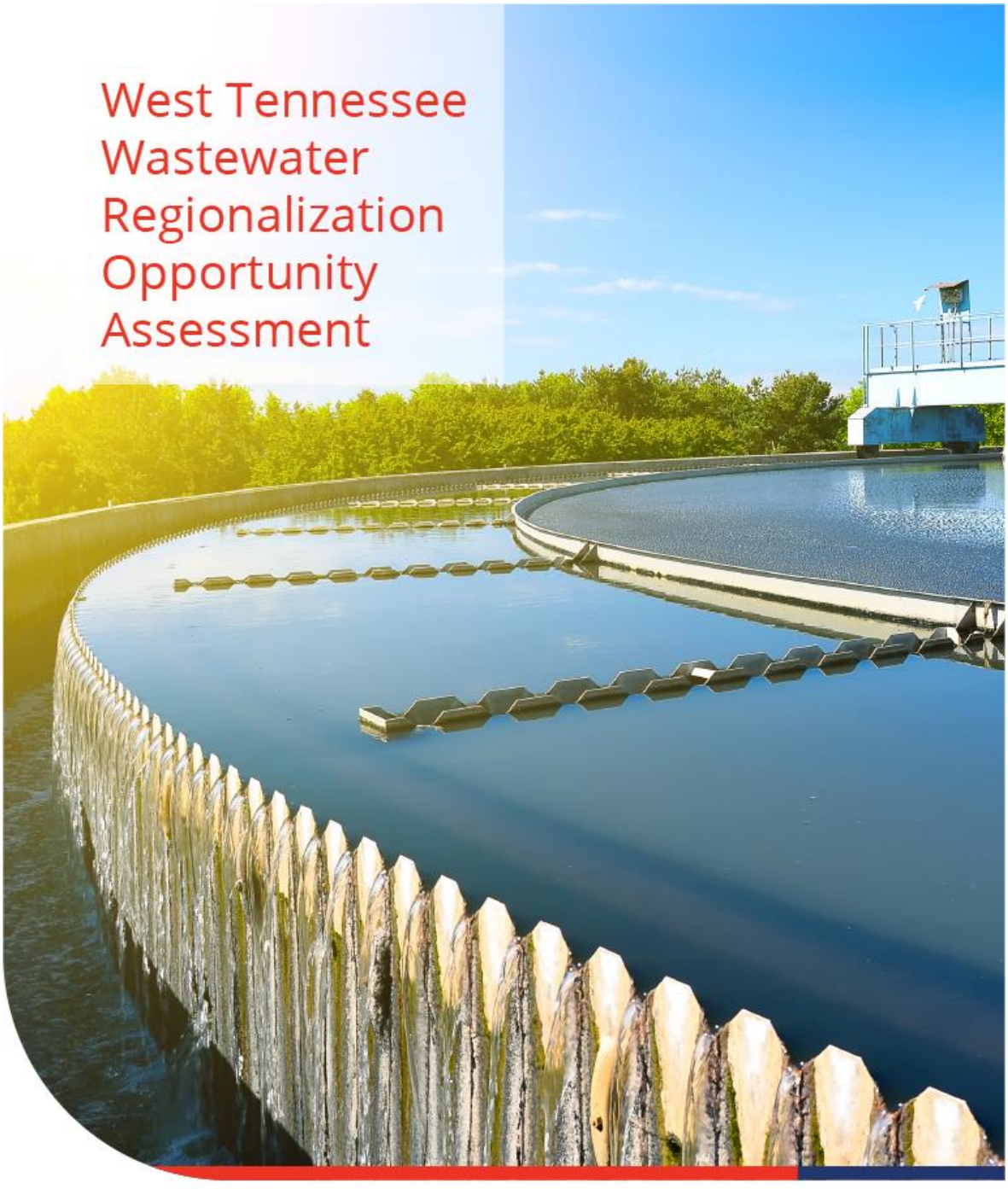
West Tennessee Wastewater Regionalization Opportunity Assessment



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EXECUTIVE SUMMARY

Overview

With the announcement of Blue Oval City in September 2021, expectations about the future of economic development in West Tennessee were reshaped overnight. Blue Oval City is a $5.6 billion investment from Ford Motor Company and SK Innovation to transform 3,600 acres at the Memphis Regional Megasite in Stanton, Tennessee, into one of the largest battery and vehicle manufacturing campuses in the country. The expected impacts on the economy are immense:

- Production of next generation all-electric F-Series trucks
- 5,800 direct new jobs (27,000 total expected over time)
- $3.5 billion contributed annually to state GDP

The direct and indirect effects on infrastructure requirements in West Tennessee will be equally profound. Road improvements, water and wastewater services, and other investments must be completed for the campus to be operational in 2025. In addition, people moving to the region for jobs at Blue Oval City will generate demand for housing, infrastructure, and local services in the surrounding area, which today consists mostly of small towns and rural communities.

The Tennessee Department of Environment and Conservation (TDEC) commissioned this study to assist communities in West Tennessee with planning for the unprecedented changes that are expected to result from Blue Oval City. Specifically, this report provides elected officials, utilities, and other community leaders in Fayette, Haywood, and Tipton Counties with a regional forecast of expected wastewater needs and identifies potential solutions for meeting future demand. The study is not intended to be prescriptive, as there are multiple ways communities could decide to address future wastewater requirements. Rather, this report is intended to serve as a planning resource or potential roadmap for solutions based on regional collaboration.

Population Growth

Calculating the impacts of transformational economic development projects like Blue Oval City is an inexact science. For example, it is impossible to know for certain how many new jobs will be filled by existing residents of West Tennessee versus people relocating from other areas of the state or from other states. Moreover, for those people relocating from other places for jobs at Blue Oval City, it is uncertain where in West Tennessee they will choose to live. A portion of those relocations will generate new residents for communities in Fayette, Haywood, and Tipton Counties. Others may choose to live in a more urbanized area in Shelby County.

That said, lessons can be learned from looking at past economic development projects in other places similar in magnitude to the expected impacts of Blue Oval City. Based on an analysis of several such projects, this study estimates that Blue Oval City could directly account for growth of nearly 34,000 new residents in Fayette, Haywood, and Tipton Counties by 2033. Over twenty years, Blue Oval City's impact on the regional population could approach 45,000.

Blue Oval City is not the only driver of residential growth in West Tennessee. Many communities are already growing as a result of economic development and new subdivisions. Given existing development trends in West Tennessee and the anticipated impact of Blue Oval City, this study estimates that the total population of Fayette, Haywood, and Tipton Counties could increase by as much as 30% by 2033 and by as much as 40% by 2043.

Table ES-1. Tri-County Study Area Population Projections (High Scenario)

County	2023	2028	2033	2038	2043
Tipton County	63,737	69,198	78,433	81,492	83,008
Fayette County	44,026	50,798	61,787	65,948	68,092
Haywood County	16,839	18,054	21,017	22,923	23,271
Total	**124,602**	**138,050**	**161,237**	**170,362**	**174,372**

Wastewater Impacts

The combined effects of planned development and Blue Oval City will necessitate investment in additional capacity for West Tennessee's wastewater systems. Regionalization systems are created and owned by more than one entity which provide economies of scale in construction and operation. Using assumptions from TDEC's collection system design standards, this study estimates that total wastewater flow in the three-county area could grow by as much as 70%, increasing from 7.3 million gallons per day (MGD) today to 12.5 MGD by 2033. By 2043, it could approximately double to 14.3 MGD.

Table ES-21. Tri-County Study Area Wastewater Flow Projections – High Scenario[1]

Geography	Average Day Flow (MGD)					
	Existing[2]	2023	2028	2033	2038	2043
Fayette	2.1	2.4	3.4	4.9	5.5	5.8
Haywood	1.5	1.5	1.7	2.1	2.4	2.4
Tipton	3.1	3.4	4.2	5.5	5.9	6.1
Total Study Area	**6.7**	**7.3**	**9.2**	**12.5**	**13.8**	**14.3**

Given the uncertainty about where exactly people working at Blue Oval City will choose to live, several municipal systems in the region may reach capacity well before 2043, or even 2033. In fact, one community is already at capacity, and another has issued a moratorium on any future development until plans are in place for additional capacity, according to interviews with local officials conducted for this study. On average, municipal systems in the region are currently at 52% capacity.

Potential Solutions

This study evaluated four potential solutions for addressing future wastewater needs:

1. **Full regionalization**: Wastewater flows could potentially convey to a new regional facility constructed in Tipton County, discharging to the Mississippi River. Existing treatment plants could convert to pump stations.
2. **Partial regionalization**: Except for Covington and Brownsville, wastewater flows could potentially convey to a new regional facility constructed near Munford, discharging to the Mississippi River. Existing treatment plants could convert to pump stations.
3. **Growth area regionalization**: Western Fayette County could remain "as is" and Brownsville could continue as a stand-alone utility. Wastewater flows for the remaining area could potentially convey to a new regional facility constructed near Oakland, discharging to the Loosahatchie River.
4. **Two service areas**: Except for Covington and Brownsville, wastewater flows in Tipton County and the portion of Haywood County north of I-40 could potentially convey to a new regional facility constructed near Munford, discharging to the Mississippi River. Wastewater flows in Fayette County and the portion of Haywood County south of I-40 could potentially convey to a new regional facility constructed near Oakland, discharging to the Loosahatchie River.

These four scenarios are not the only options available to communities in the region for meeting future wastewater needs; this study is not intended to be exhaustive. Rather, the goal is to introduce potential strategies for regionalization consideration.

[1] Source: Author's calculations using data collected by the Tennessee Association of Utility Districts.

Conceptual Capital and Operational Cost Estimates for Potential Solutions

Given the current inflationary environment and recent disruptions in supply chains resulting from the pandemic, developing reliable cost estimates is challenging. As such, the figures presented here are preliminary and intended to be used for comparison purposes as communities in West Tennessee assess the viability of potential solutions.

Table ES-2. In 2023 Dollars, Conceptual Opinion of Probable Capital Cost and Annual Operating Costs[2]

	Capital Cost	Annual Operating Cost Range
Full regionalization	$1,385,000,000	$4,530,000 - $18,340,000
Partial regionalization	$890,000,000	$4,600,000 - $12,260,000
Growth area regionalization	$350,000,000	$1,670,000 - $4,450,000
Two service areas	$505,000,000	$2,070,000 - $7,290,000

Governance

Regionalization provides an opportunity for individual wastewater service providers to achieve performance and customer service goals at a reduced cost through the creation of partnerships across service area boundaries. Table ES-4 provides a suggested comparative qualitative ranking of the feasible governance models across eight criteria.

Table ES-4. Qualitative Comparison of Governance Models

Criteria	Regional Authority	Municipal Extension	Utility District	Member Cooperative
Flexibility of oversight board appointments	High	Med	Med	Low
Flexibility to maintain local collection system ownership	High	High	Med	Low
Potential to deliver services at lowest cost to rate payers	High	High	High	Med
Staffing flexibility, recruitment, and retention	High	Med	High	Med
Recent use in and around Tennessee	High	Med	Med	Low
Potential for local, state, and federal funding	High	High	High	Med
Ease of future service area adjustments	High	High	Med	Med
Ease to establish regional model	High	High	Med	Med

[2] Author's calculations.

Based on the criteria, rankings, and evaluations, a Regional Wastewater Treatment Authority emerges as a likely candidate for the tri-county study area governance model. Municipal System Extension/ Consolidation may serve as a near-term step towards regionalization in certain locations with near term capacity needs.

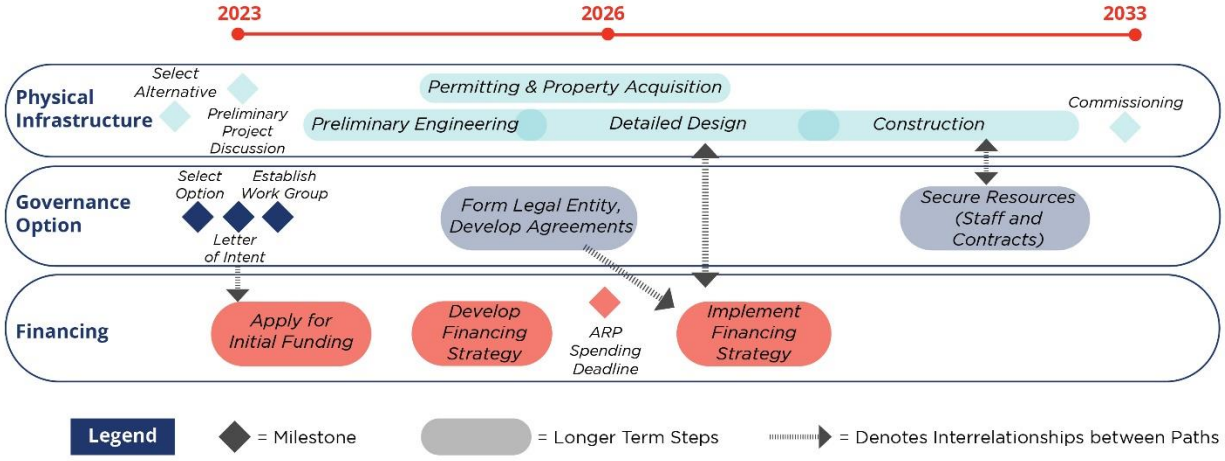
Implementation Plan

To create a regional governance approach and plan for, design, finance, and construct infrastructure to serve the region, there are several milestones to consider along parallel and coordinated paths. The parallel efforts include:

- Planning, designing, and constructing the physical infrastructure (e.g., regional plants),
- Creating a regional governance structure (e.g., a regional authority), and
- Developing and implementing a financing strategy.

Figure ES-1 illustrates these three potential parallel efforts and lays out critical milestones along each path.

Figure ES-1. Regional Solution Development Timeline



Conclusion

This report provides an analysis of regional alternatives to meet the demand for wastewater service in the tri-county study area. It is based on local stakeholder input and analysis of the best available data and judgement of a diverse professional team. The report includes alternative infrastructure arrangements along with their relative costs. It also includes a review of the regional wastewater governance structures and identifies key steps, beginning today, that will support implementation of the preferred solution.

Leadership and collaboration will be required among decision-makers to identify and implement the best solution for the region. This report provides leaders with the foundational information to support their decisions today and for the next decade, to realize a tremendous opportunity for wastewater regionalization in the growing tri-county study area.

SECTION 1. PURPOSE

The Tennessee Department of Environment and Conservation (TDEC) commissioned this study in 2022 to identify options for addressing regional wastewater needs in Fayette, Haywood, and Tipton Counties. Using information on current development trends and potential impacts of Blue Oval City, the study presents estimates of future population growth and describes how that growth may impact the region's future wastewater needs.

Based on the results of the analysis, four viable alternatives were developed as potential scenarios for how cities, counties, and utility districts in the area could work together to develop a regional approach to accommodate future growth. Several implementation and governance options are presented, drawing from regional approaches in other areas of Tennessee and other states.

This study was designed to provide high level information to communities in Fayette, Haywood, and Tipton Counties, as they engage in long-term planning to accommodate future growth. The alternatives are presented as feasible designs that can be used by communities for preliminary decision making about regional strategies. They are not intended to be detailed plans, as each alternative would require highly detailed engineering to be considered suitable for project development.

Similarly, the cost estimates presented in this report are intended to be used for comparing the alternatives at a high level in the early stage of decision making. They are not intended to provide a comprehensive financial picture, as would be required for project development. Further, the cost estimates are expressed in current dollars and not adjusted for inflation. Pursuing any of the alternatives would require a thorough cost analysis that is beyond the scope of this study.

Finally, we recognize that many communities and utilities in the area have infrastructure projects underway, or have planned improvements, including those that have been submitted for funding consideration to TDEC or other agencies. As the outcomes of those projects are uncertain, this study does not take them into consideration when discussing the alternatives. The alternatives in this report are based on the current state of infrastructure in the region.

This study was conducted by Ernst & Young LLP in collaboration with engineers and analysts at Barge Design Solutions, Blue Cypress Consulting, and Brown and Caldwell.

SECTION 2. ACKNOWLEDGEMENTS

This study is the result of numerous contributors. More than 30 city and county officials from communities in West Tennessee participated in interviews that informed the project team's understanding of local conditions and preferences related to wastewater management.

Dr. Sreedhar Upendram, assistant professor in the University of Tennessee Department of Agricultural and Resource Economics, reviewed the population and wastewater forecasting methodology and provided invaluable feedback.

This work draws heavily on the information collected by the Tennessee Association of Utility Districts (TAUD) in its survey of wastewater systems (2022). TAUD also provided guidance on state laws and regulations related to wastewater system governance.

Finally, the project team would like to thank TDEC staff for reviewing drafts of this study and offering suggestions for improvement.

SECTION 3. BACKGROUND OF THE TRI-COUNTY STUDY AREA

The tri-county study area, located in the southwest corner of Tennessee, consists of Fayette, Haywood, and Tipton Counties. Each of these three counties border Shelby County, which is home to Memphis, Tennessee's second largest city. The Memphis Metropolitan Statistical Area includes Fayette and Tipton Counties but excludes Haywood County. Tipton County shares a border with Arkansas, and Fayette County shares a border with Mississippi. The Mississippi River runs through Tipton County near the border with Arkansas. Interstate 40 (I-40), an east-west corridor, carries the most traffic in the West Tennessee region. From Memphis, I-40 continues northeast through Fayette and Haywood Counties.

The Blue Oval City site, located just off I-40's Exit 42 in the city of Stanton in Haywood County, will span 6 square miles (3,600 acres), including portions of unincorporated Haywood and Fayette Counties.[1] The site's new automotive assembly and battery manufacturing plant will fuel industry, employment, and population growth in the tri-county study area. Ensuring that communities within the tri-county study area have infrastructure in place to handle the growth is paramount.

The TAUD provided a summary of the existing wastewater facilities and their association flows in a report titled "Survey of Wastewater Systems in Haywood, Fayette, and Tipton Counties," dated October

[1] Tennessee Department of Economic & Community Development, Frequently Asked Questions, https://www.tn.gov/ecd/rural-development/blue-oval-city-resources/frequently-asked-questions.html

3, 2022. Information in this report was evaluated in order to estimate the current wastewater flows.[2] Within the tri-county study area, fourteen utilities are authorized to provide wastewater service, and thirteen of these utilities are actively treating and/or conveying wastewater. Table 1 summarizes the key characteristics of these utilities and the population they serve. The Brownsville Energy Authority (in Haywood County), the Town of Oakland (in Fayette County), and the Town of Atoka (in Tipton County) have the greatest number of wastewater connections. The average daily wastewater flow in the Haywood, Fayette, and Tipton County systems is 1.53 million gallons per day (MGD), 2.11 MGD, and 3.14 MGD, respectively.

Table 3. Summary of Existing Wastewater Utilities in the Study Area

Wastewater Utility	Utility Type	Distance to Blue Oval Site (miles)	Total Population	Total Wastewater Connections	Wastewater Average Daily Flow (MGD)
Brownsville Energy Authority	Authority	17	9,647	4,834	0.82
					0.67
Town of Stanton	Municipal	4.5	438	270	0.04
Sub-total: Haywood County			**10,085**	**5,104**	**1.53**
City of Gallaway	Municipal	18.4	700	115	0.07
City of Moscow	Municipal	32.7	747	257	0.08
Town of Oakland	Municipal	27.2	7,893	4,151	1.32
City of Piperton	Municipal	41.6	2,142	285	0.06
Town of Rossville	Municipal	41.2	906	553	0.13
Town of Somerville	Municipal	19	4,833	1,589	0.51
Sub-total: Fayette County[1]			**17,221**	**6,950**	**2.11**
Town of Atoka	Municipal	26	10,008	3,300	0.34
Town of Brighton	Municipal	27.1	2,888	1,056	N/A
City of Covington	Municipal	21.2	8,857	2,774	2.08
Town of Mason	Municipal	12.5	1,242	547	0.12
City of Munford	Municipal	28.3	6,034	2,425	0.94
Poplar Grove Utility District[2]	Authority		*	*	
Sub-total: Tipton County[3]			**29,029**	**10,102**	**3.14**
Total			**56,335**	**22,156**	**6.78**

Source: "Survey of Wastewater Systems in Haywood, Fayette and Tipton Counties," TAUD, October 3, 2022

[1] Fayette County total flow excludes Piperton since wastewater from this city is sent to Rossville for treatment.

[2] Poplar Grove Utility District, a wastewater system in Tipton County, does not presently provide wastewater service, but it is authorized to do so. "Survey of Wastewater Systems in Haywood, Fayette and Tipton Counties," Tennessee Association of Utility Districts, October 3, 2022.

[3] Tipton County total flow excludes Atoka and Brighton since wastewater from these towns is sent to Munford for treatment.

[2] Wastewater flows provided in the TAUD study are based on audit data from July 2021 and hence are referred to as 2020 baseline values for the purposes of this study.

SECTION 4. POPULATION PROJECTIONS

Population projections, along with community context and existing and planned infrastructure, help set the basis for establishing future infrastructure needs. While population growth is largely shaped by historical trends and community characteristics, future economic catalysts such as Blue Oval City impact population growth and development in ways that are more challenging to estimate accurately. A 20-year planning horizon was established for the study and population projections were calculated, including estimates for each five-year interval between 2023 and 2043. The projections are provided in five-year intervals to facilitate planning over the 20-year study horizon.

The population projections methodology included the following steps:

- Identification of the most robust source of baseline projections.[3]
- Review and evaluation of growth factors within the three counties that will influence population growth in the near- and long-term.
- Review of similar automotive plant projects to identify probable population impacts.
- Calculation of the potential population impact attributed to Blue Oval City
- Computation of revised population projections by adjusting baseline projections utilizing findings from steps 2 through 4. These projections are based on reasonable assumptions developed from credible research.

4.1 Impacts from Comparative Projects

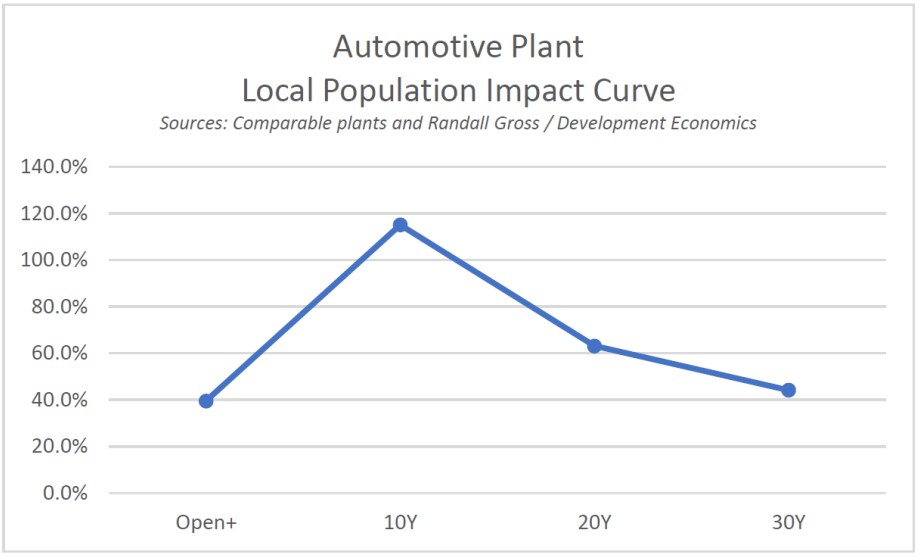
The Memphis Area Association of Governments (MAAG) commissioned an economic study on Blue Oval City in early 2022. Randall Gross/Development Economics (RDGE) carried out this study and presented its findings at MAAG's West TN Mega-Site/Blue Oval City Next Steps forum held on March 24, 2022, at the Halloran Centre in Memphis. Takeaways from this research informed the population projections methodology developed for this study, as detailed in the following section.

RDGE studied 12 historical examples of comparative automotive production facilities and their impacts on the surrounding communities. Based on the average growth trend among all the case studies, RDGE created an "Automotive Plant Local Population Impact Curve," outlined in Figure 1.[4] The X-axis displays the timeline following the automotive plants' opening dates, and the Y-axis displays the average percent increase in the surrounding communities' populations since the opening of the plants.

[3] At initiation of this study, the scope included development of original baseline projections, however, it was later concluded that the Boyd Center provided the best basis to build upon due to its robust methodology and trust in the state.

[4] According to RDGE's presentation, faster population growth occurred in suburbanized, metropolitan areas (Spring Hill, TN; Smyrna, TN; and Georgetown, KY), and slower growth occurred in non-metropolitan areas (Blue Springs, MS; Greensburg, IN;

Figure 1. Population Impact Curve for Counties Surrounding Similar Automotive Plant Projects



Source: "Blue Oval City and Economic Implications for the MAAG Region," Randall Gross/Development Economics, March 24, 2022.

RDGE reported that the average population increase for counties was 68 percent over the 30-year horizon. The minimum percent change of the counties studied was 0 percent (Decatur County/Honda), and the maximum percent change was 306 percent (Rutherford County/Nissan). According to RDGE's local population curve, the maximum population impact occurs ten years after the opening of the automotive plant. The ripple effect of increased population will continue to result in growth, but at a slower pace after the ten-year mark.

Distances of the similar automotive plants to metropolitan areas were also reviewed. In communities where the automotive plants were located within 35 miles of a larger city, more population growth occurred compared to the communities where the plant is located farther than 35 miles away. In the case of Blue Oval City, Stanton is approximately 50 miles from the city core of Memphis. Following the pattern of the other non-metropolitan areas that RDGE analyzed, the tri-county study area is expected to have less growth than communities located closer to Memphis. The Blue Oval City project is not expected to generate the level of population growth that Rutherford County experienced as a result of the Nissan plant that was built in 1983.

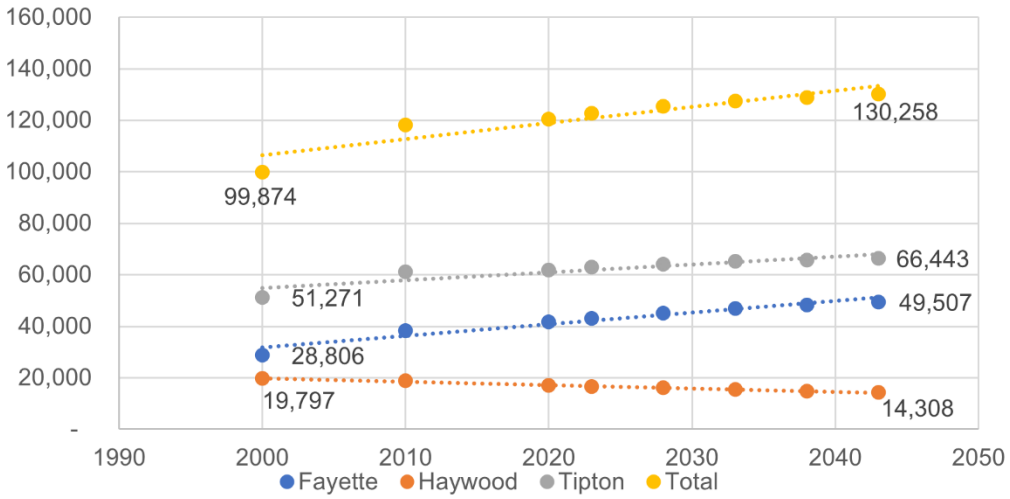
West Point, GA; and Lincoln, AL). RDGE noted in the presentation that "Commutation is maximized for a rural plant with limited local area labor force or suburban growth." (https://maagov.org/wp-content/uploads/2022/03/RGDE-BLUE-OVAL-PRESENTATION.pdf)

4.2 Projections

Baseline Projections

To determine the baseline population forecast (anticipated growth without Blue Oval City's impact), the existing population projections from local plans, state agencies, university resources, and Environmental Systems Research Institute (ESRI) Geographic Information System (GIS) data were compared. The Boyd Center for Business and Economic Research (Boyd Center), a research center at the University of Tennessee Knoxville, has a robust and trusted population projections approach with projections calculated annually through 2070.[5] The Boyd Center's projections for the study area through the 2043 planning horizon are outlined in
Figure 2. The Boyd Center developed these projections before the announcement of Blue Oval City, which makes them an excellent candidate for serving as the baseline foundation for the Wastewater Regionalization Opportunity Assessment.

Figure 2. Boyd Center Population Projections for Study Area (Finalized late 2021, Published in 2022)



Blue Oval City Jobs Forecast

Ford and SK Innovation anticipate 5,800 direct jobs[6] at Blue Oval City. Additionally, a study commissioned by the MAAG estimated an additional 21,300 indirect and induced jobs will result from

[5] The Boyd Center uses a standard projections methodology called the cohort-component model. Supported by recorded vital statistics (birth and mortality rates) provided by the Tennessee Department of Health and migration data from the Social Security Administration and U.S. Census Bureau, the Boyd Center's projections are grounded in realistic trends using a widely accepted forecast methodology and offer the best baseline forecast for the tri-county study area. Haywood County's decreasing projections align with their recent trends from the U.S. Census Bureau, which have been declining for the past 20 years.
[6] Tennessee Department of Economic & Community Development, Frequently Asked Questions, https://www.tn.gov/ecd/rural-development/blue-oval-city-resources/frequently-asked-questions.html

the Blue Oval City investment.[7] Indirect jobs refer to businesses that provide goods and services that support the campus, such as suppliers of raw materials or ancillary manufacturing components. Induced jobs are those that respond to the demand of Blue Oval City employees for external goods and services, such as restaurants and grocery stores.

Growth Factors and Assumptions

Table 4 outlines the assumptions used to calculate the population impact attributed to Blue Oval City.

Table 4. Assumptions Overview

Topic	Assumption
Percentage of Blue Oval City Jobs (Direct/Indirect/Induced) filled by Newcomers to the Region	90%
Population Allocation to Each Geography	Highest allocation to Fayette County, second highest to Tipton County, and lowest to Haywood County**. See Table 5.**
Average Household Size	For each county within the study area, the average household size for the pertinent county was used. For areas outside of the tri-county study area, the average household size was used**. See Table 6.**
Timing of Growth over Planning Horizon	Population slowly upticks in the near-term. It reaches its maximum percent increase in 2033, after which it continues to increase but at a lower rate**. See Table 7.**

The total forecast for new jobs (direct, indirect, and induced) is 27,100. To be conservative for wastewater facility planning, it is prudent to plan for the potential of a high ratio of newcomers compared to the available workforce currently residing in the tri-county study area. As a result, the first major assumption for the adjusted Blue Oval City projections suggests 90 percent of the total jobs will be filled by newcomers to the region.[8] It can be expected that 24,390 positions will be filled by people moving to the greater West Tennessee region who had not lived in this part of the state prior to the Blue Oval City announcement.

[7] "Blue Oval City and Economic Implications for the MAAG Region" RGDE, March 24, 2022, https://maagov.org/wp-content/uploads/2022/03/RGDE-BLUE-OVAL-PRESENTATION.pdf

[8] The Upjohn Institute for Employment Research reports that new jobs created by significant state economic development projects are filled by three groups: employed residents, non-employed residents, and in-migrants. On average, only 20 percent of the new jobs are filled by state residents, and the other 80 percent are filled by to in-migrants. ("Improving State Economic Development Policies," Upjohn Institute for Employment Research, Presentation at IPSSR Public Policy Forum, October 19, 2021). This West Tennessee assessment is more aggressive than the report by attributing 90 percent (rather than 80 percent) of the jobs attributed to in-migrants.

Three scenarios for population projections were created and accounted for “low”, “medium”, and “high” population growth. The differing factor within these scenarios is the percentage of growth allocated to the study area and the region outside of the study area. While the three counties in the study area have the closest driving times to Blue Oval City, factors such as a lack of available housing and other services will limit growth, at least in the short term. To determine the percentage of overall population growth for each geographic area, a scoring methodology was utilized based on the community context and policy indicators detailed in the Appendix. In each of the three scenarios, Fayette County receives the greatest allocation of growth, Tipton County receives 80 percent of Fayette’s allocation, and Haywood County receives 50 percent of Fayette’s allocation.

Table 5. Population Allocation Assumptions by Growth Scenario

Growth Scenario	Fayette County: Percentage of Growth (%)	Tipton County: Percentage of Growth (%)	Haywood County: Percentage of Growth (%)	Growth within West TN Study Area (%)	Growth Outside West TN Study Area (%)
High	30%	24%	15%	**69%**	**31%**
Medium	25%	20%	12.5%	**57.5%**	**42.5%**
Low	20%	16%	10%	**46%**	**54%**

After applying the above percentages to the forecasted incoming workforce associated with Blue Oval City (direct, indirect, and induced jobs), the total population impact was determined by multiplying the total new employees by household size (Table 6).

Table 6. Average Household Size

Geography	Average Household Size
Fayette	2.54
Haywood	2.45
Tipton	2.83
Outside of Study Area (State of Tennessee)	2.52

Source: U.S. Census Bureau, 2012 – 2016 and 2016 – 2020 American Community Survey Five-Year Estimates

Based on projects with similar contexts, population growth is anticipated to increase slowly, yet steadily in the ten years after Blue Oval City opens, as outlined in Table 7. Over time, after more public and private investment and services that support families and children have been enhanced, demand for living within the tri-county study area, and closer to the site itself, is expected to increase. Based on the community context indicators, Fayette and Tipton Counties are anticipated to experience more population growth than Haywood County in the near term. Haywood’s growth is anticipated to be

slower but will ramp up over time, as reflected in Table 7. Similar to the RDGE local population impact curve shown in
Figure 1, the population impact from Blue Oval City is expected to be greatest around the ten-year mark, which was approximated as 2033 for the purpose of this study. Growth rates are expected to slow after the ten-year mark.

Table 7. Timing of Growth Assumptions

Geography	2023	2028	2033	2038	2043
Fayette	5%	25%	50%	15%	5%
Haywood	2%	20%	40%	28%	10%
Tipton	5%	25%	50%	15%	5%

Population Projection Methodology and Results

The following equation was used to calculate the total population attributed to Blue Oval City for each county as well as the area outside of the tri-county study area:

Total Population Impact of Blue Oval City by 2043 **=** Total Forecasted Jobs (Direct, Indirect, Induced) **x** Percent Forecasted Jobs Anticipated to be Filled by Newcomers **x** Percent Allocation of Forecasted Jobs by Geography **x** Average Household Size of County[9]

Next, the timing of growth was considered. For each of the three counties, the total population impact (output from the equation above) was phased in using the timing of growth percentages shown in Table 7. The results of this calculation for the identified "high" scenario are shown in Table 8. The results of the "medium" and "low" scenarios are available in the Appendix.

Table 8. Projected Population Impact of Blue Oval City (High Scenario)

Geography	2023	2028	2033	2038	2043
Fayette	929	5,576	14,868	17,656	18,585
Haywood	179	1,972	5,557	8,067	8,963
Tipton	828	4,970	13,253	15,737	16,566

Lastly, the sum of the Boyd Center baseline projections and the Blue Oval City population impact projections were calculated. The results of the "high" scenario are captured in Table 9.[10]

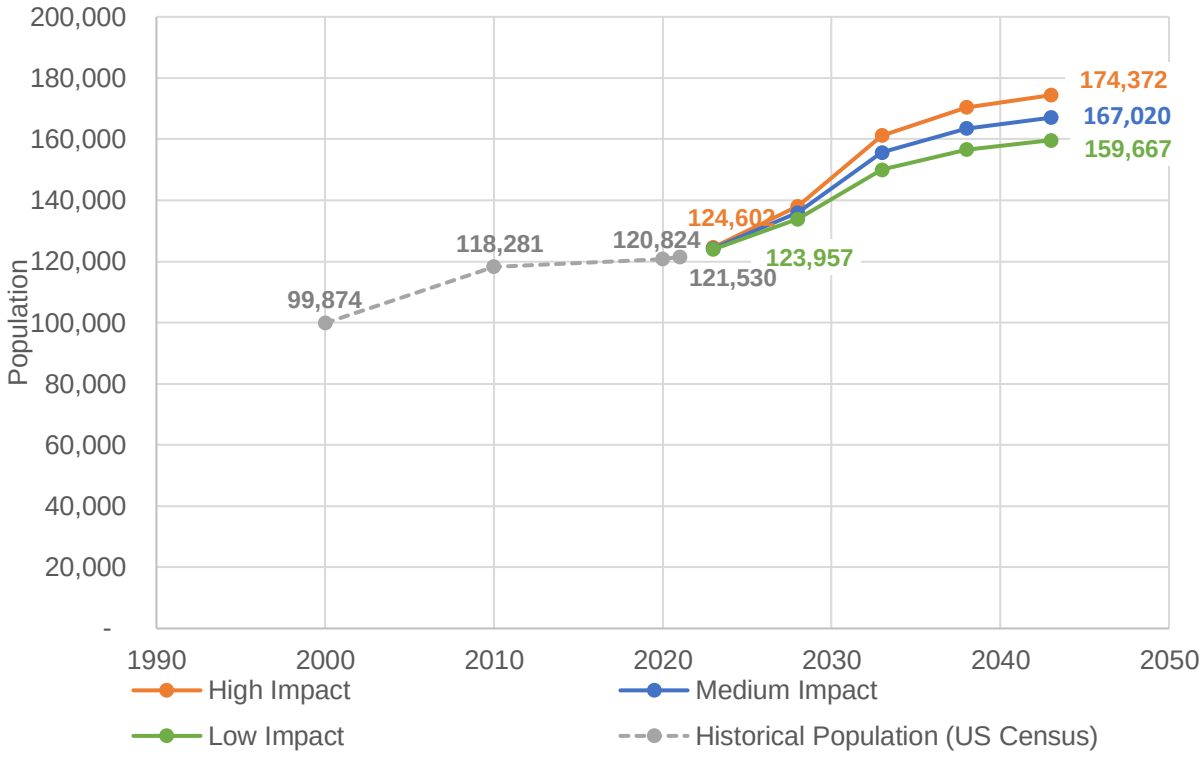
[9] The state average household size was used for the "outside of study area" geography.
[10] These projections are best estimates. The actual population growth rates could be higher or lower. Stakeholders should monitor trends and update projections as a part of preliminary engineering reports or other planning documents.

Table 9. Tri-County Study Area Population Projections (High Scenario)

Geography	2023	2028	2033	2038	2043
Fayette	44,026	50,798	61,787	65,948	68,092
Haywood	16,839	18,054	21,017	22,923	23,271
Tipton	63,737	69,198	78,433	81,492	83,008
Total Study Area	**124,602**	**138,050**	**161,237**	**170,362**	**174,372**

The “high” scenario was utilized for the alternatives analysis due to the conservative value for infrastructure planning. In this context, ‘conservative’ refers to planning for future wastewater facilities that are designed to service the highest potential demand. Figure 3 depicts population trendlines for "high”, “medium”, and “low” scenarios, as well as historic Census population counts.

Figure 3. Historical and Projected Population for Tri-County Study Area (High, Medium, Low Scenarios)



SECTION 5. WASTEWATER FLOW PROJECTIONS

Within the tri-county study area, there are 13 active wastewater utilities that serve the existing population. Table 10 provides a summary of the existing average daily flow (ADF) by county (the sum of the average daily flow values for the active utilities).

Table 10. Tri-County Study Area Baseline Wastewater Flows, 2020

Geography	2020 Average Daily Flow (MGD)
Fayette	2.11
Haywood	1.53
Tipton	3.14
Total Study Area	**6.78**

Source: TAUD, Survey of Wastewater Systems in Haywood, Fayette and Tipton Counties, October 3, 2022. Wastewater flows provided in the TAUD study are based on audit data from July 2021 and hence are referred to as 2020 baseline values for the purposes of this study. This table includes adjustments for Fayette County and Tipton County total flows based on Piperton sending flows to Rossville in Fayette County, and Atoka and Brighton sending flows to Munford in Tipton County.

Forecast Approach

As part of this study, future wastewater flows were prepared for planning years 2023, 2028, 2033, 2038, and 2043. These forecasts were made using the current wastewater flow as the baseline value and then adding the population growth multiplied by a wastewater unit rate.

TDEC collection system design standards guided the selection of wastewater unit rates, which include 100 gallons per capita per day (gpcd) for residential customers.[11] Commercial and industrial wastewater flows were estimated at 40 percent of the residential flow based on the review of other recent flow evaluations performed for small, medium, and large utilities in the southeast. It should be noted that the commercial and industrial flow is inclusive of potential community level growth such as schools, daycares and fire stations. Since the commercial wastewater volume can range widely depending on the number of customers and types of facilities, a sensitivity analysis was performed with a 10 percent range, and the results showed very little impact on the total flow value; as a result, the medium value of 40 percent was selected for this analysis. The total wastewater unit rate used in this study, including residential, commercial, and industrial flow, was 140 gpcd.

Table 9 depicts resulting wastewater flows by county for each planning year. Please note these values were calculated using the "high" scenario population projection presented in the previous section and includes the impact from Blue Oval City. In addition, these projected values include unincorporated areas, since population forecasts were performed on a countywide basis, as previously discussed.

Table 11. Tri-County Study Area Wastewater Flow Projections – High Scenario[1]

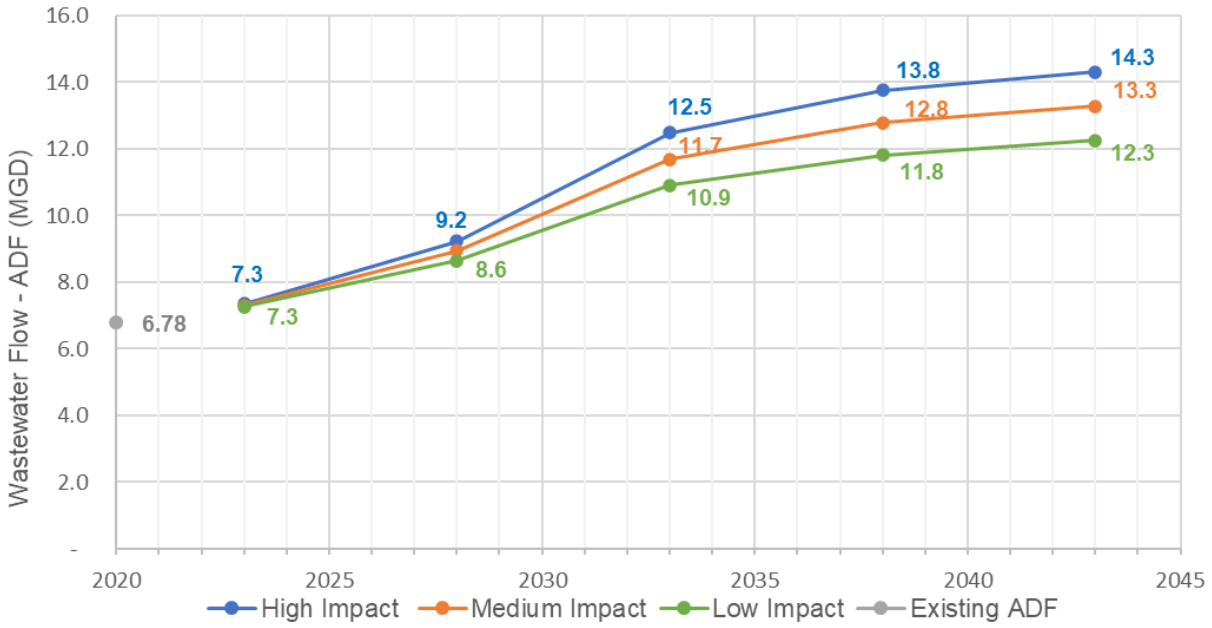
[11] Tennessee Department of Environment & Conservation (TDEC), Division of Water Resources (DWR). (2020). *DWR-NPDES-SOP-G-02-WW Design Criteria Chapter 2-072020, Design Criteria for Review of Sewage Works Construction Plans and Documents, Chapter 2*.

Geography	Average Day Flow (MGD)					
	Existing[2]	2023	2028	2033	2038	2043
Fayette	2.1	2.4	3.4	4.9	5.5	5.8
Haywood	1.5	1.5	1.7	2.1	2.4	2.4
Tipton	3.1	3.4	4.2	5.5	5.9	6.1
Total Study Area	**6.7**	**7.3**	**9.2**	**12.5**	**13.8**	**14.3**

[1] The 2023 baseline values include wastewater flows for the incorporated and unincorporated areas within the study area.

Wastewater flows provided in the TAUD study are based on audit data from July 2021 and hence are referred to as 2020 baseline values for the purposes of this study. Table 9 includes adjustments for Fayette County and Tipton County total flows based on Piperton sending flows to Rossville in Fayette County, and Atoka and Brighton sending flows to Munford in Tipton County.

Figure 4. Historical and Projected Wastewater Flow for Tri-County Study Area



SECTION 6. ALTERNATIVES EVALUATION

6.1 Background and Existing Treatment Facilities

In evaluating the methods to serve potential sewer demands of anticipated growth, several alternatives were considered. These alternatives primarily focused on regionalization – creating systems owned by

more than one entity which offer economies of scale in construction and operation. In order to start this analysis, a review of the existing utilities within the tri-county study area was completed.

Of the 13 existing utilities in the tri-county study area, there are 11 wastewater treatment plants (WWTP) that are currently operated by 9 of the utilities. Like many rural areas in Tennessee, smaller communities in the tri-county study area depend on lagoons for wastewater treatment. While these systems are relatively easy to operate, conventional treatment systems, such as oxidation ditches, sequencing batch reactors (SBRs) and other activated sludge facilities, can produce a higher quality effluent with a smaller plant footprint. Additionally, there are activated sludge facilities in the larger communities. Brownsville Energy Authority (BEA) operates a trickling filter system at one of its facilities and is currently upgrading and expanding its other WWTP from a lagoon system to an SBR process. Oakland currently has an activated sludge system. Table 10 summarizes the existing treatment facilities, as well as information regarding the treatment facility.

Table 10. Existing Wastewater Treatment Utilities and Facilities

Wastewater Utility	Utility Type	NPDES Permit No.	Existing Treatment Plant Type	Current Treatment Capacity (mgd)	Current Average Day Flow (ADF) - (mgd)	Remaining Treatment Capacity Based on Average Day Flow (ADF) - (mgd)
Haywood County				3.65	1.53	2.12
Brownsville Energy Authority	Authority	TN0075078	Lagoon	2.28	0.82	1.46
		TN0062367	Fixed Film	1.08	0.67	0.41
Town of Stanton	Municipal	TN0062154	Lagoon	0.288	0.04	0.25
Fayette County				4.25	2.11	2.14
City of Gallaway	Municipal	TN0062138	Lagoon	0.165	0.07	0.10
City of Moscow	Municipal	TN0021164	Lagoon	0.186	0.08	0.11
Town of Oakland	Municipal	TN0077836	Activated Sludge	1.50	1.32	0.18
City of Piperton	Municipal		Sends WW flow to Rossville. No current WWTP is operated.			
Town of Rossville	Municipal	TN0064092	Lagoon	1.0	0.13	0.87
Town of Somerville	Municipal	TN0021652	Lagoon	0.895	0.51	0.39
Tipton County				7.73	3.14	4.59
Town of Atoka	Municipal		Sends WW flow to Munford. No WWTP			
Town of Brighton	Municipal		Sends WW flow to Munford. No WWTP	N/A	N/A	
City of Covington	Municipal	TN0020982	Lagoon	3.62	2.08	1.54
Town of Mason	Municipal	TN0026620	Lagoon	0.11	0.12	-0.01
City of Munford	Municipal	TN0062499	On-Site BNS	2.0	0.94	1.06

Source: "Survey of Wastewater Systems in Haywood, Fayette and Tipton Counties," TAUD, October 3, 2022

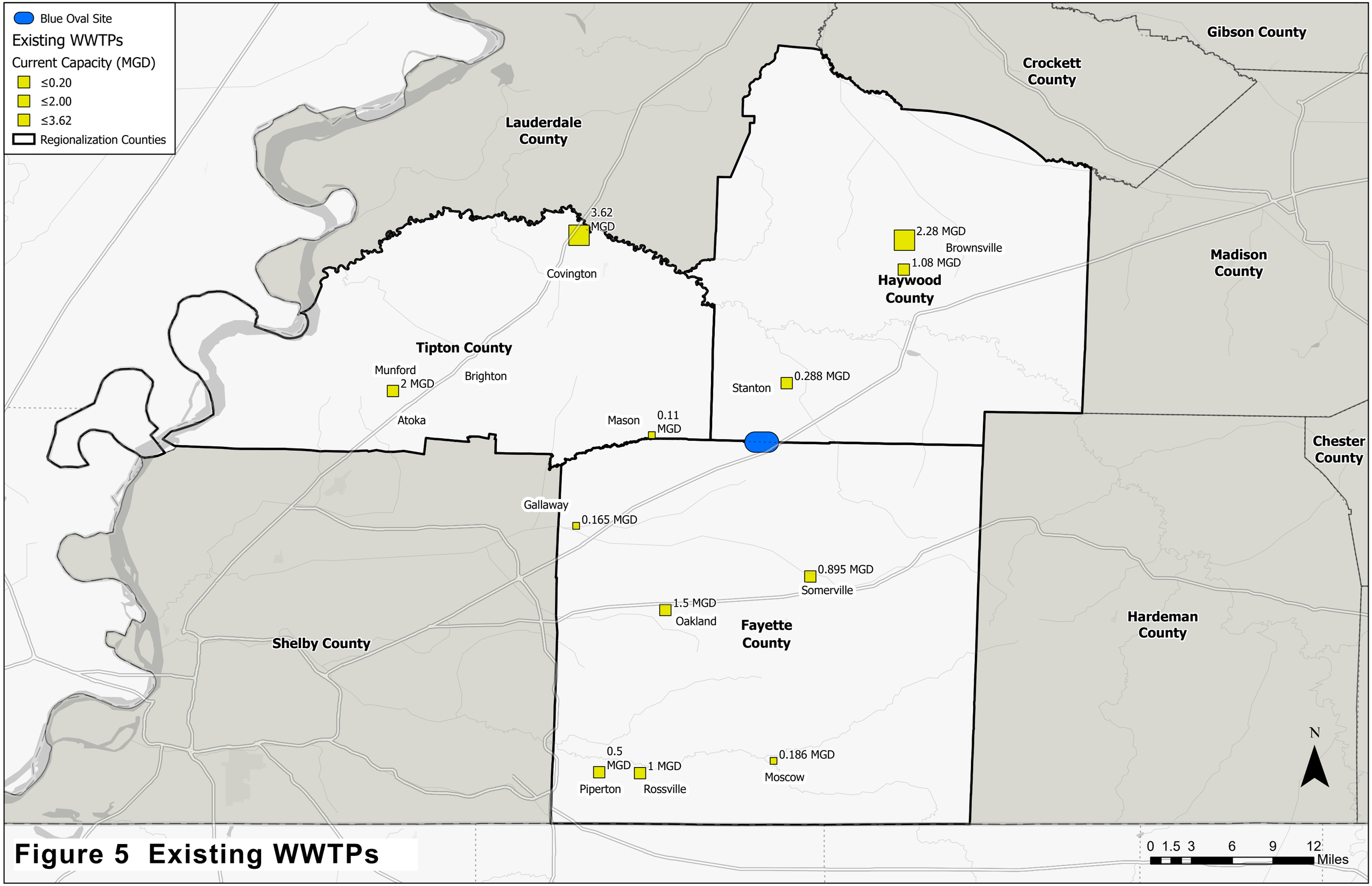


Figure 5 Existing WWTPs

6.2 Allocation of Future Flows

Alternatives for long-term wastewater treatment were based on projected flows in 2033 and 2043. The selected evaluation at ten-year intervals for this study is based on the anticipated time required to establish a regional entity and plan, fund, design, and implement projects (see Section 7 for further discussion). This analysis is based on providing facilities that will be able to meet demands through 2033 without expansion. For some of the alternatives, additional phased expansion may be required to meet wastewater flow demands until 2043. In these cases, phasing construction is described in the following alternatives discussion that will accommodate the capacity to treat the 2043 demands (e.g., adding treatment trains, etc.).

Facility planning requires quantifiable estimates of future growth. A publicly available source for city-level population projections in Tennessee was not identified and therefore a model was developed for this study. Current (2022) population numbers were used for each city provided in the TAUD report. A factor was developed to weigh the population growth inside each county proportional to the existing population of each community and inversely proportional to the distance to Blue Oval City. This indicates that population is more likely to grow where services are already present, and that people generally wish to live closer to their workplace. These weighting factors were used to determine the allocation, by community, of projected population growth[12] in each county.

The population growth projections[13] and baseline wastewater flows (Section 4) were used to determine the flow increase over each planning interval; then were multiplied by the additional population by the weighted percentages calculated as outlined above. Calculations yielded projected population data for each community. This approach assumes that all new population growth will occur within the wastewater service area of a community and that there is no treatment by decentralized systems. This is a conservative approach to account for potential wastewater flows, as all flows are assigned to community systems even though there are likely to be residential homes with septic systems in outlying areas. The projected additional population for each community were multiplied by the 140 gpcd wastewater unit rate developed from the wastewater flow projections in Section 4 and added to the 2020 Average Daily Flow (ADF) for each community.

Table 11 outlines resulting wastewater flows by utility for the 2033 and 2043 planning years. These values are based on the “high scenario” population projection described in Section 4: Population Projection.

[12] See Section 4: Population Projections
[13] See Section 4: Population Projections

Table 11. Current and Projected Flows

Wastewater Utility	Utility Type	NPDES Permit No.	Current Average Day Flow (ADF) - (mgd)	2028 ADF Projected Flow (mgd)	2033 ADF Projected Flow (mgd)	2038 ADF Projected Flow (mgd)	2043 ADF Projected Flow (mgd)
Haywood County				1.70	2.09	2.36	2.41
Brownsville Energy Authority	Authority	TN0075078	0.82	1.63	1.97	2.20	2.25
		TN0062367	0.67				
Town of Stanton	Municipal	TN0062154	0.04	0.07	0.12	0.15	0.16
Fayette County				3.40	4.93	5.52	5.82
City of Gallaway	Municipal	TN0062138	0.07	0.13	0.20	0.22	0.24
City of Moscow	Municipal	TN0021164	0.08	0.12	0.16	0.17	0.18
Town of Oakland	Municipal	TN0077836	1.32	1.99	2.78	3.08	3.24
City of Piperton	Municipal	TN0080764	0.06	0.11	0.24	0.29	0.32
Town of Rossville	Municipal	TN0064092	0.13	0.18	0.24	0.27	0.28
Town of Somerville	Municipal	TN0021652	0.51	0.87	1.31	1.48	1.56
Tipton County				4.20	5.45	5.88	6.09
Town of Atoka	Municipal						
Town of Brighton	Municipal		N/A				
City of Covington	Municipal	TN0020982	2.08	2.42	2.85	2.99	3.06
Town of Mason	Municipal	TN0026620	0.12	0.21	0.32	0.36	0.38
City of Munford	Municipal	TN0062499	0.94	1.53	2.28	2.53	2.65

6.3 Effluent Disposal/Reuse and Impacts on Alternative Selection

In developing these alternatives, effluent disposal/reuse and its impact on plant design must also be considered. In Tennessee, the most common means of effluent disposal for larger facilities is via a surface water discharge. In this evaluation, several alternatives to surface water discharge were considered.

T.C.A. § 69-3-108(e) requires applicants for a new or expanded discharge to surface waters to consider alternative disposal methods, such as land application and beneficial reuse.

For any of the alternatives discussed below, land application and reuse are potential ways of discharging effluent. However, especially for the alternatives that call for a higher wastewater flow to be treated and discharged, implementing either of these options should be an additional method of effluent disposal and not the sole method. Land application is currently included under Rule 0400-40-06. chapter 16 of the Design Criteria for Sewage Works and is focused more on treatment of effluent than on disposal of highly treated effluent. The rule includes soils restrictions similar to those for subsurface land application, which increase the amount of acreage required for land application. These restrictions result in soils loadings rates of 0.25 gpd/square foot, or roughly 10,000 gpd/acre. Assuming that there are no soil issues, 1 mgd of effluent disposal requires roughly 100 acres of land application area. The largest treatment facility anticipated in this study, a 14.3 mgd treatment plant for full regionalization, would require a minimum of 1,400 acres of land application property, assuming the entire site consisted of acceptable soils. Given challenges and the potential for areas not being approved for disposal, it would be prudent to provide 2,800 acres. At an assumed cost of $10,000 an acre, 2,800 acres would cost approximately $28 million.

Non-potable reuse, even for land application on existing farms as irrigation water, could eliminate much of the anticipated land cost. Non-potable reuse for water demands, which do not require drinking water quality, allows reuse to replace the use of higher quality water, especially potable drinking water. Reuse could also reduce the impacts of streams on dry weather months.

This study includes surface water discharge as the only effluent disposal method, but future studies will need to be completed in order to analyze if land application and/or reuse should be an additional method of disposal.

6.4 Alternative Development

The four alternatives considered for this study include the following:

1. **Full regionalization**: Wastewater flows could potentially convey to a new regional facility constructed in Tipton County, discharging to the Mississippi River. Existing treatment plants could convert to pump stations.
2. **Partial regionalization**: Except for Covington and Brownsville, wastewater flows could potentially convey to a new regional facility constructed near Munford, discharging to the Mississippi River. Existing treatment plants could convert to pump stations.
3. **Growth area regionalization**: Western Fayette County could remain "as is" and Brownsville could continue as a stand-alone utility. Wastewater flows for the remaining area could potentially convey to a new regional facility constructed near Oakland, discharging to the Loosahatchie River.
4. **Two service areas**: Except for Covington and Brownsville, wastewater flows in Tipton County and the portion of Haywood County north of I-40 could potentially convey to a new regional facility constructed near Munford, discharging to the Mississippi River. Wastewater flows in Fayette County and the portion of Haywood County south of I-40 could potentially convey to a new regional facility constructed near Oakland, discharging to the Loosahatchie River.

Each of these alternatives is discussed in greater detail in the following sections. While these are long-term regionalization solutions, utilities that decide to participate in a regionalization wastewater solution need to consider how their current short-term infrastructure needs would be a part of a long-term regionalization plan.

Alternative 1 – Full Regionalization

Alternative 1 is based on regionalizing all treatment within the tri-county study area. In this alternative, all flows from new growth are collected and pumped to the proposed regional treatment facility. Existing treatment facilities will be converted to pump stations for both new and existing flows. This alternative provides a single regional treatment facility, eliminating 10 existing facilities. This alternative provides the greatest economy of scale, as there is only one facility based on current technology, rather than 10 smaller facilities, several of which need improvement or replacement in the near future.

Based on the proposed service area, it is assumed that the treatment facility will be constructed in Tipton County, most likely in or near Munford. This allows the use of the existing outfall easement to the Mississippi River for effluent disposal. Although Munford has an existing 2.0 mgd treatment facility, it is a lagoon facility and does not appear to have any available area for expansion. Therefore, the new

treatment facility will need to be constructed elsewhere, potentially east of US Highway 51, to shorten the length of necessary influent force mains.

The remaining facilities in the service area will be converted into pump stations and pump raw wastewater to the new regional WWTP. It is assumed that all existing utilities will be connected to the regional system. Piperton and Moscow can pump to the Rossville facility, which will be converted from a lagoon to a pump station. This station will then pump north and west to the regional system. The Brownsville, Covington, Oakland, and Somerville treatment facilities will also be converted into pump stations. Gallaway and Stanton can pump to Mason, and then be re-pumped to the regional facility. The projected peak flows are based on a 3.0 peaking factor and the flow projections outlined previously. Table 12 depicts the required pumping capacity for each of the proposed master pump stations.

Table 12. Alternative 1 Pump Station Transmission Size Requirements

Location	2043 AADF Flow (MGD)	Peak Flow (MGD)	Force Main Size (inches)	Force Main Length* (miles)
Brownsville	2.25	6.75	24	33
Stanton (Pumps to Mason)	0.16	0.48	6	10
Gallaway (Pumps to Mason)	0.24	0.72	8	9
Mason (Includes Stanton and Gallaway)	0.78	2.34	16	16
Moscow (Pumps to Rossville)	0.18	0.54	8	9
Piperton (Pumps to Rossville)	0.32	0.96	8	3
Rossville (Includes Moscow and Piperton)	0.78	2.34	16	48
Oakland	3.24	9.72	30	34
Somerville	1.56	4.68	24	35
Covington	3.06	9.09	30	21
Munford	2.65	7.95	24	7

**Force main lengths are estimated based on drivable distance*

Based on current and projected flows, initial flows to the regional facility will be approximately 7.0 mgd. The 2033 AADF at the new regional treatment facility is projected to be 12.5 mgd, while the 2043 AADF is projected at 14.3 mgd. Given the proposed discharge to the Mississippi River, it was assumed that treatment requirements will be consistent with secondary treatment, although partial denitrification may be included to reduce future operating costs. For phasing purposes, it is suggested that the facility be constructed in 2033 with three parallel 4.25 mgd trains. This allows initial operation of two trains,

with the third train being utilized as flows increase. A fourth train will be added in the future to allow treatment of the 2043 flow of 14.3 mgd.

At this capacity, it is desirable to utilize a conventional activated sludge system with deep aeration basins and fine bubble diffusers. This will maximize energy efficiency in the secondary treatment system. Depending on final design parameters, the plant size is also at a breakpoint where primary treatment and anaerobic digestion may be more efficient. If this is confirmed, then the treatment operations will include:

- Preliminary Treatment (screening and grit removal)
- Primary Clarification
- Secondary Treatment (conventional activated sludge, Modified Ludzack-Ettinger process)
- Secondary Clarifiers
- Disinfection
- Anaerobic Sludge Digestion (minimum Class B pathogen reduction)
- Sludge Dewatering
- Effluent Pumping

For both options, Class B pathogen reduction is assumed as Class B biosolids are already being used in agricultural applications in the area. For pricing purposes, the second option, fine bubble aeration and anaerobic digestion, is assumed. While the initial capital cost will be higher, the O&M cost will be lower, as the primary clarifier will remove part of the aeration load from the secondary treatment system, and gas from the anaerobic digesters offers the potential of biogas recovery.

From the treatment plant, effluent will be pumped approximately 20 miles to the Mississippi River. To meet peak day requirements, a 48” force main will be required from the plant to the river. For the first portion of the route, new easements will need to be acquired connecting the treatment plant site to the existing Munford easement. The force main can then be run in the Munford easement to the final outfall location.

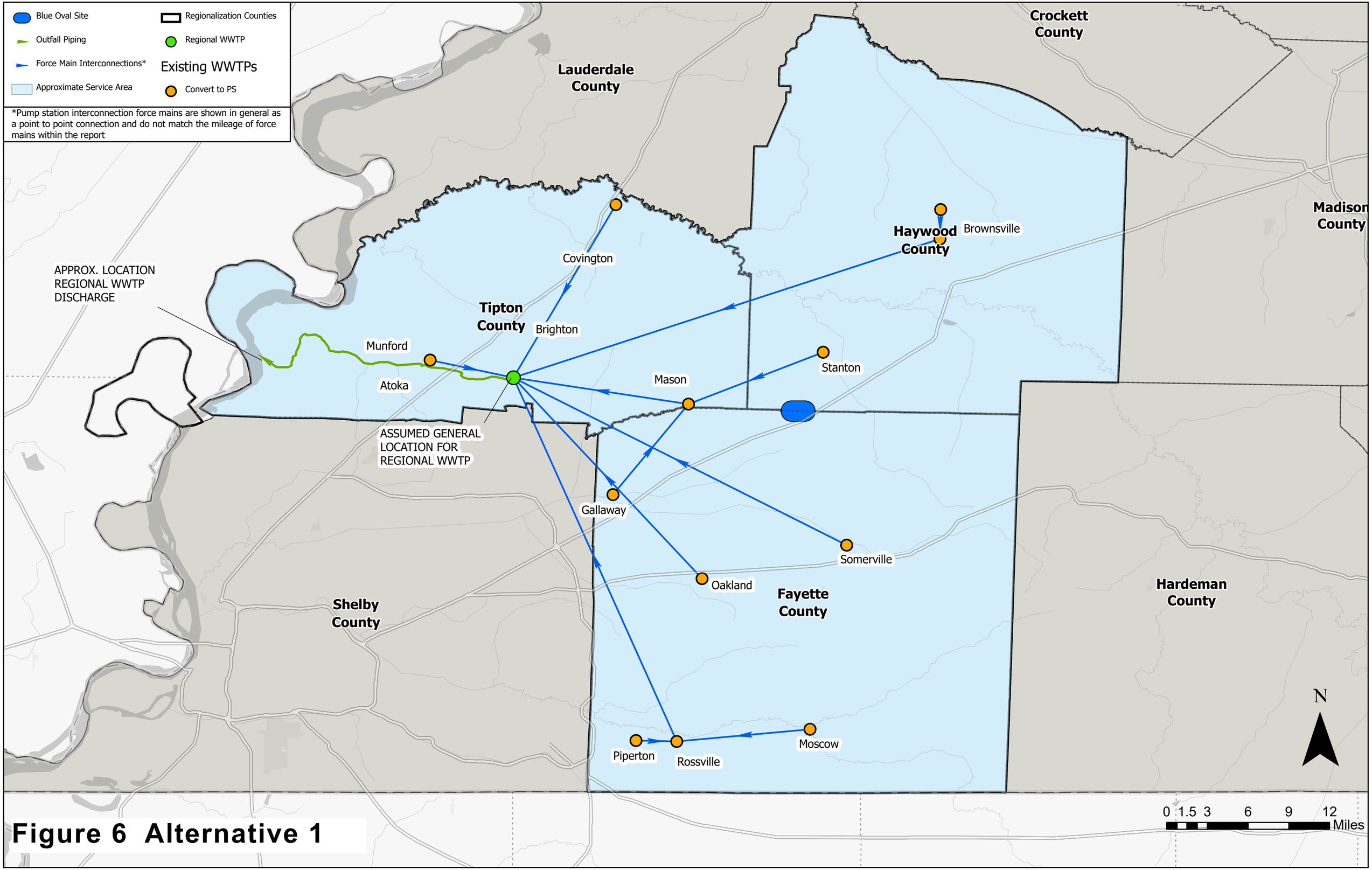


Figure 6 Alternative 1

Alternative 2 – Partial Regionalization

Alternative 2 is based on regionalizing the smaller facilities within the tri-county study area. A single regional plant will be constructed, and the existing flows from the smaller facilities, as well as the flows from new growth within the service area, will be pumped to the regional facility. Table 13 shows the facilities that would be combined into a single regional treatment facility as well as the required pumping capcity. Based on the proposed service area, it is assumed that the treatment facility would be constructed in Tipton County, most likely in or near Munford. This would allow the use of the existing outfall easement to the Mississippi River for effluent disposal. Although Munford has an existing 2.0 mgd treatment facility, it is a lagoon facility and does not appear to have any available area for expansion. The new treatment facility would need to be constructed elsewhere, potentially east of US Highway 51, to shorten the length of necessary influent force mains.

The remaining facilities in the service area that are part of this regionalization solution will be converted into pump stations and will pump raw wastewater to the new regional facility. It is assumed that all existing utilities inside the service area will be connected to the regional system. Piperton and Moscow could pump to the Rossville facility, which would be converted from a lagoon to a pump station. This station could then pump north and west to the regional system. The Oakland and Somerville treatment facilities would also be converted into pump stations. Gallaway and Stanton could pump to Mason, and then be re-pumped to the regional facility.

Table 13. Alternative 2 Pump Station Transmission Size Requirements

Location	2043 AADF Flow (MGD)	Peak Flow (MGD)	Force Main Size (inches)	Force Main Length* (miles)
Stanton (Pumps to Mason)	0.16	0.48	6	10
Gallaway (Pumps to Mason)	0.24	0.72	8	9
Mason (Includes Stanton and Gallaway)	0.78	2.34	16	16
Moscow (Pumps to Rossville)	0.18	0.54	8	9
Piperton (Pumps to Rossville)	0.32	0.96	8	3
Rossville (Includes Moscow and Piperton)	0.78	2.34	16	48
Oakland	3.24	9.72	30	34
Somerville	1.56	4.68	24	35
Munford	2.65	7.95	24	7

**Force main lengths are estimated based on drivable distance*

Based on the projected flows, the 2033 AADF at the new regional treatment facility will be 7.6 mgd, while the 2043 AADF will be 9.0 mgd. For phasing purposes, this suggests that the facility be constructed with three parallel 2.5 mgd trains in 2033. This allows initial operation of two trains, with the third train being utilized as flows increase. A fourth train will be added in the future to allow treatment of the 2043 flow of 9.0 mgd.

Given the size of the facility, land application of the entire flow would be difficult. At the time of this report, no industries in the immediate area of the plant that might use reuse water were found. As a result, it is assumed that the discharge will be piped to the Mississippi River via the existing Munford easement. Given the proposed discharge to the Mississippi River, it is assumed that treatment requirements will be consistent with secondary treatment, although partial denitrification may be included to reduce future operating costs.

These considerations indicate a treatment facility that will include the following treatment operations:

- Preliminary Treatment (screening and grit removal)
- Secondary Treatment (extended aeration, including partial denitrification)
- Secondary Clarifiers
- Disinfection
- Sludge Stabilization (minimum Class B pathogen reduction)
- Sludge Dewatering
- Effluent Pumping

For purposes of estimating construction costs, it is assumed that the secondary treatment system will consist of Carrousel™ or similar aeration basins. At this capacity, it is uncertain whether the additional complexity associated with a conventional activated sludge system with deep aeration basins and fine bubble diffusers will offset the potential reduction in energy costs. Depending on final design parameters, the plant size is also at a breakpoint where primary treatment and anaerobic digestion may be more efficient.

From the treatment plant, effluent will be pumped approximately 20 miles to the Mississippi River. To meet peak day requirements, a 42” force main will be required from the plant to the river. For the first portion of the route, new easements will need to be acquired connecting the treatment plant site to the existing Munford easement. The force main can then be run in the Munford easement to the final outfall location.

In this alternative, both Covington and Brownsville, two of the larger utilities in the tri-county study area, will remain as stand-alone facilities. Covington is at the northern end of the service area and has a 3.62 mgd capacity lagoon system, with current AADF flows of 2.08 mgd. Growth in the Covington area will be routed to the Covington treatment facility. The 2033 anticipated flow (AADF) is 2.85 mgd, while the 2043 flow is projected at 3.06 mgd. Expansion of the treatment facility should not be required within the 20-year planning period.

Brownsville is slightly remote from the remainder of the service area and has existing facilities. Currently, there are two treatment facilities: a lagoon system with a 2.0 mgd treatment capacity and a fixed film treatment system. It is assumed, the Brownsville area will remain as a stand-alone system, and growth in the Brownsville area will be routed to the Brownsville collection and treatment systems. Current flows in the Brownsville area are 1.49 mgd and are expected to grow to 1.97 mgd by 2033 and 2.25 mgd by 2043. It is understood that Brownsville is currently proposing to upgrade their existing treatment facilities. If these flows are considered in that current project, no further expansion would be necessary.

Blue Oval Site
Outfall Piping
Force Main Interconnections*
Approximate Service Area
Regionalization Counties
Regional WWTP
Existing WWTPs
WWTP not in Regionalization
Convert to PS

*Pump station interconnection force mains are shown in general as a point to point connection and do not match the mileage of force mains within the report

Lauderdale County
Tipton County
Shelby County
Crockett County
Haywood County
Fayette County
Hardeman County
Madison County
Gibson County

Covington
Brownsville

APPROX. LOCATION REGIONAL WWTP DISCHARGE

ASSUMED GENERAL LOCATION FOR REGIONAL WWTP

Munford
Brighton
Atoka
Mason
Stanton
Gallaway
Somerville
Oakland
Piperton
Rossville
Moscow

N

0 1.5 3 6 9 12 Miles

Figure 7 Alternative 2

Alternative 3 – Partial Regionalization

Alternative 3 assumes regionalization of the smaller facilities within the tri-county study area but orients the proposed plant location closer to Blue Oval City. A single regional plant will be constructed, and the existing flows from the smaller facilities, as well as the flows from new growth within the service area, will be pumped to the regional facility. Reducing the regional service area to a smaller area closer to the Blue Oval City site will reduce the capital expenditures required for transmission mains, resulting in a more cost-effective alternative.

The facilities that would be combined into a single existing regional treatment facility are listed in Table 14 below. Based on the proposed service area, it is assumed that the treatment facility would be constructed in Fayette County, near the intersection of SR 59 and SR 194. This location is close to the existing Oakland discharge location and would allow use of the Oakland discharge point.

The remaining facilities in the service area that are part of this regionalization solution will be converted into pump stations, pumping raw wastewater to the new regional facility. It is assumed that majority of the existing utilities inside the service area are connected to the regional system. If Rossville prefers to remain a stand-alone system, Piperton will pump to the new regional facility. The Oakland and Somerville treatment facilities would also be converted into pump stations, pumping to the new regional facility. Gallaway and Stanton could pump to Mason, and then be re-pumped to the regional facility. Table 14 shows the required pumping capacity for each of the proposed master pump stations.

Table 14. Alternative 3 Pump Station Transmission Size Requirements

Location	2043 AADF Flow (MGD)	Peak Flow (MGD)	Force Main Size (inches)	Force Main Length* (miles)
Stanton (Pumps to Mason)	0.16	0.48	6	10
Gallaway (Pumps to Mason)	0.24	0.72	8	9
Mason (Includes Stanton and Gallaway)	0.78	2.34	16	10
Piperton (Pumps to Oakland)	0.32	0.96	10	20
Oakland (Includes Piperton)	3.56	10.68	36	10
Somerville	1.56	4.68	24	11

**Force main lengths are estimated based on drivable distance*

Based on the projected flows, the 2033 AADF at the new regional treatment facility will be 5.0 mgd, while the 2043 AADF will be 6.14 mgd. It is suggested that the facility be constructed initially with two parallel 3.1 mgd trains. This allows the plant to serve anticipated flows through 2043, with a potential for future parallel trains if required.

As noted previously, locating the proposed regional facility near the intersection of SR 59 and SR 194 would allow the new facility to be close to the existing Oakland outfall point. This location is also central to the proposed wastewater service area and distant enough from both Blue Oval City and existing municipalities

Given the size of the facility, land application would be challenging. While effluent reuse may be a possibility in this option, especially as new development begins to occur, a "purple pipe" reuse distribution system would provide only limited effluent disposal capacity. Applying the 25% limit currently in TDEC rules, the maximum flow to reuse would be 1.54 mgd. To provide for alternative discharges, either 1.54 mgd of land application capacity or surface water disposal capacity would be required. As a result, it is assumed that the surface water outfall will require a 6.14 mgd capacity.

For this alternative, it is assumed that the discharge will be piped to the existing Oakland discharge point for surface water disposal. The Oakland discharge permit to the Loosahatchie River is favorable, with mass loadings that can be met by an advanced treatment facility. Table 15 demonstrates the discharge mass limits for the Oakland outfall.

Table 15. Existing Discharge Mass Limits

Parameter	Value (lb/day)	Statistical Base
Carbonaceous Biochemical Oxygen Demand (CBOD), 5-day	625	Monthly Average
CBOD, 5-day	875	Weekly Average
Total Suspended Solids (TSS)	750	Monthly Average
TSS	1000	Weekly Average
Nitrogen, Ammonia Total (as N)	125	Monthly Average
Nitrogen, Ammonia Total (as N)	167	Weekly Average

Based on these limits, and assuming that the plant is designed to discharge 6.14 mgd with no increase in mass loading, the discharge concentrations for the proposed regional permit are outlined in Table 16.

Table 16. Potential Discharge Mass Limits for Alternative 3

Parameter	Value (mg/L)	Statistical Base
CBOD, 5-day	12	Monthly Average
CBOD, 5-day	17	Weekly Average
Total Suspended Solids (TSS)	15	Monthly Average
TSS	20	Weekly Average
Nitrogen, Ammonia Total (as N)	2.4	Monthly Average
Nitrogen, Ammonia Total (as N)	3.3	Weekly Average

**TDEC Chapter 0400-40-03: General Water Quality Criteria Requirements will need to be met for permitting of this effluent discharge*

These treatment requirements are consistent with advanced treatment. Currently, effluent phosphorus is monitored but not regulated. Without filtration, a properly designed biological nutrient removal (BNR) facility should be able to achieve less than 3 mg/L phosphorus without filtration. Based on the anticipated permit limits and the design capacity for the facility, the following treatment operations will be included:

- Preliminary Treatment (screening and grit removal)
- Biological Nutrient Removal (four- or five-stage Bardenpho process, or similar)
- Secondary Clarifiers
- Disinfection
- Sludge Stabilization (minimum Class B pathogen reduction)
- Sludge Dewatering
- Effluent Pumping

For purposes of estimating construction costs, it is assumed that the secondary treatment system will consist of Carrousel™ or similar aeration basins with additional basins before and after the aeration basins to provide a four-stage Bardenpho biological process.

From the treatment plant, effluent will be pumped approximately 4 miles to the Loosahatchie River. To meet peak day requirements, a 36” force main will be required from the plant to the river. The effluent force main can be run in existing road rights-of-way, depending on the final plant location, or in easements if rights-of-way are not available.

In this alternative, similar to Alternative 2, both Covington and Brownsville will remain as stand-alone facilities. Covington is at the northern end of the service area and has a 3.62 mgd capacity lagoon system, with current AADF flows of 2.08 mgd. Growth in the Covington area will be routed to the Covington treatment facility. The 2033 anticipated flow (AADF) is 2.85 mgd, while the 2043 flow is

projected at 3.06 mgd. Expansion of the treatment facility should not be required within the 20-year planning period.

As discussed previously, Brownsville is slightly remote from the remainder of the service area and has two treatment facilities. Similar to Alternative 2, it is assumed the Brownsville area will remain as a stand-alone system, and growth in the Brownsville area will be routed to the Brownsville collection and treatment systems. Current flows in the Brownsville area total 1.49 mgd and are expected to grow to 1.97 mgd by 2033 and 2.25 mgd by 2043. It is understood that Brownsville is currently proposing to upgrade their existing treatment facilities. If these flows are considered in that current project, no further expansion would be necessary.

In addition, Atoka and Brighton will continue to flow to and be treated by the Munford wastewater treatment facility. Current flows in the Munford facility are 0.94 mgd, while the treatment plant capacity is 2.0 mgd. As growth continues, the flows will begin to exceed the capacity of the facility. The 2033 anticipated flow is 2.28 mgd, while the 2043 anticipated flow is 2.65 mgd. As a result, the Munford facility would need to be expanded prior to 2033 to accommodate the projected future flows. Although discharge criteria to the Mississippi River often require only secondary treatment, as the flows increase, it may make more sense to construct a mechanical treatment facility. At 2.65 mgd, an oxidation ditch with vertical aerators (similar in concept to a Carrousel™) facility may be an appropriate solution.

Blue Oval Site
Outfall Piping
Force Main Interconnections*
Approximate Service Area
Regionalization Counties
Regional WWTP
Existing WWTPs
WWTPs not in Regionalization
Convert to PS

*Pump station interconnection force mains are shown in general as a point to point connection and do not match the mileage of force mains within the report

Lauderdale County
Crockett County
Gibson County
Haywood County
Brownsville
Madison County
Covington
Tipton County
Munford
Brighton
Atoka
Stanton
Mason
ASSUMED GENERAL LOCATION FOR REGIONAL WWTP
Chester County
Gallaway
Somerville
Oakland
APPROX. LOCATION REGIONAL WWTP DISCHARGE
Shelby County
Hardeman County
Fayette County
Rossville
Moscow
Piperton
N
0 1.5 3 6 9 12 Miles

Figure 8 Alternative 3

Alternative 4 –Regionalization with Two Service Areas

Alternative 4 is based on regionalizing the smaller facilities within the tri-county study area but splits the project into two smaller service areas. This alternative allows the regional plants to be constructed closer to the applicable population centers, reducing the collection system construction required. The first region includes Fayette County and the portion of Haywood County southeast of I-40. Communities included in this southeastern service area include Piperton, Oakland, Somerville, and Gallaway. The second regional service area includes Tipton County and the portion of Haywood County northwest of I-40. Communities included in this northwestern service area include Stanton, Mason, Munford, Atoka, and Brighton. Each service area will have a single regional plant, and the existing flows from the smaller facilities, as well as the flows from new growth within the service area, will be pumped to the appropriate regional facility.

The facilities to be served in this alternative are listed in Table 17 below and will be combined into the two regional treatment facilities. Based on the proposed service areas, it is assumed that the treatment facility for the southeastern service area is constructed in Fayette County, near the intersection of SR 59 and SR 194. This site is relatively close to the existing City of Oakland discharge location and would allow use of the Oakland discharge point. The treatment facility for the northwestern service area will have a regional facility in Tipton County, near Munford. This would allow the use of the existing outfall easement to the Mississippi River for effluent disposal. The new treatment facility will be constructed east of US Highway 51 to shorten the length of necessary influent force mains.

The remaining facilities in the service area that will be part of the regionalization alternatives will be converted into pump stations and pump raw wastewater to the applicable regional facility. Piperton and Gallaway will pump directly to the new southeastern regional facility. The Oakland and Somerville treatment facilities would also be converted into pump stations, pumping to the new southeastern regional facility. Stanton will pump to Mason, and then be re-pumped to the northwest regional facility.

As noted above, the Munford outfall easement is a valuable resource for the regional treatment facility. However, the existing Munford plant does not have sufficient room to accommodate expansion and conversion to an activated sludge treatment facility. As a result, the Munford plant will be converted to a lift station, and flows pumped to the northwest regional facility, which will be located east of Munford.

Table 17 shows the required pumping capacity and force main sizing for each of the proposed master pump stations.

Table 17. Alternative 4 Pump Station Transmission Size Requirements

Location	2043 AADF Flow (MGD)	Peak Flow (MGD)	Force Main Size (inches)	Force Main Length* (miles)
Stanton (Pumps to Mason)	0.16	0.48	6	10
Mason (Includes Stanton)	0.54	1.62	12	16
Gallaway (Pumps to SE Regional Plant)	0.24	0.72	8	13
Piperton (Pumps to SE Regional Plant)	0.32	0.96	10	20
Oakland (Includes Piperton)	3.56	10.68	36	10
Somerville	1.56	4.68	24	11
Munford	2.65	7.95	24	7

**Force main lengths are estimated based on drivable distance*

Southeast Service Area Facility

Based on the projected flows, the 2033 AADF at the southeast regional treatment facility will be 4.5 mgd, while the 2043 AADF will be 5.4 mgd. Based on these projected flows, it is suggested that the facility be constructed initially with two parallel 2.75 mgd trains. This allows the plant to serve anticipated flows through 2043, with a potential for future parallel trains if required.

As noted in previous alternatives, locating a proposed regional facility near the intersection of SR 59 and SR 194 would locate the new facility conveniently close to the existing Oakland outfall point. This location is also central to the proposed wastewater service area and distant enough from both the Blue Oval City site and existing municipalities..

Given the size of the facility, land application would be difficult. While effluent reuse may be a possibility in this option, especially as new development begins to occur, a “purple pipe” system would provide only limited effluent disposal capacity. Applying the 25% limit currently in TDEC rules, the maximum flow to reuse would be 1.35 mgd. To provide for alternative discharges, either 1.35 mgd of land application capacity or surface water disposal capacity would be required. As a result, it has been assumed that the surface water outfall will require a 5.4 mgd capacity, and that the discharge will be piped to the existing Oakland discharge point for surface water disposal. The Oakland discharge permit to the Loosahatchie River is favorable, with mass loadings that can be met by an advanced treatment facility. The discharge mass limits for the Oakland outfall are outlined in Table 18.

Table 18. Existing Discharge Mass Limits

Parameter	Value (lb/day)	Statistical Base
CBOD, 5-day	625	Monthly Average
CBOD, 5-day	875	Weekly Average
Total Suspended Solids (TSS)	750	Monthly Average
TSS	1000	Weekly Average
Nitrogen, Ammonia Total (as N)	125	Monthly Average
Nitrogen, Ammonia Total (as N)	167	Weekly Average

Based on these limits, at 5.4 mgd, the discharge concentrations for the proposed regional permit will be as outlined in Table 19.

Table 19. Potential Discharge Mass Limits for Alternative 4

Parameter	Value (mg/L)	Statistical Base
CBOD, 5-day	14	Monthly Average
CBOD, 5-day	19	Weekly Average
Total Suspended Solids (TSS)	17	Monthly Average
TSS	22	Weekly Average
Nitrogen, Ammonia Total (as N)	2.8	Monthly Average
Nitrogen, Ammonia Total (as N)	3.7	Weekly Average

**TDEC Chapter 0400-40-03: General Water Quality Criteria Requirements will need to be met for permitting of this effluent discharge*

These treatment requirements will be consistent with advanced treatment. Based on the anticipated permit limits and the design capacity for the facility, the following treatment operations will be included:

- Preliminary Treatment (screening and grit removal)
- Biological Nutrient Removal (four- or five-stage Bardenpho process, or similar)
- Secondary Clarifiers
- Disinfection
- Sludge Stabilization (minimum Class B pathogen reduction)
- Sludge Dewatering
- Effluent Pumping

For purposes of estimating construction costs, it is assumed that the secondary treatment system will consist of Carrousel™ or similar aeration basins with additional basins before and after the aeration basins to provide a four-stage Bardenpho process.

From the treatment plant, effluent will be pumped approximately 4 miles to the Loosahatchie River. To meet peak day requirements, a 30" force main will be required from the plant to the river. The effluent force main can be run in existing road rights-of-way, depending on the final plant location, or in easements if rights-of-way are not available.

Northwest Service Area Facility

Based on the projected flows, the 2033 AADF at the new regional treatment facility will be 2.72 mgd, while the 2043 AADF will be 3.19 mgd. For phasing purposes, it is suggested that the facility be constructed with two parallel 1.6 mgd trains.

Given the size of the facility, land application may be feasible, if sufficient land can be located. For costing purposes, it is assumed that the discharge will be piped to the Mississippi River via the existing Munford easement. Given the proposed discharge to the Mississippi River, it is assumed that treatment requirements will be consistent with secondary treatment, although partial denitrification may be included to reduce future operating costs.

These considerations indicate a treatment facility that will include the following treatment operations:

- Preliminary Treatment (screening and grit removal)
- Secondary Treatment (extended aeration, including partial denitrification)
- Secondary Clarifiers
- Disinfection
- Sludge Stabilization (minimum Class B pathogen reduction)
- Sludge Dewatering
- Effluent Pumping

For purposes of estimating construction costs, it is assumed that the secondary treatment system will consist of Carrousel™ or similar aeration basins.

From the treatment plant, effluent will be pumped approximately 20 miles to the Mississippi River. To meet peak day requirements, a 24" force main will be required from the plant to the river. For the first portion of the route, new easements will need to be acquired connecting the treatment plant site to the

existing Munford easement. The force main can then be run in the Munford easement to the final outfall location.

In this alternative, similar to the two preceding alternatives, both Covington and Brownsville will remain as stand-alone facilities. Growth in the Covington area will be routed to the Covington treatment facility. The 2033 anticipated flow (AADF) is 2.85 mgd, while the 2043 flow is projected at 3.06 mgd. As this is less than the existing capacity, expansion of the treatment facility should not be required within the 20-year planning period.

Similarly, Brownsville will remain as a stand-alone facility, with growth in the Brownsville area routed to the Brownsville collection and treatment systems. Total flows in the Brownsville area are currently 1.49 mgd and are expected to grow to 1.97 mgd by 2033 and 2.25 mgd by 2043. It is understood that Brownsville is currently proposing to upgrade their existing treatment facilities. If these flows are considered in that current project, no further expansion would be necessary.

Blue Oval Site
Outfall Piping
Force Main Interconnections*

Approximate Service Area
Northwest
Southeast

Regionalization Counties
Regional WWTP

Existing WWTPs
WWTP not in Regionalization
Convert to PS

*Pump station interconnection force mains are shown in general as a point to point connection and do not match the mileage of force mains within the report

Lauderdale County
Gibson County
Crockett County
Tipton County
Covington
Haywood County
Brownsville
Madison County
Chester County
Hardeman County
Shelby County
Fayette County

APPROX. LOCATION NORTHWEST REGIONAL WWTP DISCHARGE
ASSUMED GENERAL LOCATION FOR NORTHWEST REGIONAL WWTP
Munford
Brighton
Atoka
Mason
Stanton
ASSUMED GENERAL LOCATION SOUTHEAST REGIONAL WWTP
Gallaway
Somerville
Oakland
APPROX. LOCATION SOUTHEAST REGIONAL WWTP DISCHARGE
Piperton
Rossville
Moscow

N

0 1.5 3 6 9 12 Miles

Figure 9 Alternative 4

Conceptual Capital and Operational Cost Estimate for Alternatives

This section describes and demonstrates the results of the opinion of probable capital cost and operational cost comparative analysis completed in February 2023 of the alternatives described in the above section. The costs are reflective of the current (February 2023) market conditions regarding labor, material, and other miscellaneous costs related to the totalized capital and annual operational range cost estimates for each alternative. To complete a more accurate capital and operational cost estimate, a more detailed plan and analysis should be developed for a chosen alternative and include a timeline for the alternative and factors related to the time value of money (inflation, escalation, depreciation of assets, etc.).

For the purposes of this report, a high level methodology was used to develop the costs for the new regional WWTPs by estimating cost on a dollar per gallon ($/gal) for each unit process and then totaling for an overall cost for each WWTP. The unit costs were then developed for each process by reviewing past projects of similar scope and extrapolating an approximate $/gal based on the contractor's schedule of values and the capacity of the unit process.

Conceptual planning level costs were also developed for each existing WWTP proposed to be abandoned (not including demolition) and a new pump station and force main constructed to pump flow to the new regional WWTP in its place. Each proposed pump station and force main were sized based on max future capacity for 2043 as well. Like the WWTP cost estimates, the cost of the pump stations were estimated by reviewing cost information from past pump station projects of similar size and scope and costs were adjusted to account for pump stations with high pumping horsepower requirements. From an engineering standpoint, the pump horsepower requirements are reduced when additional pump stations are included where force main lengths exceeded 20 miles.

Operational costs vary annually for WWTPs and pump stations for multiple factors from flow to weather conditions. As a result, an annual range was provided to show the totalized annual range of costs that could be anticipated for each alternative. For the WWTPs, the operational cost range was provided based on $/mgd for the treatment process described for each alternative. The pump stations operational range costs were calculated using the horsepower requirements (as described above) and the dollars per kilowatt-hour for electricity in the West Tennessee area.

All the costs presented in the table below are in today's (2023) dollars and include engineering and contingency, but do not include time value of money factors as described previously. For more of the cost estimate assumptions and exclusions overall, please see the Appendix for this section.

Table 20. In 2023 $, Conceptual Capital Opinion of Probable and Annual Operation Cost for Future 2043 Capacity Alternatives

ITEM	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4 - SE	ALTERNATIVE 4 - NW
Utilities Included in Regionalization	All utilities in tri-county study area	Stanton, Mason, Gallaway, Oakland, Moscow, Rossville, Piperton, Munford, Atoka, Brighton, Somerville	Stanton, Mason, Gallaway, Oakland, Somerville, Piperton	Gallaway, Oakland, Somerville, Piperton	Munford, Atoka, Brighton, Mason, Stanton
In 2023 $, Conceptual Capital Opinion of Probable Costs for Future 2043					
WWTP and Outfall Pump Station & Force Main	$600M	$355M	$135M	$85M	$160M
				Subtotal for Both = $245M	
Pump Stations & Force Mains	$785M	$535M	$215M	$185M	$75M
				Subtotal for Both = $260M	
2023 $ CAPITAL COST TOTAL	**$1,385M**	**$890M**	**$350M**	**$270M**	**$235M**
				Total for Both = $505M	
In 2023 $, Conceptual Annual Operational Cost Range for Future 2043					
WWTP and Outfall Pump Station & Force Main	$2.23-$9.15M	$3.06-$6.12M	$1.11-$2.21M	$0.97-$2.92M	$0.26-$0.98M
				Subtotal for Both = $1.23-$3.90M	
Pump Stations & Force Mains	$2.30-$9.19M	$1.54-$6.14M	$0.56M-$2.24M	$0.43-$1.73M	$0.41-$1.66M
				Subtotal for Both = $0.84-$3.39M	
2023 $ ANNUAL OPERATIONAL COST RANGE	**$4.53-$18.34M**	**$4.60-$12.26M**	**$1.67-$4.45M**	**$1.40-$4.65M**	**$0.67-$2.64M**
				Total Range for Both = $2.07-$7.29M	

[1]*All estimates are in 2023 $ and do not include time value of money factors (inflation, escalation, depreciation of assets, etc.).*

[2]*This Opinion of Probable Costs is prepared with the understanding there is no control over the cost or availability of labor, equipment, or materials, or over market conditions or a contractor's method of pricing, and these estimates of opinion of probable costs are made on the basis of professional judgement and experience.*

6.5 Near-Term Wastewater Flow Demands

In addition to the 2033, 2038 and 2043 projections, flows to 2028 were projected to determine if there were any utilities with immediate capacity issues. For this interval, it was assumed that any improvements would be done by the existing utility, as five years is insufficient time to establish a regional authority and then design, permit, and construct treatment improvements. Based off these estimates of future growth, only two utilities in the study area would be expected to experience capacity issues by 2028: Oakland and Mason.

The 2028 projected flow for the Town of Oakland is 1.99 mgd. Oakland currently has a permitted capacity of 1.5 mgd, and annual average daily flows (AADF) were reported in TAUD survey as 1.32 mgd. As a result, the facility is already at 90% of permitted capacity and design and permitting should be underway for a facility expansion. Notes from the information provided within the TAUD report indicate that the Town of Oakland is planning to expand the facility to 2.0 mgd capacity. The projected 2028 flows would result in the plant exceeding the expansion to 2.0mgd, causing Oakland to consider a larger expansion.

The 2028 projected flow for the Town of Mason is 0.20 mgd. Currently, Mason's treatment facility has a permitted capacity of 0.10 mgd and reported annual average daily flows of 0.12 mgd. This indicates that the plant is presently operating at flows greater than its permitted capacity, but the TAUD report notes that Mason is currently working to address this capacity issue. The 2033 and 2043 projected flows are 0.32 and 0.38 mgd, respectively. All of the alternatives envision connecting the Mason treatment facility to a new regional facility.

If both Oakland and Mason decide to be a part of a regionalization alternative, it is prudent that they work with their engineers to determine how economically solve their near-term capacity issues until a regionalization alternative can be implemented.

Decentralized systems were never a consideration as a solution for regionalization; however, it was considered as an interim step. As defined by EPA:

> *A combination of unit processes or BMPs designed to collect, receive, treat, and dispose of wastewater from groups of structures (e.g., homes, businesses). Some examples are septic tanks with multiple unit leach fields and septic tanks followed by community mound systems.*[14]

[14] U.S. Environmental Protection Agency. (2004). *Clean Watersheds Needs Survey – 2004 Data Dictionary*

While decentralized facilities have a place in providing wastewater service, they are intended primarily for smaller flows, in locations where onsite disposal systems (OSDS) such as septic tanks may have negative environmental impacts, and where centralized service is not available or feasible. In the tri-county study area, most of the existing communities already have at least partial service from centralized facilities and utilizing interim or decentralized facilities does not provide the benefit it might provide in an area without community systems.

OSDS typically dispose of their effluent via land application. Because decentralized systems provide lower levels of treatment than municipal systems, the ability of the soils to treat and absorb pollutants in the effluent is critical. Soils that have high organic content, high ground water, or low permeability are typically not suitable for OSDS. In addition, these systems must be installed where the potential for flooding is low. Any installation of an OSDS requires review by a soils scientist to determine whether any of these negative factors are present. This can make design and permitting of decentralized facilities, which require a State Operating Permit (SOP) or National Pollutant Discharge Elimination System (NDPES) Permit, difficult. In the tri-county study area, soil conditions can be challenging for OSDS.

These decentralized systems typically provide secondary levels of treatment, BOD and TSS of 30/30 mg/l and do not provide the level of nutrient removal required for most surface discharge permitting. The use of surface water discharge in the tri-county study area is further restricted by the limited number of available streams and the lesser number of streams that do not have stringent nutrient limits.

Because of these challenges in the study area, the use of decentralized facilities was not considered in the analysis.

SECTION 7. REGIONALIZATION GOVERNANCE OPTIONS

Regionalization provides an opportunity for individual wastewater service providers to achieve performance and customer service goals at a reduced cost through the creation of partnerships across service area boundaries. Tennessee stakeholders identified regionalization as a strategy to address existing wastewater service delivery challenges including but not limited to:

- Affordability associated with the increasing costs of capital infrastructure,
- Regulatory requirements to protect environmental and public health, and
- Competition related to recruiting and retaining qualified staff (especially licensed wastewater operators).

This section focuses on regionalization governance options for the tri-county study area and includes the following information:

- Assessment of feasible regional governance models,
- Summary of the required steps to establish and implement governance models, and
- Qualitative comparison of the governance models to assist stakeholders in selecting the most beneficial model for the study area.

7.1 Governance Model Assessment

Research on governance models indicated that four (4) governance models will be the most applicable to the tri-county study area regionalization opportunity including:

- Regional Wastewater Treatment Authority
- Municipal System Extension
- Membership Cooperative
- Utility District

Table 21 outlines a comparison of the typical governance model organizational structures including the governance team, management team, and members.

Table 21. Comparison of Governance Models

Comparison of Governance Model Organizational Structures			
Model	**Governance Team**	**Management Team**	**Members**
Regional Wastewater Treatment Authority	Board of Directors consisting of county, city and/or district representatives appointed by County Mayors	Authority Director (selected by Board) and Executive Team (selected by Director)	All participating cities and/or districts conveying wastewater to regional system
Municipal System Extension	Mayor and Council	Department Director (selected by Mayor) and Executive Team (selected by Director)	All participating cities and/or districts conveying wastewater to municipal system
Membership Cooperative	Board of Directors selected by members. Directors do not need to be resident of TN or a member of the cooperative	Cooperative Director (selected by Board) and Executive Team (selected by Director)	All participating cities and/or districts conveying wastewater to cooperative system
Utility District	Board of Commissioners selected by utility district members	Utility Director (selected by Board) and Executive Team (selected by Director)	All participating cities and/or counties conveying wastewater to utility district system.

The Appendix includes a summary of the documents and discussions with agency staff associated with each model in further detail. State regulations that must be followed to establish the governance models are described and cited below.

7.2 Regional Wastewater Treatment Authority

Description

Regional wastewater treatment authorities are established by state and local action. These actions allow the regional authority to define the:

- Overall scope of wastewater services,
- Geographic extent of the service area, and

- Roles and responsibilities of the participating agencies.

Regional wastewater treatment authorities operate autonomously and are subject to local governmental laws, rules, and regulations. Regional wastewater treatment authorities are separate and independent governmental entities that serve a particular region.

State Regulations

Regional wastewater treatment authorities may be established under the following provisions of the Tennessee Code Annotated (TCA):

- Title 68 (Health, Safety, and Environmental Protection), Chapter 221 (Water and Sewerage), Part 6 (Water and Wastewater Treatment Authority Act), and
- Title 68 (Health, Safety, and Environmental Protection), Chapter 221 (Water and Sewerage), Part 13 (Regional Water and Wastewater Treatment Authority Act).

Approval from the Tennessee Water and Wastewater Financing Board (WWFB) is required for a new regional wastewater treatment authority created under these TCA Titles, Chapters and Parts.

A regional wastewater treatment authority may also be established by a Private Act of the State Legislature. A Private Act is a state law enacted by the Tennessee General Assembly and subsequently approved by a local government.

Provisions generally required to establish a new regional wastewater treatment authority by a Private Act can be found within the TCA Title 68, Chapter 221, Parts 6 and 13. **One significant benefit of establishing a regional wastewater authority by a Private Act is that the formation and appointment of the Board of Commissioners is more flexible as compared to the requirements under the Regional Wastewater Treatment Authority Acts in TCA.**

7.3 Municipal System Extension

Description

Municipalities across Tennessee and the United States have developed wastewater infrastructure to serve their citizens and businesses. In some cases, municipalities also provide wastewater service outside of their formal limits to nearby municipalities, suburban areas, and/or unincorporated areas. Extending an existing municipal system to serve other areas creates an opportunity to leverage the collective engineering, operating, financial, and management capabilities of the participating agencies to reduce the overall costs for wastewater treatment and meet or exceed existing service levels.

State Regulation

A municipality that provides wastewater treatment may extend their system outside of their established boundaries to serve nearby cities, counties, or utility districts without obtaining the consent from a state agency assuming the extension does not encroach upon the service area of another wastewater system which has a prior right to serve the area in question and is not interested in forming a partnership. The municipal extension may occur, assuming all parties are interested, in the following ways:

- A municipality providing wastewater treatment service may enter an interlocal agreement with other cities, counties, and/or utility districts to jointly operate the respective wastewater systems,
- A municipality providing wastewater treatment service may enter a wholesale agreement with other cities, counties, and/or utility districts to treat wastewater collected from their upstream systems, and
- A municipality providing wastewater treatment service may enter a retail agreement with other cities, counties, and/or utility districts to treat wastewater collected from their system and take over the ownership, operation, and management of their local collection and conveyance systems.

7.4 Member Cooperatives

Description

Cooperative wastewater systems (like electric cooperatives) are member-owned and usually serve local regions in suburban and rural areas. Members own the utility assets, elect a governing board, and retain a management team. Cooperatives are subject to state public utility commission regulation.

State Regulations

Member Cooperatives which seek to provide wastewater service are considered nonprofit corporations in Tennessee and must comply with the following state provisions:

- TCA Title 48 (Corporations and Associations Nonprofit Corporations), Chapter 51 (General Provisions).

7.5 Utility District

Description

A wastewater utility district is a type of local government entity separate from cities and counties. Services typically include the collection, treatment, and disposal of sewage, as well as the maintenance of related infrastructure. Wastewater utility districts are governed by a board of commissioners either (a) appointed by local-officials or (b) elected by customers within the district boundary.

State Regulations

Utility Districts in Tennessee are established under the following State Regulations:

- TCA Title 7 (Consolidated Governments), Chapter 82 (Utility Districts), Part 2 (General Provisions)
- TCA Title 7 (Consolidated Governments), Chapter 82 (Utility Districts), Part 6 (Multi-County Districts)

7.6 Required Steps to Establish Governance Models

Regional Wastewater Treatment Authority

Regional wastewater treatment authorities in Tennessee have been created by a Private Act of the State Legislature. A Private Act generally includes language found in the TCA Title 68, Chapter 221, Parts 6 and 136. A considerable and favorable exception is related to the formation of the board of commissioners. **A Private Act allows the board of commissioners to be customized as agreed upon by the participating agencies.** Table 22 demonstrates the information generally developed, agreed upon, and written into a Private Act to establish a new regional wastewater treatment authority.

Table 22. Private Act Contents

Private Act – Typical Contents	
Name of authority	General manger
Identification of participating members	Condemnation and eminent domain
Statement of purpose	Rates, fees, and charges
Board of commissioners	Notes and bonds
Powers of the authority and members	Budget and annual audit process
Service area	Agreements with the authority

A Private Act to establish a new regional wastewater treatment authority is typically approved in the following manner:

- Reviewed, discussed, and passed by the State Legislature,
- Approved by two-thirds vote of the local legislative body (or bodies) pursuant to an adopted resolution,
- Announced by the presiding officer of the local legislature body (or bodies), and
- Certified by the Tennessee Secretary of State.

The development and approval of an interlocal agreement between the new regional wastewater treatment authority and participating entities **choosing to retain control of their local wastewater collection and conveyance system** is another mandatory step in the process. The development and approval of the interlocal agreement typically occurs before the Private Act process commences in the State Legislature. Table 23 demonstrates the information most often included within an interlocal agreement between a regional wastewater treatment authority and participating agencies choosing to retain local control of their wastewater collection and conveyance system.

Table 23. Interlocal Agreements

Interlocal Agreement – Typical Contents	
General provisions	Inspection and monitoring
Authorities and responsibilities	Enforcement
Regulations governing use of public sewers	Agreements/contracts for services
Reporting requirements	Severability

Municipal System Extension

A municipality that owns and operates a wastewater treatment system may extend their service area by entering an interlocal agreement with other nearby cities, counties, or utility districts. The participating agencies must have the authority to provide wastewater service pursuant to the Interlocal Cooperation Act in the TCA Title 12, Chapter 9.

The interlocal agreement may establish a joint board or create a nonprofit corporation to manage and operate the expanded wastewater system. Table 24 shows the information typically included within an interlocal agreement for a joint board or nonprofit corporation.

Table 24. Interlocal Agreement for Joint Board or Nonprofit

Interlocal Agreement for Joint Board or Nonprofit – Typical Contents	
Duration of agreement	Financing mechanisms
Name of any separate legal or administrative entity (or entities)	Annual budget and allocation
Purpose of the agreement	Severability

Member Cooperative

The formation of a wastewater member cooperative is governed by the Tennessee Nonprofit Corporation Act, TCA Title 48 (Corporations and Associations) and Chapter 51 (General Provisions). Table

25 shows the information typically included in the required charter to establish a wastewater member cooperative:

Table 25. Charter Contents

Charter – Typical Contents	
Corporate Name	Management of business and regulating affairs
Statement of Purpose	Powers and rights of the corporation, board, and members

Once the charter is developed, the following steps are required to establish the wastewater member cooperative:

- Deliver charter to the Secretary of State for filing,
- Approval and filing of the charter by the Secretary of State, and
- Filing of an application with the IRS to obtain tax-exempt status.

Utility Districts

A wastewater utility district is established under the provisions of the TCA Title 7 (Consolidated Governments), Chapter 82 (Utility Districts). A petition for the incorporation of a utility district must be filed with the Tennessee Utility Management Review Board for approval and, subsequently, submitted to the respective county mayor(s) for approval. Table 26 shows the information generally included in the petition to establish a wastewater utility district.

Table 26. Petition to Establish Wastewater Utility Districts

Petition - Typical Contents	
Proposed corporate name	Rates, fees, and charges
District boundary	Nomination of three district commissioners
Statement explaining why existing agencies cannot adequately provide service	Staffing plan
Acquisition or construction costs	Operating Costs

The required steps that must be followed to establish the wastewater utility district after the original petition is drafted include:

- Petition signed by not less than twenty-five (25) of real property owners that reside within the boundaries of the proposed district,
- Approval of signed petition by the utility management review board,
- Submittal of the approved petition to the mayor of any county in which the proposed district will serve,

- Scheduling of a public hearing by the county mayor(s) to receive comments related to the convenience and necessity of the district,
- Reading of the final comments by the county mayor(s) at the public hearing,
- Approval by county mayor(s), and
- Filing of the approval by the president of the utility district with the Tennessee Secretary of State, Utility Management Review Board, and the register of deeds of the county or counties wherein the district is located.

7.7 Qualitative Comparison of Governance Models

Table 27 provides a comparative qualitative ranking of the feasible governance models across eight criteria. Criteria and rankings were based on the following:

- Literature review focused on the establishment of governance models and the development of associated charters/agreements (refer to the Appendix for details),
- Literature review focused on governance charters and agreements associated with existing regional wastewater agencies (refer to the Appendix for details),
- Feedback from staff associated with regional wastewater agencies across Tennessee and the United States, and
- Discussions with the Tennessee Association of Utility Districts (TAUD) legal counsel on a variety of issues associated with each governance model and recent trends in and around Tennessee.

A qualitative ranking of low, medium, or high was utilized for each of the eight criteria in the comparative analysis. A high ranking indicates that the criteria would likely be easily achieved. A low ranking indicates that there would be significant challenges to meet the criteria.

Table 27. Qualitative Comparison of Governance Models

Criteria	Regional Authority	Municipal Extension	Utility District	Member Cooperative
Flexibility of oversight board appointments	High	Med	Med	Low
Flexibility to maintain local collection system ownership	High	High	Med	Low
Potential to deliver services at lowest cost to rate payers	High	High	High	Med
Staffing flexibility, recruitment, and retention	High	Med	High	Med
Recent use in and around Tennessee	High	Med	Med	Low
Potential for local, state, and federal funding	High	High	High	Med
Ease of future service area adjustments	High	High	Med	Med
Ease to establish regional model	High	High	Med	Med

There are critical benefits and challenges to possible governance models for the tri-county study area.

Benefits

- The Regional Wastewater Treatment Authority model allows considerable flexibility in terms of board development and appointment authority.
- The Regional Wastewater Treatment Authority and Municipal System Extension/Consolidation models offer the easiest path to include new service areas after establishment and the ability for existing providers to retain local control of their collection and conveyance systems.
- Municipal Extension/Consolidation of existing wastewater providers is a simple process for nearby entities to begin the regionalization process. However, the number of existing systems and large study area present challenges for its long-term application.

Challenges

- The number of existing wastewater systems and large study area present challenges for its long-term application.
- Utility Districts have specific legal requirements (board structure and appointments) that provide limited flexibility in terms of governance.

- Member Cooperatives are the least proven in large regional application and have not been common in Tennessee.

Based on the criteria, rankings, and evaluations, a Regional Wastewater Treatment Authority emerges as a likely candidate for the tri-county study area governance model. Municipal System Extension/Consolidation may serve as a near-term step towards regionalization in certain locations with near term capacity needs.

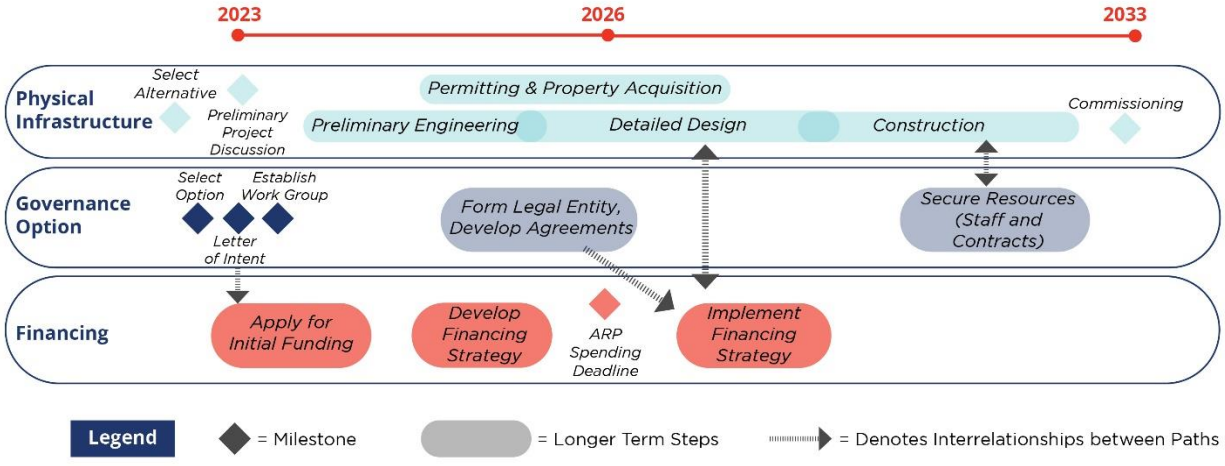
SECTION 8. IMPLEMENTATION PLAN

This section summarizes a high-level plan and approximate timeline to implement a regional solution. To create a regional governance plan to design, finance, and construct infrastructure to serve the region, there are several milestones that must be met along parallel and coordinated paths. The parallel efforts include:

- Planning, designing, and constructing the physical infrastructure (e.g., regional plant(s)),
- Creating a regional governance structure (e.g., a regional authority), and
- Developing and implementing a financing strategy.

Figure 10 illustrates these three parallel efforts and lays out critical milestones along each path. Following Figure 10 is a brief summary of each milestone, its importance, and how it relates to other milestones. Note that the timelines depicted in Figure 10 are approximate and should be refined as an alternative is selected and a more detailed implementation plan is developed. Additional critical milestones should also be identified as detailed implementation planning occurs in the future.

Figure 10. Regional Solution Development Timeline



8.1 Summary of Key Steps and Milestones

This section includes a brief description of each major step and milestone included in Figure 10 above. The milestones are organized by the path they fall on: physical infrastructure, governance, and financing. Significantly more detail will be needed in planning out the implementation of a regional solution. This plan is meant to summarize the major activities involved on each path, their approximate timetables, and intersections. Detailed guidance on the Tennessee regulatory approval process is provided in Chapter 1 of the Design Criteria for Review of Sewerage Works Construction Documents (Design Criteria) and TDEC Rules Chapters 0400-40-02 and 0400- 40-16. These steps are required for wastewater treatment facilities. Pump stations and pipelines follow a similar path, but not all steps may be required.

Physical Infrastructure

- **Select Alternative**. Local stakeholders and leaders will need to select a preferred alternative prior to making substantial financial investments.
- **Preliminary Project Discussion**. Discuss the project concept and need that the project is addressing.
- **Preliminary Engineering Report or Facilities Plan.** This step addresses additional requirements for some funding sources (e.g., life cycle cost and/or alternative analyses). Required permits and studies are identified during preliminary engineering and may influence preliminary engineering and vice-versa, so these steps are inter-dependent.
- **Preliminary Permitting and Studies**. Preliminary permitting assessments and site-specific studies vary depending on the location of treatment facilities and routes for conveyance lines in relation to other natural resources (e.g., wetlands, streams, endangered species), and infrastructure (e.g., railroads, highways). These studies influence the preliminary engineering as they may require substantial time and resources to complete and revise, as necessary, to secure necessary approvals.
- **Preliminary Plans and Engineering Report**. This step is required to establish the basis for process and facility design.
- **Property Rights Acquisition**. Property acquisition is required for new facilities and conveyance and is typically summarized in terms of specific parcels impacted, property owner, area required for completion of the project, appraised value, and completion of the legal documents required for each transaction.
- **Detailed Design**. Detailed Design includes civil, architectural, mechanical, electrical, instrumentation and controls (I&C), structural, process, mechanical, etc. for the plants and conveyance pipelines. As well as the preparation of construction plans, specifications, and

contract documents. Also included are site specific surveying and geotechnical studies needed for civil and structural design, construction risk identification, and contractor bid preparation.

- **Final Permitting**. Final permitting includes any final permits not already secured that are required prior to initiation of construction.
- **Construction of Regional WWTP(s) and Interconnections**. Complete and functional portions of the system must be built to transform design documents into wastewater infrastructure to accommodate current and future capacities. Construction requires contract documents between the facility Owner and one or more qualified contractor(s).
- **Commissioning.** Prior to initiating operations, new facilities must be tested and operated to demonstrate that they are built in accordance with the approved design and can meet applicable operating permit requirements. This requires contractor documentation of operations and maintenance requirements and training of responsible operations and maintenance staff.

Governance

- **Select Governance Structure**. Local stakeholders and leaders will need to select a preferred governance structure.
- **Letter of Intent**. Letters of intent from entities that plan to participate in a Regional System are the first step to organizing the group and developing the documents required for formalization of a legal entity.
- **Establish Work Group**. One or more champions identified that can develop required documents (i.e., name, purpose, board, powers of the authority, members, service area, etc.) for the proposed governing body in accordance with applicable state law. One or more existing entities would lead initiatives (e.g., funding applications, procure engineering services) until a regional entity is established.
- **Form Legal Entity**. Engage in legal contracts and perform certain functions. The process may vary slightly depending on the entity formed. For example, State Legislature Approval is required in accordance with Private Act for an Authority. There are specific activities required for any of the options, such as establishing a Board of Commissioners and establishing rates, fees, and charges.
- **Develop Agreements**. Agreements must be adopted by participating entities to formalize obligations of participants, and these may be developed in parallel with the formation of the legal entity.
- **Secure Resources**. Management, financial, and technical resources will be required to implement a regional solution through staff resources and/or contracts.

Financing

- **Apply for Initial Funding**. The Tennessee State Water Infrastructure Grant (SWIG) Competitive Grant Program provides an immediate opportunity for potential grant funding to support regionalization. Other financing options are available that may help address long-term financing for construction (e.g., State Revolving Funds, Community Development Block Grants, or bonds).
- **Develop Financing Strategy**. A long-term financing strategy is required to comply with customer service, financial, and regulatory requirements. Initial obligations will include securing the necessary resources to complete the above steps (Steps 3 through 9 under Physical Infrastructure and Step 6 under Governance).
- **Implement Financing Strategy**. Rates and fees must be established to fund capital costs and sustain operations and maintenance of the regional entity's assets. Initially, paying for staff and/or contract resources during implementation will be required.

8.2 Local Compliance and Near-Term Capacity Needs

This report does not include the necessary work to identify the specific steps that local government entities will need to pursue to meet their current compliance obligations and capacity needs. The near-term wastewater flow growth forecast will continue to be managed by the existing local entities until such time as a viable regional alternative exists.

The Towns of Oakland and Mason have immediate-term capacity and/or compliance concerns that require improvements. As discussed in Section 5, both Oakland and Mason have plans to add or access additional wastewater capacity to meet projected growth until a regional solution is available.

8.3 Conclusion

This report provides an analysis of regional alternatives to meet the demand for wastewater service in the tri-county study area. It is based on local stakeholder input and analysis of the best available data and judgement of a diverse professional team. The report includes alternative infrastructure arrangements along with their relative costs. It also includes a review of the regional wastewater governance structures and identifies key steps, beginning today, that will support implementation of the preferred solution.

Leadership and collaboration will be required among decision-makers to identify and implement the best solution for the region. This report provides leaders with the foundational information to support their decisions today and for the next decade, to realize a tremendous opportunity for wastewater regionalization in the growing tri-county study area.

APPENDIX

The Appendix provides additional context into the materials researched, analyzed, and developed for the report. It is referenced throughout sections of the report for readers to learn more about materials referenced, analyses completed, and assumptions and/or exclusions.

I. Community Context Indicators

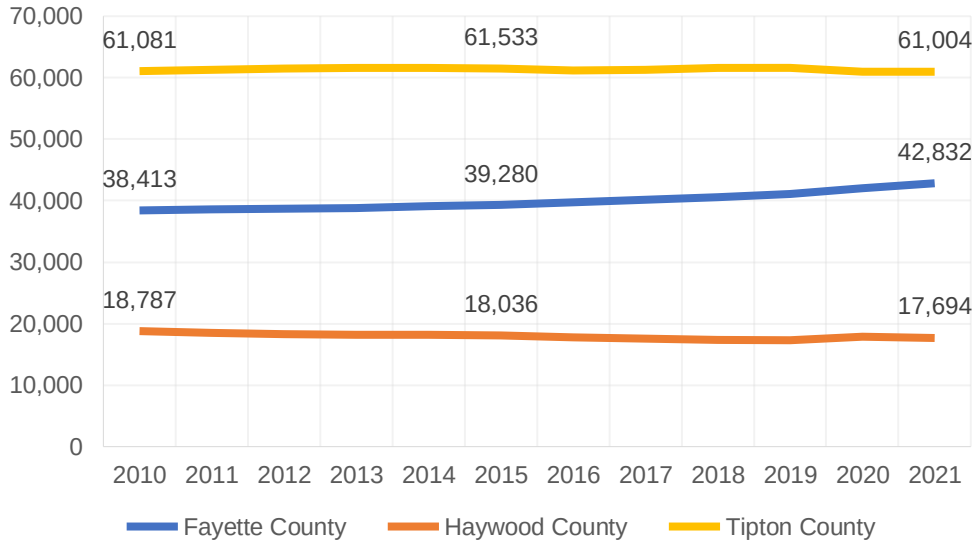
Beyond the Blue Oval City economic catalyst, there are many factors that influence a community's likelihood to change. These factors, referenced in the report as the "community context indicators," provide insight into the patterns of development and the reasons why population changes may occur in the future. A population allocation methodology was developed to compare the communities in the tri-county area to other Tennessee communities.

II. Population Trends and Growth Factors

Census Data

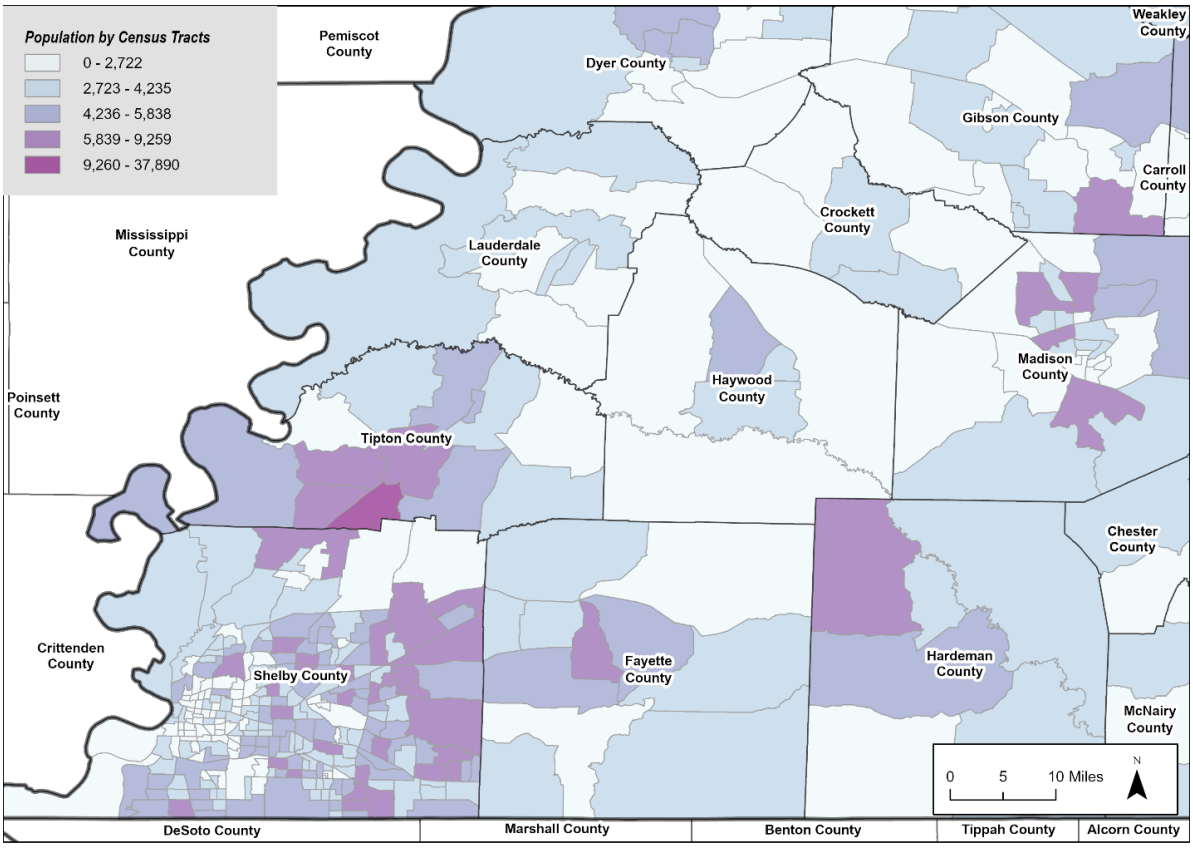
Population of tri-county area has been relatively stable over the last decade, with a modest increase from approximately 118,300 people in 2010 to 120,800 people in 2020, per the Decennial Census. Tipton has the highest total population among the three counties, but its' population declined slightly between 2015 and 2021. Haywood County's population has also been declining, while Fayette County has experienced modest growth. Figure A-1 depicts population trends since 2010, and Figure A-2 illustrates the 2020 population by census tract.

Figure A-1. Population Trends, 2010 - 2021



Source: US Census Bureau PEP Population Estimates, 2010 - 2019, 2021; US Census Bureau Decennial Census, 2000, 2010, 2020

Figure A-2. Population by Census Tract, 2020



Source: U.S. Census Bureau Decennial Census, 2020

III. Tennessee Land Use Assessments

Each year, the Tennessee Comptroller of the Treasury evaluates each county in Tennessee and categorizes land parcels as growing, stable, or declining based on their population trends. The criteria for each parcel categorization are:

- Growing: Greater than 3 percent per year
- Stable: 0 - 2.9 percent per year
- Declining: Less than 0 percent per year

Based on the Comptroller's categorizations in the 2022 land use assessments, none of the three counties in the study area have parcels categorized as "growing." Haywood County has the most parcels in decline, followed by Tipton. **Error! Reference source not found.** documents the number of parcels categorized as either stable or declining.

Table A-1. 2022 Land Use Assessment Information on Population Trends

County	Parcels with Stable Population	Parcels with Declining Population	Total Parcels with Declining Population (%)
Fayette	24,005	1,018	4%
Haywood	1,759	9,690	85%
Tipton	23,868	7,278	23%

Source: Tennessee Comptroller of the Treasury

IV. Socioeconomic Conditions

Developed by the University of Tennessee (UT) Institute for Agriculture for TDEC's State Revolving Fund (SRF) loan program, the Ability to Pay Index (ATPI) is a strong measure of economic health of all local jurisdictions in Tennessee. Considering nine different factors, such as population trends and unemployment rates, the ATPI is a score between 0 and 100 assigned to all Tennessee communities. Each year, UT recalibrates the index using the latest data from the U.S. Census Bureau's American Community Survey and the Tennessee Labor Market Report. TDEC uses the ATPI to determine principal forgiveness allocations to SRF loan borrowers. The following charts (Figures A-3, A-4 and A-5) depict comparative socioeconomic data for the three counties in the study area. The ATPI for Fayette, Haywood, and Tipton are, respectively, 80, 0, and 60.

Figure A-5. Fayette County Socioeconomic Snapshot

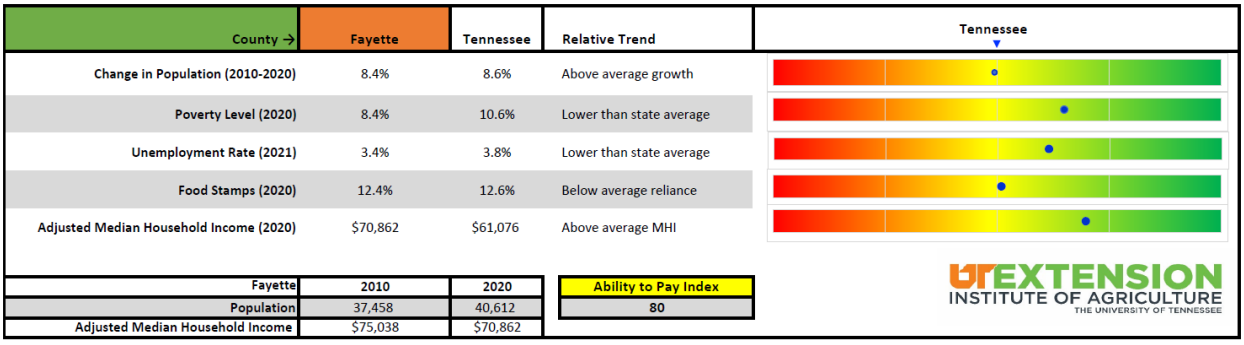
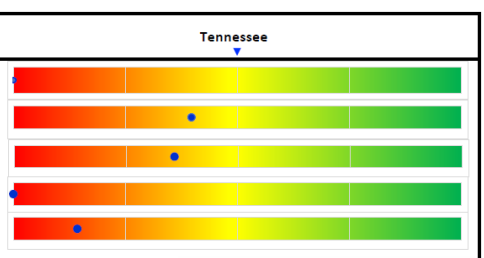


Figure A-6. Haywood County Socioeconomic Snapshot

County →	Haywood	Tennessee	Relative Trend
Change in Population (2010-2020)	-8.5%	8.6%	Losing population
Poverty Level (2020)	12.1%	10.6%	Above state average
Unemployment Rate (2021)	4.3%	3.8%	Somewhat above state average
Food Stamps (2020)	25.4%	12.6%	Very High reliance
Adjusted Median Household Income (2020)	$43,434	$61,076	Very low MHI

Haywood	2010	2020
Population	19,010	17,391
Adjusted Median Household Income	$42,876	$43,434

Ability to Pay Index
0



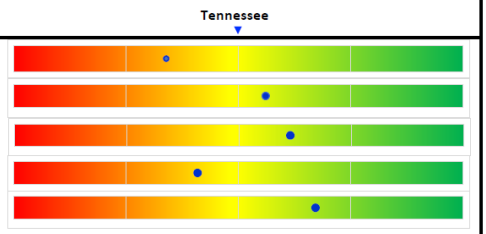
UTEXTENSION INSTITUTE OF AGRICULTURE THE UNIVERSITY OF TENNESSEE

Figure A-7. Tipton County Socioeconomic Snapshot

County →	Tipton	Tennessee	Relative Trend
Change in Population (2010-2020)	3.1%	8.6%	Growth below state average
Poverty Level (2020)	9.7%	10.6%	Lower than state average
Unemployment Rate (2021)	3.4%	3.8%	Lower than state average
Food Stamps (2020)	14.4%	12.6%	Above average reliance
Adjusted Median Household Income (2020)	$69,587	$61,076	Above average MHI

Tipton	2010	2020
Population	59,689	61,562
Adjusted Median Household Income	$65,315	$69,587

Ability to Pay Index
60



UTEXTENSION INSTITUTE OF AGRICULTURE THE UNIVERSITY OF TENNESSEE

Source: University of Tennessee Extension, Ability to Pay Index and Indicators of Economic Health

V. Housing and Development Patterns

Each of the three counties in the study area is predominantly rural. Single-family housing is typically built on large lots, and the pattern of development is sparse. Housing is somewhat more concentrated within the municipalities that are served by sewer infrastructure, but these communities have had land use policies in place for years that communicate a preference to stay rural and low-density.

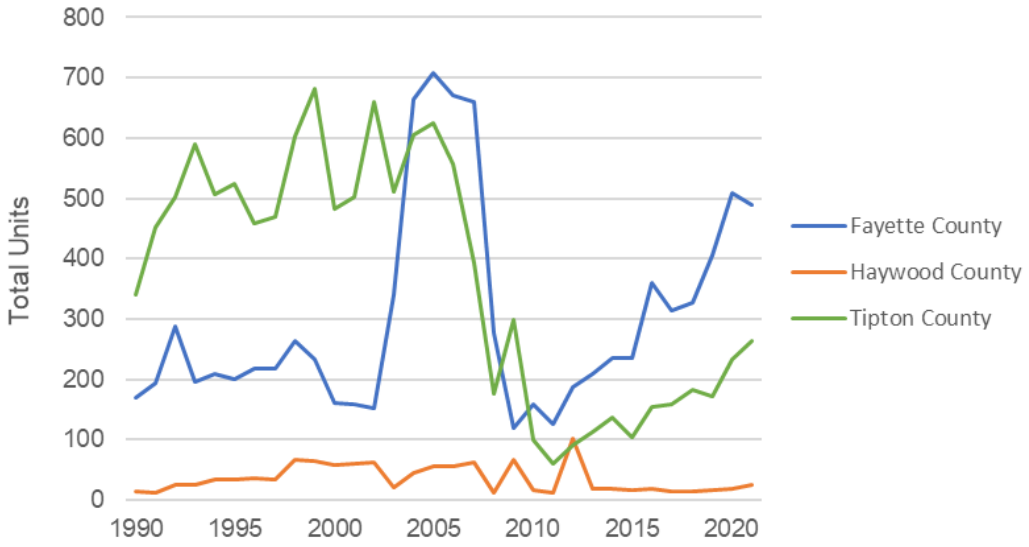
According to the US Census Bureau's Building Permits Survey, from 2015 to 2021 Fayette County's growth outpaced the other two counties significantly. An average of 370 single-family building permits issued per year in Fayette County, versus an average of 178 in Tipton and 17 in Haywood. The City of Oakland, located along US Highway 64 and near I-40, captured much of the new growth.

Table A-2. Average and Total Single-Family Building Permit Approvals, 2015 – 2021

County	Average Annual Single-Family Building Permits	Total Single-Family Building Permits, 2015-2021
Fayette	370	2,588
Haywood	17	117
Tipton	178	1,248

Source: US Census Bureau Building Permits Survey

Figure A-6. Single-Family Building Permit Trends



Source: US Census Bureau Building Permits Survey

VI. Transportation Infrastructure

Settlement patterns often depict both residential and commercial properties in proximity to major roadways. A review of historical traffic data provides a view of both where people live, and where they travel frequently (i.e., places of employment). As illustrated in Figure A-7, the roadways in the West Tennessee region with the highest daily traffic include Interstate 40, US Highway 51, US Highway 64, US Highway 70, and State Route 57.

Figure A-7. Historical Traffic Counts

Table A-12 documents annual average daily traffic (AADT) counts for each of these roadways and the counties they traverse.

Figure A-7. Historical Traffic Counts

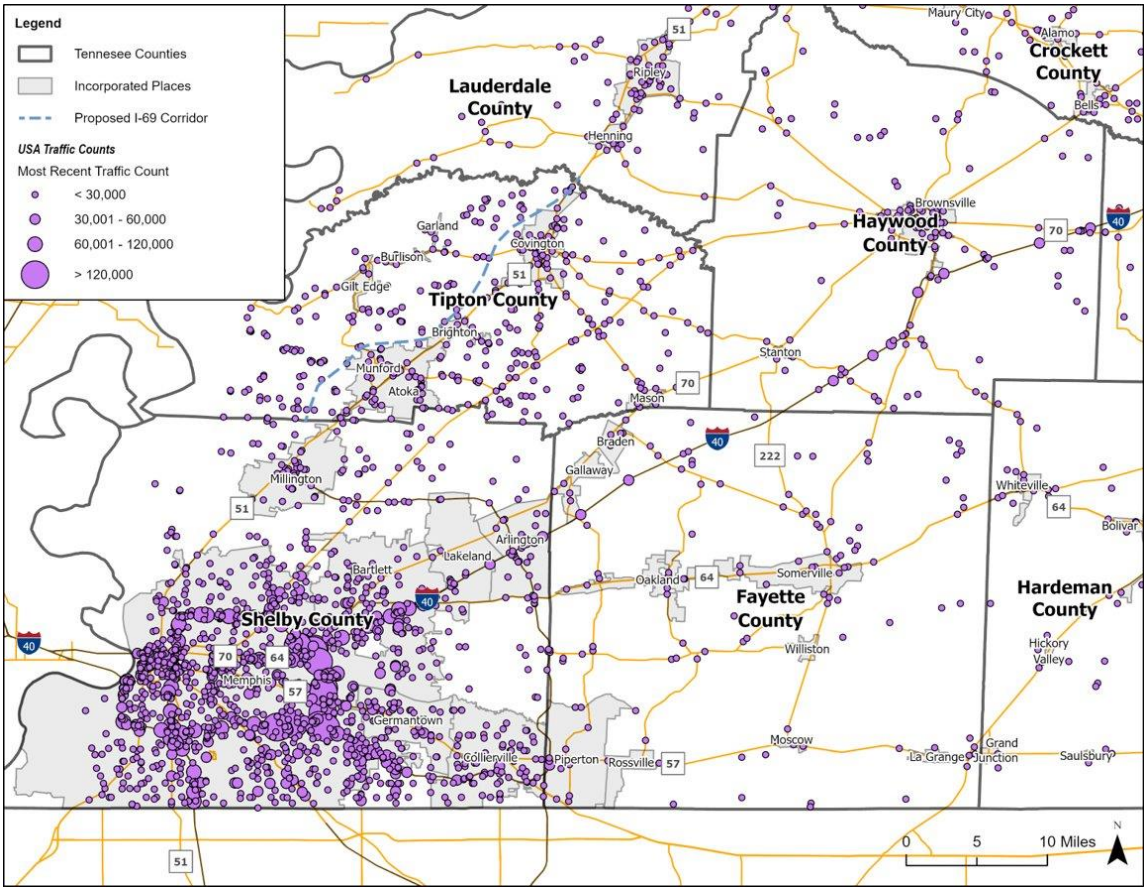


Table A-12. Annual Average Daily Traffic (AADT) by County

Road	County	AADT Range
Interstate 40	Fayette, Haywood	27,000 – 35,000 vehicles
US Highway 51	Tipton	20,000 – 30,000 vehicles
US Highway 64	Fayette	10,000 – 20,000 vehicles
US Highway 70	Fayette, Haywood, Tipton	1,000 – 4,000 vehicles
State Route 57	Fayette	2,000 – 9,000 vehicles
State Route 222	Haywood	500 – 800 vehicles

Source: ESRI Business Analyst, Traffic Counts Database

It is prudent in economic impact studies to allocate growth within the geographic areas that would require a 30-minute, 60-minute, and 90-minute commute drive times to the employment hub.[1] In this context, the drive time rings span four different states and capture portions of 39 counties, as illustrated in Table A- and **Error! Reference source not found.**. Most workers prefer a commute time of 30 minutes or less; however, megasites like Blue Oval City are expected to have an expansive regional impact. Therefore, the 30-minute, 60-minute, and 90-minute drive time rings were considered for this study.

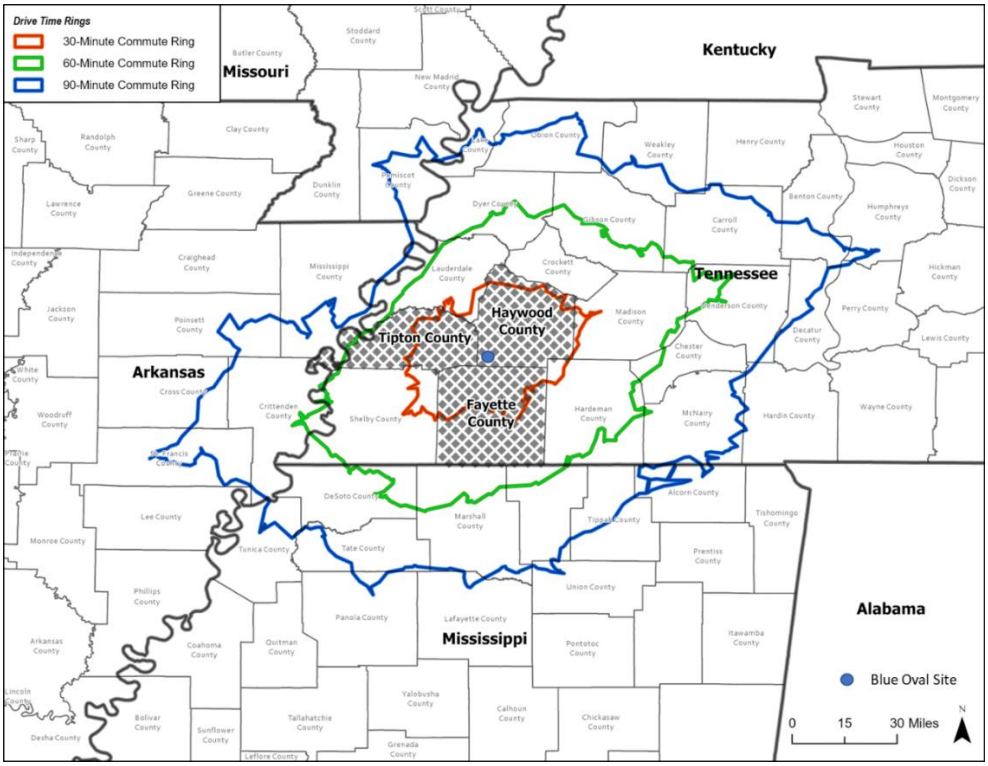
Table A-4. Statistics on Drive Time Areas

Geographic Area (drive time ring in minutes)	Total Counties Intersecting	Total Population within Drive Time Boundaries
30	7	90,529
60	19	1,311,392
90	39	1,764,665

Source: ESRI Business Analyst, U.S. Census Bureau, 2016-2020 American Community Survey Five-Year Estimates

[1] Wilson, T., Grossman, I., Alexander, M. et al. (2022). Methods for Small Area Population Forecasts: State-of-the-Art and Research Needs. Popul Res Policy Rev 41, 865–898.

Figure A-8. Commute Drive Times to Blue Oval City



A 30-minute drive time ring encompasses the majority of Haywood County's land area (88 percent), whereas less than half of Fayette and Tipton's land areas lie within the 30-minute commuting area (41 percent and 45 percent, respectively).

VII. Economic Development Context

Employment Health

In March 2022, the state of Tennessee had an unemployment rate of 3.2 percent. At that time, the unemployment rates for both Fayette and Tipton Counties stood at 3.3 percent, with Haywood County's unemployment rate at 4.5 percent. This is the most recent data available from the Tennessee Department of Labor and Workforce Development.

Quality of Public Schools

Access to schools in a community is an important draw for new residents. The quality of public schools has a significant influence on where households with children decide to locate. As shown in Figure 8, Tipton County schools rank above the state average across significantly more metrics than either Haywood or Fayette counties.

Figure 8. Public School Metrics

	Fayette	Haywood	Tipton
District Overall Letter Grade	H (Held Harmless)	H (Held Harmless)	H (Held Harmless)
TCAP Participation Rate	94.5%	96.8%	96.3%
Success Rate	9.4%	6.7%	31.6%
Valid Score Rate	93.7%	96.1%	95.9%
Ready Graduate	19.0%	27.5%	42.1%
Average ACT	17.6	16.4	20.3
Graduation Rate	90.3%	90.5%	95.5%
Post Secondary Enrollment	49.7%	56.4%	64.1%
Per Pupil Expenditures	$10,474	$10,880	$8,644
Student to Teacher Ratio	14:1	13:1	15:1
Teacher Retention	84.3%	85.2%	91.4%

Equal to or within MOE of State	Above State	Below State

Source: TN Dept. of Education 2018-2019 & 2019-2020 school years

Economic Development Context

Each counties' potential for economic development was assessed based on stakeholder interviews and a review of online materials. According to stakeholder interviews, the communities in the tri-county area have varying levels of excitement about the Blue Oval City plant. Some communities are actively planning for growth, while others have expressed limited to no interest in capitalizing on growth opportunities. Tipton County has been proactive with its March 2022 publication of the Tipton County Infrastructure Assessment, which was commissioned a result of the Blue Oval City announcement.

A review of online materials related to economic development was also conducted. As of December 2022, Fayette County was actively holding a public review period for a proposed amendment to its Growth Plan. The amendment shows that Fayette County is considering a large new growth area, based on where it would like to capture new growth from Blue Oval City. Each county has an active Chamber of Commerce, which demonstrates that each county has a contingent advocating for economic growth.

Wastewater Services

Fayette and Tipton Counties have more active water and wastewater systems in their jurisdictions than Haywood County. The coverage of wastewater networks has a tremendous impact on future growth. When sewer is available, communities are able to build more dense housing and commercial developments and support more intense industry than would be possible in areas served by septic systems. In the tri-county area, there are six public wastewater systems operating in Fayette County,

five public wastewater systems operating in Tipton County, and two public wastewater systems operating in Haywood County.

VIII. Population Allocation Methodology

A scoring matrix was to consolidate the key community quality indicators into a total score, where the maximum potential score is 48. Table A-5, Population Allocation Scoring Matrix, lists each indicator category, the metric used to score the category, the data source, and the categorical value ranges. As shown in the "Max Points Potential" column, the scoring includes weighting, based on professional judgement and experience with quantifying measures, that are qualitative in nature. For each metric, the community's statistic is classified as either "below average," "average," or "above average" based on the criteria listed in the corresponding columns.

Table 13. Population Allocation Scoring Matrix

Category	Metric	Source	Max Points Potential	Below Average		Average		Above Average	
Socioeconomic Factors	Ability to Pay Index (ATPI)	TDEC	12	2	less than 50	6	50 or higher	12	75 or higher
Available Housing	Permitting between 2015-2021	U.S. Census Bureau, Building Permits Survey	6	1	<1,000 SFH permits in past 6 years	3	1,000-2,000 SFH unit permits in past 6 yrs	6	>2,000 SFH unit permits in past 6 yrs
Wastewater Services	Extent of wastewater service coverage in county	TDEC	6	1	no wastewater service areas throughout county	3	1 - 2 municipalities or other areas served by wastewater	6	> 2 municipalities or other areas served by wastewater
Quality of Schools	Public school metrics 2018-2019 and 2019-2020 school years (comparison to state average)	TN Dept. of Edu.	6	1	<4 categories above state average	3	4-7 categories above state average	6	>7 categories above state average
Roadways	# of high-capacity roadways (measured by AADT)	ESRI	6	1	All Roadways have <5,000 annual average daily trips (AADT)	3	At least 1 Roadway(s) that has 5,000-10,000 AADT	6	>1 Roadway(s) that have >10,000 AADT
Jobs	Employment health (comparison to March 2022 state unemployment rate of 3.2%)	TN Dept. Labor & Workforce Devt	3	1	<state average minus 0.2%	2	At or within 0.2% of state average	3	> state average plus 0.2%

Category	Metric	Source	Max Points Potential	Below Average		Average		Above Average	
Economic Development Context	Have own chamber of commerce or economic development advocate; current or emerging plans	Stakeholder interviews and online review by planning team	3	1	No econ devt infrastructure	2	Have own chamber or econ devt advocate	3	Have own chamber and recent plans
Pace of growth	% of parcels declining in 2022	TN Comptroller of the Treasury	3	1	> 2/3 of parcels declining	2	1/3 to 2/3 of parcels declining	3	<1/3 of parcels declining
Proximity to Blue Oval City	Distance to Blue Oval City	Online review by planning team	3	1	Tipton County (farthest distance from Blue Oval site)	2	Fayette County (includes a portion of the Blue Oval City site)	3	Haywood County (home to the largest portion of Blue Oval City site)

IX. Results of Population Allocation Scoring

Table A-6 provides the results of the above scoring methodology for the three counties in the study area. Out of the maximum score of 48, Fayette's score was 41, Haywood's score was 19, and Tipton's score was 33. This finding provides a basis for allocating the highest amount of the anticipated new growth to Fayette County. Growth was allocated to Haywood and Tipton by comparing their scores to Fayette's score. Accordingly, Tipton County's population allocation is 80 percent of Fayette County's allocation, and Haywood County's population allocation is 50 percent of Fayette County's allocation, as reflected in the methodology discussed in Section 3 of this report.

Table A-6. Population Allocation Assumptions by Growth Scenario

Category	Metric	Fayette	Haywood	Tipton	Potential Points
Socioeconomic Factors	Ability to Pay Index (ATPI)	12	2	6	**12**
Available Housing	Permitting between 2015-2021	6	1	3	**6**
Infrastructure	Extent of wastewater service coverage in county	6	3	6	**6**
Quality of Schools	Public school metrics 2018-2019 and 2019-2020 school years (comparison to state average)	1	3	6	**6**
Roadways	# of high-capacity roadways (measured by AADT)	6	3	3	**6**
Jobs	Employment health (comparison to March 2022 state unemployment rate of 3.2%)	2	1	2	**3**
Economic Development Context	Have own chamber of commerce or economic development advocate; Current or emerging plans	3	2	3	**3**
Pace of growth	% of parcels declining in 2022	3	1	3	**3**
Proximity to Blue Oval City	Distance to Blue Oval City	2	3	1	
	Total	**41**	**19**	**33**	**48**

X. Results of the Three Population Projection Scenarios

The key assumption that changes between the three scenarios is the population allocation percentages. As illustrated in Table A-7, each scenario carries forward the assumption that Fayette County will experience the highest growth, Tipton County will receive 80 percent of Fayette County's growth, and Haywood County will receive 50 percent of Fayette County's growth.

Table A-14. Population Allocation Assumptions by Growth Scenario

Growth Scenario	Fayette County: Percentage of Growth (%)	Tipton County: Percentage of Growth (%)	Haywood County: Percentage of Growth (%)	Growth within the West TN Study Area (%)	Growth from Outside the Study Area (%)
High	30%	24%	15%	**69%**	**31%**
Medium	25%	20%	12.5%	**57.5%**	**42.5%**
Low	20%	16%	10%	**46%**	**54%**

High Scenario

Table A-8. Projected Population Impact of Blue Oval City – High Scenario

Geography	2023	2028	2033	2038	2043
Fayette	929	5,576	14,868	17,656	18,585
Haywood	179	1,972	5,557	8,067	8,963
Tipton	828	4,970	13,253	15,737	16,566
Total Study Area	**1,937**	**12,517**	**33,678**	**41,460**	**44,114**

Table A-9. Total Projected Population – High Scenario

Geography	2023	2028	2033	2038	2043
Fayette	44,026	50,798	61,787	65,948	68,092
Haywood	16,839	18,054	21,017	22,923	23,271
Tipton	63,737	69,198	78,433	81,492	83,008
Total Study Area	**124,602**	**138,050**	**161,237**	**170,362**	**174,372**

Medium Scenario

Table A-15. Projected Population Impact of Blue Oval City – Medium Scenario

Geography	2023	2028	2033	2038	2043
Fayette	774	4,646	12,390	14,713	15,488
Haywood	149	1,643	4,631	6,722	7,469
Tipton	690	4,141	11,044	13,115	13,805
Total Study Area	**1,614**	**10,431**	**28,065**	**34,550**	**36,762**

Table A-16. Total Projected Population – Medium Scenario

Geography	2023	2028	2033	2038	2043
Fayette	43,871	49,869	59,309	63,005	64,995
Haywood	16,809	17,726	20,091	21,578	21,777
Tipton	63,599	68,370	76,224	78,869	80,247
Total Study Area	**124,280**	**135,964**	**155,624**	**163,452**	**167,020**

Low Scenario

Table A-17. Projected Population Impact of Blue Oval City – Low Scenario

Geography	2023	2028	2033	2038	2043
Fayette	620	3,717	9,912	11,771	12,390
Haywood	120	1,315	3,705	5,378	5,976
Tipton	552	3,313	8,835	10,492	11,044
Total Study Area	**1,291**	**8,345**	**22,452**	**27,640**	**29,409**

Table A-18. Total Projected Population – Low Scenario

Geography	2023	2028	2033	2038	2043
Fayette	43,717	48,939	56,831	60,062	61,897
Haywood	16,779	17,397	19,165	20,234	20,283
Tipton	63,461	67,542	74,016	76,246	77,486
Total Study Area	**123,957**	**133,878**	**150,011**	**156,542**	**159,667**

XI. Capital and Operational Cost Assumptions and Exclusions

There are several factors that were included and not included in the capital cost and operation calculation of each alternative. The list below is a more extensive list of assumptions and exclusions that were data points used in developing the high level capital cost estimate and annual operational costs for each alternative not identified in the report:

- All costs include 35% contingency, as is appropriate for planning level cost.
- All costs include an allowance for Engineering at 15% of probable construction cost
- Land acquisition allowances are included in all costs. WWTP's include 10 acres, Pump Stations include 1 acre, and Force Mains include a 20' wide easement the length of the force main.
- Depreciation costs are not included
- No collection system existing and future operation and maintenance cost is included.

- No collection system expansion cost is included
- Pump stations are sized based on 2043 peak flow rate and force main distance to calculate HP requirements
- Pump stations assumed to be wet pit submersible type
- UV disinfection is assumed for Alternative 1 and sodium hypochlorite chemical feed system for disinfection for Alternatives 2-4
- No improvements, demolition, or modifications included for existing WWTP's. Assumed abandonment as-is only
- No deep or special foundations included for any structures
- Force main distances were assumed by driving directions
- No wetland disturbances, creek crossings, or horizontal directional drilling included.
- No permitting or special requirements included for discharge, related to cost
- The factor used to convert horsepower to kW was 0.746, and $0.106 kW/hr was used a average electrical rate
- Security/safety, portable water, pest control, internet/telephone, stormwater management, refuse, janitorial, vehicle costs are not included in this estimate
- O&M labor reference, Estimating Costs and Manpower Requirements for Conventional Wastewater Treatment Facilities 1971, Figure 26
- Labor Costs do not reflect "Level of Service" expectations and a more detailed labor study is prudent
- The average hourly wage for a wastewater treatment plant operator was assumed at $26 per salary.com

XII. Governance Model Literature Review

Documents describing the benefits and challenges with various governance models and providing guidance on developing successful governance charters and agreements were collected and reviewed for this study. These documents are listed in Table A-14 and summarized in the subsequent sections.

Table A-14. Documents on Governance Models and Developing Charters/Agreements

Publication Title	Focus Area	Author	Date
Governance Options, and Opportunities, for Public Clean Water Agencies in a Covid-19 World	Governance Options	The National Association of Clean Water Agencies	2020
Financing Strategies to Promote System Regionalization	Governance Options	US EPA, Environmental Finance Advisory Board	2019
Crafting Interlocal Water and Wastewater Agreements	Interlocal Agreements	University of North Carolina, School of Government, Environmental Finance Center	2019
Inter-Municipal Agreements: A Best Practice	Interlocal Agreements	State of Massachusetts, Community Compact Program	2015
Public-Private Partnerships for Transportation and Water Infrastructure	Privatization	Congressional Budget Office	2020
Privatization of Water Services in the US: An Assessment of Issues and Experience	Privatization	National Research Council	2002

Governance Options, and Opportunities, for Clean Water Agencies in a COVID-19 World (2020)

This report addresses the loss of both commercial and residential revenue due to the COVID-19 pandemic. The document notes that "These economic realities are likely to encourage options and opportunities that have not been considered before. These opportunities, which include consolidations, public-private partnerships, operating concessions, and utility privatization, may well be an appropriate outcome in certain circumstances." A roadmap is developed and discussed that includes the topics of flexibility, budget optimization, voluntary partnerships, shared services, public private partnerships, regionalization and consolidation, and sale of facilities/privatization.

Financing Strategies to Promote System Regionalization (2019)

This report addresses "concerns regarding the effectiveness, efficiency, and sustainability of the U.S. Water Sector in terms of providing universal access to safe, reliable service that is in compliance with regulatory requirements designed to protect public health and safeguard the environment". Various governance models are examined to illustrate how they can be used to improve system management including centralized management of dispersed systems and decentralized systems. Potential advantages and disadvantaged of governance models are highlighted along with specific case study examples.

Crafting Interlocal Water and Wastewater Agreements (2019)

This document provides guidance for preparing and revising interlocal agreements related to wastewater and water. The authors cite "population shifts, flooding and drought, changes in industry water and wastewater needs, and the continuous move toward reduction in overall water use" as reasons for partnership opportunities. The document addresses financial, regulatory, physical, and operational issues to be considered as part of these agreements. Draft language is included to use as a starting point for new agreements.

Inter-Municipal Agreements: A Best Practice (2015)

This guidance was developed to "use as a steppingstone to open communications that gives inter-municipal cooperation a chance at successful outcomes". The purpose of the document is to describe and illustrate (through examples) the basics of inter-municipal agreements, typical processes for developing agreements, and pathways to overcoming obstacles in negotiations.

Public-Private Partnerships for Transportation and Water Infrastructure, 2020

This report assesses whether public-private partnerships have resulted in projects being built more quickly or at a lower cost for taxpayers than other arrangements. The report also examines whether partnerships that include private financing sped up project financing.

Privatization of Water Services in the US: An Assessment of Issues and Experience (2002)

This assessment covers four major classes of privatization options including:

- Private provisions of various services and supplies,
- Private contracting for plant operation and maintenance,
- Negotiating a contract with a private firm for the design, construction, and operation of new facilities, and
- Outright sale of water utility assets to a private company.

The advantages and challenges associated with public and private systems are discussed. The study notes that the "public and private sector operations face different constraints and incentives. For example, on one hand, privately owned and operated utilities may be less tied to local politics than publicly owned utilities and they may have greater flexibility to make staffing changes. On the other hand, public systems may be more responsive to public input and more amenable to conservation objectives."

XIII. Existing Governance Charter and Agreement Review

Governance charters and agreements were identified, collected, and reviewed as part of this effort. These charters and agreements were collected from agencies of differing types (wastewater, water,

stormwater) and sizes (based on population served) across the United States. This robust collection of documents was compiled and reviewed to reduce unintended bias in the collected information. The organizations and associated characteristics (sorted by region) are depicted in Table A-15. The governance charters and agreements are summarized in the subsequent sections.

Table A-15. Existing Governance Charters and Agreements

Organization Name	Document Type and Date	Region (State)	Utility Type	Approximate Population Base
North Attleborough (Town) and Plainville (Town)	Intermunicipal Agreement (2020)	East (MA)	Water	40,000
Lisbon (Town) and Sussex (Village)	Intermunicipal Agreement (2020)	Midwest (WI)	Wastewater	25,000
Desoto County Regional Utility Authority	Senate Bill 3253 (1999)	South (MS)	Wastewater	200,000
Mississippi Capitol Region Utility Authority	Senate Bill (In-process)	South (MS)	Wastewater, Water and Stormwater	150,000
Anderson County Water Authority	Senate Bill 2362 (2007)	South (TN)	Water and Wastewater	80,000
Organization Name	**Document Type and Date**	**Region (State)**	**Utility Type**	**Approximate Population Base**
Cumberland Plateau Water Authority	Senate Bill 2920 (2022)	South (TN)	Water and Wastewater	65,000
Harpeth Wastewater Cooperative	Bylaws and Charter (2014)	South (TN)	Wastewater	>5,000
Tennessee Water Systems	Petition	South (TN)	Wastewater	>5,000
Wastewater Authority of Dickson County	Senate Bill 1966 (2001)	South (TN)	Wastewater	60,000
Pflugerville (City) and Travis (County)	Agreement (2009)	South (TX)	Stormwater	140,000

Cascade Water Alliance	Joint Municipal Utility Services Agreement (2012)	West (WA)	Water	380,000
Clearview Water Supply	Interlocal Joint Operating Agreement (2005)	West (WA)	Water	300,000
King County Wastewater Treatment Division	Agreement for Sewage Disposal and Amendments (1965)	West (WA)	Wastewater	2,000,000
Eastern Municipal Water District	Inter-Agency Sewage Agreement (2001)	West (CA)	Wastewater	1,000,000

North Attleborough and Plainville, MA

The Intermunicipal Agreement between the Town of North Attleborough and the Town of Plainville allows North Attleborough to continue to treat Plainville's water in a shared capacity and to sell additional water to Plainville. The agreement covers financial, rate, and capital improvement program elements and identifies roles and responsibilities for each party related to operational duties.

Lisbon and Sussex, WI

The Intermunicipal Agreement between the Town of Lisbon and the Village of Sussex allows for the extension of wastewater treatment services by Sussex for Lisbon. The treatment plant operated by Sussex was already officially defined as an "area wide regional wastewater treatment facility". The agreement covers capital costs (for the replacement of sewers), rates, billing, and sewer extension rules.

Anderson Water Authority, TN

The House Bill establishing the Anderson Regional Authority states that "the purpose of the Authority is to plan and develop water resources of Anderson County and the geographic region and to provide necessary wastewater collection and treatment attendant thereto. The further purpose of the Authority is to provide environmental services and to secure economic benefits to the County and geographic region that it encompasses and may serve". The Bill also describes the formation of the initial membership of the Board of Directors. The initial board consisted of two directors selected from the North Anderson County Utility District board and three directors selected from the Anderson County Utility Board. These initial board members were to be appointed by the Anderson County Mayor and confirmed by the County legislative body.

Cumberland Plateau Water Authority, TN

The House Bill establishing the Cumberland Plateau Water Authority states that the "Cumberland Plateau Water Authority created pursuant to this act shall be public and a governmental body and a political subdivision of the State of Tennessee. It is further declared that the planning, acquisition, operating, and financing of water and wastewater systems by said Authority is hereby declared to be a public and governmental purpose and a matter of public necessity. The Bill describes the formation of a seven-person Board of Commissioners. The Board includes one representative residing within the Crab Orchard Utility District, one representative residing with the South Cumberland Utility District, one representative with the Catoosa Utility District, and three representatives within the City of Crossville. The Bill authorizes the Mayor of Cumberland County to appoint the representatives from the Utility Districts and the Mayor of the City of Crossville to appoint the representatives from the city.

Desoto Regional Utility Authority (DRUA), MS

The Senate Bill establishing the Desoto Regional Utility Authority and an associated Comprehensive Sewer Use Ordinance were identified and reviewed as part of this study. The bill allowed the authority to "acquire, construct, maintain, and operate sewer treatment systems, waste treatment systems, wastewater treatment systems, and groundwater treatment systems". The ordinance serves as a mechanism to define the roles and responsibilities of the authority, members, and utilities. The board consists of two County representatives and one representative each from the five participating Cities. The authority conveys, pumps, and treats wastewater from only these five cities – not any unincorporated areas. The Cites each retained local control of their collection systems.

Mississippi Capitol Region Utility Authority, MS

The Senate Bill proposing the establishment of the Mississippi Capitol Region Utility Authority was put forth due to a November 29, 2022, complaint filed by the Department of Justice (DOJ) alleging that "the City of Jackson has failed to provide drinking water that is reliable compliant with the Safe Drinking Water Act to citizens within the boundaries of the water system". The intent of the bill was to "provide authority to the Mississippi Capital Region Utility Authority to transfer water, wastewater, and stormwater services provided by the City of Jackson to the utility authority's ownership, management, and control when the court-appointed receiver's work concludes with the water system to ensure all citizens have access to safe, clean, and reliable water, wastewater, and storm water systems at affordable, regulated rates which are just, reasonable, and provide an adequate amount of capital to keep such systems in good repair".

Water Authority of Dickson County (WADC), TN

The State Legislative document established and created the Water Authority of Dickson County "for and on behalf of the citizens of Dickson County, Tennessee". The board of commissioners was created with

two representatives from Tumbull-White Bluff Utility District, the Mayor of Dickson County, a member of the Dickson County City Council, and a member at-large from a resident of the Harpeth Utility District. All positions were to be appointed. The remainder of this document outlines the powers and authorities the executive officer and the board. WADC currently serves customers in Dickson, Hickman, Humphreys, and Williamson Counties.

Harpeth Wastewater Cooperative, TN

The Bylaws and Charter for Harpeth Wastewater Cooperative (also known as Berry's Chapel Utility) were identified and reviewed as part of this study. The Bylaws establish the purpose of the cooperative which is "to be a member-owned Tennessee nonprofit corporation, owned by its members and managed by a board of directors which have the power to establish the rates, terms, and conditions under which the Corporation will provide public utility service to the service area. The Charter (and Amendments to the Charter) provides an overview of the principles and definition of the Cooperative.

Pflugerville (City) and Travis (County), TX

The Interlocal Cooperation Agreement between the City of Pflugerville and Travis County aims to "eliminate duplication, reduce administration costs, clarify responsibility, and expedite implementation of their respective Surface Water Master Plans in that part of the City's extraterritorial jurisdiction that is located within Travis County, including the City's limited purpose annexation areas". The purpose of this agreement was to allow the parties to work cooperatively with the goal of efficient and effective coordination to implement the City's Surface Water Master Plan in concert with the City's Surface Water Master Plan.

Tennessee Wastewater Systems, TN

The Petition to Amend Certificate of Convenience and Necessity for Tennessee Water Systems was required to expand the service area of Tennessee Water Systems to include a residential subdivision in Clay County known as the Pointe. A Sanitary Sewer Service Agreement between the Tennessee Wastewater System and DH Development is included in the documentation of the petition. This agreement defines the transfer of assets, operation, and management to the Tennessee Water Systems.

Cascade Water Alliance, WA

The Joint Municipal Utility Services Agreement (JMUSA) associated with the formation of Cascade Water Alliance (CWA) covers the formation, organizational structure, asset development and supply commitment, asset management, planning, and various legal considerations associated with the Utility. CWA serves seven members including five cities (Bellevue, Kirkland, Redmond, Issaquah, and Tukwila) and two districts (Skyway Water and Sewer District and Sammamish Plateau Water). All members own

and operate their own water distribution systems and a few members have their own groundwater supply.

Clearview Water Supply, WA

The Interlocal Joint Operating Agreement between Alderwood Water and Wastewater District, Cross Valley Water District, and Silver Lake Water District defines a lead agency (Alderwood Water and Wastewater District) and establishes and describes the roles and responsibilities of the Board and the two non-lead participating agencies. The agreement also documents the roles and responsibilities associated with finance, operations, and administrative services.

Eastern Municipal Water District and the City of Helmet, CA

The Inter-Agency Sewage Agreement between the Eastern Municipal Water District and the City of Helmet was created to resolve differences associated with an earlier agreement and "to set forth new terms under which the collection, transmission, and treatment of sewage originating within the City shall be handled currently and beyond the expiration of the 1963 Agreement".

King County Wastewater Treatment Division (formerly Metro) and the City of Issaquah, WA

The Agreement for Sewage Disposal (and associated amendments) between King County and the City of Issaquah was developed for the purpose of the City of Issaquah to "deliver to Metro sewage collected by the City from the area presently located outside of the boundaries of Metro and Metro is willing to accept such sewage for disposal under certain terms and conditions." The terms and conditions in this agreement included the delivery and acceptance of sewage, construction of facilities, connection of local sewerage facilities to the metropolitan sewerage system, payment for sewage disposal, responsibility of the participants, records, development of metropolitan sewer system, use of City facilities, and various legal considerations. The City of Issaquah is one of 37 members to enter into an agreement with King County.

XIV. Agency Feedback on Existing Agreements

Agencies mentioned in section *XIII. Existing Governance Charter and Agreement Review* were contacted to obtain information about the development and implementation of their charter and/or agreement. Responses were received from certain agencies either via email or interview. The following section provides a summary of the feedback received.

Desoto Regional Utility Authority (DRUA), MS

The authority was formed to reduce the number of individual discharge points and permits within the county. The Federal government was going to place a moratorium on county development unless the Authority was established. It took about five years for the authority to be established. This period

represents the time between the initial feasibility study in 1994 and the formal authority establishment in 1999. Addressing and resolving inflow and infiltration issues that impact system capacity has been one of the biggest challenges for the Authority.

Cumberland Plateau Water Authority, TN

The authority was established due to several small utilities not having ample water supply and the permitting challenges associated with securing a future water source to account for growth. The Private Act to establish the authority was worded such that local utilities can contract with or join the authority. The authority is charged with securing a large future supply to serve all the area for water and sewer. Language was included in the Private Act to protect wages and benefits for mergers between individual utilities and the authority.

Harpeth Wastewater Cooperative, TN

The petition to become a cooperative was never formally approved due to a lack of the required voting majority. As such, the agency is a not-for-profit (but not tax exempt) entity regulated by the Tennessee Public Utilities Commission.

Cascade Water Alliance (CWA), WA

The Joint Municipal Utility Services Agreement allowed CWA to move from a non-profit status to a municipal corporation. This change of status helped immensely in terms of obtaining reasonable insurance coverage and public immunity. Another benefit from the change to a municipal corporation was a much clearer understanding on the requirements State laws. The state laws that must be followed for a municipal corporation, as compared to a non-profit, are much easier to understand. One problematic issue with the municipal corporation status is that it does not allow for police enforcement. CWA relies on County and City police for enforcement on their property for issues such as trespassing.

Clearview Water Supply, WA

The agreement has been very collaborative from the beginning between all partners as each of entered into the agreement for the similar reasons. The division of responsibilities and benefits was well thought out and has stood the test of time. There were ongoing challenges during the construction of the major capital project, both technical and legal. However, there has been no significant challenges with the ongoing administration of the project and agreement. They don't feel any significant changes are needed.

King County Wastewater Treatment Division (formerly Metro)

Staff from agencies with individual contracts with King County (i.e., satellite agencies) provided feedback for this study. They noted that the King County Wastewater Treatment Division management, technical,

engineering, and operating and maintenance staff are of the highest caliber and very dedicated to their service and protection of the environment. The most signification issue voiced was the lack of formal voting authority by the satellite agencies on funding and policy decisions. The King County Council has the final voting authority on all major funding and policy issues associated with the Wastewater Treatment Division. There is a Regional Water Quality Committee that includes elected officials from King County and partnering agencies and a Municipal Pollution Abatement Advisory Committee that includes staff, management, and elected officials from King County and partnering agencies.