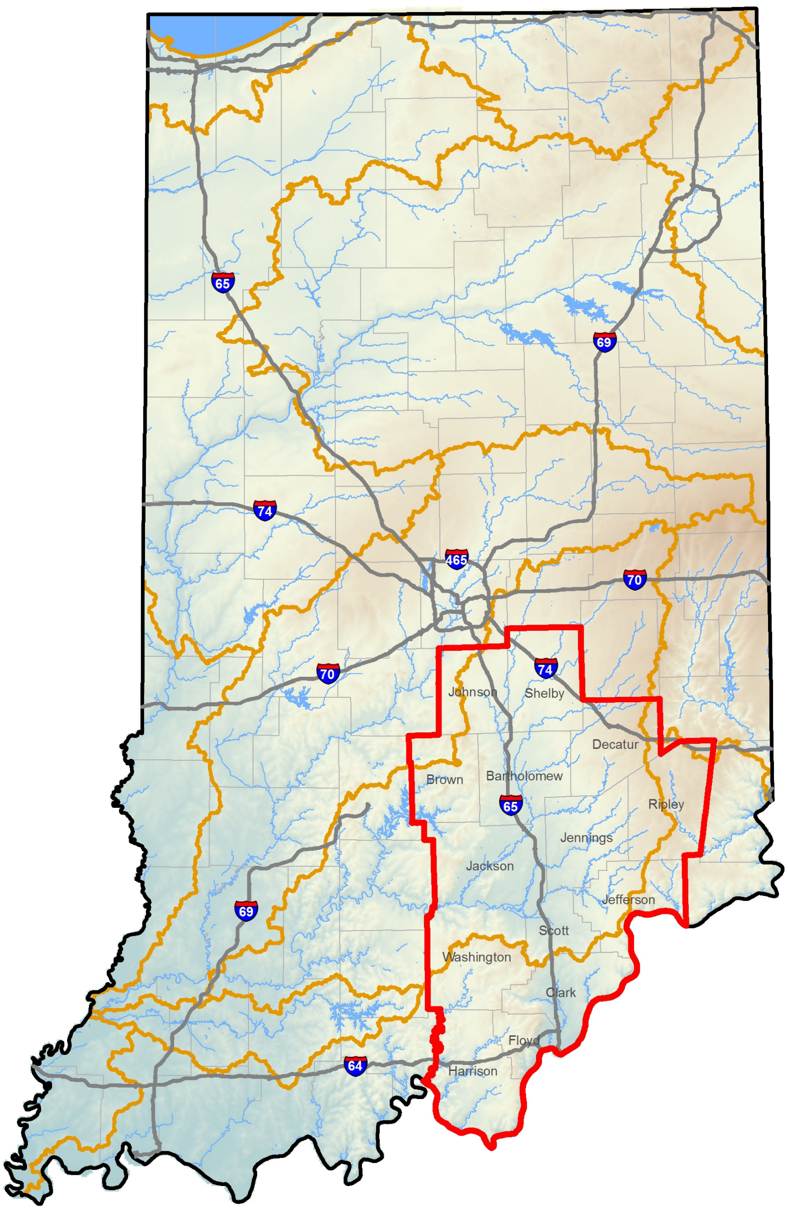
Southeastern Indiana Regional Water Supply

Feasibility and cost analysis



January 2018

Indiana Finance Authority

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PREFACE

Indiana Code 4-4-11.7-4 states that: “The authority shall monitor and study events and conditions that bear upon the ability of utilities to provide clean and safe drinking water in Indiana for the foreseeable future, including the ability of utilities to directly or indirectly fund the increasing costs of meeting governmental requirements.” This report was prepared to comply with this section of the law.

In the 14-county study area in Southeastern Indiana, there are 91 public water supply (PWS) utilities (**Figure 1**). Seventy-five of these utilities are classified by the United States Environmental Protection Agency (USEPA) as small or larger, serving 500 or more persons, while the remaining utilities are classified as very small. Due to the limited availability of data for the very small utilities, the analysis and results presented in this report are based on the subset of 75 EPA classified small or larger utilities. However, benefits of any regional cooperation would also be available to these very small utilities. Data about these utilities was obtained from the Indiana Department of Natural Resources (IDNR) Significant Water Withdrawal Facility (SWWF) database, the USEPA Safe Drinking Water Information System (SDWIS) database, water supply survey and water audit data collected for the Indiana Finance Authority (IFA) report *Evaluation of Indiana’s Water Utilities* (IFA, 2016), and other sources. The utility data was analyzed on an individual utility level, but is summarized in this report at the county scale.

Meetings were held with utility stakeholders and state agencies to understand the challenges and concerns of water utilities in Southeastern Indiana, and the potential benefits of a regional water supply alternative. The list of utilities invited to these meetings is provided in **Appendix A**. Input from utilities and local officials in the study area was encouraged and welcomed. Meetings also took place with the Indiana Utility Regulatory Commission (IURC), Indiana Economic Development Corporation (IEDC), Indiana Department of Environmental Management (IDEM), and Indiana Department of Natural Resources (IDNR) to discuss specific issues relevant to the water utilities and water resources in Southeastern Indiana, economic development, and the potential development of a regional water supply.

1.0 INTRODUCTION

The State has invested in the infrastructure of Southeastern Indiana to stimulate economic growth in the region. There are currently 184 INDOT projects to upgrade the roads and bridges in the 14-county study area (**Figure 1**) that together account for over $500 million (INDOT, 2017). Upgraded transportation and other infrastructure has positioned the region for growth, and growth is already occurring in the large communities in the region. In smaller communities, however, growth may be stifled by a lack of high quality, resilient water supplies.

Many water utilities in the Southeastern Indiana study area face and successfully overcome challenges to provide reliable and affordable water service to their customers. Some rely on sources of water that are vulnerable to drought or contamination. Others struggle to maintain continuous regulatory compliance due to source water quality. Based on previous surveys, many utilities in the study area and throughout Indiana confront rapidly increasing costs and are concerned over how to make necessary investments and repairs while maintaining affordable rates for their customers (IFA, 2015, 2016).

In the study area, there are utilities with access to adequate groundwater supplies from outwash aquifers along the Ohio River in the south and the East Fork of the White River and tributaries in Johnson, Shelby, Bartholomew and Jackson Counties (**Appendix B**). These utilities have played an important role in supplementing supplies for their neighbors through utility-to-utility wholesale water purchase agreements. While this approach has been successful to date, it is probably inadequate to fully address current and future supply, regulatory, and affordability challenges in Southeastern Indiana. Further, economic development potential may be limited where individual utility systems lack the capacity to guarantee access to abundant water supplies. New regional water infrastructure could supplement existing supplies in this part of the State. A regional system may be an economical way to secure reliable, resilient and affordable water for utilities in the region, while opening the door to market Southeastern Indiana to water-intensive industries.

For decades, the utilities of the region have invested in the development of numerous water supplies and a wealth of infrastructure. They have a long history of successful utility operation and management. It is important that any proposed regional water system take full advantage of the region’s water supply assets and experience, and be designed to supplement, reinforce, or otherwise improve the capabilities of existing utilities. A regional system should take into account the previous investments and existing business and customer relationships of the region’s utilities. It should not represent potential competition for utilities in the region, but rather an attractive wholesale water supply option that utilities may consider in their long-term planning.

The options that were investigated for this study include the following:

1. **Current Approach.** While the current, fragmented approach to water supply planning has been successful to date for many utilities in the region, current and emerging challenges are testing the limits of this approach. Areas of potential economic development that currently lack abundant water supplies are at a disadvantage in competing for water-intensive industries. The current approach is considered, with the assumption that the region's utilities with access to available supplies will continue to provide water to neighboring utilities with needs.

2. **Extended Regional System.** A regional system is considered which would deliver treated water through a pipeline from Charlestown State Park north to Bartholomew County. Water would be provided on a wholesale basis to utilities for delivery to their customers and for resale to other utilities further from the regional pipeline. The supply would be available to supplement or replace existing water supplies as needed by the region's utilities. This option would establish direct or indirect access to the regional water supply for eleven of the fourteen counties in the study area. Johnson and Shelby Counties would continue to rely on their own supplies, and Brown County would continue to rely on supplies from utilities in adjacent counties.

3. **Targeted Regional System.** A more targeted regional system is considered which would deliver treated water through a pipeline from Charlestown State Park north to Scott County. Water would be provided on a wholesale basis to utilities for delivery to their customers and for resale to other utilities further from the regional pipeline. The supply would be available to supplement or replace existing water supplies as needed by the region's utilities. This option would establish direct or indirect access to the regional water supply for eight of the fourteen counties in the study area. Johnson, Shelby, and Bartholomew Counties would continue to rely on their own supplies. Brown, Decatur, and Ripley Counties would rely on their own supplies and those from utilities in adjacent counties.

Options for meeting the region's water supply needs have been evaluated based on multiple criteria, including the following:

1. Response to the region's challenges: source vulnerability, regulatory compliance, and affordability;
2. Support for economic development;
3. Efficient regional use of capital and resources; and
4. Cost to utilities.

Water is critical to the economy of Indiana. Wise management of our water resources will help maintain and strengthen it.

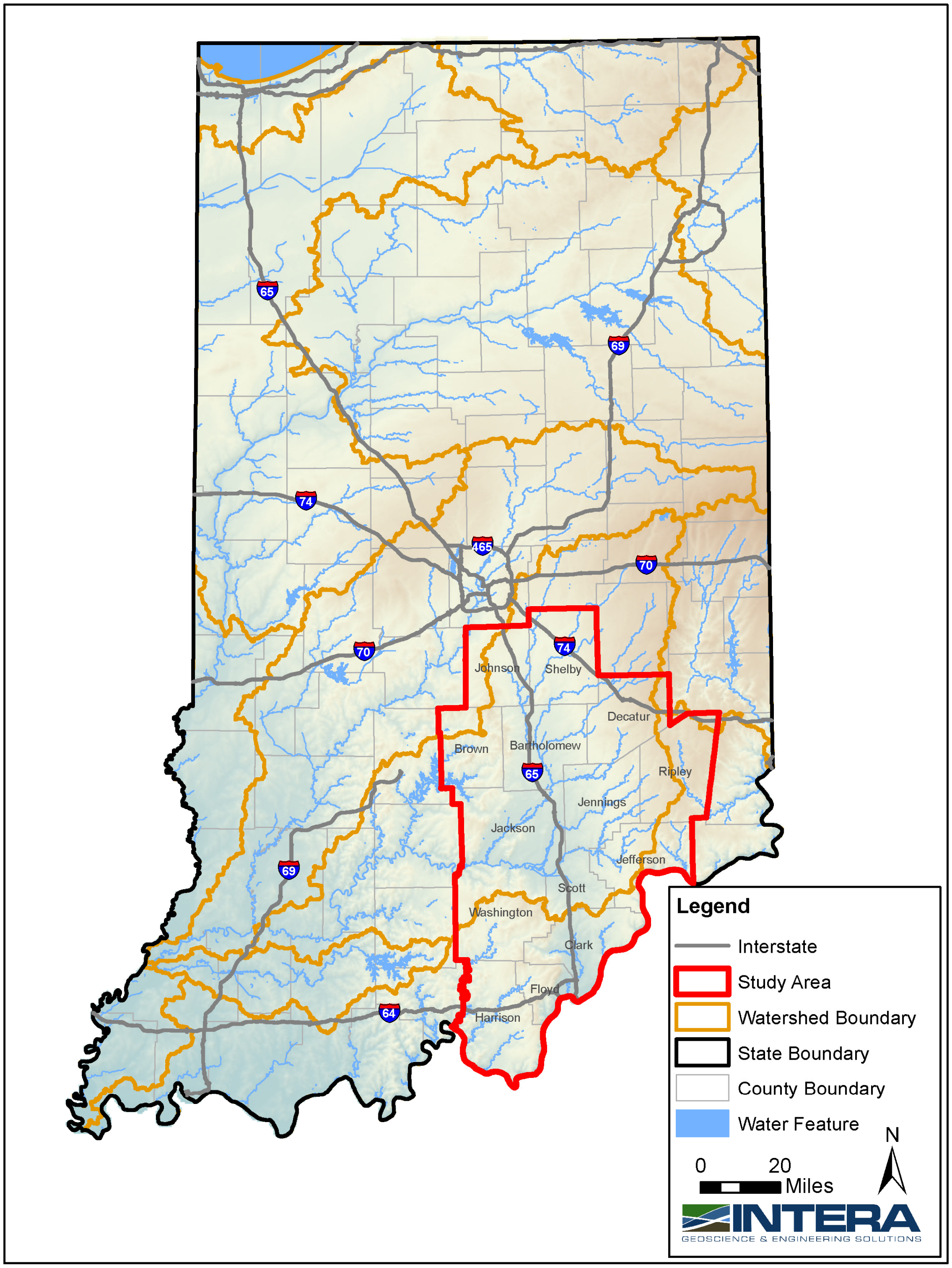

Figure 1. Southeastern Indiana study area and major watersheds.

2.0 SOUTHEASTERN INDIANA'S ECONOMIC GROWTH WILL REQUIRE WATER

Past infrastructure investments in Southeastern Indiana have positioned the region for economic growth. Spending has included bridge and interstate construction and improvements, development and improvement of port facilities, and construction of the River Ridge Commerce Center.

The Indiana Economic Development Corporation (IEDC) identified general characteristics that favor major economic development opportunities. These include:

- Ready access to interstates;
- Ready access to freight rail transport;
- Proximity to gas transmission lines;
- Proximity to electrical transmission lines;
- Proximity to first or second-class cities (population of >35,000); and
- Reliable and affordable water supplies.

As shown in **Figure 2**, the I-65 corridor has most of these features, but lacks abundant and affordable water supply options. Where reliable water supplies are not available, growth in the region may be stifled, despite past investments. Previous investment in regional infrastructure has produced a growing economy in this part of the State. However, communities with smaller systems are unable to attract large water users that are the key to future growth.

Indiana has built an economy that expects water when it needs it. We attract thirsty industries. In fact, a larger fraction of Indiana's economy relies on abundant water supplies than any other state in the nation (Rosaen, 2014). The current focus in the State on manufacturing and the growing medical and pharmaceutical industries has made water resources a critical consideration for business investments. Rosaen (2014) reports that more than 21 percent of Indiana's economy depends on the water that flows over and through the State, representing over 500,000 jobs.

Unlike many areas of the country, Indiana is fortunate to have abundant water resources to meet current demand. Large rivers, productive aquifers, and favorable weather patterns make our State relatively resistant to drought. However, the southern part of the State has less accessible groundwater and the rivers, while larger than in other regions, are further apart.

Developing and maintaining a vibrant economy in Indiana means investing in, and better managing the State's water infrastructure. Southeastern Indiana is a good place to begin because, although it has excellent transportation infrastructure and a growing economic base, water supplies are unevenly distributed. Improving access to water for supply will improve opportunities for growth.

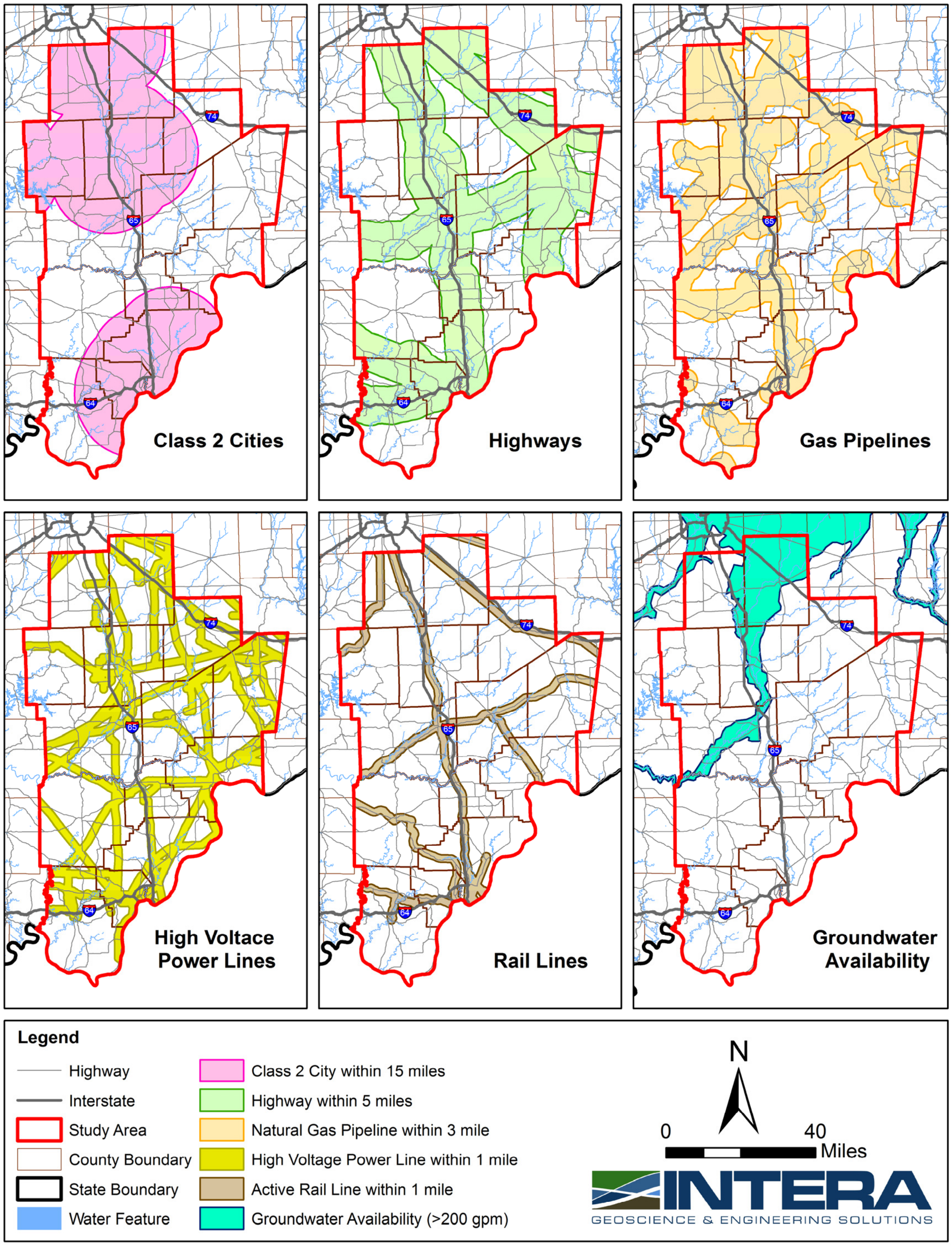

***Figure 2. Areas with infrastructure favoring economic development opportunities*.**

Notes: Class 2 cities are those with populations of 35,000 or more for labor force requirements. Highways and active rail lines are for transportation requirements. High-voltage power and natural gas is for energy requirements. Source: IndianaMap.

3.0 PARTS OF SOUTHEASTERN INDIANA LACK RESILIENT LOCAL WATER SUPPLIES

Reliable access to water is dependent on multiple factors. The most obvious is the availability of plentiful water sources. Also important is well-constructed and maintained infrastructure to ensure that water service is consistently available. As population grows, so does pressure on existing water sources, many of which are vulnerable to contamination or drought. Without contingency plans for alternative supplies, water utilities may lack the resiliency to respond to adverse conditions. Finally, reliable water service can only be provided by utilities that are fiscally sustainable. Rates must fully cover the cost of providing water service, while ensuring that basic water service requirements remain affordable. Southeastern Indiana depends on reliable and affordable water service to support the growth of communities and capture opportunities for further economic development.

Utilities in Indiana face a wide array of challenges. Challenges relevant to Southeastern Indiana include water source vulnerability and availability, regulatory compliance, and future affordability of service. Indiana is generally water-rich, but availability varies geographically. Natural conditions in Southeastern Indiana limit the distribution and accessibility of available groundwater and surface water. Throughout most of Southeastern Indiana, groundwater is unavailable to homes and businesses for self-supply, and as a result, utilities serve rural areas in addition to communities. Compared to the rest of the State, utilities in the region are generally smaller in terms of customers, but cover larger areas and move water over longer distances to their customers. In the parts of Southeastern Indiana where sources are scarce, there are few options to expand supplies or to supplement primary water sources if they are impacted by contamination or drought. Where options exist, they generally require higher rates to support extensive infrastructure improvements.

Additionally, the sources of water used by some utilities in Southeastern Indiana are difficult to manage. Utilities in the region that utilize surface water sources generally experience greater difficulty in maintaining consistent regulatory compliance. Marginal source water quality may require significant upgrades to supply and treatment infrastructure to meet drinking water standards.

Confronting these challenges is costly, and many utilities in Southeastern Indiana lack affordable options to do so. A regional water supply could provide the region’s utilities with a cost-effective option for improving the quality and resiliency of their water supplies, one that is both affordable for their customers and supports future economic development.

4.0 REGIONAL WATER UTILITIES WILL NEED TO ACCOMMODATE GROWTH

To assess the current and future water needs of the region, future utility demand was estimated for each county in Southeastern Indiana through 2060 (**Appendix C**). The foundation for estimating utility demand is based on analysis of 2015 per capita water use using Significant Water Withdrawal Facility (SWWF) data, population, and other utility data provided for previous studies. 2015 per capita water use was normalized for local weather conditions with normal summer precipitation and maximum temperature data. Projections of utility demand are based on projections of population growth from the Indiana Business Research Center (IBRC, 2016) and do not include speculative assumptions of future economic development.

Utility Demand

Utility Demand is the total demand for public water supply (PWS) utilities. Utility demand includes all water supplied to the utility's residential, commercial, industrial, and institutional customers.

A summary of current and projected population and water utility demand, by county, is shown in **Table 1** and **Figure 3.** Population of the region is projected to grow 17% from 733,152 in 2015 to 859,925 in 2060. In 2015, average daily PWS demand in the fourteen-county study area totaled 80.2 MGD. The projected 2060 average daily demand for the region is 96.5 MGD, an increase of 16.3 MGD. Peak Day, or Maximum Day, demand is a critical parameter for determining the design capacity of utility infrastructure. The total projected Maximum Day Demand for the region is 145.7 MGD in 2060.

Table 1. County population and water demand

County	Population		Percent Population Growth from 2015 to 2060 (%)		Average Day Utility Demand (MGD)		Maximum Day Utility Demand (MGD)	
	2015	2060 Projected	Average Annual	Total	2015	2060 Projected	2015	2060 Projected
Bartholomew	81,162	92,054	0.30%	13.4%	9.4	11.2	15.9	18.5
Brown	14,977	11,462	-0.52%	-23.5%	1.8	1.4	3.3	2.4
Clark	115,371	154,688	0.76%	34.1%	22.0	29.9	31.4	41.5
Decatur	26,521	26,975	0.04%	1.7%	2.6	2.7	3.4	3.5
Floyd	76,778	80,515	0.11%	4.9%	2.0	2.1	3.2	3.3
Harrison	39,578	45,446	0.33%	14.8%	4.1	4.6	6.6	7.3
Jackson	44,069	43,507	-0.03%	-1.3%	4.6	4.7	11.1	6.4
Jefferson	32,416	31,319	-0.08%	-3.4%	3.6	3.5	2.43	6.9
Jennings	27,897	29,501	0.13%	5.7%	2.6	2.7	4.3	4.4
Johnson	149,633	216,106	0.99%	44.4%	12.9	19.1	21.0	30.1
Ripley	28,701	32,998	0.33%	15.0%	2.5	2.8	4.0	4.5
Scott	23,744	24,865	0.10%	4.7%	4.8	4.9	7.7	7.7
Shelby	44,478	41,814	-0.13%	-6.0%	3.6	3.4	4.4	4.1
Washington	27,827	28,675	0.07%	3.0%	3.64	3.7	3.4	5.1
TOTAL	**733,152**	**859,925**	**0.38%**	**17.3%**	**80.2**	**96.5**	**122.1**	**145.7**

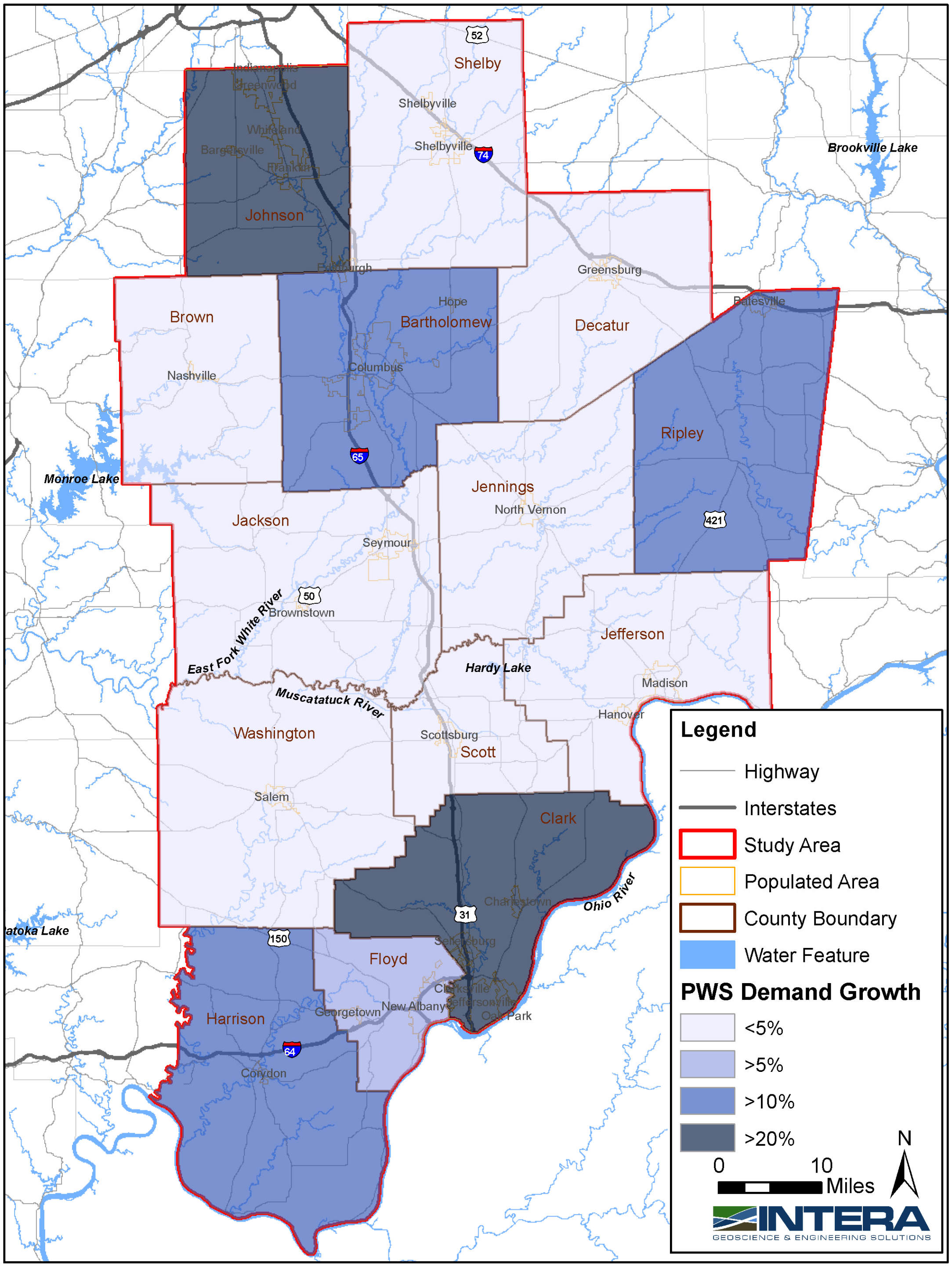

Figure 3. Projected growth in public water supply water demand from 2015 to 2060.

Notes: PWS = Public Water Supply.

5.0 NEW REGIONAL WATER SUPPLY WOULD ADDRESS UTILITY CHALLENGES

Estimating the *potential demand* for a regional water supply must be approached differently than demand forecasting for an individual utility. For this analysis, utility demand forecasts are used in conjunction with an evaluation of utility challenges to estimate the scale and location of future supply needs with respect to existing available resources and a potential regional supply.

Potential Demand for a Regional Water Supply

The potential demand for a regional water supply is the portion of utility demand that utilities elect to shift from local supplies to the regional supply as a preferable option for responding to challenges of water source vulnerability, regulatory compliance, or affordability.

Demand for the regional system will not result from simple deficits in supply, it will result as utilities select the regional supply as a favorable alternative to existing options. Utilities in Southeastern Indiana would not be obligated to connect and purchase water from the regional supply; as a result, demand can't be directly forecast based on the needs of specific utilities. Once available, utilities in the region would consider the regional supply alongside other options. If the regional supply represents the best overall solution in terms of quality, reliability, cost and support for economic development, it is assumed that the utility will choose it.

Because the demand for a regional water supply would ultimately depend on future, independent water supply decisions of individual utilities, estimated demands are *potential demands*. The estimated potential demand for a regional water supply is based on the projected demand of those utilities facing significant current or future challenges. It is assumed that, over time, challenged utilities in the region would elect to supplement or replace their current supplies with the regional supply as their best long-term option for addressing source vulnerability, regulatory compliance, and affordability. Reasonable estimates of the degree and timing of these shifts are used to estimate the growth in potential demand for the regional supply. Actual demand may be greater or smaller and the timing of growth in demand may be more or less rapid than estimated. The potential demand is used to evaluate the costs and benefits of a regional supply.

As previously noted, many utilities in Southeastern Indiana face challenges related to water source vulnerability, regulatory compliance, and future affordability of service. These challenges may overlap, for example necessary upgrades to supply and treatment facilities may create affordability challenges, or source vulnerability may create regulatory compliance challenges. Robust and resilient utilities are better positioned to support growth of communities and pursuit of water-intensive economic development opportunities.

5.1 Source Vulnerability

Source vulnerability is one of the challenges facing utilities in Southeastern Indiana that would drive demand for a reliable and cost-effective regional supply alternative. It is predicted that as utilities confront source vulnerability, some will elect to shift demand from local supplies to the regional supply. It is estimated that by 2040 and 2060, 15% and 30% respectively of the demand of utilities with source vulnerability would shift from existing sources to the regional supply.

Source Vulnerability

Potential contamination and drought challenges exist for 27% of the region's utilities, many without alternative supplies. Additional options are needed to improve the resiliency of utility service.

Both surface water and groundwater sources may be vulnerable to contamination or drought, resulting in restricted availability or higher costs. Twenty-eight percent (28%) of the utilities in Southeastern Indiana rely primarily on surface water supplies. These utilities are generally more susceptible to drought or contamination resulting from spills. The US Army Corps of Engineers (USACE) recently completed a first-of-its-kind study of the Ohio River Basin, which encompasses the study area, concluding that in the coming decades more frequent and heavy drought will put drinking water supplies in jeopardy (USACE, 2017).

Groundwater supplies are also vulnerable to contamination, which may dramatically increase treatment costs. IDEM's Source Water Assessment Program (SWAP) evaluated the susceptibility to contamination of the groundwater sources of 24 utilities in the study area. The susceptibility to contamination of these groundwater sources was classified as high or moderately high for 25% of the utilities, moderate for 50%, and moderately low for 25% (IDEM, 2017). Newly regulated and emerging contaminants, such as per- and polyfluoroalkyl substances (PFAS), 1,4-Dioxane, and pharmaceuticals and personal care products (PPCP's) may require major investments in treatment facility upgrades, significantly increasing costs of existing resources.

Figure 4 identifies which utilities in the region rely on surface and groundwater sources of supply, and shows the location of major surface water sources and outwash aquifers in and around the region. **Figure 4** and **Table 2** show the counties where one or more utilities have been identified to have source vulnerability challenges. Considering both water producers and their dependent wholesale customers, 27% of the region's utilities have some form of water source vulnerability, representing 17% of the region's PWS demand in 2015.

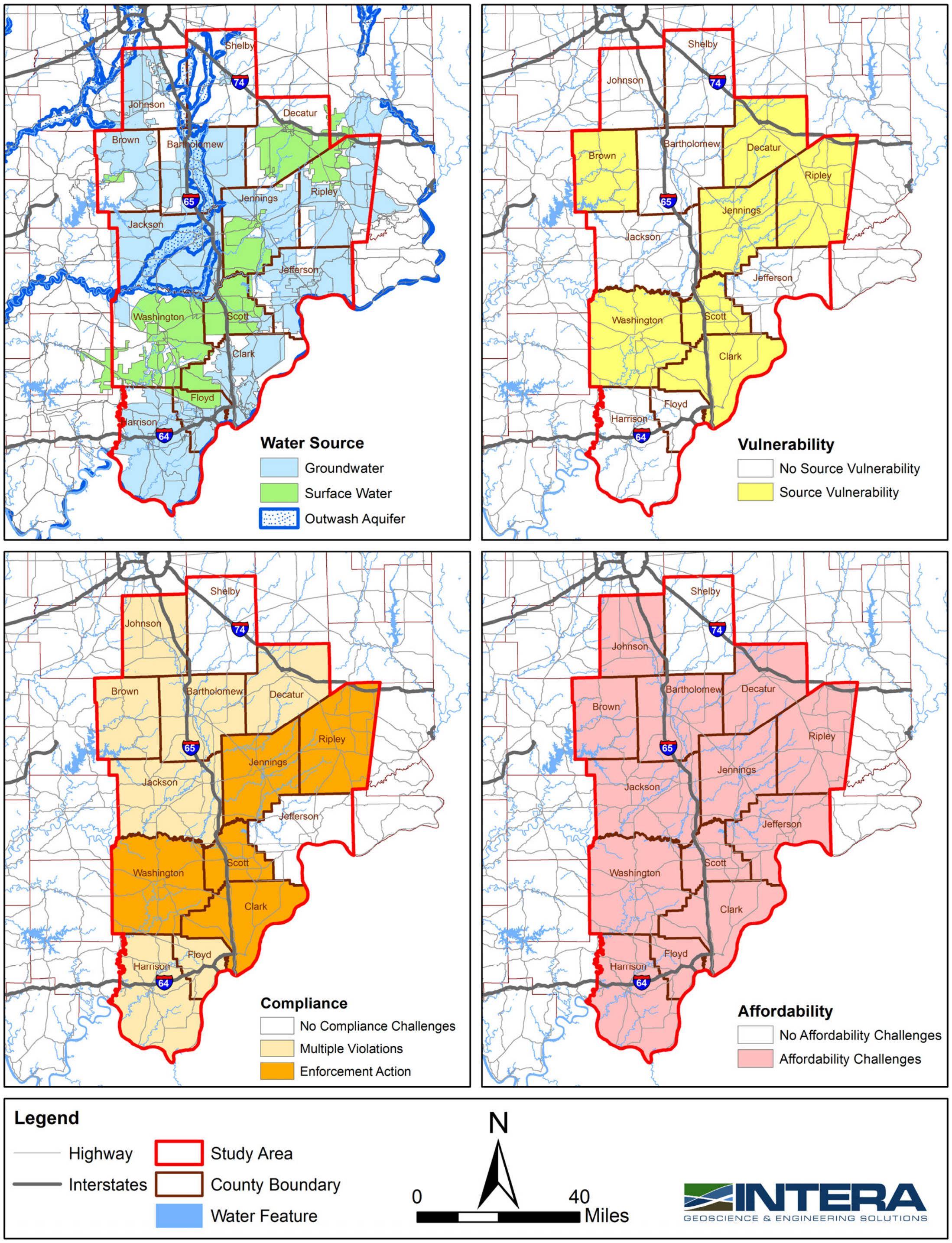

Figure 4. Utility source-water type and counties with one or more utilities with source vulnerability, regulatory compliance, and affordability challenges.

Table 2. Summary of utility challenges by county.

County	Source Vulnerability Challenges	Regulatory Compliance Challenges	Affordability Challenges
Bartholomew	N	Y	Y
Brown	Y	Y	Y
Clark	Y	Y	Y
Decatur	Y	Y	Y
Floyd	N	Y	Y
Harrison	N	Y	Y
Jackson	N	Y	Y
Jefferson	N	N	Y
Jennings	Y	Y	Y
Johnson	N	Y	Y
Ripley	Y	Y	Y
Scott	Y	Y	Y
Shelby	N	N	N
Washington	Y	Y	Y

Notes on data sources

Figure 4 and Table 2 were developed using a variety of data sources from various agencies. IndianaMap, Indiana Utility Regulatory Commission, USEPA/IDEM Safe Drinking Water Information System (SDWIS), IDEM, IFA.

Source Water Vulnerability: Identification of a county indicates that one or more, not all, utilities in that county have been identified as having potential vulnerabilities. Determination of vulnerability was based on the identification of producer or purchaser utilities relying on surface water supplies vulnerable to drought and surface water contamination from spills, or utilizing groundwater supplies in aquifers of limited extent.

Compliance: Identification of a county indicates that one or more, not all, utilities in that county have been identified as having regulatory compliance challenges indicated by having received multiple notifications of regulatory violations or having been subject to enforcement action since 9/1/2014.

Affordability: Identification of a county indicates that one or more, not all, utilities in that county have been identified as having affordability challenges. Indicators of potential affordability challenges include rates greater than $50 for 5000 gallons/month (>150% of state average), high rates of non-revenue water (20%), and/or active CSO's indicating potential for major future investments in sewer infrastructure resulting in increase in combined water/sewer bill.

5.2 Regulatory Compliance

Regulatory Compliance

In the region, 44% of all utilities and 76% of those utilizing surface water supplies experience challenges maintaining consistent regulatory compliance. A reliable, high-quality source water alternative would address some of these challenges.

The challenge of regulatory compliance would drive demand for a reliable and cost effective regional supply alternative in Southeastern Indiana. IDEM's Drinking Water Branch diligently monitors and enforces public water supply compliance with state and federal drinking water regulations. There are numerous factors that can make maintaining consistent regulatory compliance difficult for some utilities, including poor source water quality, insufficient revenue for operations and necessary maintenance, and other factors. **Figure 4** and **Table 2** show the counties where one or more utilities have been cited for multiple regulatory violations or have been subjected to enforcement action since September 2014. Forty-four percent (44%) of the region's utilities representing 24% of the region's demand in 2015 have received multiple regulatory violations or been subject to enforcement actions. The most common violation is for inadequate control of disinfection byproducts (DBP's), a challenge that predominantly, but not exclusively, affects utilities relying on surface water supplies. Seventy-six percent (76%) of the utilities that rely on surface water supplies have received multiple regulatory violations or enforcement actions. Many known and emerging contaminants, such as PPCPs, PFAS, 1,4-Dioxane and others may significantly increase the cost to maintain regulatory compliance with existing sources, surface water and groundwater alike. It is predicted that as utilities address regulatory compliance challenges, some will elect to shift demand from local supplies to the regional supply. It is assumed that by 2040 and 2060, 25% and 50% respectively of the demand of utilities with current regulatory challenges would shift from existing sources to the regional supply.

5.3 Affordability

To be fiscally sustainable, utility water rates must generate sufficient revenue to cover the full cost of operating and reinvesting in utility infrastructure. Because water is critical to public health and safety, basic service must remain affordable. The trend of greater-than-inflation increases in the cost of water service is expected to continue, driven by necessary reinvestment in aging infrastructure and upgrades to comply with drinking water regulations. Recent studies (Mack, 2017) have concluded that the affordability of water service will become a serious issue in the future for utilities and their customers. Signs of future utility financial pressure and potential difficulty preserving affordability of water service include failing infrastructure, high current rates, and competing infrastructure demands for limited capital.

Utilities throughout Indiana and the rest of the country are experiencing increasing needs to replace aging distribution infrastructure (IFA, 2015 and AWWA, 2012). Distribution infrastructure deteriorates with age, commonly accompanied by an increase in water losses and frequency of water service interruptions. Southeastern Indiana is no exception. According to data reported to IFA in 2016, 44% of the utilities in the region reported non-revenue water (NRW) of over 20% in 2015. For 19% of the utilities, NRW exceeded 30%. Non-revenue water is the percentage of produced water that is unbilled or lost to leakage. While NRW is influenced by many factors unique to each utility, in general, higher rates of NRW are a reasonable indicator of deteriorating infrastructure.

High levels of reinvestment will be necessary for Midwestern water utilities over the next few decades. For the 40-year period from 2010 to 2050, the total estimated cost for replacement of aging water mains is approximately $17,400 per customer for those served by EPA classified small utilities, nearly five times as much per customer than those served by large utilities (IFA, 2015 and AWWA, 2012). For most utilities, distribution infrastructure accounts for the majority of capital investment. Utilities with failing infrastructure will face significant future cost increases to "catch-up" to preserve system integrity and protect public health and safety.

Affordability

The cost of providing utility service is rapidly increasing. In the region, 47% of the utilities have potential affordability challenges. Utilities need a cost-effective supply option to maintain affordability for their customers.

While the Consumer Price Index (CPI) increased by 5.3% between 2011 and 2015 (Bureau of Labor Statistics, 2017), water rates in Indiana increased an average of 18.4% (Umbaugh, 2016). Of those utilities in the study area for which rate information was available, 57% have rates higher than the state average of $31.76 for 5,000 gallons per month. Additionally, rates for smaller utilities are generally higher than those for large utilities and the percentage of the population served by EPA classified medium and smaller utilities is much greater in the south (41.6%) than in the north (16.0%) and central (17.5%) parts of the State (IFA, 2016).

Even though rates in Southeastern Indiana are generally higher, many utilities do not adjust rates frequently enough to keep pace with rapidly increasing costs. Many utilities delay rate adjustments and defer needed infrastructure replacement and upgrades. As of December 2015, approximately 50% of the utilities in the study area had not adjusted rates for five years or more, and half of those had not adjusted rates for ten years or more (Umbaugh, 2016). When inadequate revenue prevents necessary maintenance, infrastructure fails, with long-term costs that far exceed short-term savings.

Some communities in Southeastern Indiana have made substantial investments in their sewer systems to eliminate Combined Sewer Overflows (CSOs). Communities with active CSOs are likely to make future investments in their sewer infrastructure with corresponding increases to rates. However, many of these communities have deferred necessary water rate increases due to concerns over the affordability of combined water and sewer service. There are seven communities in the study area with active CSOs.

To evaluate potential affordability challenges among Southeastern Indiana utilities, available data was analyzed to identify utilities likely to face future financial pressure. Selected indicators include current monthly water rates of

$50 or more for 5,000 gallons (>150% of the state average), NRW exceeding 20%, or the existence of active CSOs. Forty-seven percent (47%) of the study area utilities were identified with some form of affordability challenge, representing 45% of the region's PWS demand in 2015. **Figure 4** and **Table 2** show the counties with utilities identified to have potential affordability challenges. All counties in the study area except Shelby Counties have one or more utilities with potential affordability challenges.

Affordability is a challenge facing many utilities throughout Indiana, and in Southeastern Indiana it would drive demand for a reliable and cost effective regional supply alternative. It is predicted that as utilities address affordability challenges, some will elect to shift demand from local supplies to the regional supply. It is estimated that by 2040 and 2060, 10% and 20% respectively of the demand of utilities with potential affordability challenges would shift from existing sources to the regional supply.

5.4 Interconnected Utilities

As previously discussed, natural conditions in Southeastern Indiana limit the availability of surface water and groundwater. The useable groundwater supply is limited and only available in parts of the region. The region includes large rivers, but because they are far apart, available surface water supplies are also poorly distributed.

The combination of large, rural service territories and poorly distributed water sources requires distribution of water supplies over long distances. Increasing the capacity or resiliency of water utility supplies in Southeastern Indiana generally requires greater investment to deliver water from distant sources. As a result, necessary investments to water supply infrastructure may be cost prohibitive for utilities acting alone.

Many of the water utilities in the southeastern part of the State are interconnected to each other through wholesale water purchase agreements and emergency connections. Forty percent (40%) of the utilities in the study area purchase all the treated water they supply to their customers from one or more other utilities. These purchased-water utilities provide distribution services for their customers, but do not operate their own production and treatment facilities. They must coordinate with their wholesale supplier utilities to ensure adequate capacity for their customers' current and future needs.

Though the existing capacity of interconnections may be limited, they create an opportunity to leverage existing infrastructure to improve distribution and resilience of water supplies throughout the region.

5.5 Estimating Demand to Address Regional Challenges

As described in Section 5.0, it is anticipated that in response to source water vulnerability, regulatory compliance, and affordability challenges, utilities will, over time, opt to supplement or replace current supplies with the regional supply. The potential demand for a regional system is estimated at the county level, and is calculated based on reasonable assumptions of the degree and timing of these shifts in demand by “challenged” utilities. The respective shifts in demand presented in Section 5.0 are summarized in **Table 3**.

Based on these anticipated shifts, the total potential average day demand in the study area for a regional water supply system is estimated to be 8.6 MGD in 2040 and 17.9 MGD in 2060. Corresponding maximum day demands are 13.3 MGD and 27.6 MGD in 2040 and 2060, respectively. The estimate of potential demand for the regional supply based on projected utility demand (as described in Section 4.0) and the percentages of the demand of challenged utilities that are assumed would be shifted from existing supplies to the regional supply over time (see Table 3). The projected growth over time of potential average day demand is shown in **Figure 5**.

Table 3. Assumed percentage of utility demand of challenged utilities shifted to the regional supply from 2020 to 2060.

Challenge	2020	2040	2060
Source Vulnerability	0%	15%	30%
Regulatory Compliance	0%	25%	50%
Affordability	0%	10%	20%

Note: Percentages are the assumed reasonable portions of utility demand of those utilities identified with source vulnerability, regulatory compliance, or affordability challenges that challenged utilities would over time opt to shift from existing supplies to the regional supply. For utilities affected by more than one challenge, the shift in demand is estimated as the maximum of all challenges affecting that utility, not their sum.

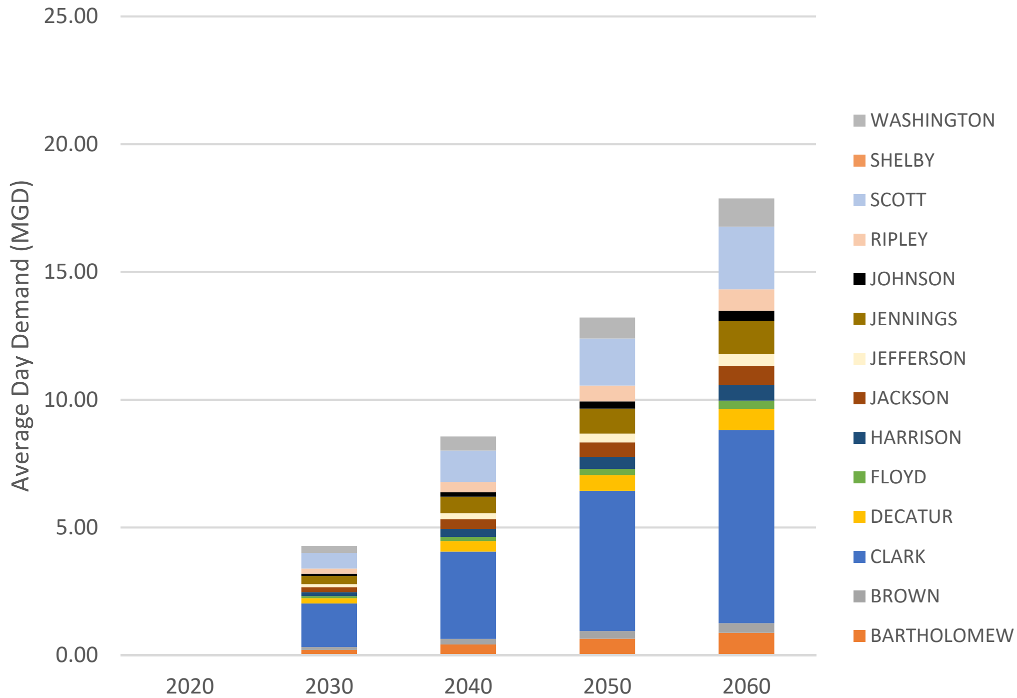

Figure 5. Potential demand for regional water supply, 2020-2060.

Note: The estimate of potential demand for the regional supply is based on projected utility demand and the percentages of the demand of challenged utilities that are assumed would be shifted from existing supplies to the regional supply over time (see Table 3). Shelby County does not have any utilities identified as having source vulnerability, regulatory compliance, or affordability challenges; as a result, the potential demand from Shelby County for the regional supply is estimated to be 0 MGD.

6.0 SOUTHEASTERN INDIANA HAS REGIONAL WATER SUPPLY OPTIONS

Options for meeting the region's water supply needs were evaluated based on multiple criteria, including effectiveness in addressing the region's water supply challenges (source vulnerability, regulatory compliance, and affordability); support for economic development; efficient regional use of capital and resources; and cost to utilities.

6.1 Existing Supplies Are Adequate for Parts of the Region

There are utilities in Southeastern Indiana with access to groundwater supplies from productive outwash aquifers in the south along the Ohio River and in the northern part of the region along the East Fork of the White River and tributaries in Johnson, Shelby, Bartholomew and Jackson Counties. These utilities have played an important role in meeting the water supply needs of their neighbors through utility to utility wholesale water purchase agreements. Further from these areas, water resources suitable for public water supply are more distant from the communities that need them. As a result, the costs for utilities to independently develop water supplies are higher than in other parts of the State. While existing supplies have sufficed to date, it is unlikely that they can address future supply, regulatory, and affordability challenges for the entire southeastern Indiana region. Further, economic development potential is hampered where individual utility systems lack the capacity to guarantee ready access to abundant water supplies for prospective industries.

6.2 Charlestown State Park has Regional Supply Capacity

Charlestown State Park overlies a prolific outwash aquifer along the Ohio River with the capacity to sustain high rates of water production. The water supply was originally developed with the construction of seven Ranney (horizontal collector) wells for the Indiana Army Ammunition Plant (INAAP) built during the Second World War. While the original water supply infrastructure is in poor condition, redevelopment of the well field would enable production of 75 MGD or more of drought-proof, high-quality water supplies to communities and industries in Southeastern Indiana (Layne, 2011).

Small well fields currently produce less than 1 MGD from the aquifer to supply the City of Charlestown, Charlestown State Park, and the River Ridge Commerce Center, located on the site of the former INAAP (IDNR, 2017).

A regional water system supplied from the Charlestown State Park aquifer could address many of the current and future challenges facing water utilities in Southeastern Indiana. A regional system could bridge the water-scarce area between the aquifers in the north along the East Fork of the White River and in the south along the Ohio River. This would secure reliable access to water into the next century and enable the region to pursue water-intensive economic development opportunities along the I-65 corridor.

Figure 6 illustrates the concept for addressing regional water supply needs. It includes a redeveloped high-capacity well field and new treatment facility utilizing groundwater from the Charlestown aquifer, and a pipeline to deliver water north through an area generally centered on the I-65 corridor. The regional supply would supplement existing surface water and groundwater supplies in the region. Locally, some portions of the region are adequately served by existing water utilities, and do not require supplemental regional supplies. The regional utility would own and operate the wells, treatment plant and trunk pipeline. The water from the regional supply would be available for existing or new utilities to purchase for delivery to their customers, and for resale to other utilities, further from the trunk main (**Figure 6**).

6.3 Other Potential Regional Water Sources

There are other water sources near the region that currently operate as regional water supplies or have that potential, including Monroe Lake, Patoka Lake, Brookville Lake, and the outwash aquifers of the West Fork of the White River, Whitewater River, and Ohio River. Utilities outside of the region that use these sources currently provide wholesale water to some utilities at the periphery of the region. In general, these utilities are more efficiently served through existing interconnections to these sources. As a solution for the entire region, the location of the existing sources is not ideal. They are all relatively distant from the I-65 economic development corridor and, as a result, pipelines constructed for distribution of regional supplies will not offer the added benefit of supporting the economic development potential of the region. The benefits of enhancing the regional utilization of these sources would be best evaluated in conjunction with future studies of the regions in which these sources are located.

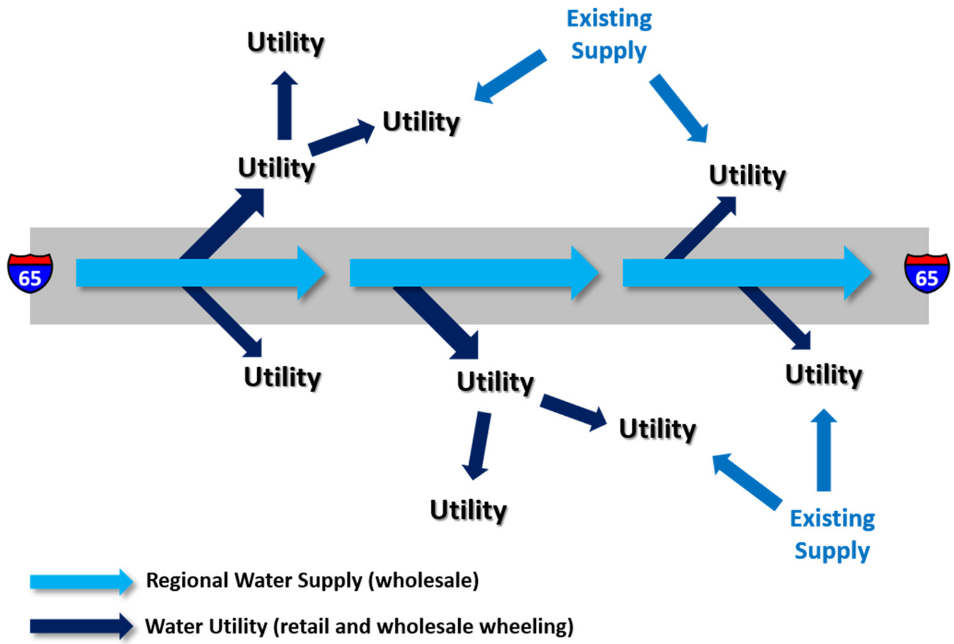

Figure 6. Conceptual schematic of a regional water supply to supplement existing utility supplies.

Notes: The regional water supply is delivered along the I-65 corridor directly to existing utilities and indirectly via wheeling by existing utilities to utilities in the region that are located farther from the I-65 corridor. Existing supplies include surface water and groundwater sources currently utilized by the region's utilities, and wholesale supplies originating from Monroe Lake, Patoka Lake, and outwash aquifers of the White, Whitewater, and Ohio Rivers.

7.0 FRAMEWORK FOR ANALYSIS OF OPTIONS

Three options were developed for evaluation, including continuation of the current independent approach to utility planning and two regional system options. All options seek to capitalize on existing utility water supplies and interconnections between utilities to extend the reach of existing and proposed supplies without constructing redundant infrastructure. Options are described in this section and compared in Section 8.0.

Option 1: Current Approach

While the current independent approach to water supply planning has been successful to date for many utilities in the region, current and emerging challenges are testing the limits of this approach. Areas of potential economic development that currently lack abundant water supplies are at a disadvantage when competing for water-intensive industries. The current approach is evaluated, which assumes that the region's utilities with access to available supplies will continue to provide water for their own customers and to neighboring utilities with water supply needs. This includes supplies originating from Monroe Lake, Patoka Lake, and the outwash aquifers of the large rivers.

Option 2: Extended Regional System

A regional system is considered, which would deliver treated water through a pipeline from Charlestown State Park north to Bartholomew County. Water would be provided on a wholesale basis to utilities for delivery to their customers and for resale to other utilities further from the regional pipeline. The supply would be available to supplement or replace existing water supplies as needed by the region's utilities. This option would establish direct or indirect access to the regional water supply for eleven of the fourteen counties in the study area, including more than 65 utilities. Johnson and Shelby Counties would continue to rely on their own groundwater supplies, and Brown County would continue to rely on wholesale supplies from adjacent counties originating from Monroe Lake and the outwash aquifer of the White River.

Option 3: Targeted Regional System

A more targeted regional system is considered, which would deliver treated water through a pipeline from Charlestown State Park north to Scott County. Water would be provided on a wholesale basis to utilities for delivery to their customers and for resale to other utilities further from the regional pipeline. The supply would be available to supplement or replace existing water supplies as needed by the region's utilities. This option would establish direct or indirect access to the regional water supply for eight of the fourteen counties in the study area, including more than 48 utilities. Johnson, Shelby, and Bartholomew Counties would continue to rely on their own groundwater supplies. Brown, Decatur, and Ripley Counties would continue to rely on their own supplies and wholesale supplies from adjacent counties originating from Monroe Lake, and the outwash aquifers of the White, Whitewater, and Ohio Rivers.

Development of Options

The conceptual designs developed for the regional system options include supply and conveyance infrastructure. Supply infrastructure includes wells, raw water mains, and treatment facilities. Conveyance infrastructure includes finished water mains, ground storage tanks and pump stations, with supplemental facilities to allow for treatment and circulation to manage water quality in the transmission main. Further detailed engineering study and design will be required to plan and implement each phase of the project.

Costs to rehabilitate or construct new collector wells, a water treatment plant, pump stations, storage tanks and water mains were estimated using parametric methods. A contingency of 25% of construction costs was included, and it was assumed that engineering, legal, land acquisition, and other non-construction costs would total approximately 20% for supply and 30% for conveyance infrastructure. The cost estimates are generally classified as AACE Class 5 estimates with an expected accuracy of -20% to +40% (AACE, 2016). Operating costs include labor, power, chemicals, residuals disposal, maintenance, transportation, insurance, and other costs.

Interconnections between utilities provide the ability to “wheel” water from one system to the next, thereby extending the reach of the regional supply without constructing redundant infrastructure. It is assumed that, for an appropriate fee, utilities would be willing to wheel water through their distribution system for sale to a subsequent utility. Wheeling fees are typically based on reasonable recovery of a portion of the capital invested in utilized infrastructure, plus operating costs (AWWA, 2017). For this study, wheeling fees are estimated to be $0.50 to $1.00 per thousand gallons for each utility that wheels water. Utilities located far from the trunk main may directly and indirectly incur wheeling fees from more than one utility.

There are technical, regulatory, and operational issues that must be addressed for wheeling, including different source water and resulting regulatory requirements, differences in disinfectants used in distribution systems, and water quality differences, access and pricing. Enhancing interconnection is feasible, but requires evaluation and planning.

7.1 Option 1 – Current Approach

With the current approach, utilities respond to growth and water supply challenges with independent investments. Some communities are located close to rivers or productive aquifers and have enough water to satisfy current needs and growth. Others are already trying to make their small systems do more than they should. In the parts of the region where there are available supplies, some utilities have the capability to continue to develop and offer water supply to neighboring utilities. However, in areas of Southeastern Indiana with greater scarcity there are challenges. Utilities with source water quality or regulatory compliance challenges that do not have local supply alternatives face high costs to independently upgrade their systems and sustain adequate service. The lack of easy access to reliable and abundant water supplies impedes efforts to confidently invite water-intensive economic development opportunities.

Water supply infrastructure required for the current approach may include:

- Water mains to establish new interconnections and reinforce existing connections to facilitate utility to utility water sales. The costs of interconnection are recovered through negotiated water purchase agreements. Of the region's utilities, 40% purchase all their water supply and do not have their own production capabilities; and
- New independent or shared investments in water supply and treatment infrastructure to address future supply deficits, vulnerability of water sources to drought, contamination, or increased competition, and regulatory compliance challenges. Of the region's utilities, 27% have vulnerable sources and 44% experience some challenges in maintaining regulatory compliance.

The construction cost for the current approach is unknown and not estimated. Facilities constructed for independent utilities will generally be smaller and lack economies of scale.

Among study area utilities for which rate information was available the average and minimum rates in 2015 were $7.31 and $2.29 per 1,000 gallons, respectively (Umbaugh, 2016). From 2011 to 2015, Indiana water utility rates increased at an average annual rate of 4.3%, more than three times the 1.3% average annual rate of inflation over the same time period. It is very likely that many utilities will continue to experience rapidly increasing costs to address aging infrastructure and more stringent regulations. Due to competing capital needs and concerns over affordability, future investments in supply and treatment infrastructure will be more difficult.

The Current Approach (Option 1) would provide the following results:

Reliability – utilities in counties near abundant supplies will benefit from future supply reliability, while those in areas of limited surface water and groundwater supplies will not.

Source Vulnerability – there are 20 utilities in the region with potential source vulnerabilities. Under the current approach, many may continue to be vulnerable, or incur high costs to address these vulnerabilities.

Regulatory Compliance – there are 33 utilities in the region with regulatory compliance challenges. Under the current approach, many may continue to experience these challenges, or incur high costs to upgrade sources and treatment.

Affordability – there are 33 utilities in the region with potential affordability challenges. Under the current approach, many may experience more severe challenges.

Economic Development – under the current approach, the availability of abundant, reliable, and affordable water supplies for water-intensive economic development opportunities along the I-65 and US-31 corridor will be limited in capacity and proximity to independent utilities' supplies.

Water supply investments which continue to promote incremental improvements to the patchwork of existing systems in Southeastern Indiana will produce, at best, temporary benefits that fail to fully address current challenges, future needs, and the opportunity for economic growth. With the current approach, the vulnerability of water supplies in the region will likely persist or worsen.

7.2 Option 2 – Extended Regional System

An Extended Regional System would extend north from the Ohio River along the I-65 corridor to Bartholomew County. The regional water supply would be made available directly and indirectly (via wheeling by existing utilities) to supplement the supplies of more than 65 utilities in Bartholomew, Clark, Decatur, Floyd, Harrison, Jackson, Jefferson, Jennings, Ripley, Scott, and Washington Counties (**Figure 7**).

Johnson and Shelby Counties would continue to be supplied from their existing groundwater supplies. Brown County would continue to be supplied by wholesale providers adjacent to the study area utilizing sources originating from Monroe Lake and the outwash aquifers of the White River.

The Maximum Day Demands met by the Extended Regional System are projected to be 12.6 MGD and 26.3 MGD in 2040 and 2060, respectively.

When completed, the system would include the following infrastructure:

- Collector well field, with 5 collector wells, 41.2 MGD (26.2 MGD firm) pumping capacity;
- Raw water transmission mains, including 3.9 miles of 42-inch, 0.3 miles of 36-inch, 0.4 miles of 30-inch, and 0.2 miles of 24-inch pipe;
- Treatment plant with 30 MGD (22.5 MGD firm) treatment capacity, 10 MG treated water storage, and 30 MGD pumping capacity;
- Water transmission mains, 8.7 miles of 42-inch pipe, 14.5 miles of 30-inch pipe, 17.7 miles of 16-inch pipe, and 14.5 miles of 12-inch pipe to Bartholomew County;
- Distribution facilities, including 15 MG storage, 10 to 30 MGD pumping capacity, supplementary chemical feed, and equipment for monitoring and management of water quality; and
- Telemetry and other systems.

The total construction cost for the Extended Regional System is estimated to be $276.9 million, including $139.1 million and $137.8 million, respectively, for supply and conveyance infrastructure. Construction may be phased to develop capacity as needed. Details of estimated construction costs are provided in **Appendix D**.

For the Extended Regional System, operating costs per 1000 gallons are estimated to be $1.84 per 1,000 gallons in 2040 and $1.34 per 1,000 gallons in 2060. For utilities that are served via wheeling by one or more existing utilities, additional wheeling charges will apply. Wheeling charges are estimated to be $0.50 to $1.00 per 1,000 gallons per utility. For comparison, the state average equivalent rate is $6.35 per 1,000 gallons based on monthly use of 5,000 gallons (Umbaugh, 2016). Among study area utilities for which rate information was available the average and minimum rates are $7.31 and $2.29 per 1,000 gallons, respectively. Estimates of operating costs per 1000 gallons are highly dependent on water sales. Details of operating costs are presented in **Appendix D**.

An Extended Regional System would make a regional water supply option available to more than 65 utilities in 11 counties in Southeastern Indiana, providing the following results:

Reliability – a reliable, drought proof alternative supply will be available to address future supply shortages or increased competition for limited resources.

Source Vulnerability – an alternative supply will be available to utilities with potential source vulnerabilities. Seventeen utilities in the 11 counties have been identified as having potentially vulnerable sources.

Regulatory Compliance – an alternative supply will be available to utilities with current compliance challenges. Twenty-seven utilities in the 11 counties have been identified as having regulatory compliance challenges.

Affordability – an affordable, alternative supply will be available to utilities with potential affordability challenges. Twenty-eight utilities in the 11 counties have been identified as having potential affordability challenges.

Economic Development – abundant, reliable, and affordable water supplies will be readily available for water-intensive economic development opportunities along 68 miles of the I-65 and US-31 corridor from the Ohio River to Bartholomew County.

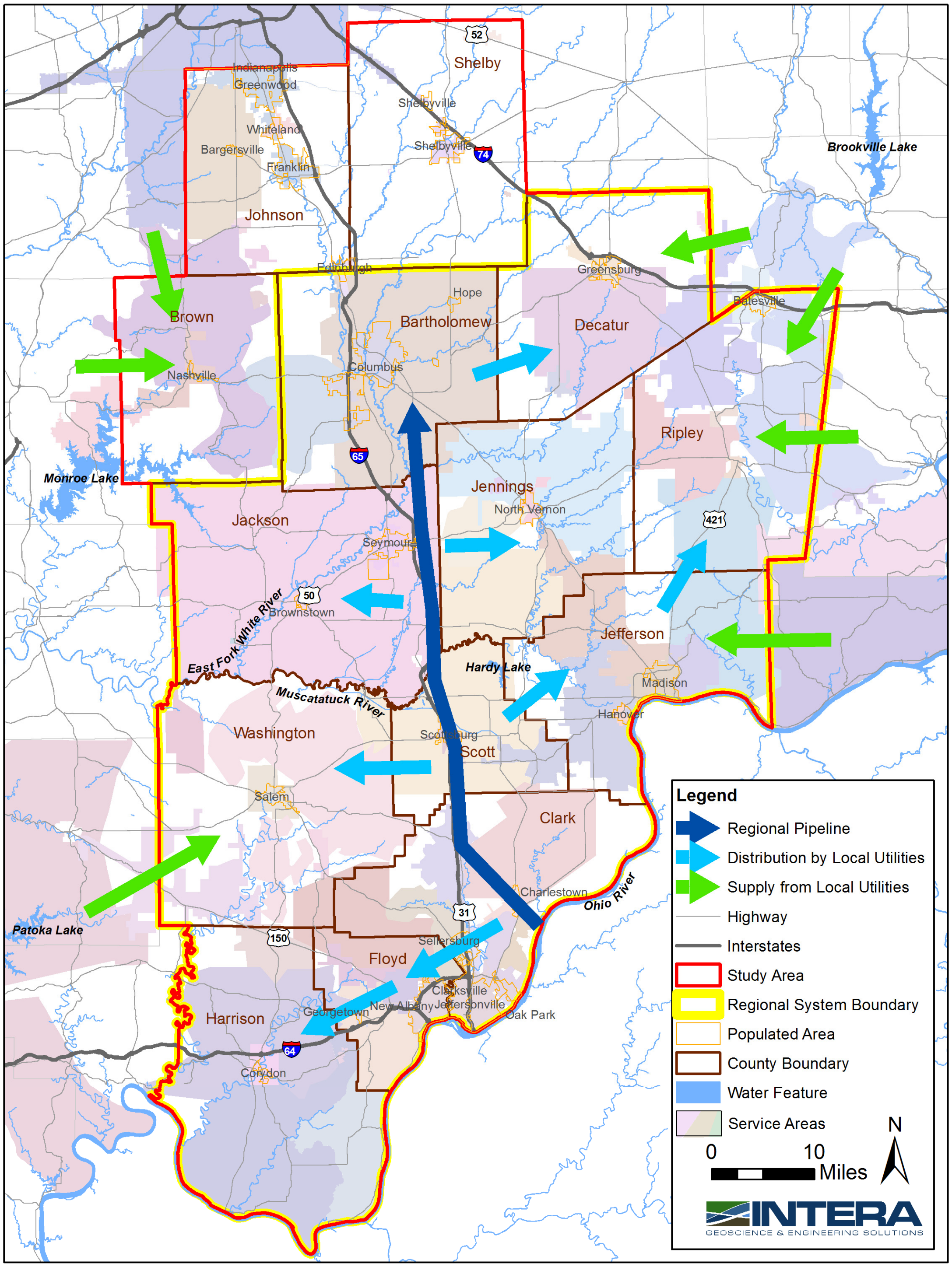

Figure 7. Extended Regional System (Option 2).

Notes: The Extended Regional System would make a regional water supply option available to more than 65 utilities in 11 counties. Johnson and Shelby Counties would continue to rely on their existing groundwater resources. Brown County would continue to rely on supplies originating from Monroe Lake and the White River outwash aquifer. A regional pipeline would extend from Clark County to Bartholomew County, directly and indirectly covering approximately 68 miles of the I-65 economic development corridor.

7.3 Option 3 – Targeted Regional System

A Targeted Regional System would extend north from the Ohio River along the I-65 corridor to Scott County. The regional water supply would be made available directly and indirectly (via wheeling by existing utilities) to supplement the supplies of more than 48 utilities in Clark, Floyd, Harrison, Jackson, Jefferson, Jennings, Scott, and Washington Counties (**Figure 8**).

Johnson, Shelby, and Bartholomew Counties would continue to be supplied from their existing groundwater supplies. Brown County would continue to be supplied by wholesale providers adjacent to the study area utilizing sources originating from Monroe Lake and the outwash aquifers of the White River. Decatur and Ripley Counties would continue to be supplied by their own supplies and by other utilities with supplies originating from the outwash aquifers of the Whitewater and Ohio Rivers.

The Maximum Day Demands met by the Targeted Regional System are projected to be 10.6 MGD and 22.3 MGD in 2040 and 2060, respectively.

When completed, the system would include the following infrastructure:

- Collector well field, with 5 collector wells, 41.2 MGD (26.2 MGD firm) pumping capacity;
- Raw water transmission mains, including 3.9 miles of 42-inch, 0.3 miles of 36-inch, 0.4 miles of 30-inch, and 0.2 miles of 24-inch pipe;
- Treatment plant with 30 MGD (22.5 MGD firm) treatment capacity, 8 MG treated water storage, and 30 MGD pumping capacity;
- Water transmission mains, 8.7 miles of 36-inch pipe and 8.6 miles of 24-inch pipe to Scott County;
- Distribution facilities, including 15 MG storage, 10 to 25 MGD pumping capacity, supplementary chemical feed, and equipment for monitoring and management of water quality; and
- Telemetry and other systems.

The total construction cost for the Targeted Regional System is estimated to be $219.8 million, including $138.6 million and $81.2 million, respectively, for supply and conveyance infrastructure. Construction may be phased to develop capacity as needed. Details of estimated construction costs are provided in **Appendix D**.

For the Targeted Regional System, operating costs per 1000 gallons are estimated to be $1.36 per 1,000 gallons in 2040 and $1.04 per 1,000 gallons in 2060. For utilities that are served via wheeling by one or more existing utilities, additional wheeling charges will apply. Wheeling charges are estimated to be $0.50 to $1.00 per 1,000 gallons per utility. For comparison, the state average equivalent rate is $6.35 per 1,000 gallons based on monthly use of 5,000 gallons (Umbaugh, 2016). Among study area utilities for which rate information was available the average and minimum rates are $7.31 and $2.29 per 1,000 gallons, respectively. Estimates of operating costs per 1000 gallons are highly dependent on water sales. Details of operating costs are presented in **Appendix D**.

The Targeted Regional System option would make a regional water supply option available to more than 48 utilities in 8 counties in Southeastern Indiana, providing the following results:

> **Reliability** – a reliable, drought proof alternative supply will be available to address future supply shortages or increased competition for limited resources.
>
> **Source Vulnerability** – an alternative supply will be available to utilities with potential source vulnerabilities. Ten utilities in the 8 counties have been identified as having potentially vulnerable sources.
>
> **Regulatory Compliance** – an alternative supply will be available to utilities with current compliance challenges. Twenty-three utilities in the 8 counties have been identified as having regulatory compliance challenges.
>
> **Affordability** – an affordable, alternative supply will be available to utilities with potential affordability challenges. Twenty-one utilities in the 8 counties have been identified as having potential affordability challenges.
>
> **Economic Development** – abundant, reliable, and affordable water supplies will be readily available for water-intensive economic development opportunities along 47 miles of the I-65 and US-31 corridor from the Ohio River to Jackson County.

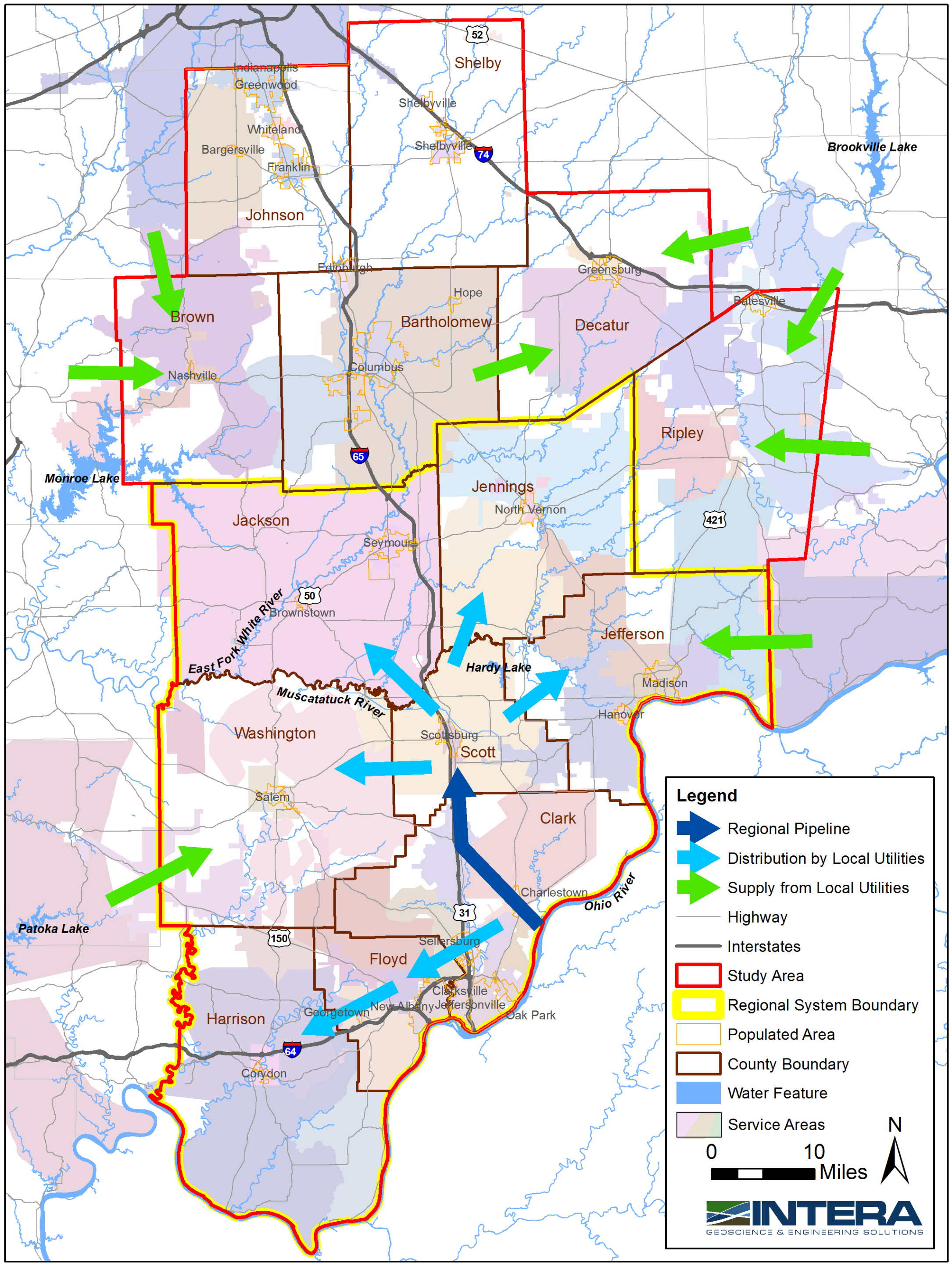

Figure 8. Targeted Regional System (Option 3).

Notes: The Targeted Regional System would make a regional water supply option available to more than 48 utilities in 8 counties. Johnson, Shelby, and Bartholomew Counties would continue to rely on their existing groundwater resources. Brown County would continue to rely on wholesale supplies originating from Monroe Lake and the White River outwash aquifer. Decatur and Ripley Counties would continue to rely on their own supplies and wholesale supplies originating from the outwash aquifers of the Ohio and Whitewater Rivers. A regional pipeline would extend from Clark County to Scott County, directly and indirectly covering approximately 47 miles of the I-65 economic development corridor.

8.0 COMPARISON SHOWS TARGETED REGIONAL SYSTEM IS THE PREFERRED OPTION

The current approach (Option 1) and two regional water supply alternatives (Options 2 and 3) were evaluated and compared based on multiple criteria.

8.1 Evaluation Criteria

The options are evaluated based on the following criteria:

1. Response to the region's challenges: source vulnerability, regulatory compliance, and affordability;
2. Support for economic development;
3. Efficient regional use of capital and resources;
4. Cost to utilities; and
5. Other advantages and disadvantages.

8.2 Comparison and Observations

A summary of the evaluation and comparison of all options is presented in **Table 4**. The following observations emerge from the analysis and comparison of options:

With funding support for construction, a regional supply may feasibly provide reliable access to water supplies at a lower cost than possible for individual utilities acting independently. Operating costs for the targeted system appear reasonable, and economically attractive for utilities in the region as they consider options to address their current and future water supply challenges.

Regional water supply planning for adjacent regions may reveal additional opportunities or challenges that may be best addressed cooperatively.

The higher construction and operating costs of the Extended Regional System do not appear to be justified by the incremental increase in capacity and benefits over the Targeted Regional System. The additional counties reached by the Extended Regional System, but not the Targeted Regional System, may be adequately and more economically served from other sources, including Brookville Lake, and the outwash aquifers of the White, Whitewater, and Ohio Rivers.

The Targeted Regional System makes water available for water-intensive economic development in areas along the I-65 corridor that currently lack ready access to abundant, reliable water supplies. North of this area the outwash aquifers of the East Fork of the White River provide access to supplies with the potential to support economic development along the I-65 corridor in Bartholomew and Johnson Counties.

Table 4. Comparison of regional water supply options for Southeastern Indiana.

	Option 1 Current Approach	Option 2 Extended Regional System	Option 3 Targeted Regional System
Description	Independent utility planning and development of water supply and treatment infrastructure. Limited coordination of water supply planning and management. Organic growth of limited regional suppliers. Independent investments in improvements to address source vulnerability and water quality-related regulatory compliance issues.	Regional water supply extends north along the I-65 corridor to Bartholomew County, available directly and indirectly to supplement existing supplies of more than 65 utilities in Bartholomew, Clark, Decatur, Floyd, Harrison, Jackson, Jefferson, Jennings, Ripley, Scott, and Washington Counties. Johnson, Shelby, and Brown Counties would continue to be supplied by existing utilities within and adjacent to the study area.	Regional water supply extends north along the I-65 corridor to Scott County, available directly and indirectly to supplement existing supplies of more than 48 utilities in Clark, Floyd, Harrison, Jackson, Jefferson, Jennings, Scott, and Washington Counties. Johnson, Shelby, Bartholomew, Decatur, Ripley and Brown Counties would continue to be supplied by existing utilities within and adjacent to the study.
Water Sources Utilized	Existing local surface water and groundwater supplies, wholesale supplies originating from Monroe Lake, Patoka Lake, and outwash aquifers of the White, Whitewater, and Ohio Rivers	Regional groundwater supply from the Charlestown State Park Ohio River outwash aquifer, existing local surface water and groundwater supplies, and wholesale supplies originating from Monroe Lake, Patoka Lake, and outwash aquifers of the White, Whitewater, and Ohio Rivers	Regional groundwater supply from the Charlestown State Park Ohio River outwash aquifer, existing local surface water and groundwater supplies, and wholesale supplies originating from Monroe Lake, Patoka Lake, and outwash aquifers of the White, Whitewater, and Ohio Rivers
Response to Utility Challenges			
Source Vulnerability	Minimal	Provides a reliable, high quality supply option to more than 65 utilities, including 19 with identified challenges.	Provides a reliable, high quality supply option to more than 48 utilities, including 10 with identified challenges.
Regulatory Compliance	Minimal	Provides a reliable, high quality supply option to more than 65 utilities, including 29 with identified challenges.	Provides a reliable, high quality supply option to more than 48 utilities, including 23 with identified challenges.
Affordability	Minimal	Provides affordable supply option to more than 65 utilities, including 30 with identified challenges.	Provides affordable supply option to more than 48 utilities, including 21 with identified challenges.
Regional Supply Demand			
2040 Max Day	0 MGD	12.6 MGD	10.6 MGD
2060 Max Day	0 MGD	26.3 MGD	22.3 MGD
Support for Regional Economic Development	Local	Clark County to Bartholomew County (~68 miles along I-65 corridor)	Clark County to Jackson County (~47 miles along I-65 corridor)
Regional Capital and Resource Efficiency	Minimal	Potential for utilities to defer or reduce future supply and treatment investment	Potential for utilities to defer or reduce future supply and treatment investment
Capital Cost at Build-Out	Unknown	$276.9 million	$219.8 million
Operating Cost			
2040 ($/1000 gallons)	Min $2.29, Avg $7.31 *	$1.84	$1.36
with wheeling fees		$2.34 to $2.84	$1.86 to $2.36
2060 ($/1000 gallons)	Min $2.29, Avg $7.31 *	$1.34	$1.04
with wheeling fees		$1.84 to $2.34	$1.54 to $2.04
Other Advantages	Requires no change, minimal initial effort	Regional cooperation may facilitate access to additional funding options.	Minimizes infrastructure needed to leverage existing utility interconnections. Regional cooperation may facilitate access to additional funding options.
Other Disadvantages	Missed opportunities for cost saving and other economies of scale through regional collaboration.	Operating costs highly dependent on water sales, may be higher in early stages of system operation.	Operating costs highly dependent on water sales, may be higher in early stages of system operation.

Notes: All costs are in 2017 dollars. The capital cost of Option 1 was not calculated; it would include all independent utility investments in supply, treatment, and conveyance infrastructure that could be avoided or reduced because of the availability of the regional supply option. The operating cost of Option 1 varies by utility and was not calculated. Values shown are the minimum and average 2015 retail rates for water utilities in the study area (Umbaugh, 2016). Fees for wheeling are based on wheeling by one intermediary utility, estimated to be $0.50 to $1.00 per thousand gallons.

9.0 PLANNING IS NEEDED TO MANAGE REGIONAL WATER SUPPLIES IN INDIANA

Previous surveys of utilities around the State demonstrated broad support for collaboration and regional planning (IFA, 2015 and 2016). The following conclusions reflect new insight into the value of regional analysis.

9.1 Effective long-term solutions may involve multiple regions

The feasibility of water supply options for Southeastern Indiana could be affected by choices other regions make about their water needs and their resources. If other regions in the State were anticipating drought and the value of water increased, the need for a new supply could spread out the costs for a pipeline along I-65. Of course, such a plan should only be considered after exhausting local solutions within the adjacent region and balanced against the costs of long, inter-regional pipelines.

9.2 Efficiencies are gained, but costs for a regional solution are new to the State

Regional solutions to water problems cost money. Development of a regional supply will require leadership and financial support to be economically feasible for area utilities. The State needs to support the definition and planning process of each region. Each region of the State can share economic benefits of growth and manage the costs of water to ensure that it remains affordable.

9.3 Appropriate scope and scale of collaboration varies by region

The scope and scale of collaboration depend on collective regional needs and available financial and management resources. A regional approach to water allows for a common set of constituencies that have many common priorities and requirements. In effect, the options considered need to satisfy the many local water demands and the anticipated issues with developing the resource locally. In this instance, phased development has economic benefits:

- Leverage existing interconnections among area utilities,
- Ability to supply water to extend the reach of a regional supply,
- Reduce construction cost,
- Alleviate competitive concerns.

9.4 Indiana should begin planning in other regions

The State needs to begin the process of considering and supporting regional planning. The problems that exist with respect to water availability, water demand, and water quality are all interrelated. If the State is going to get a return on the existing investments in roads, power, and bridges to create jobs, water needs to be included in the planning. Water resources are clearly one of the strengths of the State, especially if we develop regional plans. These plans will help buffer the risks for business and protect the environment as new jobs are generated.

9.5 Regional planning ideally addresses all water use

Water utility demand growth will occur separate from changes in other water use. It does not account for water use for agriculture, energy production, or self-supplied industry. In some counties, non-public water supply water use is a significant portion of total water withdrawals from available groundwater and surface water sources. **Table 5** indicates the percentage of total water withdrawals in each county that are for non-public water supply uses.

In response to the drought of 2011-2012, the capacity of agriculture and irrigation groundwater wells increased dramatically in counties within the study area. For example, in 2015, in Bartholomew, Jackson, Johnson, and Shelby Counties, the capacity of irrigation wells totaled over 300 MGD. From 2010 to 2015, installed irrigation well capacity increased by more than 20% in these counties.

Table 5. Water-use by sector in Southeastern Indiana in 2015 (IDNR, 2017).

County	**PWS**		**Energy**		**Industry**		**Irrigation***		**Total**
	MGD	%	MGD	%	MGD	%	MGD	%	**MGD**
Bartholomew	10.4	59	0.0	0	2.8	16	4.5	26	**17.8**
Brown	0.0	69	-	-	-	-	0.0	31	**0.1**
Clark	22.1	71	-	-	8.7	28	0.2	1	**31.0**
Decatur	2.6	91	-	-	0.2	8	0.0	1	**2.8**
Floyd	1.2	1	80.4	98	0.4	0	0.0	0	**82.0**
Harrison	2.6	100	-	-	-	-	0.0	0	**2.7**
Jackson	5.4	59	-	-	0.5	6	3.2	35	**9.1**
Jefferson	6.1	1	1,187	99	-	-	-	-	**1,193.1**
Jennings	1.1	66	-	-	0.5	34	-	-	**1.6**
Johnson	10.1	83	-	-	1.6	13	0.4	4	**12.2**
Ripley	1.2	68	-	-	0.6	32	0.0	0	**1.8**
Scott	3.3	80	-	-	0.9	20	-	-	**4.2**
Shelby	5.7	65	0.1	1	1.9	22	0.9	10	**8.6**
Washington	2.5	97	-	-	0.1	3	-	-	**2.6**

*Irrigation sector water use includes agriculture use and crop irrigation.

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Appendix A – Utilities Invited to Project Discussion

Appendix A. Public water supply utilities invited to discuss the regional supply investigation at project initiation. Additional conversations occurred throughout the project.

County	Public Water Supply
BARTHOLOMEW	Columbus Municipal Utility
BARTHOLOMEW	Eastern Bartholomew Water
BARTHOLOMEW	Hope Water Department
BARTHOLOMEW	Southwestern Bartholomew Water Corp.
BROWN	Brown County Water Utility
BROWN	Cordry Sweetwater Conservancy District
BROWN	Nashville Water Department
CLARK	Borden Tri-County Region
CLARK	Charlestown Water Department
CLARK	Charlestown/River Ridge
CLARK	Indiana American Water - S. Indiana
CLARK	Marysville Otisco Nabb Water Corp.
CLARK	Rural Membership Water Corp. Of Clark Co
CLARK	Sellersburg Water Department
CLARK	Silver Creek Water Corporation
CLARK	Washington Township Water
CLARK	Wastewater One, Llc-Rivers Edge Utility
CLARK	Watson Rural Water Company
DEARBORN	Lawrenceburg Municipal Utilities
DECATUR	Decatur Co. Water Corp.
DECATUR	Greensburg Municipal Water Works
DECATUR	Lake Santee RWWD
DECATUR	St. Paul Municipal Water
DECATUR	Westport Water Company
FLOYD	Edwardsville Water Corporation

County	Public Water Supply
FLOYD	Floyds Knobs Water Company, Inc.
FLOYD	Georgetown Water Department
FLOYD	Greenville Water Utility
HARRISON	Corydon Water Works
HARRISON	Lanesville Water Works
HARRISON	Palmyra Water Works
HARRISON	Ramsey Water Company, Inc.
HARRISON	South Harrison Water Corporation
HARRISON	Town Of Elizabeth
JACKSON	Crothersville Utilities
JACKSON	Indiana American Water - Seymour
JACKSON	Jackson County Water - Reddington
JACKSON	Jackson County Water Utility
JACKSON	Medora Water Department
JEFFERSON	Canaan Utilities
JEFFERSON	Hanover Water Department
JEFFERSON	Kent Water - Hanover College
JEFFERSON	Kent Water Company
JEFFERSON	Madison Water Department
JEFFERSON	Rykers Ridge Water Company
JENNINGS	Dupont Water Company
JENNINGS	Hayden Water Association
JENNINGS	Jennings Northwest Regional Utility
JENNINGS	North Vernon Water Department
JENNINGS	Vernon Water Department
JOHNSON	Bargersville Water Department
JOHNSON	Edinburgh Water Utility
JOHNSON	Indiana American Water

County	Public Water Supply
JOHNSON	Prince's Lake Water Department
JOHNSON	Trafalgar Water Department
JOHNSON	Whiteland Water Works
LAWRENCE	Bedford City Utilities
LAWRENCE	Mitchell Water Department
RIPLEY	Batesville Water Utility
RIPLEY	Holton Community Water Corp.
RIPLEY	Hoosier Hills Regional Water District
RIPLEY	Milan Water Works
RIPLEY	Napoleon Community Rural Water Corp.
RIPLEY	Osgood Water Department
RIPLEY	Sunman Water Works
RIPLEY	Versailles Water Works
SCOTT	Scottsburg Water Department
SCOTT	Stucker Fork Water Utility
SHELBY	Indiana American Water - Shelbyville
SHELBY	Morristown Water Department
SHELBY	Waldron Conservancy District
WASHINGTON	Campbellsburg Water Works
WASHINGTON	East Washington Rural Water
WASHINGTON	New Pekin Water Utility
WASHINGTON	Posey Township Water Corp.
WASHINGTON	Salem Water Works

Appendix B – Public Water Supply Utilities List

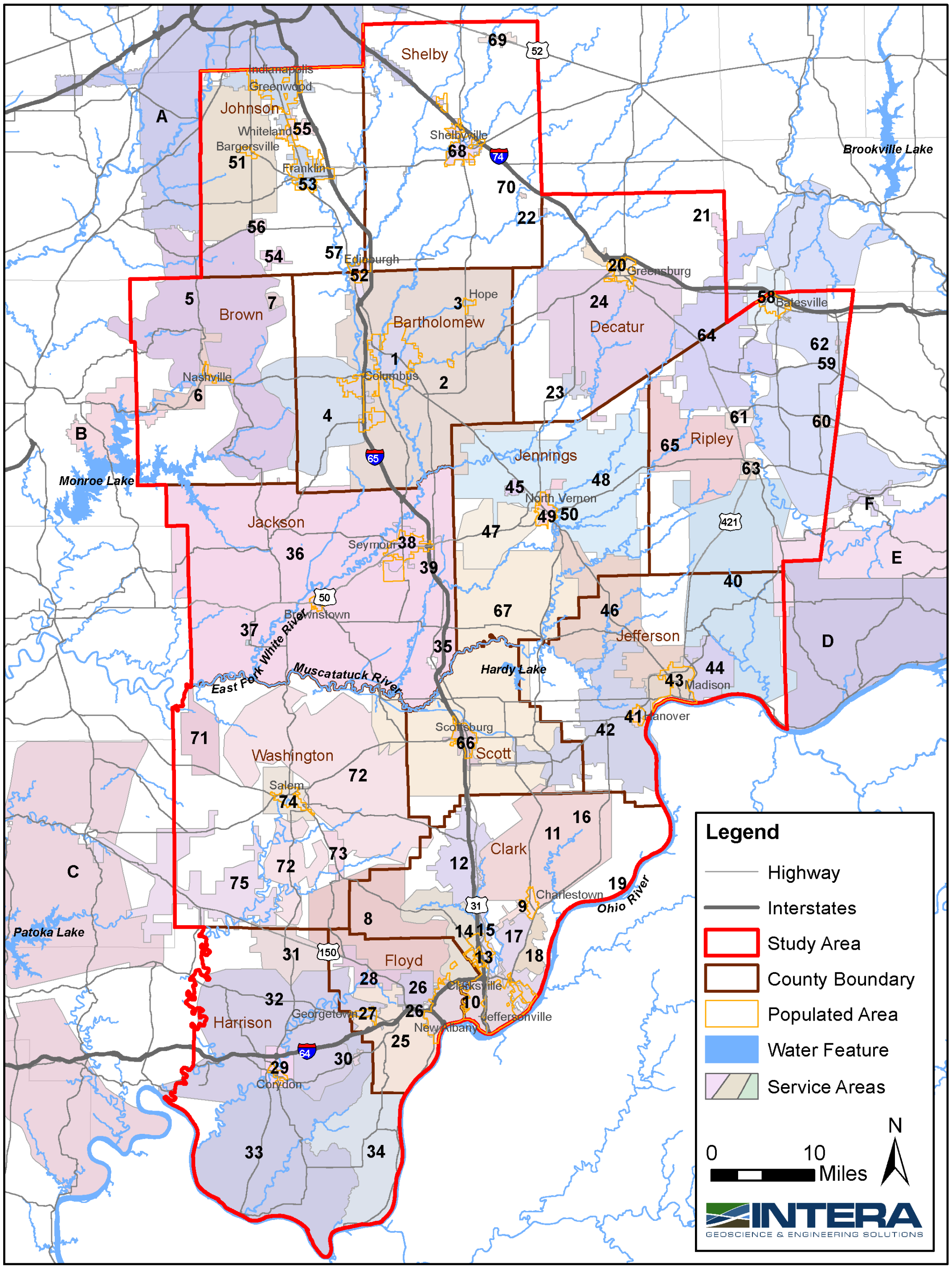

Figure B1. Public Water Supply Utilities in the Southeastern Indiana study area.

Table B1.Public water supplies serving the study area as shown in Figure B1.

Map Index Number	Utility Name	PWSID	Map Index Number	Utility Name	PWSID
1	COLUMBUS MUNICIPAL UTILITY	IN5203002	42	KENT WATER COMPANY	IN5239004
2	EASTERN BARTHOLOMEW WATER	IN5203004	43	MADISON WATER DEPARTMENT	IN5239006
3	HOPE WATER DEPARTMENT	IN5203006	44	RYKERS RIDGE WATER COMPANY	IN5239007
4	SOUTHWESTERN BARTHOLOMEW WATER CORP.	IN5203008	45	JENNINGS NORTHWEST REGIONAL UTILITY	IN5240002
5	BROWN COUNTY WATER UTILITY	IN5207001	46	DUPONT WATER COMPANY	IN5240004
6	NASHVILLE WATER DEPARTMENT	IN5207002	47	HAYDEN WATER ASSOCIATION	IN5240005
7	CORDRY SWEETWATER CONSERVANCY DISTRICT	IN5207004	48	JENNINGS WATER, INC.	IN5240006
8	BORDEN TRI-COUNTY REGION	IN5210002	49	NORTH VERNON WATER DEPARTMENT	IN5240008
9	CHARLESTOWN WATER DEPARTMENT	IN5210003	50	VERNON WATER DEPARTMENT	IN5240009
10	INDIANA AMERICAN WATER - S. INDIANA	IN5210005	51	BARGERSVILLE WATER DEPARTMENT	IN5241001
11	MARYSVILLE OTISCO NABB WATER CORP.	IN5210006	52	EDINBURGH WATER UTILITY	IN5241002
12	RURAL MEMBERSHIP WATER CORP. OF CLARK CO	IN5210009	53	INDIANA AMERICAN WATER - JOHNSON COUNTY	IN5241005
13	SELLERSBURG WATER DEPARTMENT	IN5210010	54	PRINCES LAKE WATER DEPARTMENT	IN5241007
14	SILVER CREEK WATER CORPORATION	IN5210011	55	WHITELAND WATER WORKS	IN5241009
15	SUNFLOWER VALLEY WATER CO, INC.	IN5210012	56	TRAFALGAR WATER DEPARTMENT	IN5241014
16	WASHINGTON TOWNSHIP WATER	IN5210015	57	CAMP ATTERBURY	IN5241015
17	WATSON RURAL WATER COMPANY	IN5210016	58	BATESVILLE WATER UTILITY	IN5269001
18	CHARLESTOWN/RIVER RIDGE	IN5210018	59	HOOSIER HILLS REGIONAL WATER DISTRICT	IN5269002
19	WASTEWATER ONE, LLC-RIVERS EDGE UTILITY	IN5210022	60	MILAN WATER WORKS	IN5269003
20	GREENSBURG MUNICIPAL WATER WORKS	IN5216002	61	OSGOOD WATER DEPARTMENT	IN5269004
21	LAKE SANTEE RWWD	IN5216003	62	SUNMAN WATER WORKS	IN5269005
22	ST. PAUL MUNICIPAL WATER	IN5216004	63	VERSAILLES WATER WORKS	IN5269006
23	WESTPORT WATER COMPANY	IN5216005	64	NAPOLEON COMMUNITY RURAL WATER CORP.	IN5269007
24	DECATUR CO. WATER CORP.	IN5216008	65	HOLTON COMMUNITY WATER CORP.	IN5269008
25	EDWARDSVILLE WATER CORPORATION	IN5222001	66	SCOTTSBURG WATER DEPARTMENT	IN5272001
26	FLOYDS KNOBS WATER COMPANY, INC.	IN5222002	67	STUCKER FORK WATER UTILITY	IN5272002
27	GEORGETOWN WATER DEPARTMENT	IN5222003	68	INDIANA AMERICAN WATER - SHELBYVILLE	IN5273002
28	GREENVILLE WATER UTILITY	IN5222004	69	MORRISTOWN WATER DEPARTMENT	IN5273003
29	CORYDON WATER WORKS	IN5231001	70	WALDRON CONSERVANCY DISTRICT	IN5273006
30	LANESVILLE WATER WORKS	IN5231003	71	CAMPBELLSBURG WATER WORKS	IN5288001
31	PALMYRA WATER WORKS	IN5231004	72	EAST WASHINGTON RURAL WATER	IN5288002
32	RAMSEY WATER COMPANY, INC.	IN5231005	73	NEW PEKIN WATER UTILITY	IN5288004
33	SOUTH HARRISON WATER CORPORATION	IN5231006	74	SALEM WATER WORKS - LAKE SALINDA	IN5288005
34	TOWN OF ELIZABETH	IN5231007	75	POSEY TOWNSHIP WATER CORP.	IN5288006
35	CROTHERSVILLE UTILITIES	IN5236001	A	CITIZENS WATER - INDIANAPOLIS	IN5255019
36	JACKSON COUNTY WATER UTILITY	IN5236003	B	EAST MONROE WATER CORPORATION	IN5253003
37	MEDORA WATER DEPARTMENT	IN5236004	C	PATOKA LAKE REGIONAL WATER	IN5219012
38	INDIANA AMERICAN WATER - SEYMOUR	IN5236005	D	PATRIOT WATER DEPARTMENT	IN5278001
39	NATURAL PUBLIC SUPPLY, INC.	IN5236009	E	ABERDEEN PATE WATER COMPANY, INC.	IN5258001
40	CANAAN UTILITIES	IN5239001	F	DILLSBORO WATER WORKS	IN5215002
41	HANOVER WATER DEPARTMENT	IN5239003			

Note: Utilities directly serving the study area are identified with numbers and utilities outside of the study area that supply water to other utilities in the study area are identified with letters.

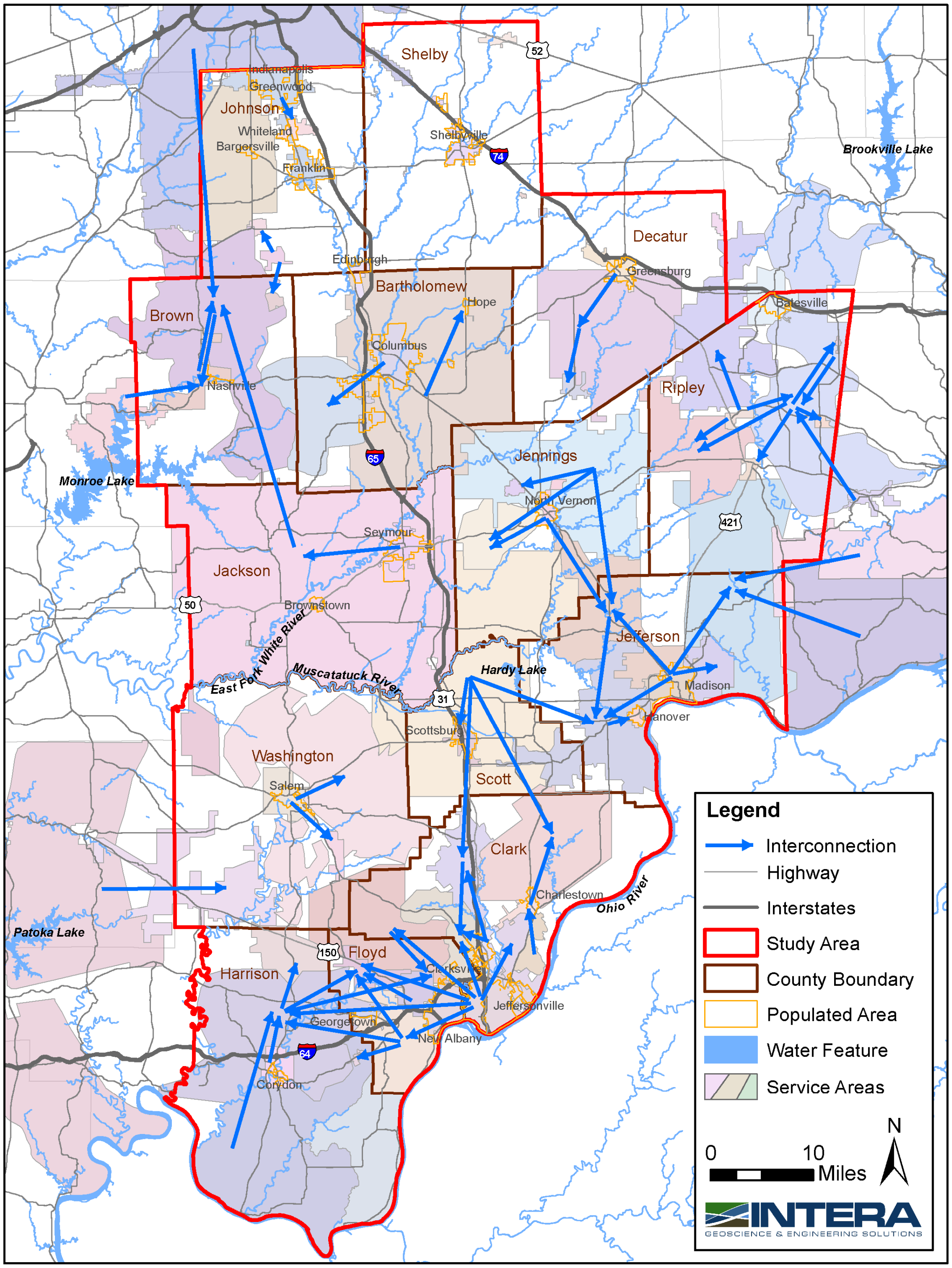

Figure B2. Utility interconnections in Southeast Indiana.

Appendix C – Southeast Indiana Water Demand Forecast

WATER DEMAND FORECAST FOR SOUTHEASTERN INDIANA

Memorandum Report
Prepared for Indiana Finance Authority
January 2018

1.0 Introduction

The purpose of this project is to develop estimates of the probable future water demand for the public water supply utilities in the 14-county planning area in Southeastern Indiana. Future water demand is projected in five-year increments for the period 2020 through 2060. The forecasted demand will be used to evaluate the scale and location of future supply needs with respect to existing available resources and the potential regional supply.

2.0 Method

The main driver of water demand for public water systems is population served, in other words, the number of people to which the utility delivers water. Therefore, for this demand forecast, we utilized the per capita rate method. Per capita rates are calculated when you divide the total amount of water produced (plus imports) and divide it by the number of people served. This gives you a number of gallons per person per day (GPCD) for each utility. In this study, the future water demand is calculated using the 2015 GPCD rate for each utility and adjusting it for population growth and for precipitation and temperature.

From the 2016 IFA Report, *Evaluation of Indiana Water Utilities,* the necessary dataset for each utility was available for 2015, as a base year. Other current and historical water use data from the United States Geological Society (USGS) and the Indiana Department of Natural Resources (IDNR) Significant Water Withdrawal Facilities (SWWF) database, was collected to verify the data utilized.

Forecasts of future water use typically assume “normal” weather conditions. Normal is defined as the 1981-2010 average. For this study, our base year GPCD is 2015, so we adjusted the forecast for normal weather for each county for summer temperature and summer precipitation.

3.0 Data

The following subsections describe the datasets used to forecast the demand for Southeastern Indiana. The region for which water demand is predicted is located along the Interstate-65 corridor running from the Ohio River in the south to Shelby and Johnson Counties in Central Indiana. The 14 Indiana counties included in the assessment are: Brown, Johnson, Shelby, Jackson, Bartholomew, Decatur, Washington, Scott, Jennings, Ripley, Harrison, Floyd, Clark, and Jefferson.

3.1 2015 Gallons Per Capita Per Day

The data on water use in the 14-county study area came primarily from a compilation of data from the 2016 IFA Report that included an infrastructure survey and an AWWA Water Audit of community water systems throughout Indiana (IFA, 2016). From this data, the water use and population served data was obtained for each utility in the 14-county region. Due to the confidential nature of this data, individual utility data cannot be presented here. Instead, county summaries are provided. **Table 1** shows the 2015 water use and population served for each county in the region. An estimated 80.15 million gallons per day (MGD) were used by public water supply utilities to serve over 640,000 people in 2015 (~125 GPCD).

Table 1. *County totals for 2015 public water supply water use and 2015 population served for Southeastern Indiana.*

County	2015 Public Supply Water Use (MGD)	2015 Population Served
Bartholomew	9.41	59,153
Brown	1.79	18,396
Clark	21.95	165,599
Decatur	2.57	19,885
Floyd	2.05	24,349
Harrison	4.10	36,729
Jackson	4.61	35,811
Jefferson	3.57	25,531
Jennings	2.63	30,277
Johnson	12.92	125,073
Ripley	2.50	26,062
Scott	4.80	25,747
Shelby	3.61	18,543
Washington	3.64	29,258
Grand Total	**80.15**	**640,413**

3.2 Future Population Served

The main driver of water demand from public water systems is population served. In the past, the growth in population served was accompanied by roughly proportional increases in water use. The growth rate (average trend) of the population of the study area between 1985 and 2015 was 1.5 percent per year. In general, approximately 80 percent of population is served by public systems.

The official projection of resident population by county are prepared by the Indiana Business Research Center (IBRC). The State's official population projections for 2015-2050 that were released in March 2012 have been updated based on the Census 2010 population counts (IBRC, 2016).

Upon consultation with the IBRC, the population projections for 2015-2050, were adjusted and extended for the purpose of this study using the updated population counts for 2015 as a base and then updating future values with the growth rates used in the original projections of 2012. The actual 14-county total population count for 2015 was lower by 5,590 persons than the original 2012 projections. The average growth rate in the 2015-2060 projections is 0.33 percent per year. **Table 2** shows the total county population projections from 2020-2060. The regional population is expected to increase by over 102,000 people from 2020-2060.

The future values of total population were used to calculate the population served for each utility. Using 2015 as the base year, the percent of the total county population that was served by a utility was assumed constant. Therefore, if a utility served 43% of the total county population in 2015, it was assumed that they would serve 43% of the county in 2040.

Table 2. *Adjusted projections of total population in Southeastern Indiana Counties: 2020-2060 (IBRC, 2016).*

County	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2045**	**2060**
Bartholomew	81,162	83,287	85,150	86,596	87,682	88,583	89,425	90,302	91,178	92,054
Brown	14,977	14,959	14,766	14,394	13,941	13,431	12,905	12,424	11,943	11,462
Clark	115,371	121,346	126,719	131,397	135,561	139,438	143,213	147,038	150,863	154,688
Decatur	26,521	26,903	27,244	27,465	27,533	27,470	27,345	27,222	27,099	26,975
Floyd	76,778	78,284	79,535	80,385	80,799	80,905	80,817	80,716	80,616	80,515
Harrison	39,578	41,285	42,746	43,894	44,738	45,336	45,758	45,654	45,550	45,446
Jackson	44,069	44,569	44,921	45,078	45,005	44,807	44,505	44,172	43,840	43,507
Jefferson	32,416	32,569	32,637	32,540	32,326	32,090	31,858	31,678	31,499	31,319
Jennings	27,897	28,341	28,743	29,000	29,131	29,202	29,256	29,337	29,419	29,501
Johnson	149,633	159,322	168,477	176,765	184,158	190,855	197,192	203,496	209,801	216,106
Ripley	28,701	29,583	30,380	31,015	31,477	31,823	32,115	32,409	32,704	32,998
Scott	23,744	24,190	24,539	24,742	24,820	24,842	24,845	24,851	24,858	24,865
Shelby	44,478	44,779	44,962	44,921	44,631	44,151	43,550	42,972	42,393	41,814
Washington	27,827	28,169	28,470	28,699	28,791	28,795	28,753	28,727	28,701	28,675
14 Co. Total	**733,152**	**757,585**	**779,288**	**796,891**	**810,592**	**821,729**	**831,537**	**841,000**	**850,462**	**859,925**

3.3 Normalized Weather

As previously discussed, demand forecasts typically utilize normal weather, the 1981-2010 average. This is because water demand is greatly affected by weather, primarily temperature and precipitation. In hot and dry weather, demand increases. When the weather is cooler and wetter, demand is lower.

Relative to normal weather, the year 2015 was a wet year with air temperatures remaining close to or slightly above normal. The implication for the forecast based on the 2015 water use data is that if the weather conditions in 2015 were normal, the actual water use would be higher. Therefore, the 2015 water is “normalized” using the weather data and empirical coefficients that represent the responsiveness of water use to changes in temperature and precipitation (PRISM, 2017). The normal weather data used to adjust the 2015 base year GPCD is provided in **Table 3**.

Table 3. *Historical Summer Season (May-September) Maximum Temperature (°F) and Precipitation (inches) in Southeastern Indiana (PRISM, 2017).*

County	Maximum Summer Temperature (°F)		Summer Precipitation (inches)	
	2015	Normal 1981-2010	2015	Normal 1981-2010
Bartholomew	81.4	80.60	27.5	20.42
Brown	81.0	80.80	25.6	22.26
Clark	83.1	83.24	26.2	20.62
Decatur	80.9	80.32	23.4	20.56
Floyd	83.0	81.82	22.7	19.84
Harrison	82.9	82.72	22.3	19.23
Jackson	81.8	80.98	26.9	21.00
Jefferson	81.5	80.58	25.6	20.58
Jennings	81.7	80.86	26.2	20.28
Johnson	80.3	80.42	25.9	20.69
Ripley	81.0	80.96	20.9	19.83
Scott	82.3	81.92	25.5	20.61
Shelby	80.8	80.36	25.2	20.06
Washington	82.5	82.14	22.1	19.86

3.4 Peak Month and Day Utility Data

Utility demand typically increases in the summer, when the temperature is higher, and precipitation is lower. These higher levels of demand are called the peak demand for a utility. Even though typically, the peak demand only occurs for a few months of the year, utilities must design their systems to accommodate them. Therefore, it is important for the design of a regional system to understand how the demand peaks in Southeastern Indiana.

Each utility reports their daily water production to the Indiana Department of Environmental Management (IDEM) via State Form 34609, Monthly Report of Operation (MRO) (IDEM, 2017). In order to calculate a peaking factor for peak monthly and peak daily demand, the MROs for each utility were used. A peaking factor is the ratio of the peak to average. The peak month factors ranged from 1.13-1.92, with a regional average of 1.22. The peak daily factors ranged 1.10-2.74, with a regional average of 1.64. This means that on average demand increases to 1.64 times the daily average during times of peak demand.

4.0 Future Water Demand

Future water demand was calculated for each utility in the 14-county region. The GPCD for each utility was multiplied by the projected population served and then normalized for weather. The sum of the utility water demand in each county is summarized in **Table 4.** The average day water demand for Southeastern Indiana is expected to increase from 83.8 MGD in 2020 to 96.5 MGD in 2060. That is an increase of 12.7 MGD.

The peak month and peak day demand are provided in **Table 5** and **Table 6**, respectively. The peak month demand increases 16.0 MGD from 103.0 in 2020 to 119.1 in 2060. The peak day demand increases 18.9 MGD from 126.9 in 2020 to 145.7 MGD in 2060.

Table 4. *County totals for projected public water supply average day demand for Southeastern Indiana in million gallons per day (MGD).*

County	2020	2025	2030	2035	2040	2045	2050	2055	2060
Bartholomew	10.09	10.32	10.49	10.62	10.73	10.83	10.94	11.05	11.15
Brown	1.76	1.74	1.70	1.64	1.58	1.52	1.46	1.41	1.35
Clark	23.45	24.48	25.39	26.19	26.94	27.67	28.41	29.15	29.89
Decatur	2.65	2.68	2.70	2.71	2.70	2.69	2.68	2.67	2.65
Floyd	2.09	2.12	2.15	2.16	2.16	2.16	2.16	2.15	2.15
Harrison	4.14	4.29	4.40	4.49	4.55	4.59	4.58	4.57	4.56
Jackson	4.83	4.87	4.89	4.88	4.86	4.83	4.79	4.75	4.72
Jefferson	3.60	3.61	3.59	3.57	3.55	3.52	3.50	3.48	3.46
Jennings	2.61	2.65	2.67	2.68	2.69	2.69	2.70	2.71	2.72
Johnson	14.07	14.88	15.62	16.27	16.86	17.42	17.98	18.53	19.09
Ripley	2.49	2.56	2.61	2.65	2.68	2.71	2.73	2.76	2.78
Scott	4.78	4.85	4.89	4.90	4.90	4.91	4.91	4.91	4.91
Shelby	3.67	3.68	3.68	3.66	3.62	3.57	3.52	3.47	3.43
Washington	3.59	3.63	3.66	3.67	3.67	3.66	3.66	3.66	3.65
14 Co. Total	**83.82**	**86.36**	**88.43**	**90.09**	**91.49**	**92.77**	**94.01**	**95.26**	**96.51**

Table 5. *County totals for projected public water supply peak month demand for Southeastern Indiana in million gallons per day (MGD).*

County	2020	2025	2030	2035	2040	2045	2050	2055	2060
Bartholomew	13.39	13.69	13.93	14.10	14.25	14.38	14.52	14.66	14.80
Brown	2.06	2.03	1.98	1.92	1.85	1.77	1.71	1.64	1.58
Clark	27.47	28.68	29.74	30.68	31.56	32.42	33.28	34.15	35.01
Decatur	3.04	3.08	3.10	3.11	3.10	3.09	3.08	3.06	3.05
Floyd	2.42	2.46	2.49	2.50	2.50	2.50	2.50	2.49	2.49
Harrison	5.01	5.19	5.33	5.43	5.50	5.55	5.54	5.53	5.52
Jackson	5.74	5.79	5.81	5.80	5.77	5.74	5.69	5.65	5.61
Jefferson	4.43	4.44	4.43	4.40	4.37	4.33	4.31	4.29	4.26
Jennings	2.95	2.99	3.02	3.04	3.04	3.05	3.06	3.07	3.07
Johnson	19.22	20.32	21.32	22.22	23.02	23.79	24.55	25.31	26.07
Ripley	3.17	3.26	3.32	3.37	3.41	3.44	3.47	3.50	3.54
Scott	5.59	5.67	5.71	5.73	5.74	5.74	5.74	5.74	5.74
Shelby	4.24	4.26	4.25	4.22	4.18	4.12	4.07	4.01	3.96
Washington	4.30	4.34	4.38	4.39	4.39	4.39	4.38	4.38	4.38
14 Co. Total	**103.03**	**106.20**	**108.81**	**110.91**	**112.69**	**114.31**	**115.89**	**117.48**	**119.07**

Table 6. *County totals for projected public water supply peak day demand for Southeastern Indiana in million gallons per day (MGD).*

County	2020	2025	2030	2035	2040	2045	2050	2055	2060
Bartholomew	16.73	17.10	17.39	17.61	17.79	17.96	18.14	18.31	18.49
Brown	3.17	3.13	3.05	2.96	2.85	2.74	2.63	2.53	2.43
Clark	32.54	33.99	35.24	36.36	37.40	38.41	39.43	40.46	41.49
Decatur	3.51	3.56	3.59	3.60	3.59	3.57	3.56	3.54	3.52
Floyd	3.24	3.29	3.33	3.35	3.35	3.35	3.34	3.34	3.34
Harrison	6.59	6.82	7.00	7.14	7.23	7.30	7.28	7.27	7.25
Jackson	6.55	6.60	6.62	6.61	6.58	6.54	6.49	6.44	6.39
Jefferson	7.19	7.21	7.19	7.14	7.09	7.04	7.00	6.96	6.92
Jennings	4.25	4.31	4.34	4.36	4.37	4.38	4.39	4.41	4.42
Johnson	22.20	23.47	24.63	25.66	26.59	27.47	28.35	29.23	30.11
Ripley	4.00	4.11	4.20	4.26	4.31	4.34	4.38	4.42	4.46
Scott	7.51	7.62	7.68	7.71	7.71	7.71	7.72	7.72	7.72
Shelby	4.41	4.43	4.42	4.40	4.35	4.29	4.23	4.18	4.12
Washington	5.00	5.05	5.09	5.11	5.11	5.10	5.10	5.09	5.09
14 Co. Total	**126.89**	**130.68**	**133.78**	**136.24**	**138.32**	**140.20**	**142.05**	**143.89**	**145.74**

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Appendix D – Cost Analysis Tables

Construction Cost
Extended Regional System (full build out)

Description	Quantity	Units	Unit Cost	Extended Cost	Annual maintenance expense	
Supply infrastructure						
Rebuild or replace Collector Well #1 (8.9 mgd)	1	LS	$6,500,000	$6,500,000	1.0%	$65,000
Rebuild or replace Collector Well #3 (5.6 mgd)	1	LS	$5,000,000	$5,000,000	1.0%	$50,000
Rebuild or replace Collector Well #5 (4.0 mgd)	1	LS	$5,000,000	$5,000,000	1.0%	$50,000
Rebuild or replace Collector Well #6 (7.7 mgd)	1	LS	$6,500,000	$6,500,000	1.0%	$65,000
Rebuild or replace Collector Well #7 (15.0 mgd)	1	LS	$8,000,000	$8,000,000	1.0%	$80,000
Raw water main, 42-inch	4900	LF	$420	$2,058,000	0.5%	$10,290
Raw water main, 42-inch, rock excavation	15800	LF	$525	$8,295,000	0.5%	$41,475
Raw water main, 36-inch	1800	LF	$360	$648,000	0.5%	$3,240
Raw water main, 30-inch	2000	LF	$300	$600,000	0.5%	$3,000
Raw water main, 24-inch	1000	LF	$240	$240,000	0.5%	$1,200
Treatment plant, 30 mgd (22.5 mgd firm)	1	LS	$48,800,000	$48,800,000	1.0%	$488,000
Storage, 10 MG	1	LS	$4,283,000	$4,283,000	1.5%	$64,245
Supply subtotal				$95,924,000		
Contingency	25%	of construction		$23,981,000		
Non-construction costs	20%	of construction		$19,184,800		
Supply total				$139,089,800		$921,450
Conveyance infrastructure						
Finished water main, 42-inch, rock excavation	45936	LF	$525	$24,116,400	0.5%	$120,582
Finished water main, 30-inch, rock excavation	30624	LF	$375	$11,484,000	0.5%	$57,420
Finished water main, 30-inch	45936	LF	$300	$13,780,800	0.5%	$68,904
Finished water main, 16-inch	93456	LF	$160	$14,952,960	0.5%	$74,765
Finished water main, 12-inch	76560	LF	$120	$9,187,200	0.5%	$45,936
Pump Station 1						
Storage, 4 MG	1	LS	$1,990,000	$1,990,000	1.5%	$29,850
Pump Station, 25 mgd, 1500 HP	1	LS	$4,030,000	$4,030,000	1.5%	$60,450
Pump Station 2						
Storage, 3 MG	1	LS	$1,990,000	$1,990,000	1.5%	$29,850
Pump Station, 15 mgd, 700 HP	1	LS	$2,700,000	$2,700,000	1.5%	$40,500
Pump Station 3						
Storage, 3 MG	1	LS	$1,990,000	$1,990,000	1.5%	$29,850
Pump Station, 15 mgd, 700 HP	1	LS	$2,700,000	$2,700,000	1.5%	$40,500
Pump Station 4						
Storage, 2 MG	1	LS	$1,990,000	$1,990,000	1.5%	$29,850
Pump Station, 5 mgd, 250 HP	1	LS	$1,870,000	$1,870,000	1.5%	$28,050
Pump Station 5						
Storage, 2 MG	1	LS	$1,990,000	$1,990,000	1.5%	$29,850
Pump Station, 5 mgd, 250 HP	1	LS	$1,870,000	$1,870,000	1.5%	$28,050
Pump Station 6						
Storage, 1 MG	1	LS	$1,990,000	$1,990,000	1.5%	$29,850
Pump Station, 2 mgd, 75 HP	1	LS	$870,000	$870,000	1.5%	$13,050
Conveyance subtotal				$88,921,360		
Contingency	25%	of construction		$22,230,340		
Non-construction costs	30%	of construction		$26,676,408		
Conveyance total				$137,828,108		$757,307
Grand Total - Full Build-Out				$276,917,908		

Notes:
All costs are in 2017 Dollars

Operating Costs
Extended Regional System

	2030	2040	2050	2060
Average Demand (MGD) [2]	4.08	8.17	12.64	17.11
Source of Supply				
Average TDH	370	380	390	400
Average power cost ($/MG)	$ 138	$ 141	$ 145	$ 149
Power	$ 205,231	$ 421,555	$ 669,398	$ 929,381
Chemicals	$ 149,070	$ 298,140	$ 461,285	$ 624,429
Residuals	$ 29,814	$ 59,628	$ 92,257	$ 124,886
Maintenance	$ 1,175,130	$ 1,343,005	$ 1,510,881	$ 1,678,757
Other	$ 149,070	$ 298,140	$ 461,285	$ 624,429
Conveyance				
Average power cost ($/MG)	$ 91	$ 118	$ 146	$ 173
Power	$ 135,654	$ 351,805	$ 673,475	$ 1,080,262
Chemicals	$ 59,628	$ 119,256	$ 184,514	$ 249,772
Maintenance	$ 332,925	$ 332,925	$ 442,095	$ 442,095
Other	$ 59,628	$ 119,256	$ 184,514	$ 249,772
Admin & General				
Salaries & Benefits Insurance	$ 1,500,000	$ 2,250,000	$ 2,625,000	$ 3,000,000
Transportation	$ 187,500	$ 225,000	$ 262,500	$ 300,000
Other	$ 150,000	$ 225,000	$ 300,000	$ 375,000
	$ 150,000	$ 225,000	$ 300,000	$ 375,000
Total	$ 1,987,500	$ 2,925,000	$ 3,487,500	$ 4,050,000
Per 1000 gallons	$ 3,899,625	$ 5,489,506	$ 6,944,410	$ 8,375,260
	$ 2.62	$ 1.84	$ 1.51	$ 1.34

Notes:

1) All costs are in 2017 Dollars
2) The average demand for the years 2030, 2040, 2050, and 2060 is the estimated potential demand of the Extended Regional System (Option 2), which is derived from estimates of demand shifted from existing water supplies to the regional supply by challenged utilities in the 11 counties with direct or indirect access to the Extended Regional System supply, as described in the report. The regional system supplements existing utility water supplies.

Construction Cost

Targeted Regional System Phase 1 (to 2040)

Description	Quantity	Units	Unit Cost	Extended Cost	Annual maintenance expense	
Supply infrastructure						
Rebuild or replace Collector Well #1 (8.9 mgd)	1	LS	$6,500,000	$6,500,000	1.0%	$65,000
Rebuild or replace Collector Well #3 (5.6 mgd)	1	LS	$5,000,000	$5,000,000	1.0%	$50,000
Rebuild or replace Collector Well #5 (4.0 mgd)	1	LS	$5,000,000	$5,000,000	1.0%	$50,000
Raw water main, 42-inch	4900	LF	$420	$2,058,000	0.5%	$10,290
Raw water main, 42-inch, rock excavation	15800	LF	$525	$8,295,000	0.5%	$41,475
Raw water main, 24-inch	1000	LF	$240	$240,000	0.5%	$1,200
Treatment plant, 15 mgd (11.25 mgd firm)	1	LS	$31,900,000	$31,900,000	1.0%	$319,000
Storage, 4 MG	1	LS	$1,987,000	$1,987,000	1.5%	$29,805
Supply subtotal				$60,980,000		
Contingency	25%	of construction		$15,245,000		
Non-construction costs	20%	of construction		$12,196,000		$566,770
Supply total - Phase 1				$88,421,000		
Conveyance infrastructure						
Finished water main, 36-inch, rock excavation	46000	LF	$450	$20,700,000	0.5%	$103,500
Finished water main, 24-inch, rock excavation	45500	LF	$300	$13,650,000	0.5%	$68,250
Pump Station 1						$0
Storage, 2 MG	1	LS	$1,325,000	$1,325,000	1.5%	$19,875
Pump Station, 10 mgd, 350 HP	1	LS	$3,150,000	$3,150,000	1.5%	$47,250
Pump Station 2						$0
Storage, 2 MG	1	LS	$1,325,000	$1,325,000	1.5%	$19,875
Pump Station, 5 mgd, 250 HP	1	LS	$2,290,000	$2,290,000	1.5%	$34,350
Pump Station 3						$0
Storage, 2 MG	1	LS	$1,325,000	$1,325,000	1.5%	$19,875
Pump Station, 5 mgd, 75 HP	1	LS	$1,330,000	$1,330,000	1.5%	$19,950
Conveyance subtotal				$45,095,000		
Contingency	25%	of construction		$11,273,750		
Non-construction costs	30%	of construction		$13,528,500		$332,925
Conveyance total - Phase 1				$69,897,250		
Grand Total - Phase 1				$158,318,250		

Notes:
All costs are in 2017 Dollars

Construction Cost

Targeted Regional System Phase 2 (to 2060)

Description	Quantity	Units	Unit Cost	Extended Cost	Annual maintenance expense	
Supply infrastructure						
Rebuild or replace Collector Well #6 (7.7 mgd)	1	LS	$6,500,000	$6,500,000	1.0%	$65,000
Rebuild or replace Collector Well #7 (15.0 mgd)	1	LS	$8,000,000	$8,000,000	1.0%	$80,000
Raw water main, 36-inch	1800	LF	$360	$648,000	0.5%	$3,240
Raw water main, 30-inch	2000	LF	$300	$600,000	0.5%	$3,000
Treatment plant expansion, 30 mgd (22.5 mgd firm)	1	LS	$16,900,000	$16,900,000	1.0%	$169,000
Storage, 4 MG	1	LS	$1,987,000	$1,987,000	1.5%	$29,805
Supply subtotal				$34,635,000		
Contingency	25%	of construction		$8,658,750		
Non-construction costs	20%	of construction		$6,927,000		$350,045
Supply total - Phase 2				$50,220,750		
Conveyance infrastructure						
Finished water main	0	LF	$383	$0	0.5%	$0
Pump Station 1 expansion						
Storage, additional 3 MG	1	LS	$1,546,000	$1,546,000	1.5%	$23,190
Pump Station, expand to 25 mgd, 1500 HP	1	LS	$1,330,000	$1,330,000	1.5%	$19,950
Pump Station 2 expansion						
Storage, additional 3 MG	1	LS	$1,546,000	$1,546,000	1.5%	$23,190
Pump Station, expand to 10 mgd, 700 HP	1	LS	$620,000	$620,000	1.5%	$9,300
Pump Station 3 expansion						
Storage, additional 3 MG	1	LS	$1,546,000	$1,546,000	1.5%	$23,190
Pump Station, expand to 10 mgd, 200 HP	1	LS	$690,000	$690,000	1.5%	$10,350
Conveyance subtotal				$7,278,000		
Contingency	25%	of construction		$1,819,500		
Non-construction costs	30%	of construction		$2,183,400		
Conveyance total - Phase 2				$11,280,900		$109,170
Grand Total - Phase 2				$61,501,650		
Full Build-Out						
Supply				$138,641,750		
Conyeyance				$81,178,150		
Grand Total				$219,819,900		

Notes:
All costs are in 2017 Dollars

Operating Costs

Targeted Regional System

	2030	2040	2050	2060
Average Demand (MGD) [2]	3.46	6.93	10.75	14.58
Source of Supply				
Average TDH	370	380	390	400
Average power cost ($/MG)	$ 138	$ 141	$ 145	$ 149
Power	$ 173,869	$ 357,652	$ 569,399	$ 792,066
Chemicals	$ 126,290	$ 252,945	$ 392,375	$ 532,170
Residuals	$ 25,258	$ 50,589	$ 78,475	$ 106,434
Maintenance	$ 566,770	$ 566,770	$ 916,815	$ 916,815
Other	$ 126,290	$ 252,945	$ 392,375	$ 532,170
Conveyance				
Average power cost ($/MG)	$ 73	$ 95	$ 116	$ 138
Power	$ 91,649	$ 239,080	$ 456,987	$ 736,604
Chemicals	$ 25,258	$ 50,589	$ 78,475	$ 106,434
Maintenance	$ 332,925	$ 332,925	$ 442,095	$ 442,095
Other	$ 25,258	$ 50,589	$ 78,475	$ 106,434
Admin & General				
Salaries & Benefits	$ 1,000,000	$ 1,500,000	$ 1,750,000	$ 2,000,000
Insurance	$ 125,000	$ 150,000	$ 175,000	$ 200,000
Transportation	$ 100,000	$ 150,000	$ 200,000	$ 250,000
Other	$ 100,000	$ 150,000	$ 200,000	$ 250,000
Total	$ 2,493,223	$ 3,442,993	$ 4,690,339	$ 5,540,691
Per 1000 gallons	$ 1.97	$ 1.36	$ 1.20	$ 1.04

Notes:

1) All costs are in 2017 Dollars
2) The average demand for the years 2030, 2040, 2050, and 2060 is the estimated potential demand of the Targeted Regional System (Option 3), which is derived from estimates of demand shifted from existing water supplies to the regional supply by challenged utilities in the 8 counties with direct or indirect access to the Targeted Regional System supply, as described in the report. The regional system supplements existing utility water supplies.