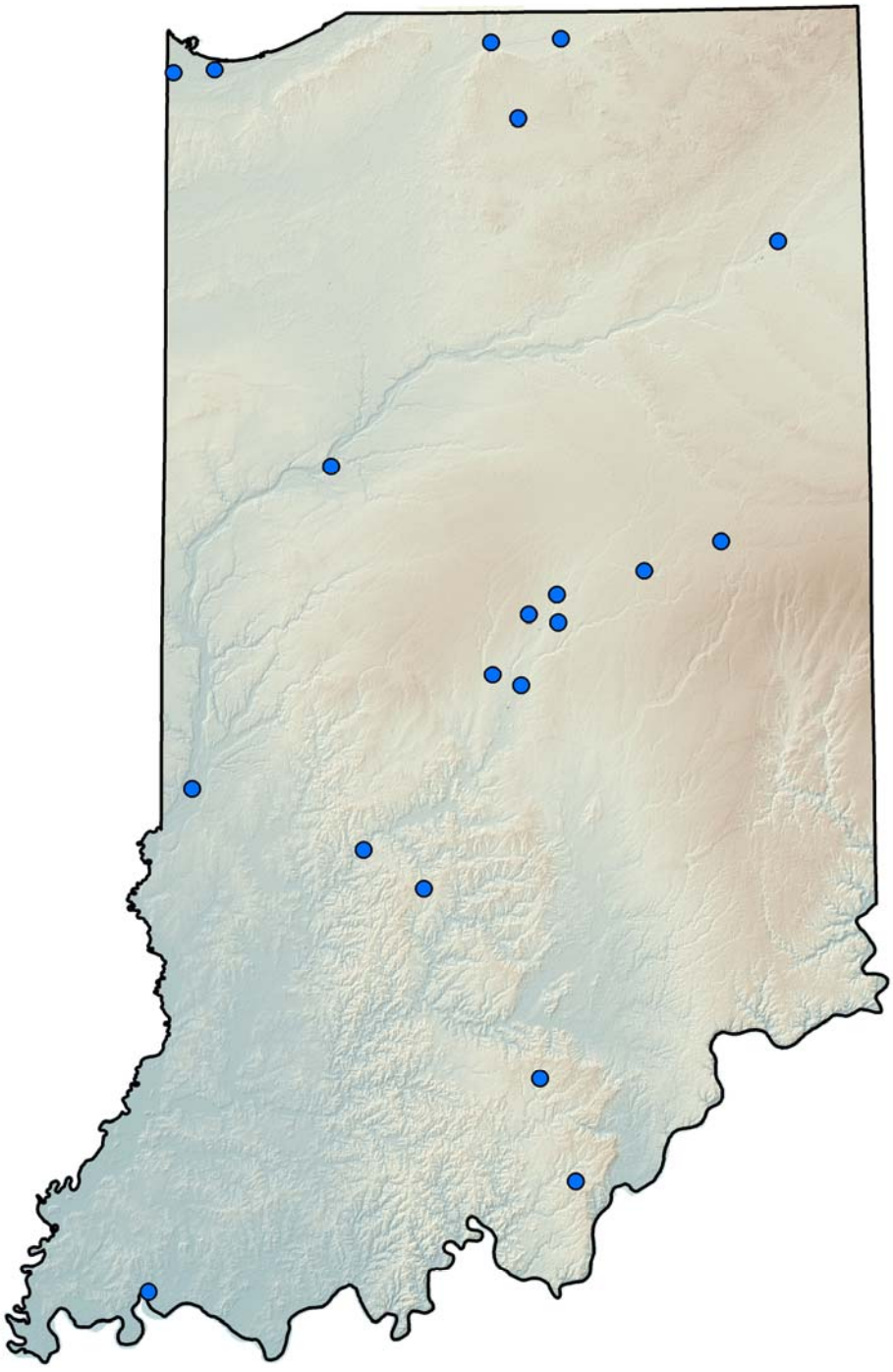
Evaluation of Water Utility Planning in Indiana

A survey of best practices, challenges, and needs

October 2015



Indiana Finance Authority

This report has been prepared pursuant to Senate Bill 474
for presentation to the Indiana State Legislature

October 2015

The Indiana Finance Authority acknowledges the contribution of INTERA Incorporated for the creation of this report. INTERA was assisted by staff from Lochmueller Group and Curry and Associates, Inc. See Appendix A for professional biographies of contributing members.

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Why the IFA did this study

The Indiana Finance Authority (Authority or IFA) is a body corporate and politic, not a State agency and though separate from the State, the exercise by the Authority of its powers constitutes an essential public function. The Authority was created in 2005 under IC 4-4-10.9 and 4-4-11, et seq. and is governed by a five-member board including the State Treasurer, State Budget Director and three members appointed by the Governor. One of the statutory purposes of the Authority is to oversee State debt issuance and provide efficient and effective financing solutions to facilitate state, local government, and business investment in Indiana. In addition, the Authority manages three environmental finance programs; State Revolving Fund (SRF) drinking water and wastewater loan programs and the Indiana Brownfield remediation loan program. Information regarding the Authority's programs can be found at www.in.gov/ifa/.

Over the past several years there has been increasing attention to the need for additional information about how economic growth in the state may be affected by the availability of water. The drought of 2012 forced awareness about the need for information and communication among State and Federal agencies, utilities, industry, agriculture, and other water users. In their report on this topic, the Indiana Utility Regulatory Commission (IURC) suggested that the state's water utilities are managing their infrastructure without some of the basic data that might help modernize and integrate use of the resource.

The General Assembly of the State of Indiana directed the IFA to conduct a survey of water utilities to determine how they are managing long-term planning needs. The law directed the IFA to survey the utilities that serve the fifteen most populous cities in Indiana and another five small systems that could provide some geographic and scale diversity to the investigation (Figure 1). The survey questions were designed to help the study team understand how these utilities manage their water resources and infrastructure, and how they plan for growth.

Our objectives were reflected in the types of questions posed in the survey. In general, they were related to supply, demand, infrastructure and exploratory questions. The survey was designed to help determine 1) how the utilities understood the availability of water resources, 2) how they used information about demand and system failure to plan for maintenance and expansion, and finally, 3) how utilities calibrate their rates and charges to both protect the ratepayers and improve their system.

Given the language of the law, this survey was confined to public water purveyors. No effort was made to discuss or account for water use by irrigators, power plants, industrial water users or domestic water systems. While this emphasis reflects the language of the state law, we have attempted to address this in our recommendations for future work.

Community	Population	Utility Name
Indianapolis	820,445	Citizens Energy Group
Fort Wayne	253,691	Fort Wayne City Utilities
Evansville	117,429	Evansville Water & Sewer Utility
South Bend	101,168	South Bend Water Works
Hammond	80,830	Hammond Water Works Department
Bloomington	80,405	City of Bloomington Utilities
Gary	80,294	Indiana American Water Northwest Operations
Carmel	79,191	Carmel Utilities
Fishers	76,794	Citizens Energy Group / Indiana American Water
Muncie	70,085	Indiana American Water Muncie
Lafayette	67,140	Lafayette Water Works
Terre Haute	60,785	Indiana American Water Terre Haute
Anderson	56,129	Anderson Water Department
Noblesville	51,969	Indiana American Water Noblesville
Elkhart	50,949	Elkhart Public Works And Utilities
Speedway	11,812	Speedway Water Works Department
Salem	6,319	Salem Water Works
Bremen	4,588	Bremen Water Department
Spencer	2,215	BBP Water Company
Edwardsville	No census data	Edwardsville Water Corporation

Figure 1. List and location of the communities served by the utilities surveyed.

While the utility survey provided substantial data from a variety of communities about how infrastructure planning occurs today in different settings, we also asked the utility representatives to comment on the role of the many state agencies that regulate and evaluate use of water. These comments prompted our team to conduct a survey of state and federal "water-related" agencies to understand how they coordinate data collection; how they interact with the other agencies; and whether they consider water supply planning a critical need for the state. The agency surveys provided the institutional perspectives on the advantages and challenges to statewide planning. These data, in combination with the 2013 and 2014 reports by the IURC, were the basis for our findings (IURC, 2013 and 2014).

What IFA found

The problem of aging infrastructure in Indiana is as serious as it is across the country. None of the utilities interviewed in this survey thought they were replacing mains at a rate that was adequate. Many felt that the process of establishing rates precluded long-term sustainable planning. Local government and regulatory authorities were considered to favor minimizing rates in the short term, frequently at the expense of system integrity and long-term costs for the next generation of customers.

Since 1980 the State of Indiana has done sporadic analyses of the water resources of the state. In the last 20 years, while utilities have grown, groundwater use has increased and surface water use has declined, there are new questions about planning for the infrastructure needed to deliver safe water to the citizens. After surveying 20 utilities about the effects of use on the resource and their various approaches to planning, we discovered that growth varies across sectors of the state, and utilities are no longer confident that they will be able to satisfy the needs of the future without talking to their neighbors.

The utilities surveyed generally agreed that more information and data about the hydrologic conditions near their wells and intakes would be useful. The consensus seemed to be that, outside of their system, little is known about the status of the aquifers, rivers, or reservoirs used by them and their neighbors. More information is needed and coordination of that information for use by utilities would help the utilities anticipate water availability and impacts as they plan for expansion. Little information is available (according to the utilities surveyed) about the status of the resource and the effects of other regional water users. This could be a role played by the state.

For a majority of the utilities surveyed there has been a noticeable deterioration in surface water or groundwater quality that reduces the yield of the resource. While many of the systems in the largest utilities had wells in the more industrialized parts of their service area, these results were unexpected and impressive. Managing these plumes and the effects of other dischargers is a problem that most of the systems are not particularly equipped to handle.

To improve the quality and efficiency of utility planning, more information is needed about the resource, neighboring water users, and the general regulatory environment of these systems. Targeted regional planning would complement a state assessment to create a modern state water plan. Agencies need to better coordinate their activities to serve the changing needs of utilities while the regulatory scheme is revisited to promote long-term investments and conservation.

1.0 HOW UTILITIES PLAN FOR THE FUTURE

1.1 Senate Bill 474

In January 2015, the Indiana General Assembly passed Senate Bill 474 (SB 474) directing the Indiana Finance Authority (IFA) to prepare a report on the status of planning and long range needs of 20 utilities in Indiana (Appendix B). The law instructed the IFA to survey the utilities that serve the fifteen most populous cities in Indiana and an additional five smaller systems that could provide some geographic and scale diversity to the investigation.

The survey was designed to determine 1) plans for continued access to water resources, 2) approaches used to assure fiscal sustainability and ratepayer protection, 3) regional cooperation among utilities and 4) other information relevant to planning. In the survey, questions were asked about the source of supply used by the utilities for drinking water, the methods used to forecast demand, the approach used for infrastructure management, and then exploratory questions were posed to allow the utilities to offer their thoughts on the topics at hand. The interview team followed the structure of the survey while allowing the response and the local conditions and characteristics of each utility to lead the discussion to any topic of interest to the utility.

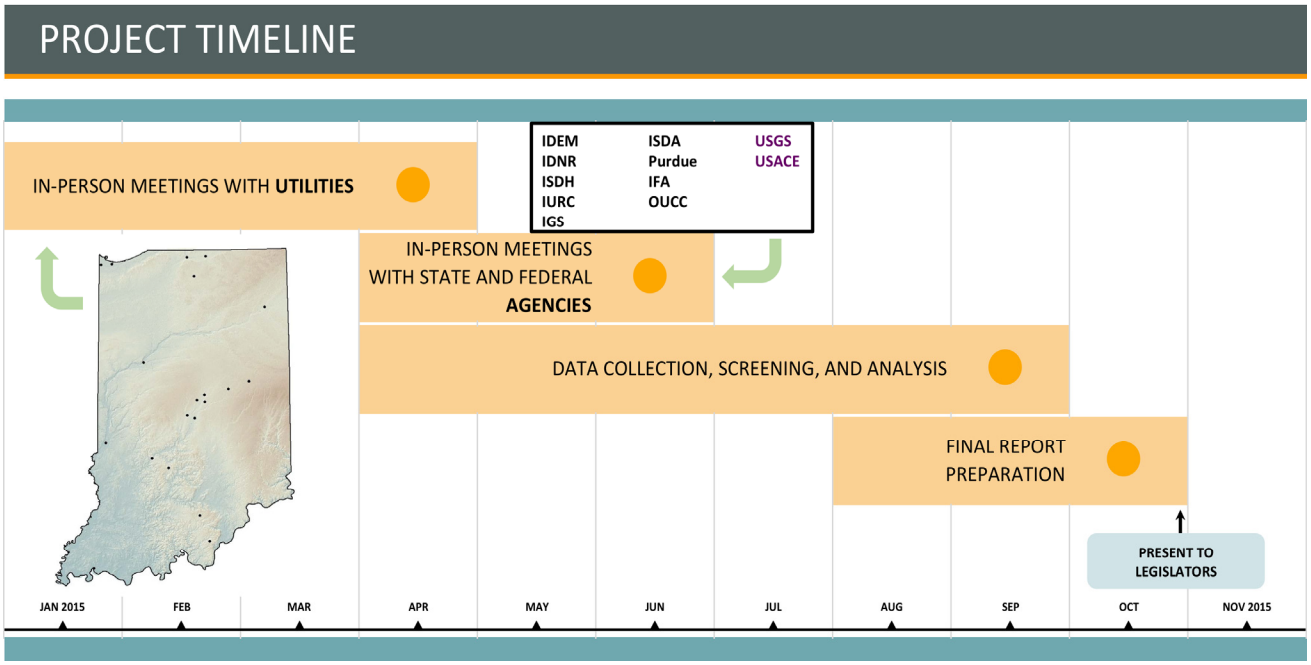


Figure 2. Timeline and steps taken to complete the requirements of SB 474.

The information collected from the survey responses was analyzed to understand how utilities surveyed plan for the future and their long term needs. Based on the results of the exploratory questions of the utility survey, the IFA conducted another survey of the state and federal agencies that have some role in water supply analysis, regulation, mapping and management. The agency surveys, while not specifically required by SB 474, provided institutional perspectives on the challenges to statewide planning. The project steps and timeline are shown in Figure 2.

1.2 Need for planning – lack of interconnectivity and resilience means systems more vulnerable

Nationally, over the past several years there has been increasing interest in water supply and state policy on water management. Neighboring states are altering the way they organize hydrologic information and the various institutions that regulate and survey the resource. Unlike electrical generators who share a transmission system to move power from a few centralized plants to their customers around the state, local water supplies and treatment plants deliver drinking water to local customers. With a few exceptions, there is no physical grid to connect the many city utilities that deliver water to industries, homes and businesses across the state. Historically, local control of the resource has served the state well. However, because many systems rely on a single source of supply, the lack of interconnectivity and resilience also means that these local systems may be more vulnerable to shortage. Economic uncertainty created by this vulnerability accompanied by the increasing use of the state's aquifers, explain why water supply planning is an active topic for policy-makers.

Senate Bill 474 (P.L. 91) called for an analysis of water resource planning by a survey of the drinking water utilities that serve the largest communities in the state and several smaller systems that serve smaller, more rural communities. By design this was not a random sample of water systems. This survey targets the utilities that could provide new insight into the range of issues faced as they respond to demographic and regulatory change. Based on the most recent census, the communities surveyed provide drinking water to about 33 percent of the residents of the state (Maupin et al, 2014). One quarter of the population obtains their drinking water from individual domestic water wells. This means that approximately 2.5 million residents of the state are served by more than 500 small and medium sized utilities that are the bulk of the water systems regulated by state agencies.

Planning for change (in demand or supply) is a part of any well-run utility and the survey was designed to identify the methods and strategies used by utilities to prepare for the future – including how they developed capital plans to replace and expand infrastructure (AWWA, 2007). While every utility reflects the local history, geography and economy of the community they serve, the survey was designed to illuminate the general principles of good planning and management.

1.3 Issues identified in previous reports

In the last several years, other important surveys and reports have been completed that identify problems and issues that need to be accounted for by water users in general and drinking water systems in particular. The Indiana Utility Regulatory Commission's (IURC) reports on water utilities (2013 and 2014) and the State Chamber report (2014) outlined the geography and timing of withdrawals among all water users. While the IURC reports focused on how water utilities manage their financial and physical assets, the Chamber report considered all water users in the state and considered the broad problems of growth in use exceeding available resources.

The IURC's two reports were based on reporting required of all utilities by Senate Enrolled Act 132 (SEA 132). More than 80 percent of all the drinking water utilities in the state participated. This survey showed that many smaller systems (and some medium systems) did not have a firm grasp of the standard methods needed to account for cost of service. The differences between the systems are great and the number of smaller systems without the institutional capacity to manage finances suggested that there are problems training and maintaining professional staff. The IURC report also showed that there was a general lack of awareness of the other water users in each basin. Among other recommendations, these two recent reports suggest that the state would benefit from regional water supply planning. The IURC analysis considered the following topics:

- State agencies with water supply responsibilities
- Water utility service territories
- Types of resources used by utilities
- Conservation and drought planning
- Infrastructure improvements
- Planning and management methods

Some of these issues were also considered in this work. Our more open-ended survey adds detail and insight into the planning and management choices being made by systems in the state.

1.4 Utility survey approach

The utility survey was constructed to provide information about the process, tools, and data that individual utilities use to plan for future water supply and infrastructure. A copy of the utility survey is provided in Appendix C.

The survey was conducted in four sections; water supply, water demand, infrastructure/fiscal sustainability, followed by a set of open-ended questions designed to allow each utility to comment on the state's regulation of utilities.

Each section of the survey is described in more detail below. The discussion was generally unconstrained by time allowing follow-up questions that introduced new topics.

1. Water supply – addresses what is known about the source yield, any trending water quality issues, and impacts from neighboring water-users. We also asked about how the utility monitors its supply; whether the utility monitors with its own equipment or if it relies on other agency monitoring such as the USGS or IDNR.

2. Water demand and planning – discusses how future demand is anticipated. This section also deals with drought and conservation planning as we try to understand how utilities plan and deal with supply shortage.

3. Infrastructure and fiscal sustainability - asks for specific information about the utilities infrastructure and capital investment planning.

4. Exploratory - asks more open ended questions to give the utilities the opportunity to discuss additional issues and/or challenges they have experienced. This section also touches upon the subject of regulation and legislation that affects utilities.

Each utility in the study was given the same survey questions. The responses to these questions, along with additional documents provided by the utility, were collated and analyzed to tabulate and highlight interesting similarities and differences. The topics discussed in this report summarize key findings. This report is not a comprehensive analysis of each question, but a focused interpretation of the results.

1.5 Utility survey response

Survey focused on the largest communities with an additional group of smaller systems.

Senate Bill 474 specified that the utilities surveyed were those that serve the 15 most populous communities with an additional five smaller utilities selected across the state. A list of these communities, their locations, and their utilities is provided in Figure 1. According to the EPA, Indiana has 789 community water supplies. This means that our survey accounts for less than 3% of the utilities in the state. However, because we were surveying the largest systems, the population of the communities served by these utilities is over two million people (2.1 million), approximately 30% of Indiana's population (US Census, 2010). So, while the number of utilities surveyed is small, the study examines the utilities that serve approximately 1/3 of the state's population (Figure 3).

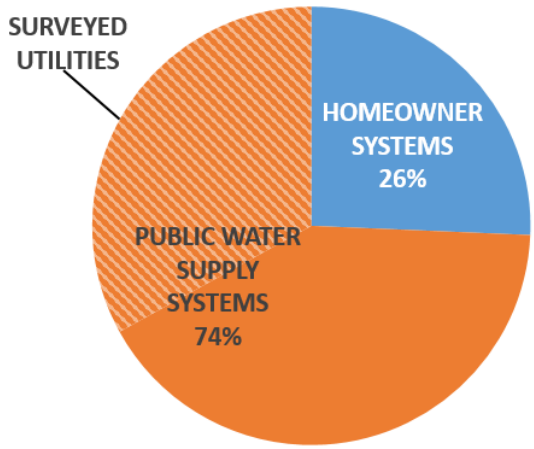


Figure 3. Distribution of the water supply for the population of Indiana (2014). The 20 utilities surveyed deliver water to about 30% of the state population.

Seventy-three percent (73%) of utilities in Indiana are considered "very small" or "small" according to the EPA community water supply classification system (Figure 4). However, eleven (11) of the utilities surveyed for this investigation are "large," defined as serving 10,001 to 100,000 people, and five(5) are "very large," serving greater than 100,000 people. By design, our survey was skewed towards larger utilities serving more populous communities.

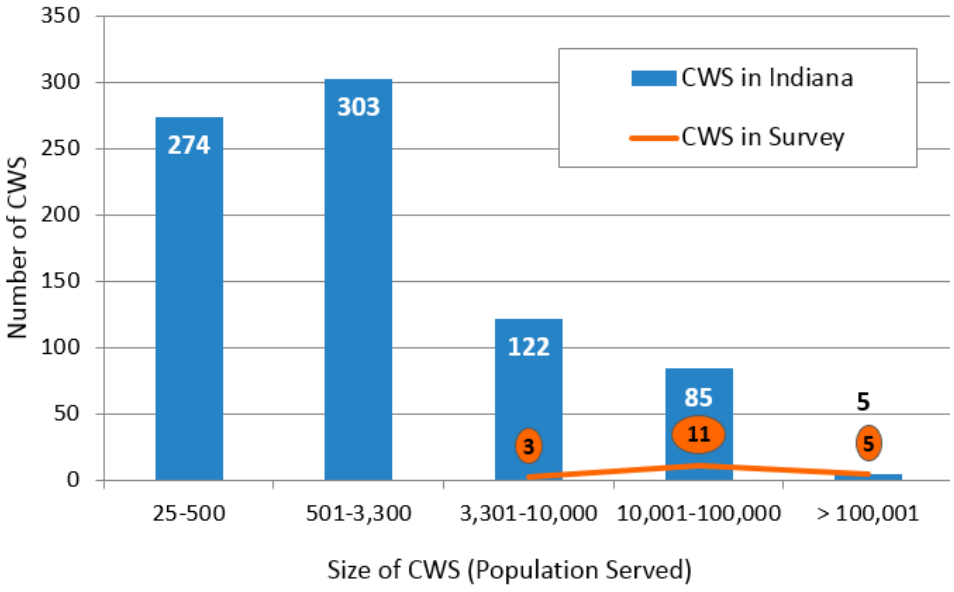


Figure 4. Number and size of Community Water Systems (CWS) in Indiana relative to the number and size of those in the survey. (There are only 19 utilities shown on the graph because Noblesville and Fishers are both served by Indiana American Water Company).

The effect of this focus on larger systems was to more often select utilities that are under the IURC's jurisdiction for establishing rates. Of the utilities in the survey, 75% were regulated by the IURC, while only about 11% of the utilities in the state are under their jurisdiction (Figure 5).

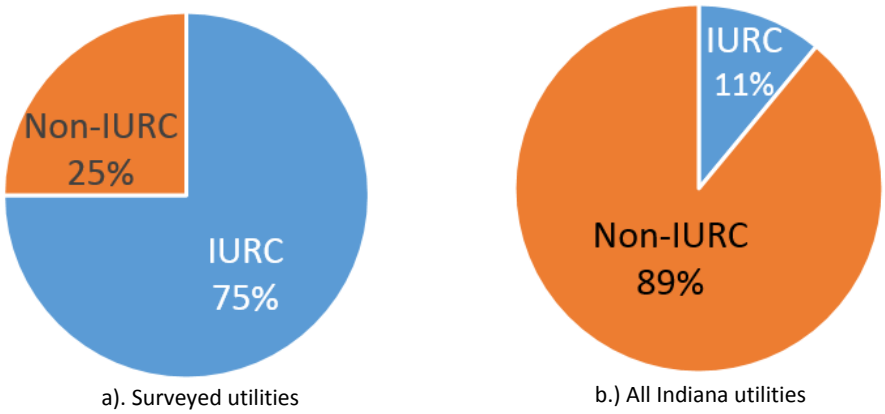


Figure 5. Percent of surveyed utilities that are regulated by the IURC and the percent of utilities in Indiana that are regulated by the IURC.

The north-to-south geographic distribution of the utilities surveyed was relatively even. Out of the total, 6 were from Northern Indiana (north of the Wabash River), 8 were in Central Indiana (between the Wabash and the unglaciated region further south) and another 6 utilities were located in Southern Indiana (between Martinsville and the Ohio River) (Figure 6).

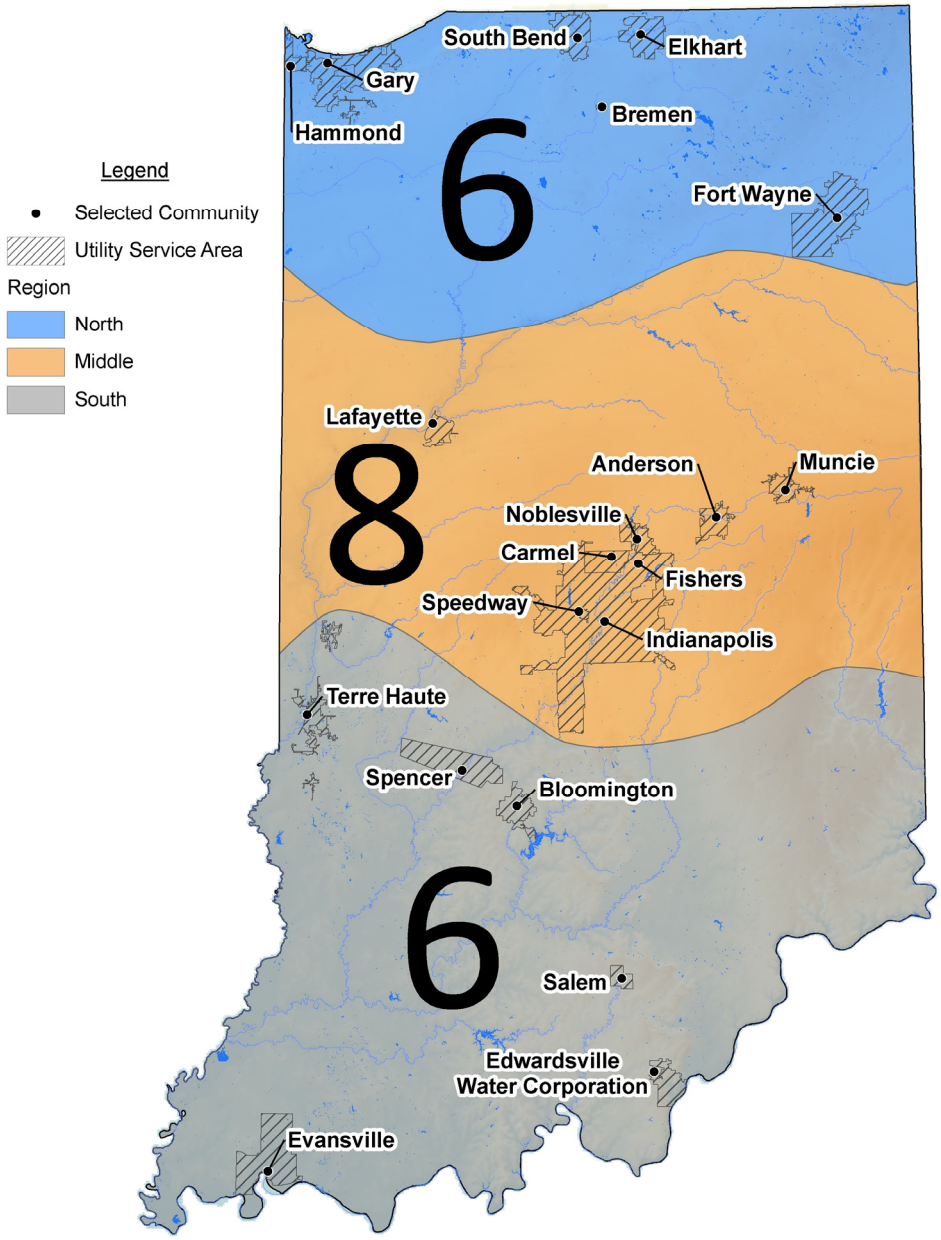
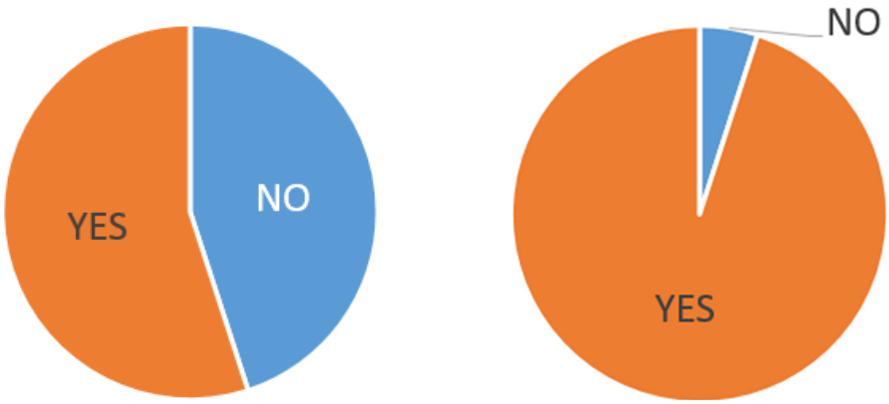


Figure 6. Number of utilities surveyed in each region of Indiana.

About half of the utilities understand the limitations on their raw water.

About half of the utilities surveyed (11 of 20) said they had estimated the yield of the aquifers, reservoirs, or surface waters they use as their source of supply (Figure 7). The survey was careful to clarify that the question was not whether the utility understood their well yields but the composite potential yield of their source of supply. For a state that has had limited experience and few rules about total regional use and limits, this is relatively high. When the utilities were asked about the methods used to derive these yield estimates, answers varied from published reports, to studies of their particular system, to

ballpark estimates based on some engineering analysis. There was no single approach used to determine the yield for the sources of supply. Some, but not all of the utilities that had an understanding of the yield (that is, several of the 11 that answered yes) also had some knowledge of the extent of other water use from the same resource beyond their intakes. When asked if the resource use was sustainable long-term, all but one of the utilities surveyed expressed confidence that current use did not exceed availability (Figure 7).



a). Do you have yield information for the water resources that supply your system?

b.) Do you believe that current yields will be available in the future?

Figure 7. Utility survey results for questions regarding water supply yield.

1.6 Few utilities consider neighboring water use when developing plans.

While only 4 of the 20 utilities surveyed noticed the effects of water use by others, half of the utilities surveyed were at least somewhat concerned about their neighbors (Figure 8). In the discussions with the system managers, this was sometimes an expression of concern about growth and new withdrawals by the adjacent utility but in some cases it was related to new non-public water supply users (e.g., irrigation, industrial use, aggregate mines, power plants). The concern about the neighbors was further illustrated by the fact that only 7 of the 20 utilities were not concerned about upstream withdrawals (Figure 8).

Despite this expression of uncertainty, only 7 of the 20 utilities accounted for the neighboring water use when they developed their plans for new supplies (Figure 8). This means that many of the systems were developing plans and building infrastructure with no knowledge of one of the factors that they thought might limit their ability to access the resource. The lack of insight about the risks of future use in each area could be addressed by hydrologic measurements in the vicinity of the reservoirs, streams and aquifers used by the utilities. However, of the 20 systems, only 12 were monitoring the source of supply (as opposed to simply monitoring their production) (Figure 8). There was consensus when asked whether additional hydrologic data and analysis would help them plan. All of the utilities said they would appreciate additional information about the resource that was provided by an impartial agency.

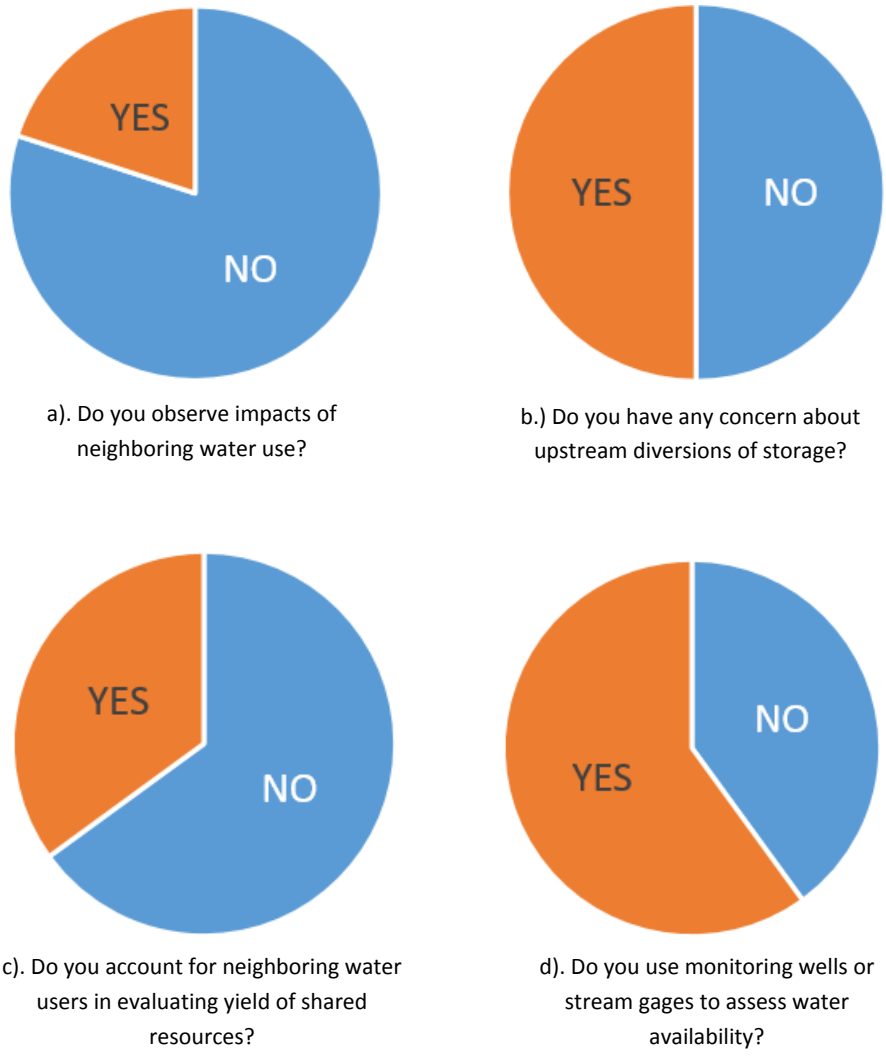


Figure 8. Utility survey results for questions regarding neighboring water users and monitoring.

Water availability is often limited by source water quality.

One of the issues addressed by this survey that had not been touched on in earlier work was the effect of water quality on water availability. The survey asked the utilities whether water quality limited yield. Surprisingly, 80% of the systems said that they had experienced some limitation on yield due to water quality (Figure 9). The source of water quality problems described by the utilities varied. In some cases it included natural compounds (e.g., iron and manganese or ammonia in groundwater) and in others the problem was related to agricultural chemicals in the source water (e.g., nutrients or pesticides in runoff) and in some groundwater supplies there were limitations because of legacy

80% of the systems said that they had experienced some limitation on yield from poor water quality.

contamination from past industrial activities (e.g., solvents). In each case, the costs of developing uncontaminated supplies from other sources had to be balanced against the additional cost of treatment. Many of the utilities mentioned that these costs (at least those related to land use practices off-site) are being inappropriately borne by their ratepayers.

When the utilities were asked if there were trends in water quality that they noticed in their raw water monitoring, 60 percent said that water quality was getting worse (Figure 9). In some cases this was described as problems with seasonal runoff and in others it was a problem of intercepting plumes of contaminants that had not been previously identified. The issue of groundwater quality affecting public water supply yield is addressed by existing wellhead protection regulation. However, other than sophisticated (and costly) treatment, there are few resources available for dealing with the problems caused by transient releases from non-point sources upstream.

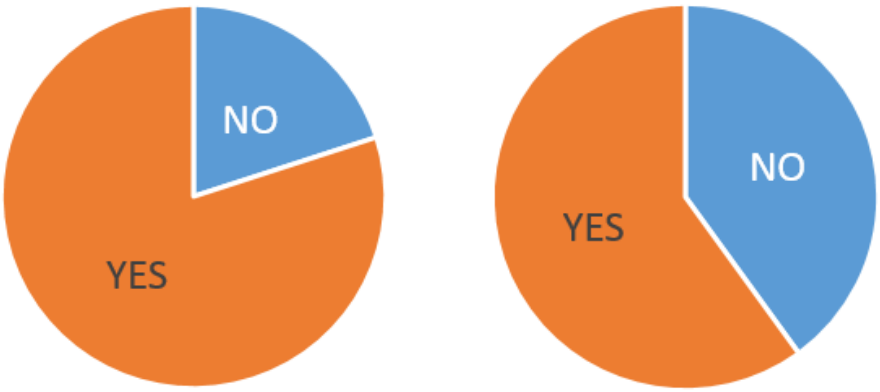
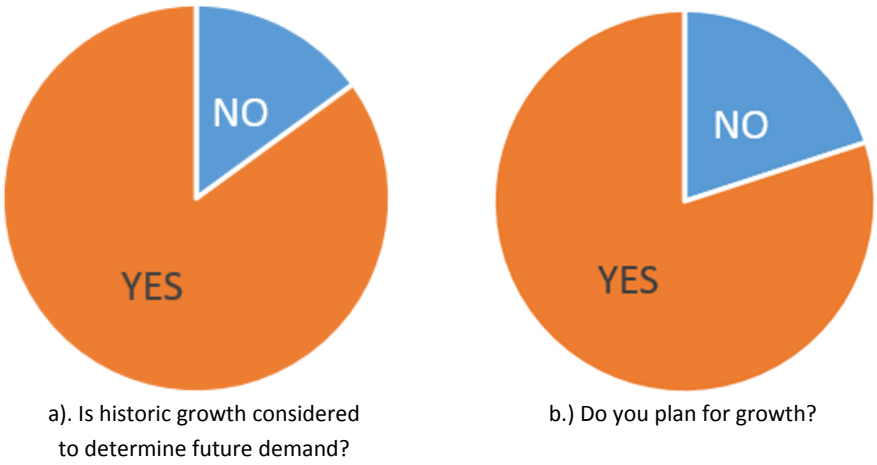


Figure 9. Utility survey results for questions regarding water quality.

Most utilities anticipate future demand by looking at history.

Demand forecasting is a primary input to water supply planning. Consequently, there were several questions posed regarding demand, methods for projections and the length of planning horizons. Nearly all (15 of 20) of the survey utilities use historic trends in population and water use to prepare forecasts of future demand (Figure 10). The larger utilities have staff with the expertise to assess population trends, including land use analyses integrated with geographical information systems (GIS). This gives them the ability to disaggregate residential use from commercial-industrial (CI) use and CI use further by, for example, Standard Industrial Classification (SIC), allowing for more accurate forecasts. Smaller utilities responded that they rely on other agencies (e.g., chambers of commerce, plan commissions, economic development offices) for population forecasts to inform planning.

Of the 20 utilities, 4 responded that they do little to no planning for growth (Figure 10). While this appears to be shortsighted, this response was often explained by demographics. Two of these survey utilities had over 5 percent negative population growth rates, based on Census populations from 2000 to 2010. (However, another 5 of the 20 survey utilities also had negative growth but still engage in demand forecasting.) These two utilities have plentiful source waters and now are dealing more with infrastructure upkeep than concerns about securing additional water for a growing population. The other two communities serve fewer than 10,000 people, so the incentive and resources to engage in long-term planning, and the demand forecasting involved, don't exist.



a). Is historic growth considered to determine future demand?

b.) Do you plan for growth?

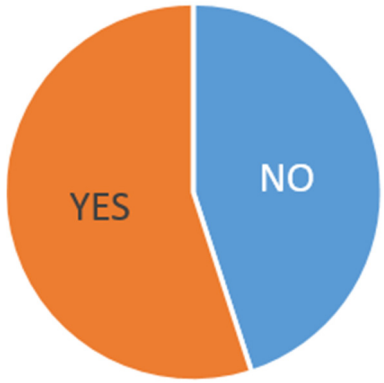
Figure 10. Utility survey results for questions regarding demand planning?

For several communities, their source of supply is more plentiful than their water demand (e.g., Ohio River, Lake Michigan). The utilities serve fairly large populations (from 80,000 to 160,000), yet they have seen significant population declines (from -3 percent to -22 percent). However, like most of the growing communities, forecasts of demand using models of historic population and water use is conducted, but with generally shorter planning horizons. In such cases, utility resources are directed toward maintaining or improving existing facilities rather than acquiring new sources of water; building reservoirs, intakes, and wells; or treatment facilities and distribution systems.

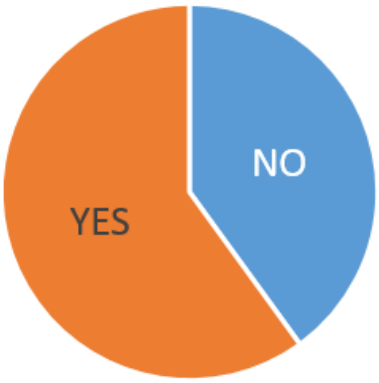
More than half of the utilities have shortage, drought and conservation plans.

The utilities surveyed were also asked about conservation, shortage, and drought planning. A total of eleven (11) utilities have a conservation plan. Twelve (12) of the utilities surveyed have a shortage plan, while only six (6) utilities have a drought ordinance. Six (6) of the utilities do not have any conservation plan, shortage plan, or a drought ordinance (Figure 11).

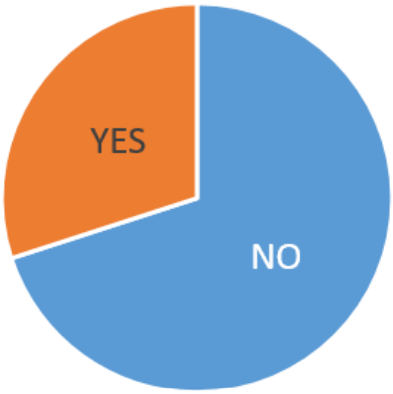
The twenty (20) utilities were also asked what the most common hurdle to long-range planning was for them. Nine (9) utilities cited that a lack of regional water planning was a hurdle to long-range planning. Nine (9) utilities also cited that unfunded mandates and regulations were a hurdle to long-range planning.



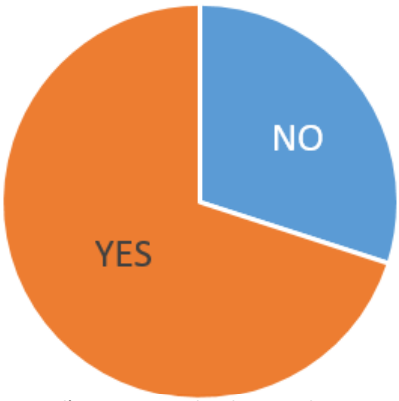
a). Does your utility have a conservation plan?



b.) Does your utility have measures in place to deal with shortage of any kind?



c). Does your utility have a drought ordinance?



d). Do your utility have either a shortage plan, conservation plan, or a drought ordinance?

Figure 11. Utility survey results for questions regarding shortage, drought, and conservation plans.

Nearly all of the utilities surveyed said they were unable to invest adequately in infrastructure.

With only a few exceptions, the utilities surveyed for this study indicated that they need to invest more in their infrastructure. Notably, the utility with the most well-developed asset management program - currently replacing aging pipes at a rate of 0.7% per year (143–year cycle) - reported that their planning indicates a need to increase that rate. Because of the uniqueness of each utility (e.g., treatment plant age, pipe installation dates and materials) it is not possible to directly calculate the adequacy of investment by Indiana utilities with the data

currently available. One way to get a sense of the scale of the problem is by evaluating trends in the value of Utility Plant in Service (UPIS).

Utility Plant in Service (UPIS) is the total of the original cost of all infrastructure assets in use by the utility. UPIS totals reported to the IURC reflect the original cost of utility infrastructure and do not include accumulated depreciation. While trends in UPIS are limited as an indicator of the adequacy of investment in utility infrastructure, because of the need to regularly invest in renewal of aging infrastructure, a steady or declining UPIS is a clear sign of underinvestment. For the nineteen utilities surveyed that reported data for the years 2011 to 2013, the general trend in UPIS is increasing for fifteen (78.9%), steady for three (15.8%) and decreasing for one (5.3%). There are 450 Indiana utilities that reported their UPIS data to the IURC in 2012 and 2013. Of those, 216 (48%) reported steady or decreasing UPIS year to year. Based only on this simple (and crude) metric we can say that our utilities surveyed appear to be doing a better job of investing in their infrastructure than Indiana utilities as a whole.

The data collected in this survey and previous surveys conducted by the IURC show that the majority of Indiana water utilities are unable to adequately invest in infrastructure, risking the deterioration of service quality and reliability and shifting costs to future generations. Several factors contribute to inadequate investment 1) Misunderstanding of value, 2) Short-term thinking and 3) Poor planning. These factors are described in the following sections.

Misunderstanding of value

Limited public understanding of the value of infrastructure limits support for necessary investments (pipes are expensive but invisible). In the 2015 AWWA State of the Water Industry Report two of the top five concerns of utility professionals were that the customers had no sense of the value of the infrastructure or the resource (AWWA, 2015). As they point out in that report, "*Effectively communicating infrastructure challenges to customers and key decision makers is vital, yet the industry has historically struggled in this area.*"

Short-term thinking

Local officials and regulators resist rate increases out of well-intentioned concern over affordability without realizing that this ultimately makes the problem worse. Underfunding current maintenance and investment needs "buys" lower rates today with higher than necessary rates for future generations. Intergenerational affordability is sacrificed by short-term underinvestment. Long-term affordability can be addressed with focused assistance programs for the most vulnerable and regional cooperation to reduce costs for smaller utilities.

Poor planning

Investment needs are generally underestimated by those utilities that have weaker infrastructure planning and asset management practices. The only way to be fiscally sustainable is to understand the funding and replacement needs of water infrastructure.

All of the utilities surveyed were asked about their capital investment plans. Fourteen out of the nineteen utilities had a 5-year capital investment plan (CIP), which they updated annually. In addition, nine of the utilities also maintained CIPs that project investments 10 or 20 years into the future. Longer-horizon CIPs were generally for very large capital projects, and for projected investments that focus on groups of assets, such as water main replacements. Asset management planning can provide much longer-range forecasts (30 years or more) which can be helpful for projecting the likely magnitude of future investments and planning to manage competing capital needs and long-term rates. Five of the utilities budgeted capital projects from year to year, developing 5-year or longer CIP's only when planning for large projects or as the basis for a water-rate increase petition.

Utilities focus on reliability and efficiency

A majority of the utilities noted that they take advantage of other planned municipal infrastructure improvements to minimize costs and disruption. In these instances, water main and service line replacement projects are coordinated with sewer improvements to comply with long-term control plans (LTCP), utility relocations driven by highway or road improvements, or street repaving projects. Several of the utilities reported that they stagger investments in sewer and water systems to avoid simultaneous impacts of separate rate increases.

A few of the utilities surveyed noted that their planning is focused primarily on improving reliability and efficiency, not on growth. Utilities that formerly supplied large amounts of water to industry have excess capacity today, a result of loss of industry and successful efforts by remaining industries to improve efficiency of water use. These utilities focus their planning efforts on right-sizing of supply, treatment and pumping facilities and replacement of aging infrastructure.

Table 1 summarizes the total utility plant in service (UPIS) and planned 5-year capital investment plan (CIP) per customer for the utilities surveyed. Note that because UPIS reflects the total original construction cost, it is always less than the true replacement cost of existing infrastructure. Utilities with more recently constructed infrastructure will, all other things being equal, have a higher UPIS.

Table 1. Summary of 5-year capital investment plan and UPIS for surveyed utilities.

	Minimum	Maximum	Mean	Median
5-Year CIP per customer	$ 12	$ 2,252	$ 681	$ 560
UPIS per customer	$ 1,244	$ 5,787	$ 3,439	$ 3,175
5-Year CIP as a percentage of UPIS	0.3%	144.3%	24.1%	17.6%

Figure 12 indicates the percentage of surveyed and SEA132-reporting utilities that reported plans to make investments within the next 5 years in different types of infrastructure. Transmission and distribution is the most common target of planned investment. In fact, many utilities identified transmission and distribution investments in multiple years. The state-wide group of SEA132-reporting utilities reported planned investment with significantly less frequency than the survey group. Considering the known needs of utilities in general, particularly in the replacement of aging distribution systems, the low frequency of planned investment indicates that as a whole Indiana utilities are unable to adequately invest in infrastructure. A more detailed discussion of infrastructure and Indiana utilities is provided in Appendix D.

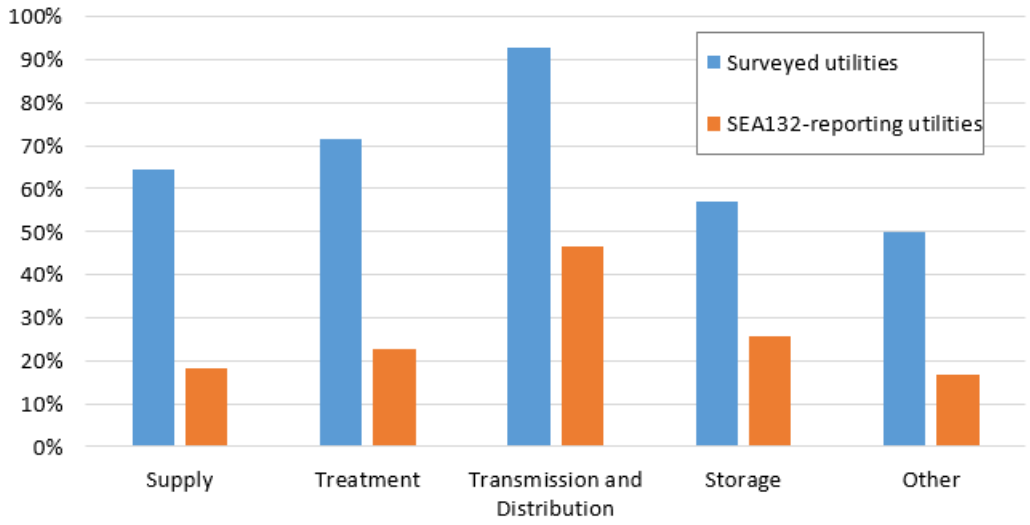


Figure 12. Percentage of utilities with planned investment in next 5 years

Utilities would like the state to help by collecting and interpreting relevant data.

The final section of the survey was open-ended. Each utility was asked to offer their ideas and comments about how the state was supporting the planning process.

When asked how the state could assist with long-range water resource planning there were a variety of responses related to water resources.

- 80% said they would appreciate support with water quantity data, including aquifer data, stream flow data, and basin studies.
- 25% indicated that they would like the state to provide more useful water quality data, including Potential Sources of Contamination and NPDES permit holder data.
- One utility said they would like the state to provide water quality and quantity data from a neighboring state.
- One utility responded by asking the state to assist with data analysis.

Almost half of the utilities surveyed (9/20) thought that the state should provide dedicated funding to support water resource planning. Both municipal and non-municipal utilities wanted the state to develop economic and demographic growth models (8/20). Many utilities requested information about irrigation wells and agricultural water use (8/20). Utilities wanted to know more about non-utility withdrawals and their combined impacts on water availability (7/20). Utilities requested that the state improve data requests and accessibility (6/20). Specifically, utilities wanted the state to better coordinate their requests for data and make accessing the data easier.

2.0 INTERPRETATION OF SURVEY RESPONSE

Water utility planning is affected both by water resource availability and changes in demand. In Indiana the hydrology and geography varies dramatically from north to south. This section considers how the geography of the state was reflected in the responses received during the survey.

Indiana's abundance of water resources varies with location, quantity, and quality throughout the state (Clark, 1980). Surface water intakes are often installed on large rivers, such as the Ohio, White or Wabash Rivers, or utilities use reservoirs as their source of supply. Figure 13 shows the surface water intakes in the state. Generally the rivers are closer together in the north and further apart in the south. In a similar way, groundwater is more plentiful in the northern part of the state where glacial action created extensive unconsolidated water-yielding deposits.

Figure 14 shows the high capacity groundwater wells in Indiana (IDNR, 2014). As discussed in the 2014 Indiana Chamber report, water is abundant in the northern part of the state (generally north of the Wabash River) because there are both "relatively thick regional aquifers and large, drought-resistant streams" (Chamber, 2014). In the central part of the state, water resources are more limited. Streamflows are made up of more runoff and the alluvial aquifers are relatively narrow. Reservoir storage in Central Indiana is positioned near the larger population centers. The more dense concentration of people and the more sparse water resources makes it critical that the system is managed properly to accommodate growth. In the southern part of the state, groundwater is limited by the absence of aquifers and substantial surface water is only available in the lower reaches of the rivers or the Army Corps of Engineers reservoirs (Figure 13 and Figure 14).

The abundant aquifers and even spacing of medium-size communities in the northern part of the state allow the utilities in this area to have less concern about their neighboring water users than other areas. While the cities are often built around historic manufacturing centers, they are surrounded by farmland. Based on the IDNR water withdrawal data, industrial withdrawals are falling while more wells are being added for irrigation than any other use. Both shallow sand and deeper bedrock aquifers are used to supply irrigation in parts of this region.

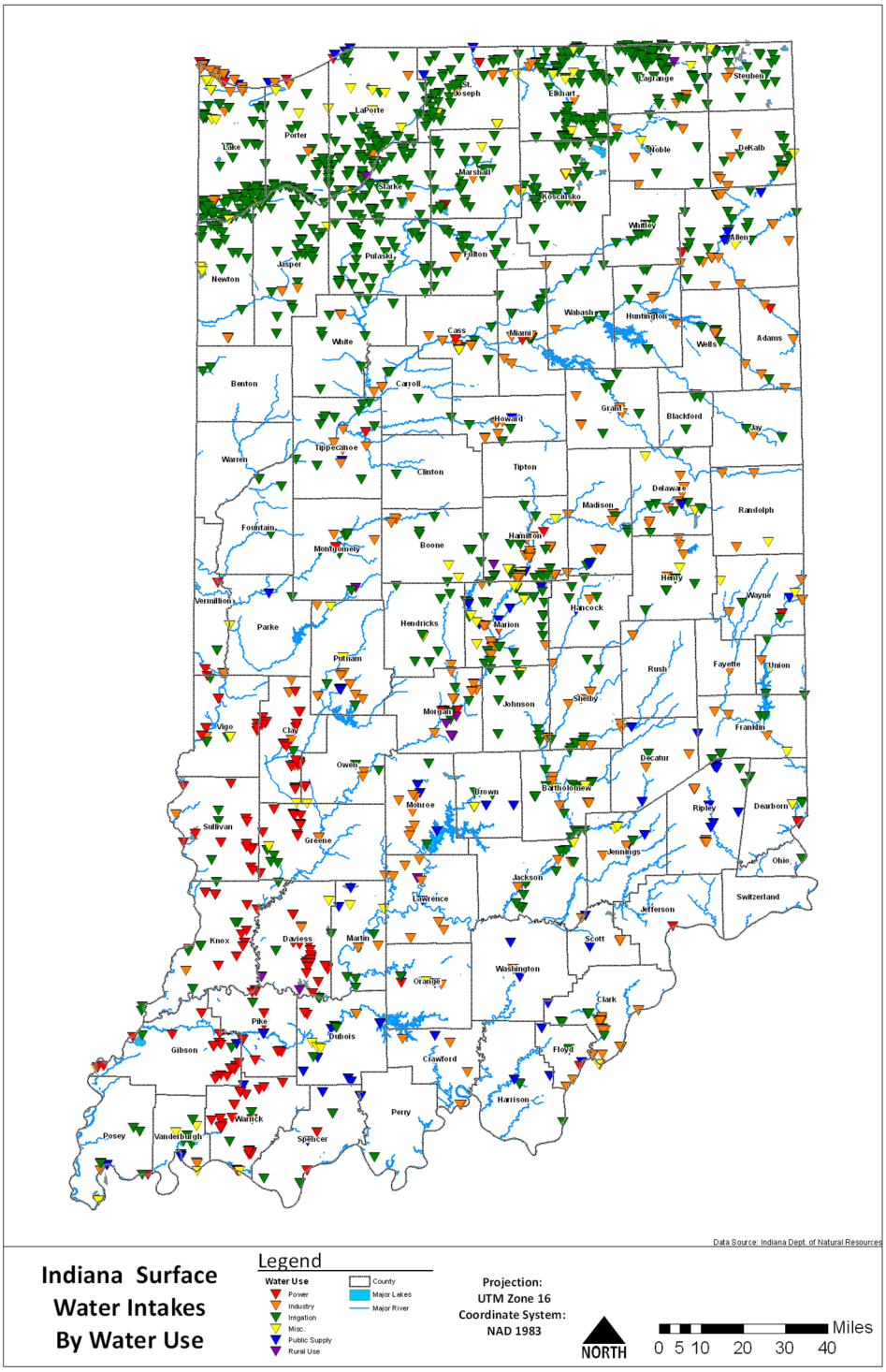


Figure 13. Surface water intakes by water-use sector in Indiana (Chamber, 2014).

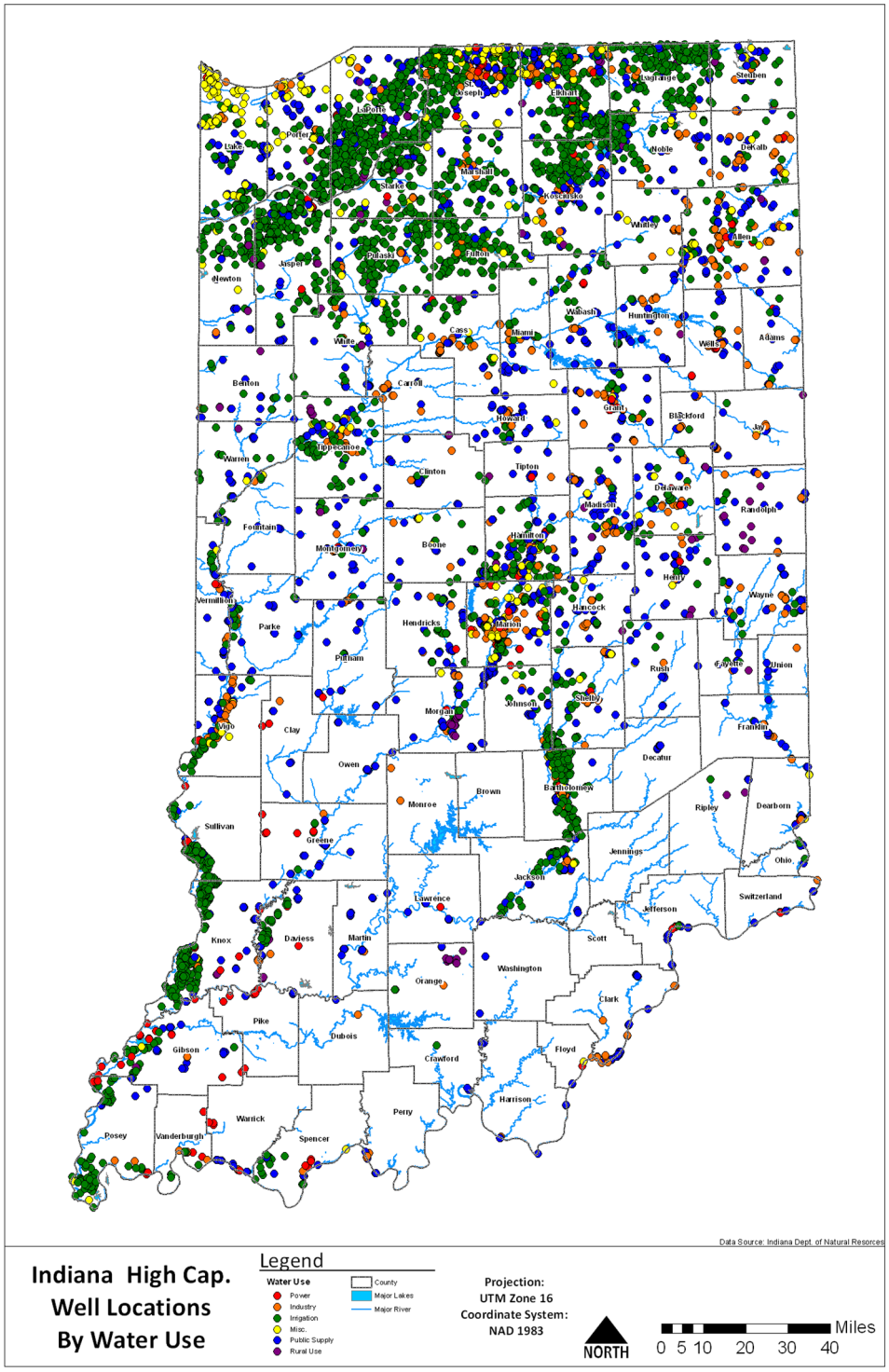


Figure 14. Groundwater wells by water use in Indiana (Chamber, 2014).

The central part of the state has less abundant water supplies and greater population growth. The area is dissected by narrow, shallow alluvial aquifers along larger rivers and the cities may use reservoirs to supplement other supplies and to satisfy growing demands. The land use in the central region is more industrial and metropolitan in the counties surrounding Indianapolis with utilities that serve many thousand customers. Unlike the other two regions of the state, the municipalities in this (metro) region are relatively close to one another, often sharing service area boundaries.

Many utilities in the southern part of the state rely on surface water sources (reservoirs and rivers) for their communities. Several communities with access to the alluvial aquifers adjacent to larger rivers use wells along the rivers as their source of raw water for their system. While the supplies are larger and the resource is less vulnerable to drought, the southern part of the state has many water users besides water utilities. Some of the larger power plants are located on the big rivers, mining is important especially in the southeast, and like other areas of the state, irrigation is a growing use in the flood plains. It is a well-understood aspect of this region that the sources of supply are abundant but they may be distant from the areas where water is needed. The hydrology of the state explains the number of regional water districts and rural utilities that have been developed south of Bloomington.

Geography of changing demand

The future demand for water is affected by differing rates of population growth. Many of the surveyed communities in the northern region have experienced negative growth from 2000 to 2010, however irrigation use is increasing fastest in this region (Figure 15). Conversely, many of the surveyed communities in the central region of the state experienced significant growth from 2000 to 2010 and for many of the counties in the central region, public supply is the biggest user (Chamber, 2014). In the southern part of the state the growth rate from 2000 to 2010 of the surveyed communities varied; a number of counties in the southern region have a large amount of water use by the energy and industrial sectors, however this use is concentrated primarily near large rivers and reservoirs (Figure 15).

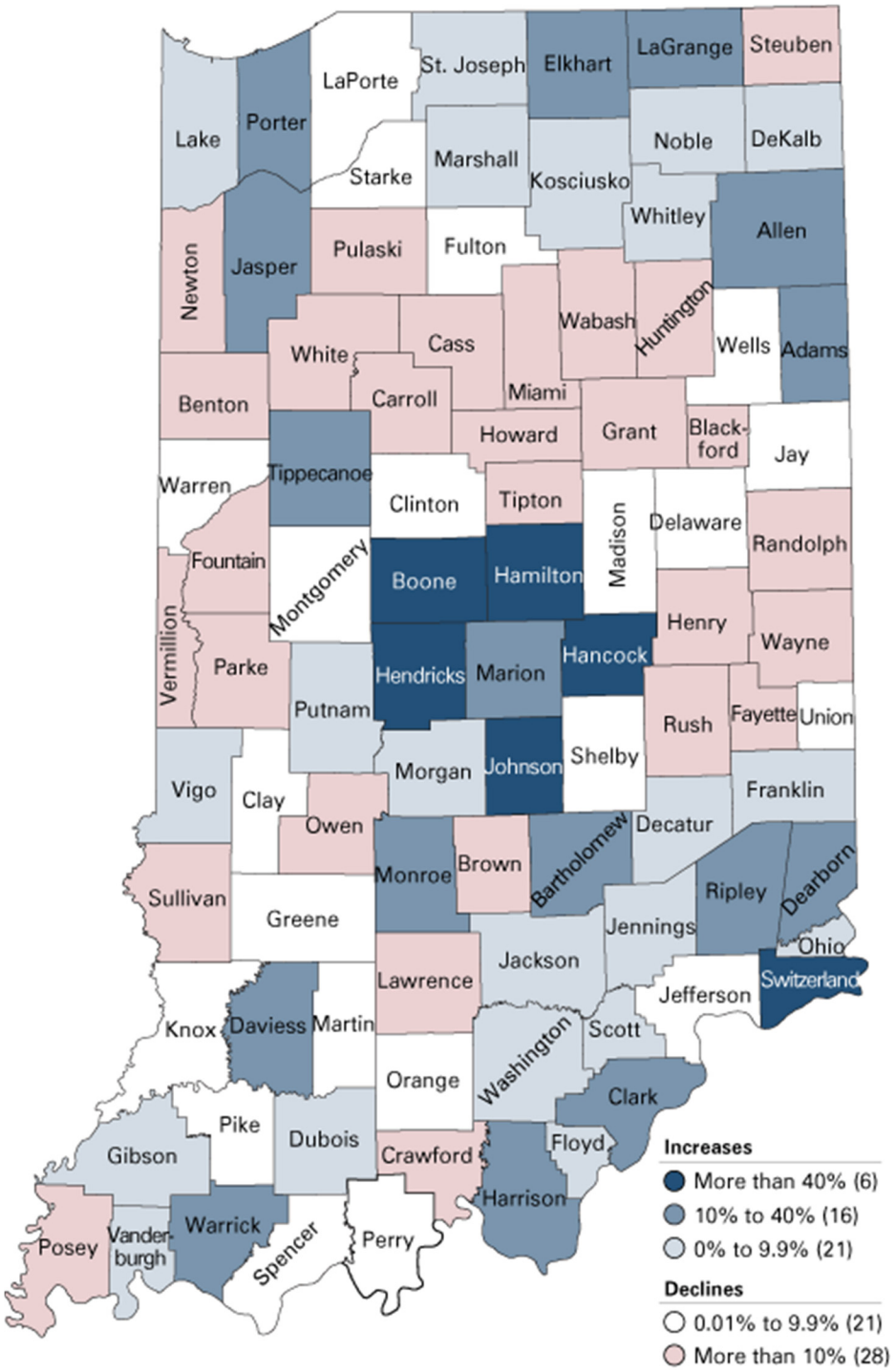


Figure 15. Population change by county in Indiana from 2000-2010 (Kinghorn, 2012).

Growing demand and constrained supplies make Central Indiana utilities more attentive.

A number of responses to the utility survey highlighted the regional differences. For example, we asked the utilities if they have an estimate of yield in their wells, wellfields, and/or intakes. Four (4) of the six northern region utilities and three (3) of the six southern region utilities do not know the yield of the source of supply. Only two (2) of the eight central region utilities do not know their source yield (Figure 16).

This makes sense regionally because in the central region where the utilities are very close to one another, it is critical that the utility know the available yield of their supply. In the north, where groundwater is relatively abundant and some utilities use Lake Michigan water, it is understandable that utilities are less concerned about their sources of supply. This sensitivity is also apparent when we asked about the effect of neighboring users. Out of the eight (8) utilities surveyed in the central region, five (5) utilities account for neighboring users, whereas the majority of the utilities surveyed in the north and south regions do not account for neighboring users.

We also asked if the utilities notice impacts from neighboring water users. Four (4) of the utilities that notice impacts from neighboring users are located in the central region around the large population high growth centers. There were also (2) utilities that reported they do not notice impact from neighboring utilities but do notice impacts from nearby agriculture or irrigation wells. One (1) of these utilities is located in the central region and the other is located in the southern region.

Despite the fact that only six (6) utilities surveyed notice impact from surrounding users, ten (10) utilities are concerned about upstream users. Six (6) of the eight (8) utilities in the central region are concerned with upstream users, while only two (2) utilities in the northern and two (2) in the southern regions are concerned (Figure 17). This data again points to the large population centers experiencing the most growth in the central region.

Central Indiana utilities often pay closer attention to their sources of supply.

Although most of the northern and southern region utilities said that they have not noticed impacts from neighboring water users, they did not (as often) have the data to back up their observation. Three (3) of the northern utilities and four (4) of the southern utilities do not monitor their sources, while seven (7) of the eight (8) central region utilities monitor their supply and six (6) know the yield of their source of supply (Figure 18).

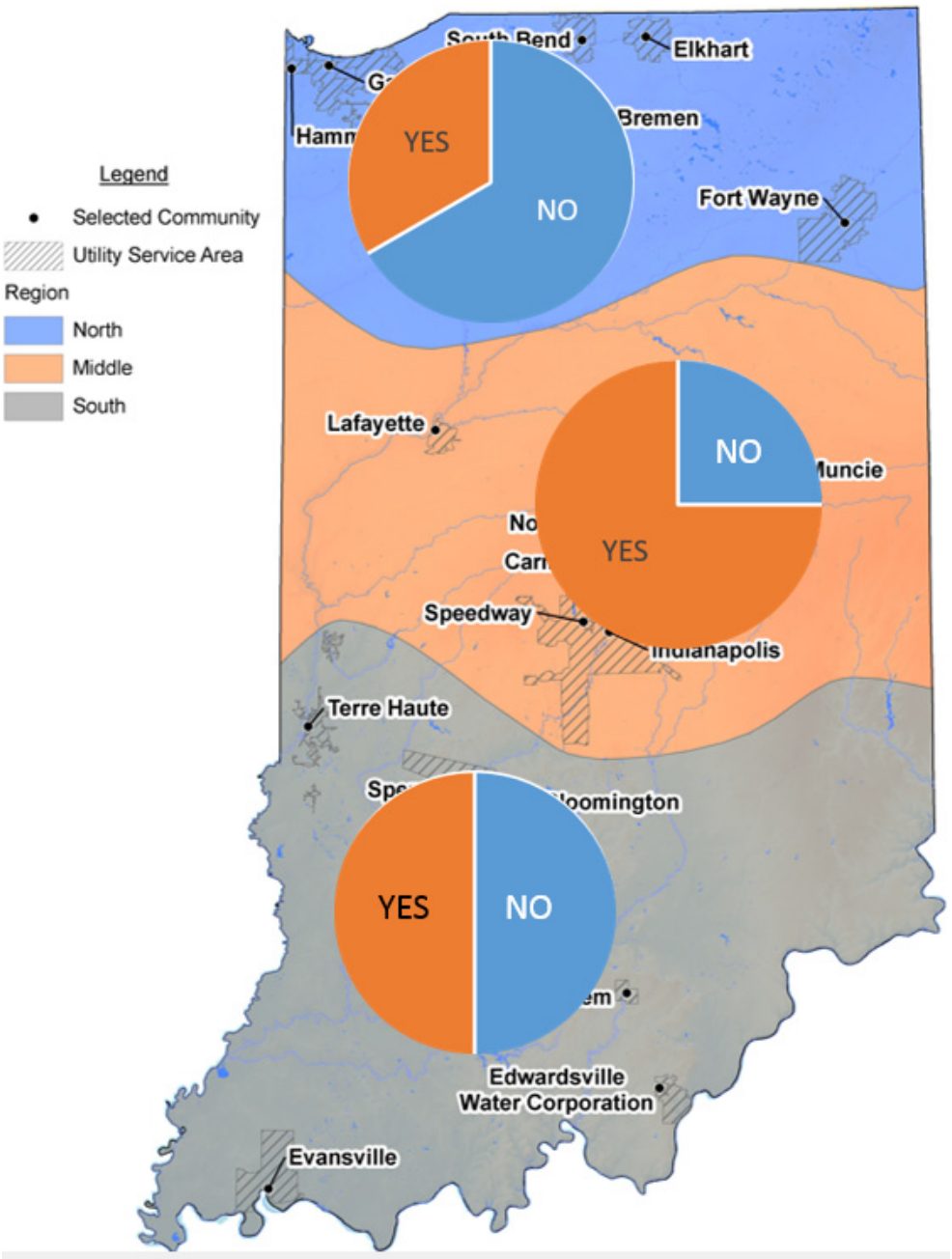


Figure 16. Regional results of the utility survey regarding knowledge of yield of utilized water resource.

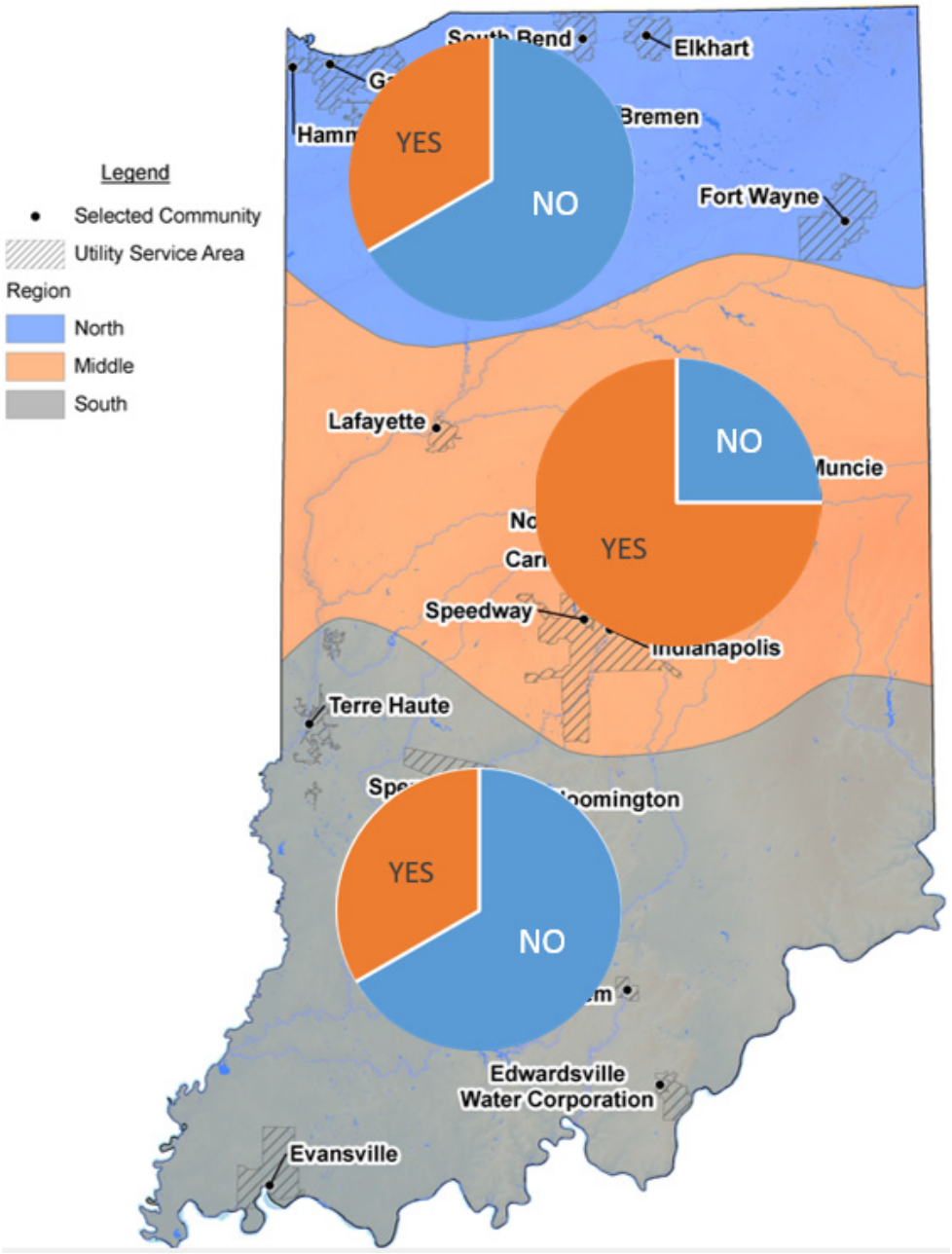


Figure 17. Regional results of the utility survey regarding concern for upstream users.

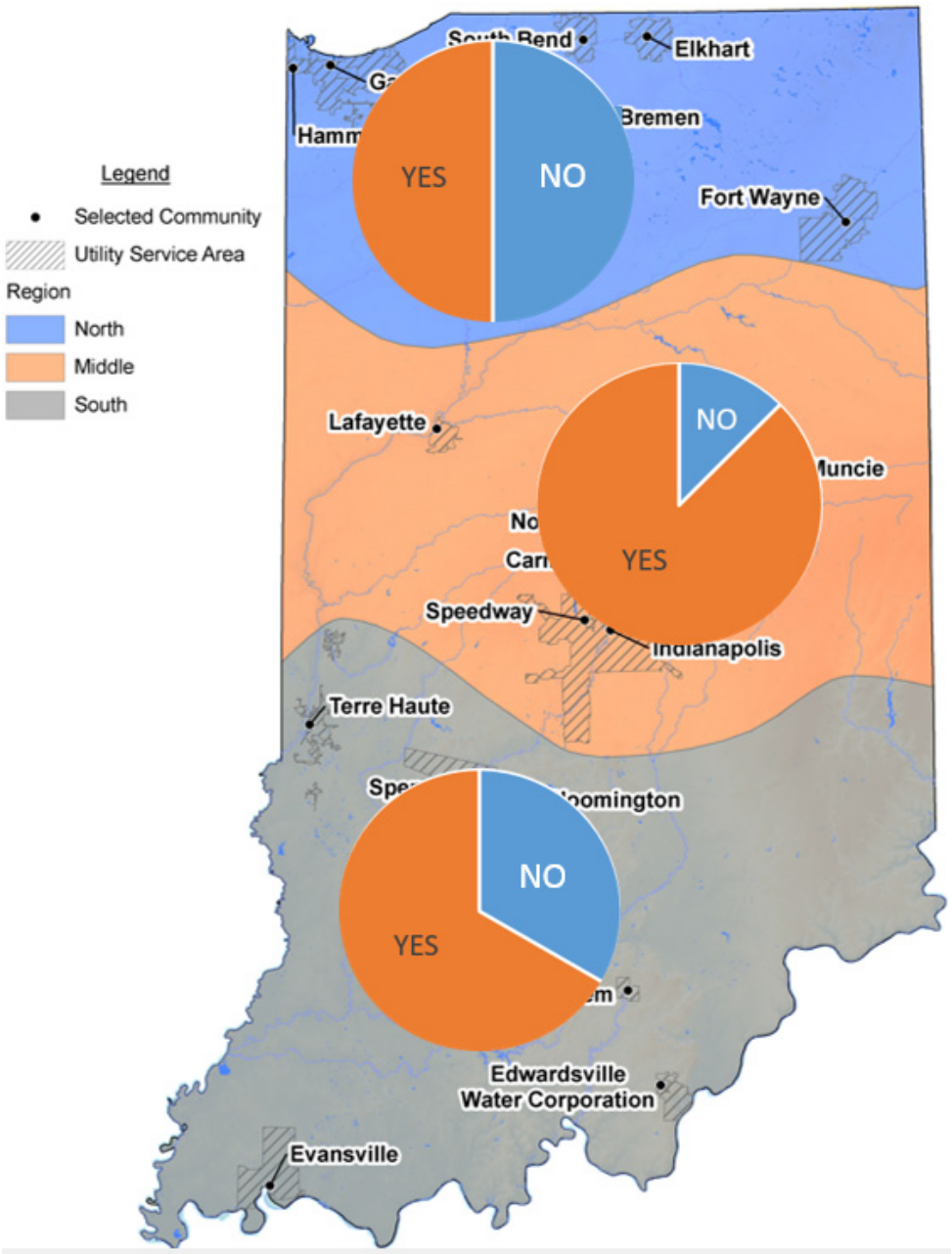


Figure 18. Regional results of the utility survey question asking if the utility monitors the source water.

Infrastructure constraints vary by region

Rather than being only concerned about availability in the central region, seven (7) of the eight (8) utilities surveyed reported infrastructure and/or design constraints that also limited options. The constraints mentioned by the central utilities included dead ends, aging pipes, undersized pipes, raw water transmission limits, and sedimentation in conveyance. Four (4) of the six (6) utilities in the southern region also reported design constraints that limit water availability. These southern utilities reported physical conditions limiting construction, aging pipes, sedimentation in storage, and undersized pipes. Given the fact that many of the cities in the northern region have excess capacity, it make sense that only two (2) of the six (6) utilities reported design limitations of treatment capacity and aging pipes.

Utilities have different types of neighbors in each region of the state.

"We would like to know who are the significant water users (not just utilities, but also mining, industry, agriculture and energy) in the area and how much water they withdraw and from what location. We'd like to see this data compiled and analyzed to draw observations on existing demands and how this impacts the resources available. We'd also like to see future growth projections analyzed and the impact this growth has on the sustainability of the sources used."

In the north the utilities have industrial and municipal neighbors that may be a part of their networks in the regional River Basin Commissions or the Great Lakes Compact. The St. Joseph River Basin and the Kankakee River Basin each have commissions that include representatives of the utilities and the counties as they work to protect water quality. Many irrigators near the Michigan state line are organized as the Michiana Irrigation Association. This group hosts technical discussions about water use in the region.

Utilities in the north have these organizations to support participation in these discussions and are often aware of these organizations regardless of the degree to which they participate as members.

Water use in the middle of Indiana is dominated by public supply systems. In the past several months these utilities have begun meeting as the "Central Indiana Drinking Water Collaborative." This group is making itself aware of the activities of their neighboring utilities and developing a planning process to consider how the region can satisfy the needs of growth.

Southern Indiana has many small volume but large service area utilities. While groundwater use along streams is increasing and water quality is a concern, the needs in the south are for plans to move water from distant but abundant sources.

2.1 Utilities (statewide) may know their neighbors but have no forum to communicate with them.

Almost all (18 of the 20) utilities reported knowing the significant withdrawals near their systems but only eleven (11) have communicated with these neighbors. Each region has utilities that are communicating with other significant users; four (4) utilities in the northern region, five (5) utilities in the central region, and two (2) utilities in the southern region. During the open-ended conversations many utilities offered their opinions about how this could be improved. The consensus of the survey was that the state could help them with communication and discussion to establish and maintain working relationships between the various water users in their areas.

2.2 The state should convene regional meetings and provide technical support and leadership.

According to the utilities surveyed, the state can assist with long-range planning primarily by providing funding for planning (9 utilities); developing coordinated, online data requests (6 utilities); and by notifying the utilities of new water projects (5 utilities).

"It could be beneficial to host a conference of large users, including sectors of agriculture, industry, public water supply, energy, and others. We want to know what the others are thinking."

Six (6) of the eight (8) central region utilities think that funding and guidance for planning would be a useful way the state could assist with long-range planning. This speaks to the fact that local utilities in Central Indiana have already begun the public process of planning without any state support. While their independence is admirable, many of the smaller utilities surveyed for this project expressed concern that the state had no formal role in the planning effort being discussed. The smaller utilities were sensitive to the perception that the larger utilities may be thinking of "planning" as a marketing opportunity rather than a discussion of supply and demand. In the survey it was clear that this call for state support was based on a general sense of "home rule" and self-determination that drives many decisions in these communities.

Response to one open-ended question evoked a near-unanimous response among the utilities surveyed – all but two of the water utilities said they thought the state should be playing a larger role in, "... bringing all neighboring water users together." Most systems were not interested in interference with their priorities as much as they wanted the state to help in convening discussion among water users so each could discuss their plans for new development. In some areas of the state the water utilities are not growing as fast as other users. Agricultural use or cooling water demands may be growing more rapidly than public water systems.

2.3 Regional planning needs to adapt to the characteristics of the region.

> *"It feels like utilities are continually faced with new regulations, while other non-utility water users are not."*

The utilities in every part of the state operate in unique circumstances. Regional planning needs to adapt to the characteristics of the region. The utilities surveyed were asked to identify any hurdles to long-range planning. Nine (9) utilities cited the lack of a regional water planning process as a hurdle to long-range planning; six (6) of the eight (8) central region utilities, one (1) northern region utility, and two (2) southern region utility (Figure 19). Nine (9) utilities reported that unfunded mandates and regulations were a hurdle to long-range planning; five (5) in the northern region, two (2) in the central region, and two (2) in the southern region.

The impact of regulations and unfunded mandates is significant for the northern utilities. One utility stated they feel "over-regulated" and suggests that the state, Could tailor regulations to each utility.

The need for regional planning is also noteworthy. Several utilities, particularly in the central region, added to their comments that a neutral, third party was needed to lead the regional planning effort. One utility felt it was the responsibility of the utilities to lead the planning efforts.

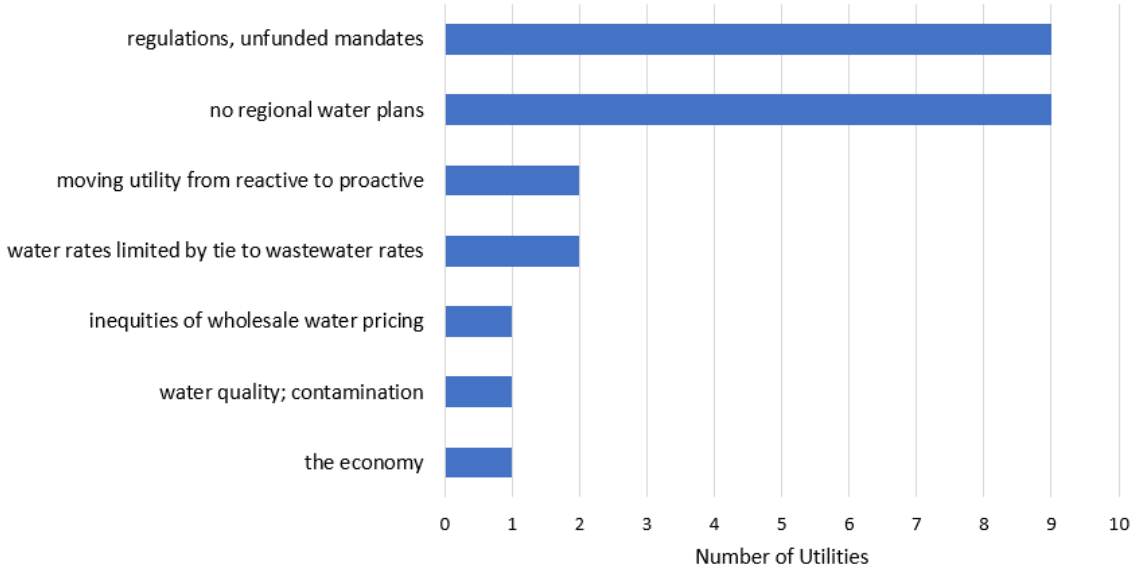


Figure 19. Utility survey results regarding hurdles to planning.

2.4 Utilities suggested that the state manage acquisition and interpretation of data to support planning.

> *"Could the state develop a portal where we would report our data that could then be accessed by all the state and federal agencies that need it?"*

When open-ended discussion questions were asked about how the state could support long-range water resource planning, no limits were placed on the number of suggestions. There were fifty-five (55) suggestions that additional data would be useful, in one form or another. Out of the thirty responses to this question from the central region utilities, all of them said they would like more water level, aquifer, and streamflow data to better understand constraints on the system. Each utility in the central part of the state expressed an interest in understanding the composite effects of all the withdrawals on the resource and each other.

Embedded within these comments was a general sense of disappointment that the state was not already doing the work of "connecting the dots." The utilities expressed a sense of urgency about this need. They explained that while they would like the state to be responsible for data collection and analysis, if that doesn't occur, the utilities would take steps to meet among themselves to define regional priorities. The utilities recognize the importance of planning to their short-term operation and their long-term sustainability.

2.5 Utilities thought that infrastructure and capital planning should be given greater priority in determining rates.

One of the general problems brought out in the survey response was about how the short-term focus of regulatory agencies and local government officials undermines the ability of utilities to establish rates that are adequate to meet the needs of the future. Most of the respondents commented that customers are rarely willing to pay more for water.

Every utility felt that with insufficient rates there was little choice but to let these infrastructure problems be solved by future generations. The discussion during the survey with the OUCC staff indicated their sense of their role as a protector of the *current* utility consumer. This problem is structural and will need to be addressed with either separate legislation or changes in existing regulations in addition to an effort to educate the public and local government official regarding the value of water infrastructure. While infrastructure replacement is a common news item, there were few suggestions (by the utilities) that could alter the outcome.

2.6 In some areas of the state, poor water quality has substantial impact on drinking water availability. More research needs to be done to understand how to manage this problem.

It is not uncommon for water utilities to reconsider their supply options because of raw water quality problems (and treatment costs) at their intakes. In general, water utilities have considered all water quality deficiencies as a part of the water treatment design problem.

In order to address the extent of this impact, part of the survey asked the utilities if they knew of conditions where raw water quality limited availability. Of the 20 utilities surveyed, 16 said that yield was limited, to some degree, by poor water quality. While this result might make sense given the fact that many of these drinking water systems were in older communities with legacy industrial sites, many comments were also made about the presence of agricultural compounds in surface water and groundwater (and some pointed out that the problems were natural background, not pollution). To better understand how water quality may contribute to reductions in source water availability, we queried the IDEM water quality databases to map the areas where samples had been collected (Figure 20 and Figure 21).

The distribution of IDEM exceedances, as well as the USGS report on water-quality, show that in many of the parts of the state water quality may not be improving (Risch, et al, 2014). Further work needs to be done to understand this problem.

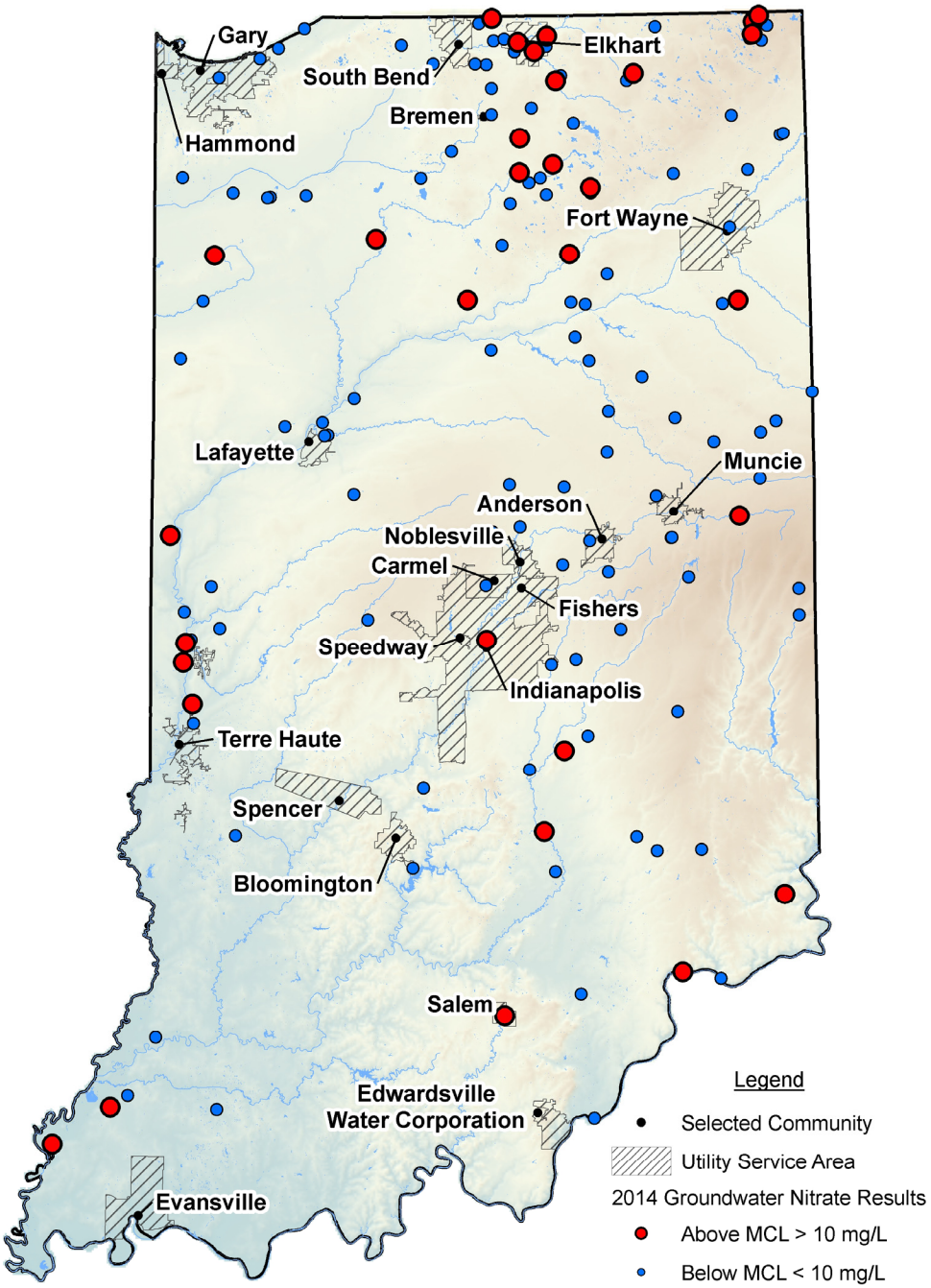


Figure 20. 2014 Groundwater nitrate concentrations in water supply wells in Indiana.

2.7 **Drought plans (and conservation planning) should be standard practice.**

As highlighted in the IURC 2014 report, every utility should be required to include a drought plan in their operating plan. Further, the IURC stated, *"…there continues to be a lack of planning for drought. In addition, most utilities have made no provision for obtaining additional water supplies, should demand significantly increase or an emergency occur."* Our survey suggests not much has changed since 2014 as only six of the 20 utilities interviewed reported having a drought plan or ordinance.

However, several utilities have water sources and facilities capable of producing much more water than their community requires. Three of those surveyed utilities use either Lake Michigan or the Ohio River and, therefore, have little need for a drought plan. In fact, one utility mentioned that they had too many other pressing concerns to address.

Of those six utilities having a drought plan, one is located in the North Indiana region, one in the South Region, and four in the Central Indiana region. As mentioned previously, the fastest growth in municipal demand coupled with a limited set of alternative supplies, and numerous competing users, occurs in Central Indiana. A review of utility service areas shows that from 9 – 48 other utilities are located within 10 miles of the surveyed utilities in the Central Region. As a result, Central Indiana utilities have a greater awareness of drought impacts on their water supplies and are taking steps to address supply adequacy.

The Drought of 2012 provided operational experience for utilities to assess the capabilities of their source waters under high demand/stressed resource conditions. While no utilities expressed not being able to meet demand, one utility stated that they had difficulty in doing so and that without increasing their treatment capability they may face shortages when the next severe drought occurs. Numerous utilities (11 of 20) have operational Conservation Plans, typically designed to reduce peak demands. Six of the 11 utilities expressed having used their Conservation Plan in 2012. Interestingly, of those six, the same four utilities in Central Indiana that have a drought plan also activated their Conservation Plan in 2012.

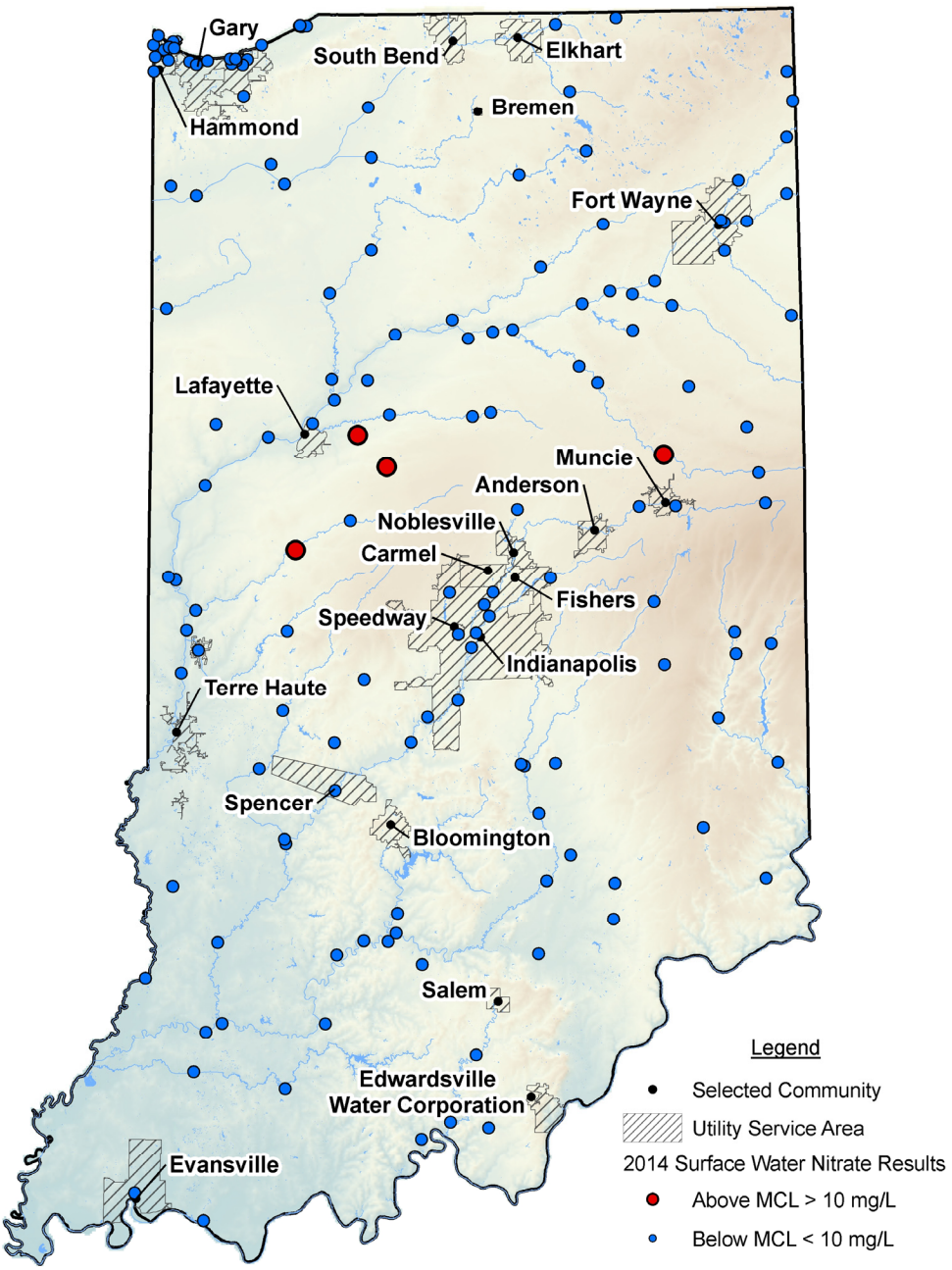


Figure 21. 2014 Surface water nitrate data measured at fixed stations throughout Indiana.

3.0 AGENCY RESPONSIBILITIES FOR WATER IN INDIANA

The previous section of the report describes general findings from the utility survey that argue for an active role by the state. This section reviews the existing regulatory and technical infrastructure in Indiana to describe how agencies interact and how they each see themselves in the process of water supply planning in the state.

Utilities were unclear how the many "water agencies" exchanged data and information to manage the resource.

During the survey, when the utilities made suggestions about how the state could move forward on this topic, there was only limited understanding of the role each agency played in the management of water supply. It was assumed that one or another agency would do the work of planning but it was not clear which agency might lead this effort. Given the role of various state and federal agencies with respect to stream flow, reservoir management, runoff control and water quality, we decided that the best approach to understanding the institutional setting was to survey the agencies and institutions that implement existing state and federal laws.

Like most states, Indiana distributes responsibility among a number of agencies to manage, protect and regulate water. The utility survey showed that most utilities know that government is responsible for elements of water resources management (e.g., IDEM regulates contaminant releases into water, IDNR records water use). However, the survey response suggested that most of the utilities were unsure how the agencies shared data or responsibility. In effect, the utilities were unsure why agencies often seemed to have overlapping functions or why the individual agencies were not more purposefully arranged to sort out the problems of water supply and management.

This section of the report describes some of the most important water agencies in the state and federal government and will delineate the different missions of the agencies and their purpose relative to water supply planning. The survey results were interpreted to explain the various institutional relationships as they currently exist.

3.1 Background and history of coordinating water agencies and policy

Over the last five years the governor's office and the legislature have grappled with the problem of water resources and planning (Figure 22). The executive branch began considering alternative institutional arrangements for water in 2011; the state legislature began work on new solutions after the statewide drought of 2012. These earlier efforts are the background against which this work was done. The following section summarizes the recent history of activities that preceded the water utility survey specified in SB 474.

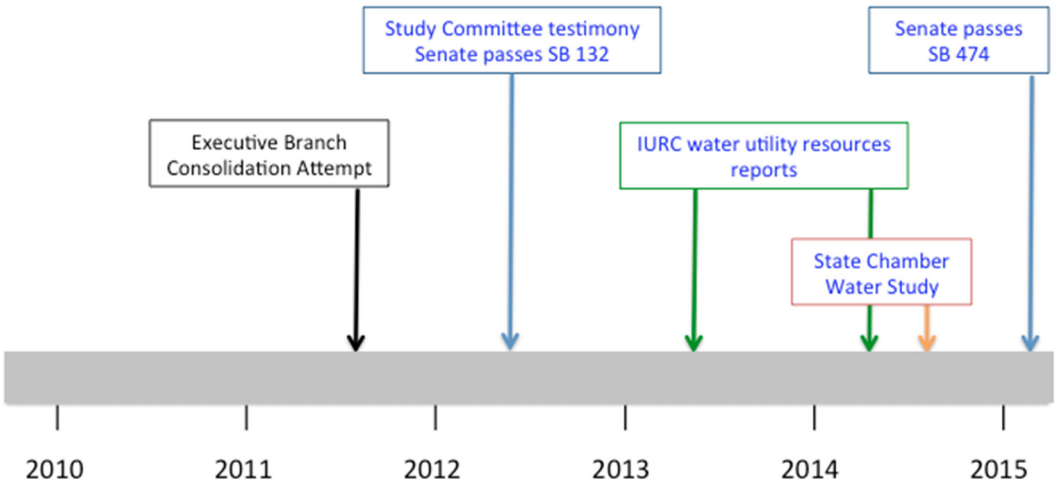


Figure 22. Timeline of recent water resource planning efforts in Indiana.

In 2011 the governor's office asked the primary resource and regulatory agencies of the state to consider ways that they could consolidate water programs to better serve the public. That group of principals at IDEM, ISDH, IDNR, IDHS, and ISDA met regularly for more than six months to attempt to consolidate programs and simplify the organization that collectively manage waters of the state.

The effort was not successful. The group was unable to overcome the individual participant's sense of ownership for their agency missions. They developed a mock-up of an organizational chart for a new "Indiana Office of Water" and developed a plan for realigning the programs that are currently part of many agencies into the new structure (Appendix E). However, the differences between the regulatory aspects of water management, especially those related to water quality and the non-regulatory programs that inform the public about the resource, were too much to overcome.

3.2 Understanding agency overlap and data sharing

During the utility surveys there were questions raised about how the various water agencies were coordinating their efforts to manage and plan. Everyone understood that many different state and federal agencies "touch water." How the various agencies communicated and shared data was less clear. Many of the utilities wondered about the different ways that the state shares a responsibility to monitor water with the federal agencies. They also expressed their uncertainty about how the responsibility was shared or which agency of the state was defining state policy. Many wondered how money moved from the state into the different institutions that were engaged in water-related work.

An agency survey was done designed to illuminate how the agencies view their role in the patchwork that makes up the state water resources institutional framework. We were interested in understanding how each agency saw what they were doing (defined by their statutory mission) fitting with the other agencies. Did they see any substantive overlap with other agencies? Were they collecting and sharing data? Were they managing or characterizing the resource? To what extent were they doing hydrological research?

3.3 **Water agencies**

When the IURC considered the different agencies that have a role in the regulatory process they included:

- Indiana Department of Environmental Management (IDEM)
- Indiana Department of Natural Resources (IDNR)
- Indiana Utility Regulatory Commission (IURC)
- Indiana State Department of Health (ISDH)

In addition, we identified other non-regulatory state agencies that have a role in evaluating, protecting or describing water resources and water infrastructure:

- Indiana State Department of Agriculture (ISDA)
- Indiana Geological Survey (IGS)
- Indiana Finance Authority (IFA)
- Indiana Water Resources Research Center - Purdue (IWRRC)
- Office of Utility Consumer Council (OUCC)

Further, we knew there were two important federal agencies that were directly involved in water resources analysis and management:

- U.S. Army Corps of Engineers (USACE)
- U.S. Geological Survey (USGS)

Consequently, we surveyed for these public agencies to determine how they work with their sister agencies and gage the degree to which they share information and data with each other and the public. In addition, our survey asked questions to understand how important water supply planning might be relative to their existing activities.

3.4 **Agency survey findings**

The survey included questions to determine how each agency identified their level of responsibility in water supply-related activities.

These elements represented the key tasks that are usually a part of regional water supply planning. We asked each agency to estimate their degree of responsibility for supply, resource assessment, management and research activities (Appendix F).

- Data collection
- Hydrogeologic interpretation and mapping
- Hydrologic modeling for yield
- Interactions with local water users and planners
- Water supply and resources management
- Water resources research

Responses were limited to:

1. No responsibility
2. Limited responsibility
3. Core responsibility

Agency missions have understandable overlap

The differences in their responses grouped the agencies into high, medium, and low levels of responsibility for these tasks: four agencies were in a group that saw themselves as very engaged in the full spectrum of data collection, mapping, management and research (Table 2). Another three agencies were moderately engaged in these activities, and another three that had almost no responsibility for these technical tasks.

Table 2. Reported mission overlap by agencies.

Agencies	Degree of Mission Overlap (0.0=No Overlap)	
IDNR	0.86	
USGS	0.86	**Most**
IDEM	0.75	
IGS	0.71	
IWRRC	0.67	
IURC	0.64	**Moderate**
USACE	0.58	
IFA	0.33	
ISDH	0.25	
ISDA	0.20	**Least**
OUCC	0.08	

Agencies most responsible for water in the state have varied applications but similar activities.

The two "primary" state water agencies; the Department of Natural Resources (IDNR) and the Department of Environmental Management (IDEM), responded to the survey by identifying most of these activities as central to their mission. Other than mapping, the IDNR Division of Water had the same level of responsibility for these activities as IDEM. Where IDEM described their work as having only a limited role in hydrogeologic mapping and interpretation, IDNR considers itself, at least in part, as a mapping agency. The Indiana Geological Survey (IGS) also sees these activities as part of their core responsibility – except for managing resources, where it has no role.

The USGS also saw these same activities as embedded in their mission and purpose. The USGS, however, sees its role as less related to managing supplies and interacting with local water users (which both state agencies identify as core responsibilities) and more related to hydrologic analysis and research. In this way the state's relationship with this federal agency reflects a collaborative approach to water that matches missions and skills.

The Indiana State Department of Agriculture (ISDA) manages programs that help farmers and land-owners but their work is at the farm scale. They describe themselves as having a key role in helping farmers manage land, water and soil so they are engaged but their support is less regional and more site-specific.

Some agencies involved in many activities but with limited water responsibility

The Indiana Water Resources Research Center (IWRRC) at Purdue describes itself as being responsible for data collection, modeling, outreach to users and water research, and from an academic standpoint, this make sense. The IWRRC has a self-identified position as the state school that helps farmers and land owners. Their researchers not only generate important data on water quality and land use impacts, they develop new tools for solving problems.

In 2012 the Indiana Utility Regulatory Commission (IURC) was given responsibility to survey all water utilities in the state about their planning and fiscal controls. They have completed two annual survey reports about utility preparedness for drought, use of conservation plans, and fiscal management to fulfill the requirements of SEA 132. While not engaged in hydrologic analysis or mapping, this work has given the IURC a role in considering how one of the important water users manage their utility and the resources of the state. The U.S. Army Corps of Engineers (USACE) is engaged in all of these activities but in a limited role relative to the primary state agencies in each capacity. The USACE is involved in all of these activities but usually in a background capacity. They are implementing agreed upon management plans with clear objectives; they are not policy-makers.

Some agencies are more involved in finance or administration

The Indiana Finance Authority (IFA) and the Indiana Department of Agriculture (ISDA) are responsible for water programs but their missions extend beyond water to matters of fiscal management in the case of the IFA and site-specific land management practices in the case of the ISDA. Neither agency is regulatory per se, instead they act as organizers of information and outreach for land management.

Most agencies collect data and interact with users

Nearly all the state and federal agencies surveyed (10 of the 11) are involved with some kind of data collection (Figure 23). This is a reflection of the normal activities of any government office. Data are either collected from the public (i.e., the “customer” of the agency) or collected from the environment to characterize the effects of a permitted activity or facility on the public. All of the agencies, as one would expect, are engaged with water users in one capacity or another. Any agency that is engaged with the activities of development carefully considers their job as partially attending to the publics’ needs and interests.

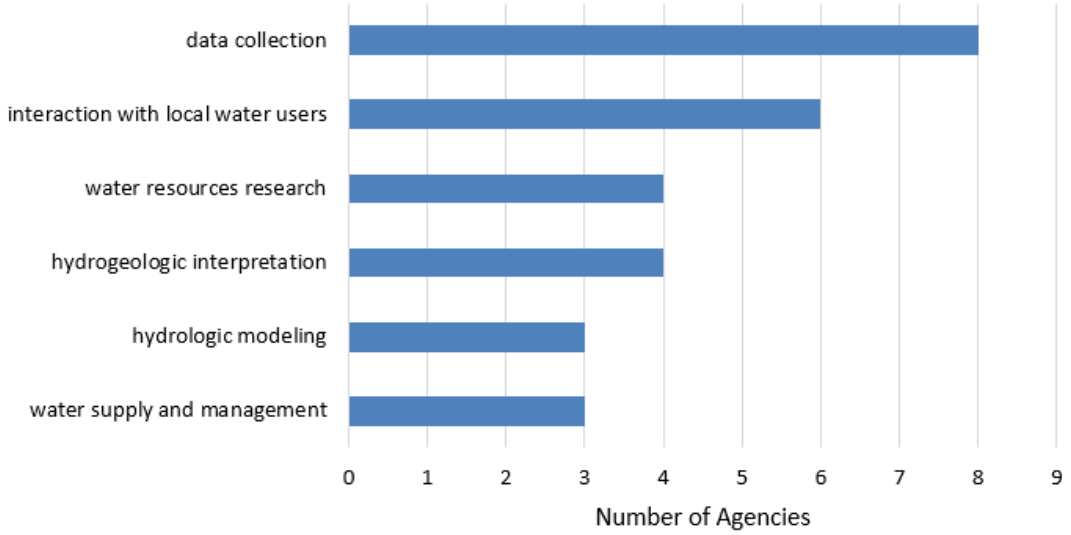


Figure 23. Results of the agency survey. Each agency determined which responsibilities were either core, limited, or not their responsibility. This figure shows core responsibility.

Water management and research are not common

Some of the agencies surveyed are only indirectly associated with water resources and water supply development (Figure 23). The Indiana Finance Authority, as an example, encounters water utilities as part of a broader set of fiscal responsibilities that include infrastructure loans. The agency, however, is far removed from managing resources – although that may be what the owners of the infrastructure are doing on a daily basis. The agencies that are engaged in water resource management and/or research include the universities and some of the state and federal water-related agencies.

Modeling and mapping are technical specialties

Only a few specialized agencies are engaged in developing physical process models (Figure 23). These agencies (e.g., IDEM, IDNR, IGS, USGS, USACE) apply these tools to determine the potential effects of proposed development on water resources and long-term availability. These agencies have the mission and staff needed to interpret the available data to generate useful maps of the waters of the state. Previously, mapping and analysis answered more local questions about individual well yield and flows and not the more distributed problem of regional water availability. Groundwater and surface water modeling once was the exclusive domain of government agencies. Technology and engineering skills are advanced in such a way that this work is often done by specialized consulting firms.

Data management and interconnection is uncoordinated and complex

The fact that most of the agencies collect data is not surprising but the questions we heard from the utilities related to whether the data collected by each was shared among the various agencies. (During the survey utilities frequently pointed out that they report to the IDEM, the IDNR, the IFA, the IURC about their systems, often with overlapping topics and requests.) In order to judge the amount of efficiency or overlap we asked each agency to confirm that they send or receive data with any of the agencies we were interviewing (Figure 24). This allowed us to evaluate the degree to which each agency was "connected" to the data that was being assembled by their collective efforts.

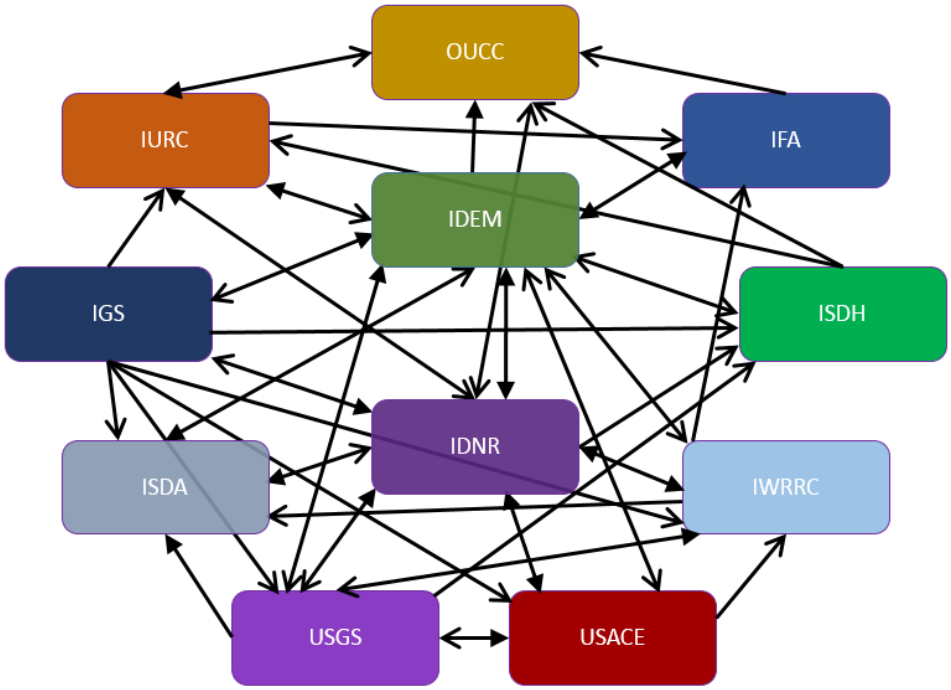


Figure 24. Self-reported data flow among agencies surveyed for this report. Filled in arrows indicate that both agencies responded similarly.

When we compare the agencies it is clear that the IDEM and the IDNR have the largest role in data generation and application. The position of each agency in our chart illustrates some aspect of their role in data collection and sharing. Some observations:

1. The response to the survey illustrates the fact that there is limited oversight or coordination among the agencies. The data collected by each agency is used to fulfill the agency mission while no single entity is responsible for managing the data or evaluating the connected implications of each activity.

2. Both the IDNR and the IDEM are engaged with many of the other water-related agencies of the state. This role is understandable given the fact that each agency considered "data collection" to be a core part of their mission.

3. A data-sharing agency may not be a data-receiving agency. Some agencies generate more than they receive and visa-versa.

4. Some agencies have focused, narrow missions so they are less engaged in data transfer in either direction. The IURC, the OUCC, the ISDA, and the ISDH are all less active in generating new data or sharing what they use in their work.

5. The federal agencies are, for the most part, data providers. They have the resources and the technical capacity to ask and answer questions with their own staff and equipment. They are less likely to use other agencies' data.

6. Not all the agencies report their relationship with others bi-laterally. That is, only some of the agencies that said they shared their data with another also had that confirmed by the recipient reporting that they receive the data.

The flow of data among these agencies reveals important patterns. The IDEM, IDNR, and the IGS are, generally speaking, data providers. The statutory and administrative responsibilities of each agency require IDEM and IDNR to collect data to make judgments and administer state and federal programs. The IDNR uses this information to interpret the landscape and develop maps for use by the public.

The mission of the IGS is to inform the private and public sectors about the distribution of the geological resources of the state for economic value and environmental protection. As one of the oldest state agencies, the IGS was created to help the state exploit and add value to available subsurface resources. The focused agencies who send and receive less than others deal with water because it is connected to their mission but in a way that is either indirect (e.g., OUCC, IURC) or at a local scale that is less useful to other agencies (e.g., ISDA, ISDH).

The federal agencies provide data to support state decisions. Their role is to provide excellent data on stream flows, aquifer levels, and reservoir management. They are not in a position (nor should they be) to set priorities for water supply and management.

When we examine the order of the agencies based on the number of times they either said they shared data with or received data from another agency, a familiar lineup develops (Figure 25). The top two are IDEM and the IDNR and the bottom few include the ISDH and the ISDA (for reasons that were considered earlier) but other features also emerge. The IGS is ranked as one of the top data providers (their IndianaMap web portal is used by many across the state) but very few other agencies report sharing data with them. Their position moves from the top of the "providers" column to the bottom of the "receivers" column.

Data Providers	Data Receivers
IDEM	IDEM
IDNR	IDNR
IGS	IURC
USGS	IWRRC
IWRRC	OUCC
USACE	USGS
IURC	ISDA
ISDH	USACE
OUCC	ISDH
ISDA	IGS

Figure 25. Rank ordered agencies according to their data sharing response. Agencies listed higher in the table identified more connections (sending and receiving data) than the agencies lower on the list.

Funding is uncoordinated and inefficient

Based on the survey response, funding is not coordinated (each agency sees their project and purpose independent of others) and there is no mechanism to leverage the relationships of the agencies with each other or the private sector. In one case (the U.S. Army Corps) we heard that the state of Indiana had repeatedly been unable to provide the required match for much larger federal water supply investigations and planning projects. The USACE has an annual operations and maintenance budget for facilities in the state of about $20,000,000. They made it clear that additional money was available through their planning division but in the past the state was unable to provide its required state match. Currently, many agencies and organizations separately contract with the USGS to gage stream flow or install monitoring wells for different programs and purposes. This diffusion of responsibility has led to an unfortunate outcome – according to the IURC's recent reports the state has a sparse and inadequate groundwater-level monitoring network. Until the state coordinates these interactions, we can expect no change.

All of the agencies believed that the source of funding for planning should be stable (the general fund) and many had alternative suggestions including a fee for water use, a tax on bottled water, and a pollution impact fee.

All of the agencies agreed that water supply planning should be a priority

The utility survey asked each water provider to offer their ideas about the value or importance of different planning activities. The utility survey showed that there is broad consensus about the need to establish authority for planning and to begin the task of collecting data to evaluate the dimensions of the resource (Figure 26). Similarly, all of the agencies voiced their opinion that water resources planning and analysis was a critical priority that needed attention and management by the state.

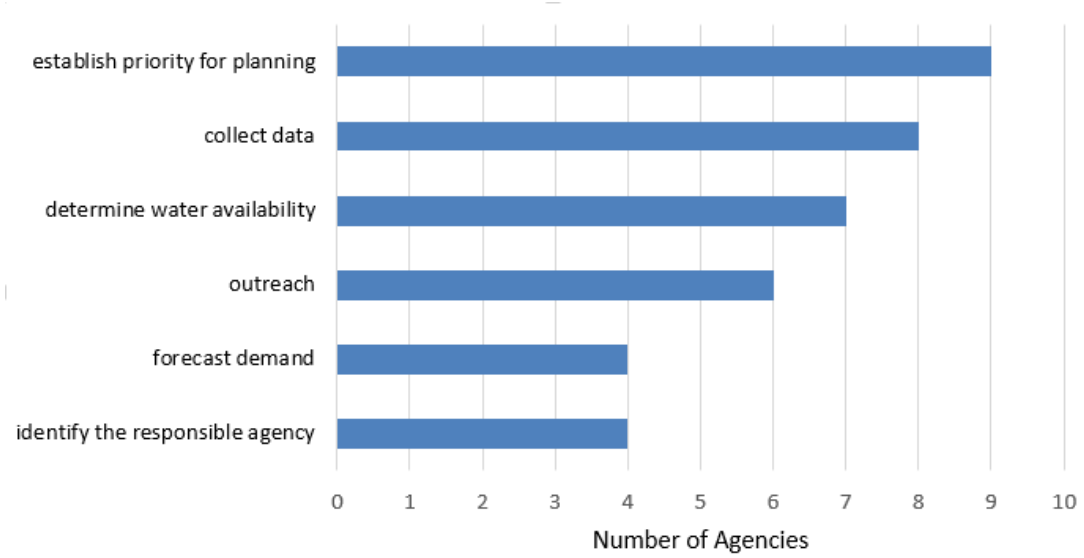


Figure 26. Most important needs for planning and management according to fill-in-the-blank question on the survey. The number of agencies providing each response is shown on the x-axis.

The agency response showed that the role of the state should also include determining water availability in regions and managing outreach among the various water users and land managers to determine needs. While not a majority, 4 agencies said that the task list should include forecasting future demand and identifying the responsible agency for the work.

The majority of the agencies surveyed identified what they believed were the most important components of a plan. The agencies identified tasks and goals of a plan that included the following:

1. establish methods for regional planning (define regions)
2. collaborate with stakeholders
3. collect data – monitor the system
4. assess the dimensions of the resource
5. forecast future demand
6. meet future water needs
7. manage the resource

Of the agency respondents, 80% thought the state should forecast demand, support stakeholders involvement, assure that utilities (and other users) can meet water needs, collect hydrogeologic data and assess the sustainability of the resource. Another 60% suggested the state should establish methods for regional planning and work to manage the resource. In effect, these recommendations follow the general outline of a regional water supply plan.

There is no consensus on how planning should be done

When asked how this work should be done, more than half of the surveyed agencies responded by saying it could either be handed to an existing branch of government or it could be given to a special team that coordinates the work. It was suggested that the planning could be done with state-supported data infrastructure for water demand forecasting and resource assessment by a small team. Some suggested that a new group be established as the Indiana Water Survey. Others said that it should be done by a non-regulatory agency. Others suggested a combination of existing agencies. There was no consensus on the approach that the state should take.

Agencies did not want to stretch to include a planning mission

Each agency suggested that their role in developing a state plan should be some activity broadly related to their existing mission – assuming the funds for that work would be appropriated. This is consistent with the rather static arrangement of roles and responsibilities that were documented in the survey. In effect, none of the surveyed agencies stated clearly that they should be the natural home for water supply planning.

3.5 Summary of agency survey

In the past five years the executive branch and the legislature have attempted to modify how we meet the needs of the state from a water resource and supply perspective. As a part of our survey we asked questions to help us determine what the utilities thought was a natural role for the state in regional water supply planning. The survey demonstrated that the utilities have a consistent perspective on the role of the data, other water users, and the public in the process of planning.

Utilities raised questions about the degree to which state and federal agencies were coordinating their efforts. This survey of state and federal agencies found that there is little coordination and even less comprehensive data management. The response to the agency survey showed that technical staff often interacts as specialized professionals but rarely as collaborative managers of funding, data or the resource. What is missing is a coordinating authority and necessary resources.

State needs central data management

All of the agencies agreed that water supply planning is a critical priority for the state. However, there is no state "hub" for data management and water resource planning. Our analysis demonstrates that the need exists. The agencies suggested that their role in the planning process would be aligned with (and limited to) their existing missions.

More data is needed to determine water availability and future demand

The agencies agree that Indiana needs to collect more data on streams and aquifers in the state. They argue that data collection needs to become a priority if we hope to anticipate where the future shortages could occur and what contingencies would be needed to prevent crisis.

Technical skills from multiple agencies are needed

This survey showed that these agencies have complementary skills interpreting, modeling and mapping water resources. These skills need to be deployed in the planning effort to take advantage of data investment and knowledge that already exists.

Many agencies "touch" water but few have the technical depth needed to forecast future needs or determine existing resource availability. This work should to be orchestrated among the specialized and mission-focused state and federal agencies that have hydrologists and engineers on staff.

Agency reorganization may not be possible

Previous attempts at reorganizing the state's water-related agencies failed. The static inertia of overlapping responsibilities and missions could not be overcome without dire emergency. Something short of reorganization may allow the state to leverage existing strengths of each agency.

Federal funds are available

The federal role in water resources management (data and investigations) can be leveraged if the state identifies its priorities. Federal agencies make funding available to states that have clear priorities and a team dedicated to implementation. This is one thing that our neighbors in the Midwest are doing better than Indiana.

There is no obvious lead agency that emerged from this analysis. However, none of the surveyed agencies should be left out of any statewide planning process. Each has data and skills to bring to the table that support the broad goals of the planning process. Water supply planning requires utilities to forecast growth and identify future supplies that can meet future demands. The institutional arrangements in Indiana allow for enough freedom to accomplish the primary goals of planning, however, there needs to be some understanding of each agencies mission, skills, data and history.

4.0 SUMMARY OF FINDINGS

4.1 Utilities believe that the state should invest in water resource data collection and analysis. Only half of the utilities surveyed monitor their source of supply.

There is little information on total available groundwater in the state. However, the few clusters of monitoring wells in the aquifers of the state make it impossible to track trends, determine impacts, and provide the validation needed to avoid conflicts among users. An expanded network of groundwater monitoring wells should be installed around the state, beginning with areas of greatest concern.

The USGS has historically been funded by IDNR and IDEM to observe, report, calculate, and estimate low flow statistics of Indiana rivers and streams. While this information is needed to estimate surface water availability and drought yield, the funding for this work has been sporadic and unreliable. By monitoring flow trends, signals of drought will not be missed. This would leverage existing cooperative agreements for data collected between USGS and the state.

We do not know the usable volume of most reservoirs in the state. As the reservoirs age (many were constructed prior to 1970) sedimentation has reduced the usable volume in the system. In order to make the most of these important components of the system, the state needs to have an accurate estimate of their volume.

4.2 Water quality may locally limit availability. This problem needs to be understood and mapped.

The survey showed that for 80 percent of the utilities water availability was limited by source water quality. The effect of poor water quality on availability needs to be considered systematically to understand water supply constraints in different parts of the state. The reasons for geographic variation in water quality trends (both surface and groundwater) need to be understood so best practices can be integrated into the planning process. More research should be devoted to these factors affecting our resources.

4.3 Utilities surveyed were interested in state support to meet other water users in their area.

Few utilities currently consider their neighboring water users when planning for new infrastructure but most of those in the survey were interested in what was happening around them. All but two of the utilities surveyed wanted the state to convene regional discussions and more than half of the utilities were concerned about upstream use. There appeared to be a consensus that regional discussion lead by the state would be a useful beginning point for planning. Individual utilities generally think of their source as independent of other water users and utility plans only accounts for changes in use by the utility. However, given the growth in non-utility water use, as well as growth by neighboring municipal users, it is critical that planning have a more regional perspective.

4.4 Utilities use a variety of methods to forecast water demand.

Most utilities (15 of 20) reported using some form of historical data analysis to predict future needs. Rarely are these estimates for projecting more than 5 or 10 years into the future. If utilities in the state are going to have robust capital plans that include infrastructure replacement, they will need confidence in predicted growth rates in their areas. Utilities suggested that the state might play a role collecting data and coordinating or conducting regional demand forecasts.

4.5 Conservation and shortage planning needs to become standard practice.

Conservation plans and shortage plans are relatively common in Central Indiana and among larger water systems. However, shortages could occur in communities from spills, well failure, main breaks or other short-term disruptions. In order to improve system reliability, conservation plans and shortage plans need to become a normal part of source of supply planning. Conservation plans may not be the correct approach for systems that have extremely large supplies like the Ohio River. Even in these situations, however, utilities need to be able to manage longer term disruptions to their supply as a part of planning.

4.6 Drought planning is important and regional plans may be critical.

The economy of the state depends on a reliable system and drought planning is one way to reduce the risk of failure for all water users. Currently the utilities rely on river intakes, reservoirs and groundwater to meet their customers' needs. Given the fact that groundwater use has increased in many areas it is important for these regions to develop robust drought response plans. These plans should be coordinated with their neighbors to be reliable and secure. Drought would have regional consequences and many parties would need to work together to allow for power production, drinking water withdrawals and critical industrial uses.

4.7 The state needs to protect the value of IDNR's water withdrawal database.

The IDNR has one of the most extensive databases on water use in any state in the nation. It has not, however, been tested or used for statewide planning purposes. The IGS evaluated the cartographic and hydrogeologic data contained within the IDNR significant water withdrawal database for each of the 20 utilities surveyed for this report (Appendix G). The work of detailed digital curation is a core area of expertise at the IGS. The data integration and validation work that will need to be done for regional planning may fit within the IGS mission.

4.8 Replacement of aging infrastructure presents a major challenge.

None of the utilities surveyed thought they were able to do all that they should to maintain critical infrastructure and replace aging mains in their system. Many of the utilities surveyed simply repair pipes as failure occurs. This group operates without an optimized plan for managing their aging infrastructure assets.

With looming and rapidly increasing replacement needs, this approach will result in increasing frequency of emergency repairs accompanied by deteriorating service and higher than necessary rates for customers. Based on reported capital investment plans and trends in the value of Utility Plant in Service it is clear that in general, utilities are underinvesting in replacement of aging infrastructure. Communities with little or no growth are further challenged to cover increasing costs with fewer customers. Achieving fiscal sustainability, as aging infrastructure requires replacement means that utilities adopt asset management practices to better understand and plan to meet their unique needs

4.9 Water-rate policies need to be altered to encourage water resource and fiscal sustainability

Sustainable water service is possible with modern planning techniques backed by regulatory alignment and support to promote resource sustainability and full-cost recovery. The short-term focus of regulatory agencies and local officials undermine the ability of utilities to establish rates adequate to meet the needs of the future. Most of the respondents commented that customers are rarely willing to pay more for water.

Every utility felt that with insufficient rates there was little choice but to let these infrastructure problems be solved by future generations. This problem is structural and will need to be addressed with either separate legislation or changes in existing regulations in addition to an effort to educate the public and local officials regarding the value of water resources and infrastructure.

4.10 There is no obvious lead agency that emerged from this analysis.

There is currently no central “hub” for data management and water resource planning. All of the agencies agreed that water supply planning is a critical priority for the state. The agencies suggested that their role in the planning process would be aligned with (and limited to) their existing missions. A central hub would focus attention on the task and provide support to regions. This survey showed that these different agencies have complementary skills interpreting, modeling and mapping water resources. These skills and tools need to be thoughtfully assembled in the planning effort to take advantage of the long history of data and knowledge that already exists.

4.11 **There are federal dollars that could support water supply planning.**

The federal role in water resources management (data and investigations) can be leveraged if the state identifies its priorities. Federal agencies (namely, the Army Corps of Engineers) make funding available to states that have a list of priorities and objectives and a team dedicated to implementation.

LITERATURE CITED

AWWA, 2007. American Water Works Association Manual of Water Supply Practices, Guide to Water Resource Planning (M-50), Denver, CO, second edition. 395 p.

AWWA, 2015. State of the Water Industry Report. accessed [October 2015] at URL http://www.awwa.org/resources-tools/water-and-wastewater-utility-management/state-of-the-water-industry.aspx

Clark, D. E. (Ed.). 1980. The Indiana Water Resource: Availability, Uses, and Needs. Governor's Water Resource Study Commission, State of Indiana.

Indiana Department of Natural Resources (IDNR), 2014. Significant Water Withdrawal Database, accessed [October 2015] at URL http://www.in.gov/dnr/water/4841.htm

Indiana State Chamber of Commerce (Chamber), 2014. WATER AND ECONOMIC DEVELOPMENT IN INDIANA: Modernizing the State's Approach to a Critical Resource, a report to the State Chamber of Commerce. 92 p.

Indiana Utility Regulatory Commission (IURC), 2013. Annual Report to the Regulatory Flexibility Committee of the Indiana General Assembly. 74 p., accessed [October 2015] at URL http://www.in.gov/iurc/files/Water_Utility_Resource_Report-_FINAL-_8282013_with_cover(1).pdf

Indiana Utility Regulatory Commission (IURC), 2014. Annual Report to the Regulatory Flexibility Committee of the Indiana General Assembly. 96 p., accessed [October 2015] at URL http://in.gov/iurc/files/IURC_Water_Utility_Resource_Report_2014_FINAL.pdf

Kinghorn, M., 2012. Indiana Business Review, Spring, Indiana Business Research Center at the Kelley School of Business, Indiana University, 5 p.

Maupin, M.A., Kenny, J.F., Hutson, S.S., Lovelace, J.K., Barber, N.L., and Linsey, K.S., 2014. Estimated use of water in the United States in 2010: U.S. Geological Survey Circular 1405, 56p., http://pubs.usgs.gov/circ/1405/

Risch, M.R., Bunch, A.R., Vecchia, A.V., Martin, J.D., and Baker, N.T., 2014, Water quality in Indiana—Trends in concentrations of selected nutrients, metals, and ions in streams, 2000–10: U.S. Geological Survey Scientific Investigations Report 2014–5205, 47 p., http://dx.doi.org/10.3133/sir20145205.

U.S. Census Bureau, 2010. Decennial Census. Accessed [October 2015] at URL http://www.census.gov/mp/www/cat/decennial_census_2010/

APPENDICES

Appendix A. Utility Survey Team (1 page)

Appendix B. Senate Bill 474 (4 pages)

Appendix C. Utility Survey (2 pages)

Appendix D. Fiscal Sustainability and Infrastructure in Indiana (35 pages)

Appendix E. Proposal for Consolidation of Indiana's Water Regulatory Program (25 pages)

Appendix F. Agency Survey (2 pages)

Appendix G. Spatial Analysis of 20 Selected Water Utility in Indiana (19 pages)

Appendix A. Utility Survey Team

Jack Wittman, Ph.D., INTERA

Over the past 30 years Jack has been a consulting groundwater hydrologist working as a water supply expert for states, tribal governments, agricultural producers, drinking water utilities and industrial clients. He got his Ph.D. at IU-Bloomington where he specialized in regional and local groundwater flow modeling. During the last 25 years he has served as the president of the Indiana Water Resources Association, been appointed to the governor's water shortage task force, served on his local drainage board and recently authored the State Chamber of Commerce Report, "Modernizing the State's Approach to a Critical Resource." Jack is currently the vice president of the Midwestern Division of INTERA, Incorporated, a water resources consulting firm that performs water supply planning analyses around the country. INTERA staff were primarily responsible for the analysis and writing in this report.

Dan Haddock, PE, ENV SP

Dan is a Senior Project Manager and the Drinking Water Practice Leader for Lochmueller Group. He has 25 years of experience covering the full life-cycle of utility infrastructure. For an investor-owned utility, Dan managed the engineering function for 35 water and wastewater utilities in Indiana, Illinois, Ohio, and Michigan including master planning, design and construction, capital program management, rate cases, and operational support. He holds leadership roles on national AWWA committees for Water Resource Planning and Management, Asset Management, and Sustainable Infrastructure, and is active in the development of AWWA policies, manuals, and conferences. Dan is a registered professional engineer in eleven states, and is a registered Envision Sustainability Professional.

Sarah Hudson

Sarah Hudson is a graduate of Indiana University (B.S.) and the University of Dayton (M.S.) with degrees in Biology. She has more than 15 years of experience in the water industry helping communities find sustainable solutions to drinking water and wastewater needs while employed at the DeKalb County Soil and Water Conservation District, the Indiana Rural Community Assistance Program, the Indiana Department of Environmental Management, the Indiana State Revolving Fund Loan Program, and most recently at Curry & Associates, Inc. in Danville, Indiana.

Appendix B. Senate Bill 474

SENATE BILL No. 474

DIGEST OF INTRODUCED BILL

Citations Affected: Noncode.

Synopsis: Analysis of water utility planning and needs. Requires the Indiana finance authority (authority) to prepare an analysis of the planning and long range needs of: (1) the water utilities serving the 15 most populous cities in Indiana; and (2) five other water utilities selected by the authority from among the water utilities having less than $500,000 in annual gross revenue. Authorizes the authority to contract with professionals or with a state educational institution for the performance of some or all of the authority's duties relating to the analysis. Requires the authority to complete the analysis and submit it to the legislative council not later than November 1, 2015. For calendar year 2015, relieves the utility regulatory commission of the duty to submit an annual report concerning water utilities to the legislative council and the interim study committee on energy, utilities, and telecommunications.

Effective: Upon passage.

Charbonneau

January 14, 2015, read first time and referred to Committee on Environmental Affairs.

Introduced

First Regular Session 119th General Assembly (2015)

PRINTING CODE. Amendments: Whenever an existing statute (or a section of the Indiana Constitution) is being amended, the text of the existing provision will appear in this style type, additions will appear in **this style type**, and deletions will appear in ~~this style type.~~

Additions: Whenever a new statutory provision is being enacted (or a new constitutional provision adopted), the text of the new provision will appear in **this style type**. Also, the word **NEW** will appear in that style type in the introductory clause of each SECTION that adds a new provision to the Indiana Code or the Indiana Constitution.

Conflict reconciliation: Text in a statute in *this style type* or ~~*this style type*~~ reconciles conflicts between statutes enacted by the 2014 Regular Session and 2014 Second Regular Technical Session of the General Assembly.

SENATE BILL No. 474

A BILL FOR AN ACT concerning utilities.

Be it enacted by the General Assembly of the State of Indiana:

SECTION 1. [EFFECTIVE UPON PASSAGE] **(a) The following definitions apply throughout this SECTION:**

(1) "Authority" refers to the Indiana finance authority created by IC 4-4-11-4.

(2) "Commission" refers to the Indiana utility regulatory commission created by IC 8-1-1-2.

(3) "Gross revenue" means all intrastate operating revenue received by a water utility for furnishing water to the customers of the water utility. The term does not include revenue derived by a water utility from the sale of water to another water utility for resale by the other water utility.

(4) "Small water utility" means a water utility whose gross revenue from furnishing water to customers in Indiana is less than five hundred thousand dollars ($500,000) per year.

(5) "State educational institution" has the meaning set forth in IC 21-7-13-32.

(6) "Water utility" means any of the following:

(A) A public utility, as defined in IC 8-1-2-1(a), that furnishes water to its customers.

(B) A municipally owned utility, as defined in IC 8-1-2-1(h), that furnishes water to its customers.

(C) A not-for-profit utility, as defined in IC 8-1-2-125(a), that furnishes water to its customers.

(D) A utility that:

(i) is owned cooperatively by its customers; and

(ii) furnishes water to its customers.

(E) A conservancy district established under IC 14-33 that furnishes water to its customers.

(F) A regional district established under IC 13-26 that furnishes water to its customers.

(b) The authority shall:

(1) conduct a survey of the operations; and

(2) prepare an analysis of the planning and long range needs; of the water utilities described in subsection (c).

(c) The subject of the survey and analysis conducted by the authority under subsection (b) must be:

(1) the water utilities that serve the fifteen (15) most populous cities in Indiana, as determined according to the 2010 decennial census; and

(2) five (5) small water utilities selected by the authority as subjects for the survey and analysis.

(d) In preparing the analysis required by this SECTION, the authority shall gather and consider:

(1) information concerning the plans of each water utility for:

(A) continued access to water resources;

(B) fiscal sustainability, including ratepayer protection; and

(C) regional cooperation among water utilities; and

(2) other information the authority considers relevant to the planning and long range needs of water utilities.

(e) In preparing the analysis required by this SECTION, the authority:

(1) shall consult with:

(A) the water utilities that are the subject of the survey and analysis; and

(B) the commission; and

(2) may consult with any other entity or individual having information the authority considers relevant to the planning and long range needs of water utilities.

(f) The authority may hold public meetings to gather information for the purposes of preparing the analysis required by this SECTION.

(g) The authority may enter into contracts with one (1) or more professionals or state educational institutions under which the professionals or state educational institutions will perform some or all of the duties imposed on the authority by this SECTION. The authority may compensate the professionals or state educational institutions for work performed under this SECTION with:

(1) money from the drinking water revolving loan fund established by IC 13-18-21-2; or

(2) any other funds appropriated to the authority.

(h) In preparing the analysis required by this SECTION, the authority shall use aggregated data in a manner that:

(1) protects the confidential information of individual water utilities; and

(2) is consistent with IC 5-14-3-4.

(i) The authority shall complete the analysis required by this SECTION and submit the analysis to the legislative council not later than November 1, 2015, in an electronic format under IC 5-14-6, in place of the annual report to the legislative council that the commission would otherwise be required to submit under IC 8-1-30.5-3(c)(1) not later than November 1, 2015.

(j) For the calendar year 2015, the commission is not required to:

(1) collect, compile, organize, summarize, and report data and information;

(2) make recommendations; or

(3) prepare and submit reports to:

(A) the legislative council; and

(B) the interim study committee on energy, utilities, and telecommunications;

under IC 8-1-30.5-3.

(k) This SECTION expires January 1, 2016.

SECTION 2. **An emergency is declared for this act.**

Appendix C. Utility Survey

Indiana Finance Authority Water Planning Questionnaire

Supply

1. Do you have any yield information for your system? (That is, do you have an estimate of yield in each of your wells, well fields, and/or intakes?) **(We would like to know the actual yield values if you have them.)**
    a. How do you quantify yield (e.g., drought of record, low flow, probability)?
    b. Do you believe current yields will be available in the future from a resource perspective?
2. Do you have contracts to purchase wholesale water from a regional supplier?
    a. Are there any circumstances where you believe that the contract water may not be available?
3. Do you use monitoring wells or stream gages to assess water availability?
4. Does water quality limit availability in any part of the system?
5. Do you account for neighboring water users? (e.g., other utilities, industry, agriculture) in evaluating yield of shared resources?
    a. Do you observe impacts of neighboring water use?
6. Are there differences between the designed and actual operational yields of your well fields or intakes?
7. Is surface water yield stable over time?
8. Do you have any concerns about upstream diversions or storage?
9. Efficiency and maintenance:
    a. Are there any notable trends in raw water quality from current supplies?
    b. Are there infrastructure and design constraints that limit the availability of water in your system that are not related to source of supply?
    c. How do you account for these design constraints?
10. Is water re-use an element of your long-range water supply planning?

Demand

Please provide a general overview of your long-term planning process, and to the extent possible, provide answer the following questions.

1. How do you plan for growth in demand?
    a. How frequently do you revisit the plan?
    b. What variables are considered when developing your water demand forecast?
    c. Do you use structured scenario analysis to predict future demand?
2. Does your utility have a conservation plan?
    a. Was the plan used during 2012?
    b. Does it include seasonal or conservation pricing?
    c. If you have a conservation plan, what roles does it play in long-range water supply planning?
3. Does your utility plan for drought? Do you have a drought ordinance?
    a. Was the plan used during 2012?
    b. Do you have any triggering mechanism to implement the drought plan?
    c. What is the design drought used in your plan?
    d. Has it ever been invoked to manage demand?
    e. Does your utility have measures in place to deal with shortage of any kind if they occur?
4. Do you have wholesale contracts to sell raw or treated water to other utilities or other users?
    a. How do you work with them to plan for needed capacity?
    b. How do you work with them on water conservation efforts or to curtail use during

drought?

c. Do you expect changes in the future – fewer/more contracts, greater/less wholesale water use?

Infrastructure

1. What is the utility's planning horizon for demands and resource needs (e.g., 10 years, 20 years)?
2. What time horizons do the utility's capital investment plans (CIP) cover (e.g., 5 years, 10 years)?
3. In long-term planning, does the utility evaluate opportunities for interconnection with other utilities for purposes of meeting projected supply needs or improving resiliency?
4. What are the utility's projected investment needs in their current CIP? What are the drivers for those needs: growth; regulatory compliance; reliability/resilience; replacement of aging infrastructure?
5. How does the utility plan for renewal of aging infrastructure? What percentage of total length of mains is annually targeted for replacement?
6. How does the utility track and manage water loss?

Exploratory

1. Does your ownership type afford it any advantages or disadvantages that influence its ability to plan for long-range water resource needs?
    a. If yes, please describe.
2. What existing or proposed legislation limits your ability to plan for long-range water resource needs?
3. In general terms, what are the most significant hurdles you face in implementing long-range water resource planning?
4. How can the State of Indiana best assist you with its long-range water resource planning?
5. What data would you find useful to have for your long-range water resource planning efforts that you currently do not have, due to the fact that the data does not exist or it exists but you are not able to access it?
6. Do you know the other significant water users in the region that surround and impact your service area and source water?
    a. If no, would you be interested in the State's assistance in identifying the other significant water users?
7. Do you communicate with the other significant water users in the region? If yes, please describe how.
8. What long-range water resource planning are you doing that you wish other significant water users were doing?

Requested Documents

- Planning documents (e.g., demand projections, infrastructure planning)
- Capital investment plans (e.g., 5 year, 10 year)
- Asset management plans
- Conservation plan
- Drought plan

Appendix D. Fiscal Sustainability and Infrastructure in Indiana

Fiscal Sustainability and Infrastructure Planning

1 Introduction

Senate Enrolled Act 474 (SEA 474) directed the Indiana Finance Authority (IFA) to conduct a survey and analysis considering water utility planning and long range needs, continued access to water resources, fiscal sustainability, including ratepayer protection, regional cooperation among water utilities, and other relevant information (Indiana State Legislature, 2015). This document addresses the portion of the analysis related to infrastructure planning and fiscal sustainability, including ratepayer protection. The analysis is based on survey responses from the 19 utilities serving the 20 study communities and additional data for Indiana water utilities collected by the Indiana Utility Regulatory Commission (IURC) under the authority of Senate Enrolled Act 132 (SEA 132).

In the 2015 State of the Water Industry Report prepared by the American Water Works Association (AWWA), the top five most important issues identified by survey respondents were the following (AWWA, 2015):

1. Renewal and replacement (R&R) of aging water and wastewater infrastructure
2. Financing for capital improvements
3. Long-term water supply availability
4. Public understanding of the value of water systems and services
5. Public understanding of the value of water resources

Availability of water supplies and the infrastructure needed to safely deliver them top the list of concerns of the utility industry. As a whole, utilities in Indiana and across the country have been tremendously successful in ensuring reliable access to safe drinking water. Due in large part to this success, a high level of service is not only expected from our water utilities, but frequently taken for granted. Concern over public understanding of the value of water resources and infrastructure round out the top five list. Maintaining the infrastructure necessary to sustain current levels of water service requires significant investment. Public understanding of the value of water resources and systems is crucial to gaining support for adequate funding of this infrastructure.

We identified four general areas of opportunity to improve and maintain the fiscal sustainability and reliability of Indiana's water utility infrastructure.

- Improve utility infrastructure planning practices, including asset management planning to prepare for the renewal of aging infrastructure
- Strengthen support of regulatory agencies and local government authorities for fiscal sustainability of water utilities and affordability of service
- Improve public understanding of the value of water resources and infrastructure
- Provide state support for regional water supply solutions, including coordination and funding for planning and infrastructure projects that are cost-effective at multiple-utility scales.

The analysis, conclusions, and recommendations are discussed in greater detail in this document.

1.1 Water utility infrastructure

Water utilities are "distinctly capital intensive" compared to other utilities. The infrastructure assets required to supply, treat, and deliver drinking water are costly and have very long service lives, frequently serving generations of water customers (Beecher, 2011). However, infrastructure does not last forever and periodic maintenance and replacement is required to sustain its function.

1.1.1 Infrastructure needs

Because utility assets are long-lived, infrastructure costs are "locked in", even as conditions change. Conditions may change as a result of the loss of a major customer or termination of a wholesale water purchase agreement, or they may change simply as a result of steadily increasing efficiency of domestic water use.

The maximum capacity of infrastructure and the cost to construct it is determined by peak demands which may occur only a few days of the year. The result is that capacity is frequently underutilized, particularly in the case of communities with high peak usage. Table 1 summarizes the typical service lives and basis for design capacity of different types of utility infrastructure.

Table 1. Types and typical characteristics of utility infrastructure

Utility Plant	**Description**	**Typical asset service lives**	**Typical basis for design capacity**
Source	Intakes, wells, reservoirs	20 to 70 years	AD - reservoirs, MD - intakes and wells
Pumping	Pumping plant structures and equipment	20 to 40 years	MD, MH, fire protection
Treatment	Treatment plant structures and equipment	15 to 40 years	MD
Transmission and distribution	Pipelines, service lines, hydrants, meters, storage tanks	10 to 100 years	MH, fire protection
General	Offices, equipment	3 to 40 years	n/a

AD – average day, MD – max day, MH – max hour

The United States Environmental Protection Agency's (USEPA's) 2011 Drinking Water Infrastructure Needs Survey and Assessment estimated that for the 20-year period ending in the year 2030, there are over $6.55 billion in infrastructure needs in the State of Indiana, excluding needs related to growth (USEPA, 2013). More than two-thirds of the total need (approximately 69%) was identified for water transmission and distribution infrastructure, most of it for replacing or refurbishing aging or deteriorating water mains (Figure 1).

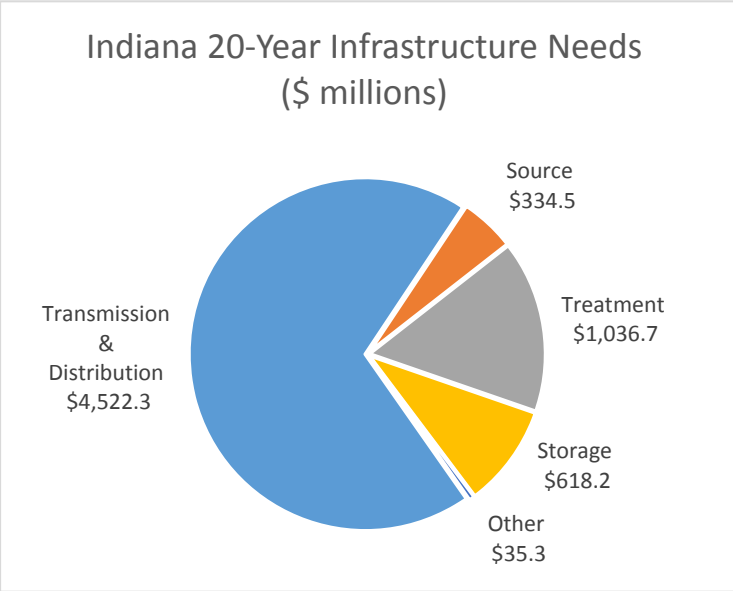


Figure 1. Indiana Drinking Water Infrastructure Needs (USEPA, 2013)

AWWA has forecast that investment needs for water main replacement in the Midwest will peak in the 2030's as more and more buried pipes reach the end of their service lives. For utilities in the Midwest, the total cost of main replacement from 2010 to 2050 is estimated to range from $3,455 per household for large utilities to $17,400 per household for very small utilities (AWWA, 2012). For comparison, these amounts are equivalent to approximately one to four times the average value of utility plant in service (UPIS) for Indiana water utilities (Indiana Utility Regulatory Commission , 2015). The costs facing customers of smaller utilities are significantly higher than those facing the customers of large utilities.

This wave of main replacement needs will build and persist for decades. It has arrived in Indiana, and careful planning and adequate funding will be needed to maintain acceptable service levels while keeping the cost of water service affordable.

1.1.2 Infrastructure planning and management

In 2008, USEPA and six national water and wastewater associations developed guidance to be used to promote *Effective Utility Management (EUM).* The resulting *Ten Attributes of Effectively Managed Water Sector Utilities* are illustrated in Figure 2 (Association of Metropolitan Water Agencies, et al, 2008). The Ten Attributes have been built upon to develop key performance metrics, a benchmarking framework, and tools for assessment and identification of opportunities to strengthen utility management (Matichich, et al., 2014).

Although the *Ten Attributes* were developed to apply broadly to all aspects of utility management, all of them have a direct relationship to or dependence on effective planning and management of utility infrastructure. The attributes *Financial Viability* and *Infrastructure Stability* are particularly relevant. Measures associated with these attributes emphasize life-cycle cost accounting and planning for adequate investment in infrastructure renewal to ensure reliable utility service.

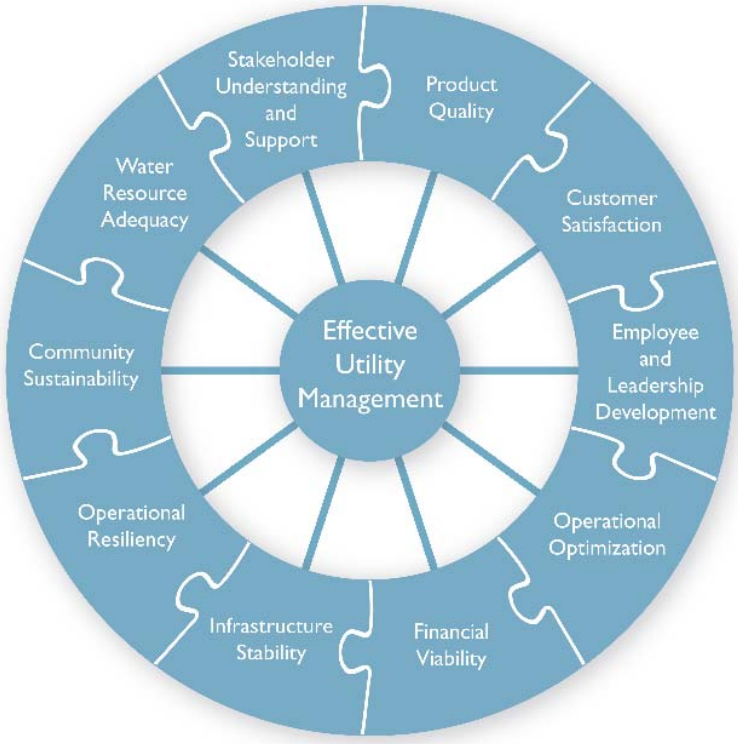


Figure 2. Ten attributes of effectively managed water sector utilities (Association of Metropolitan Water Agencies, et al, 2008)

For much routine utility planning, it is adequate to focus primarily within the area of operation of the utility. In some regions of the state, water supply needs may be met most cost-effectively by regional solutions. In these cases, a coordinated and collaborative approach to utility planning is needed.

Life-cycle cost accounting is an indispensable tool for effective infrastructure planning. Life-cycle cost accounting considers all capital costs and operating and maintenance expenses over the life of the project. It is a more accurate measure of the long-term cost of a proposed investment and the resulting impact to water rates required to support it. Capital costs alone, or capital costs with limited operating cost information only capture part of the picture and may lead to decisions that do not provide the best long-term value for utility ratepayers. The IURC recommends the use of life-cycle costs to evaluate proposed capital project alternatives (Indiana Utility Regulatory Commission, 2014).

Effective planning and management practices result in proactive investment and maintenance, reliable service levels, and management of risk, all of which support economic development. They also result in the lowest long-term rates and greater customer confidence in utility management.

In contrast, poor planning and management is generally reactive and results in deteriorating service. Rate increases are infrequent and characterized by sudden dramatic shocks. Reactive investment results in higher long-term rates, uncertain reliability of water supply, and higher perceived risk, which has a negative impact on economic development potential.

1.2 Fiscal sustainability

Fiscal sustainability in the context of water service can be generally defined as a water utility's ability to *manage its finances so it can meet its spending commitments, both now and in the future, and whether it ensures future generations of ratepayers (or taxpayers) do not face an unmanageable bill for services provided to the current generation* (Government Finance Officers Association, 2012). Some utilities have gone further, defining fiscal sustainability principles to guide their policies, planning, and rate setting. The following principles of fiscal sustainability were developed by the San Diego County Water Authority (2015).

- maintain strong credit rating
- adhere to industry cost of service principles
- ensure all beneficiaries of service pay a fair share of costs
- consistent application of rate setting and other financial policies
- support intergenerational equity
- result in an appropriate level of fixed revenues for fixed obligations
- fulfill legal requirements

These principles highlight the importance of considering the *long-term* implications of decisions related to investment in infrastructure and establishing rates. Well-intentioned efforts to protect ratepayers by deferring expenses and limiting rate increases in the short-term may in fact harm ratepayers in the long-term. Deferral of necessary investments in infrastructure repair and renewal will eventually result in deteriorating service, and higher long-term costs to be borne by future generations.

Full-cost pricing is a critical element of fiscal sustainability. Full-cost pricing is "a pricing structure for drinking water service which fully recovers the cost of providing that service in an economically efficient, environmentally sound, and socially acceptable manner, and which promotes efficient water use by customers (USEPA, 2006)."

There are numerous challenges to achieving fiscal sustainability, including water supply uncertainty, threats to water quality, uncertain regulation affecting water quality or quantity, changing environmental compliance standards, higher customer expectations, aging infrastructure, and increasing economic inequality resulting in affordability challenges for low-income families.

Careful planning by utilities, support of regulators and local government authorities, and public awareness of the value of water resources and infrastructure are all necessary to achieve fiscal sustainability.

1.3 Water rates

Over the last decade, water rates in the United States have increased at an annualized rate of 5.5%, more than double the consumer price index (Figure 3). This is consistent with a 2002 estimate by the USEPA that water utility rates would need to increase at a rate of 3% above inflation to close the gap

between needs and revenue (USEPA, 2002). Over the coming decades, water rate increases will continue to exceed inflation in order to meet growing investment needs.

The term “conservation conundrum” refers to the fact that conservation efforts and increasing efficiency of water fixtures reduce water sales and revenue, but do not reduce the large fixed costs that must be covered for a utility to be fiscally sustainable. Indiana-American Water reported in public filings for a recent rate case (IURC Cause 44450) that per capita water use by their residential customers in Indiana has declined at an average annual rate of 2.06% over the past 10 years, and at an accelerated rate of 2.94% over the past 5 years (Indiana-American Water Company, Inc., 2014). A similar trend is widely reported by utilities across the country. Careful rate design is required to ensure that fiscal sustainability is not put at risk by these trends.

Public understanding of the value of water service is critical to ensure adequate funding for utilities. This is challenging because the majority of utility infrastructure is buried and hidden from view. The fact that water and sewer costs are increasing faster than the rate of inflation, and that customers are generally using less water today than they did in the past makes explaining the need for rate increases that much more difficult. Explaining the many factors that drive the need for investment takes time and effort, but is increasingly necessary to secure adequate revenue through utility rates.

1.4 Ratepayer protection

Preserving affordability for water utility customers requires a long-term focus. Well-intentioned, short-term efforts to protect ratepayers by resisting rate increases will have a negative long-term impact on affordability, if insufficient revenue results in the deferral of needed maintenance and investments. Affordable, reliable service is achieved in the long-term by responsibly managing and investing in the

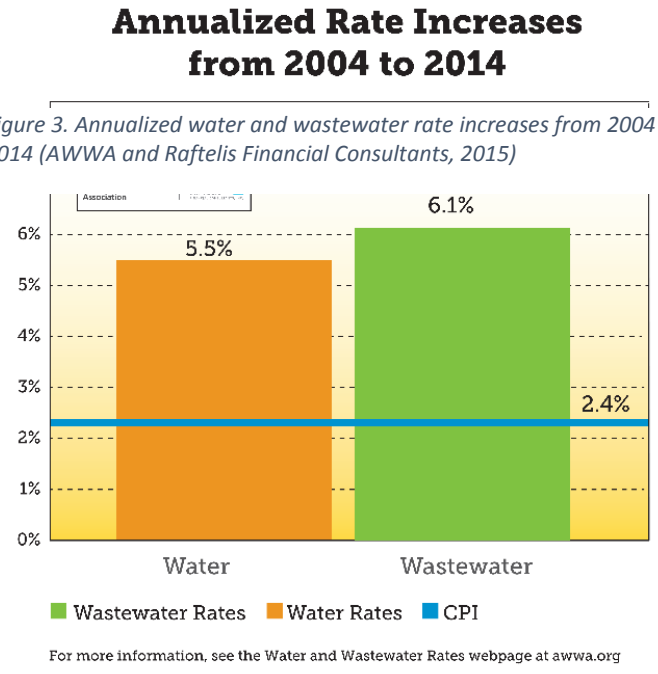


Figure 3. Annualized water and wastewater rate increases from 2004 to 2014 (AWWA and Raftelis Financial Consultants, 2015)

infrastructure needed to provide it. Affordability should be addressed for the most vulnerable of households through focused assistance programs and education on wise water use.

Some practices that contribute to ratepayer protection include:

- Transparency
- Life-cycle costing
- Full cost pricing
- Affordability programs
- Effective asset management planning
- Adequate funding for maintenance and replacement of aging infrastructure
- Public education
- Conservation/wise water use

USEPA considers water service to be affordable if rates are no greater than 2.5% of median household income (MHI). However, MHI is limited as an indicator of affordability in that it does not capture impacts across diverse populations with wide ranges of income. (Stratus Consulting, 2013). Improved measures of affordability should consider indicators such as income distribution and household size to avoid imposing economic hardship on lower-income households (National Consumer Law Center, 2014).

1.5 Regional cooperation

Opportunities for regional cooperation cover a wide spectrum ranging from consolidation through purchase of smaller utilities by larger utilities to informal cooperation and information sharing. Regional cooperation may include:

- Consolidation
- Wholesale water supply
- Shared ownership and operation of facilities
- Interconnection for reliability and contingencies
- Sharing of technical expertise
- Collaboration on resource planning and protection
- Emergency support (InWARN)

The benefits of regional cooperation may include lower overall operation and maintenance cost; greater technical, managerial, and financial capacity; enhanced ability to attract and retain qualified staff; better emergency response; more reliable service; and an enhanced ability to plan on a watershed basis.

Barriers to regional cooperation include political obstacles; lack of knowledge about various forms of regional cooperation; competition for limited resources; the perception of loss of local control; lack of state support for regionalization; lack of coordination among funding sources; large upfront capital costs for regional systems; and the condition and size of existing small systems (Martin, 2012).

2 Water utilities surveyed

The 20 surveyed communities are served by 19 utilities, including the largest water utilities in the state. Though all utilities in Indiana face common challenges, some characteristics of the surveyed utilities differ from those of the smaller utilities throughout the state.

2.1 Size of Utilities

The size and characteristics of the surveyed utilities vary (Table 2). The population served by the utilities ranges from the smallest serving 4,700 people, classified by the USEPA as a medium utility, to the largest serving 876,728 people, classified as a very large utility (USEPA, 2015). In total, the surveyed utilities serve a population of 2,179,430 (799,852 customers), or 33.6% of the state's population. In the state of Indiana, there are over 800 community water supplies (CWS's) of various sizes as indicated in Figure 4.

Table 2. Summary of surveyed utility population and service area (Indiana Utility Regulatory Commission , 2015)

		Minimum	Maximum	Median
Population served by utility		4,700	876,728	63,580
Customers served by utility		1,785	308,662	25,904
Service territory	sq. mi	2.77	674.74	52.29
Customer density	per sq. mi	31	1083	473

While most of the surveyed utilities serve urbanized areas, some also serve rural areas. The density of customers ranges dramatically from 31 to 1,083 customers (79 to 3,377 people) per square mile of service territory. Lower customer density suggests that on average more distribution infrastructure is required to serve each customer. More distribution infrastructure per customer has implications for the operation and maintenance expenses and future replacement needs that must be borne by each

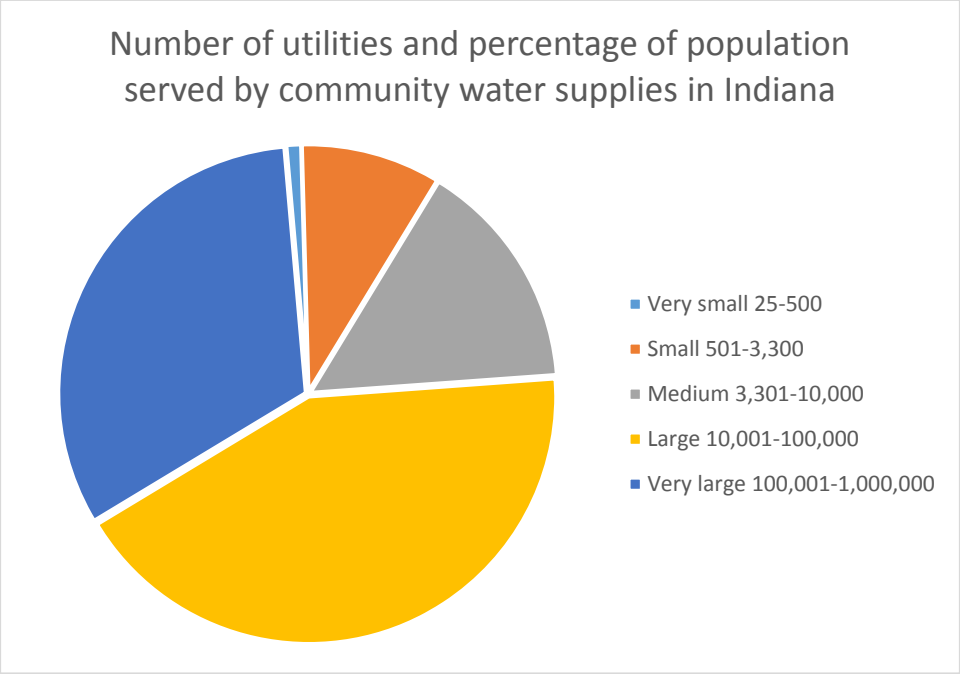


Figure 4. Indiana utilities (USEPA, 2015)

customer. It is also related to water loss, which among other factors is directly related to the length of pressurized water main.

2.2 Trends in customers and water sales

Data collected by the IURC under the authority of Senate Enrolled Act 132 (SEA 132) was analyzed to determine trends in numbers of customers and volume of water sold from 2011 to 2013 for the surveyed utilities (Indiana Utility Regulatory Commission , 2015). One of the surveyed utilities did not report data for 2013. The general trends are summarized in Figure 5. While 89.5% of the surveyed

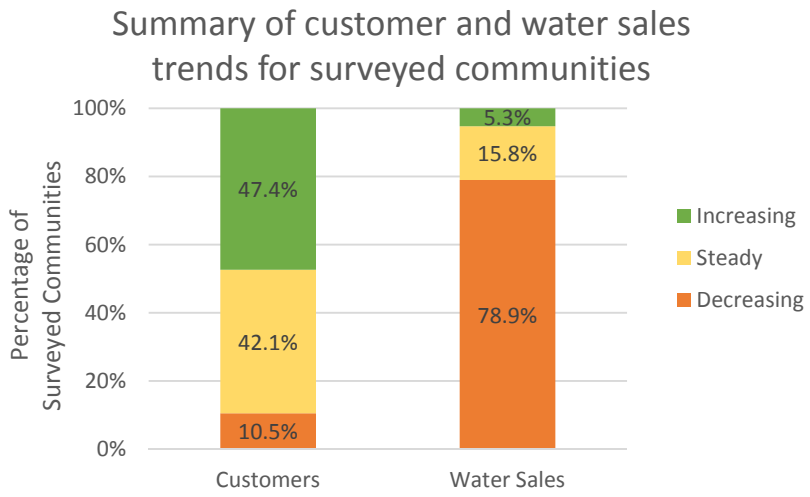


Figure 5. Summary of customer and water sales trends

utilities reported *steady or increasing* numbers of customers served, in the same period 78.9% reported *declining* water sales. Due to improving efficiency of water fixtures and greater attention to water efficiency by industries, per capita water use has been declining for many years. As a result, many utilities across the US have experienced flat or declining demand even during periods of modest population growth. This has significant implications for fiscal sustainability and water utility rates because existing rate structures are largely based on variable, volumetric charges. Declining sales generate less revenue to cover the cost of serving the same or more customers. Effectively designing rates that cover the full cost of service even as usage declines is critical to sustaining reliable water service.

2.3 Utility plant in service

Utility Plant in Service (UPIS) is the total of the original cost of all infrastructure assets in use by the utility. UPIS totals reported to the IURC reflect the original cost of utility infrastructure and do not include accumulated depreciation. UPIS per customer for the surveyed communities ranges from $1,244 to $5,787 per customer, with an average of $3,439 per customer. In general, UPIS per customer tends to be lower for larger utilities, due to economies of scale. Note that because UPIS reflects the total original construction cost, it is always less than the current replacement cost of existing infrastructure. Due to the escalation of construction costs over time, utilities that have made more recent investments in new facilities or replacement of aging infrastructure will tend to have higher UPIS totals per customer.

While UPIS is limited as an indicator of the adequacy of investment in utility infrastructure, a steady or declining year-over-year trend in UPIS is a clear sign of underinvestment in infrastructure. For the nineteen surveyed utilities that reported data for the years 2011 to 2013, the general trend in UPIS was increasing for fifteen (78.9%), steady for three (15.8%) and decreasing for one (5.3%). In Indiana, 450

utilities reported UPIS data to the IURC for the years 2012 and 2013. Of those, 216 (48%) of them reported a steady or declining trend in UPIS (Indiana Utility Regulatory Commission , 2015). This simple metric indicates that in general, Indiana utilities are systematically underinvesting in their infrastructure. As a group, the surveyed utilities are doing a relatively better job of investing in their infrastructure.

3 Infrastructure planning practices

The infrastructure planning practices of the surveyed utilities vary. In this section, common practices and deficiencies are identified, as well as notable best practices. The survey and statewide data suggest that in general the surveyed utilities utilize more effective planning practices than the average Indiana utility.

3.1 Approaches to infrastructure planning

All of the surveyed utilities were asked about their capital investment plans. Fourteen out of the nineteen utilities (73.7%) had a 5-year capital investment plan (CIP), which they updated annually. In addition, nine of the utilities (47.4%) also maintained longer-horizon CIP's, projecting anticipated investments 10 or 20 years into the future. Longer-horizon CIP's were generally for very large capital projects, and for projected investments focused on groups of assets, such as water main replacements. Asset management planning can provide long-range forecasts (30 years or more) which can be helpful for projecting the likely magnitude of future investments and planning to manage competing capital needs and long-term rates. At the other end of the spectrum, five of the utilities budgeted capital projects from year to year, developing 5-year or longer CIP's only when planning for large projects or as the basis for a petition for an increase in water rates.

A majority of the surveyed utilities noted that they take advantage of other planned municipal infrastructure improvements to share costs and minimize disruption. In these instances, water main and service line replacement projects are coordinated with sewer improvements mandated in long-term control plans (LTCP), utility relocations driven by highway or road improvements, or street repaving projects. Several of the utilities reported that they plan the timing of significant investments in sewer and water systems to avoid simultaneous impacts of separate rate increases.

A few of the surveyed utilities noted that their planning is focused primarily on improving reliability and efficiency, not on growth. Many utilities that formerly supplied large amounts of water to industry have excess capacity today, a result of loss of industry and successful efforts by remaining industries to improve efficiency of water use. These utilities focus their planning efforts on right-sizing of supply, treatment and pumping facilities and replacement of aging infrastructure.

There are multiple drivers for infrastructure projects, including regulatory compliance, capacity, resiliency, source protection, aging infrastructure. Considering needs and planning infrastructure improvements in an integrated way is necessary to optimize the investment of limited capital.

Several of the surveyed utilities expressed interest in the establishment of minimum recommended standards for planning, and benchmarking to measure and evaluate the performance of Indiana utilities.

3.2 Planned capital investment

Table 3 summarizes planned 5-year capital investment plan (CIP) totals per customer and as a percentage of UPIS for the surveyed utilities.

Table 3. Summary of 5-year capital investment plan totals per customer for surveyed utilities

	Minimum	Maximum	Mean	Median
5-Year CIP per customer	$ 12	$ 2,252	$ 681	$ 560
5-Year CIP as a percentage of UPIS	0.3%	144.3%	24.1%	17.6%

Figure 6 indicates the percentage of surveyed and SEA 132-reporting utilities that plan to make investments within the next 5 years in different types of infrastructure. Transmission and distribution is the most common target of planned investment. In fact, many utilities identified transmission and distribution investments in multiple years. The state-wide group of SEA 132-reporting utilities reported planned investment with significantly less frequency than the survey group. Considering the known needs of utilities in general, the low frequency of planned investment suggests that as a whole Indiana utilities are underinvesting in infrastructure.

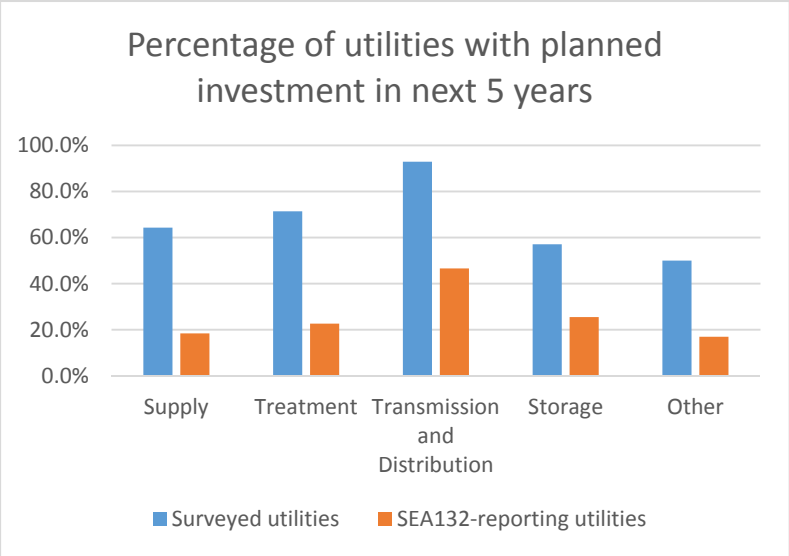


Figure 6. Summary of 5-year utility investment plans (Indiana Utility Regulatory Commission , 2015)

3.3 Conclusions: infrastructure planning practices

The following summarizes observations, best practices, and conclusions related to the infrastructure planning practices of the surveyed utilities and utilities in Indiana as a whole.

Observations:

- As reported for SEA 132, a relatively small percentage of utilities identified planned infrastructure investments within the next 5 years. This suggests that infrastructure planning practices are lacking.
- Most of the surveyed utilities are using generally effective planning practices, though a few do very little. The lack of a 5-year capital investment plan suggests an ad-hoc approach to utility planning, which increases operational and financial risks for the utility and its customers.

- Some of the surveyed utilities commented that consistent minimum planning standards should be required of all utilities, and that benchmarking would be an effective tool for evaluating and promoting improved planning practices.
- Surveyed utilities expressed interest in improved access to data for planning, and support for regional planning efforts.

Best practices of surveyed utilities:

- Coordination of growth and demand forecasting for water and wastewater planning
- 5-year plan for all capital investments, updated annually
- Longer-term (15-20 year) planning for major capital projects and categories of investments, such as main replacement, meters, replacement of major equipment
- Capital planning built around longer term (20-50 years) demand and source of supply planning
- Consideration of trends in water use efficiency to project demands and determine future capacity requirements
- Right-sizing of older utility facilities originally built for higher demands
- County-level and other regional water supply planning efforts involving multiple utilities
- Coordinated timing of large water and sewer utility capital investments
- Benchmarking of service levels

Conclusions:

- Most of the surveyed utilities, with a few exceptions, are effectively planning.
- The relative lack of planned investment as reported for SEA 132 suggests that many Indiana utilities are underinvesting and need to improve planning practices.
- Some of the surveyed utilities have well-developed approaches to planning. These could be studied and modeled as best practices for other utilities of similar size and technical capability.
- Minimum standards should be established for infrastructure planning and management. Benchmarking should be explored as a means of promoting effective planning practices.

4 Asset management practices

Asset management is a set of practices used to provide the service level required by utility customers at the lowest long-term cost and acceptable level of risk. This section describes the surveyed utilities' reported asset management practices, draws conclusions from SEA 132 data regarding the apparent level of asset management planning by Indiana utilities, and makes comparisons to national trends.

While asset management is frequently associated with distribution systems which comprise the largest group of utility assets, it applies to all assets including supply, treatment, storage, and administrative facilities. Because replacement needs are increasing for all utilities, an asset management plan is a critical tool for ensuring reliable, affordable water service in the long-term.

4.1 Fundamentals and importance of asset management

Asset management addresses five core questions (WERF, 2014):

- What is the current state of my assets?
- What is my required level of service?
- Which assets are critical to sustained performance?
- What are my best O&M and CIP investment strategies?
- What is my best long-term funding strategy?

The process of developing an asset management plan follows ten basic steps as illustrated in Figure 7.

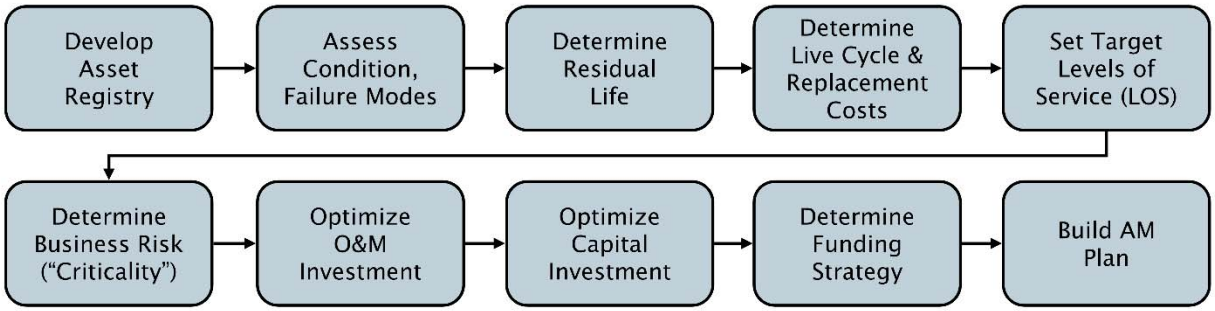


Figure 7. Ten-step asset management process (WERF, 2014)

An *asset registry and inventory* is composed of a listing of all assets owned by the utility, with information related to the capacity, age, service life, condition, criticality, and other characteristics of each asset.

The *replacement cost* is estimated for all assets. This is the cost to replace the asset in current funds. In most cases, the replacement cost will be greater than the original cost of the asset reflected in UPIS.

The *level of service* is the service level required to meet defined customer and utility expectations of service quality and reliability and to comply with regulatory requirements.

Strategies for maintenance and replacement of infrastructure are developed to ensure that the defined level of service is met at the lowest life-cycle cost.

A properly developed and implemented asset management plan supports fiscally sustainable rates. Bond ratings agencies consider asset management practices when evaluating the financial risk of utilities for the purpose of establishing utility credit ratings (Standard and Poor's Ratings Services, 2014).

Regulatory agencies in many states now require asset management plans for various purposes, such as access to funding and renewal of discharge permits. The 2014 Water Resources Reform and Development Act (WRRDA) established a requirement that utilities develop fiscal sustainability plans with components of asset management in order to obtain loans through the Clean Water State Revolving Fund (CWSRF) program.

4.2 Asset management practices in Indiana

Less than two-thirds of the surveyed utilities reported systematic planning for replacement of aging water mains, and less than one-third have what would be considered well-developed asset management programs. Of the surveyed utilities, the highest rates of water main replacement were 0.7% (143-year cycle) and 0.35% (286-year cycle). These utilities indicated that while significantly increased from historical levels, their planning indicated that current rates of replacement were not fully adequate. All other surveyed utilities were further behind. AWWA projects that for the typical utility necessary water main replacement rates will increase to 1.0% by 2020 and to 2% by 2035 (AWWA, 2012).

Figure 8 summarizes the percentage of surveyed and SEA 132-reporting utilities that plan to invest in their distribution systems in one or more of the next five years. The surveyed utilities reported a significantly higher frequency of planned investment. More than half of the SEA 132-reporting utilities indicated no plans to invest in distribution infrastructure in the next five years. This suggests that many utilities may lack information about the condition and replacement needs of their distribution systems.

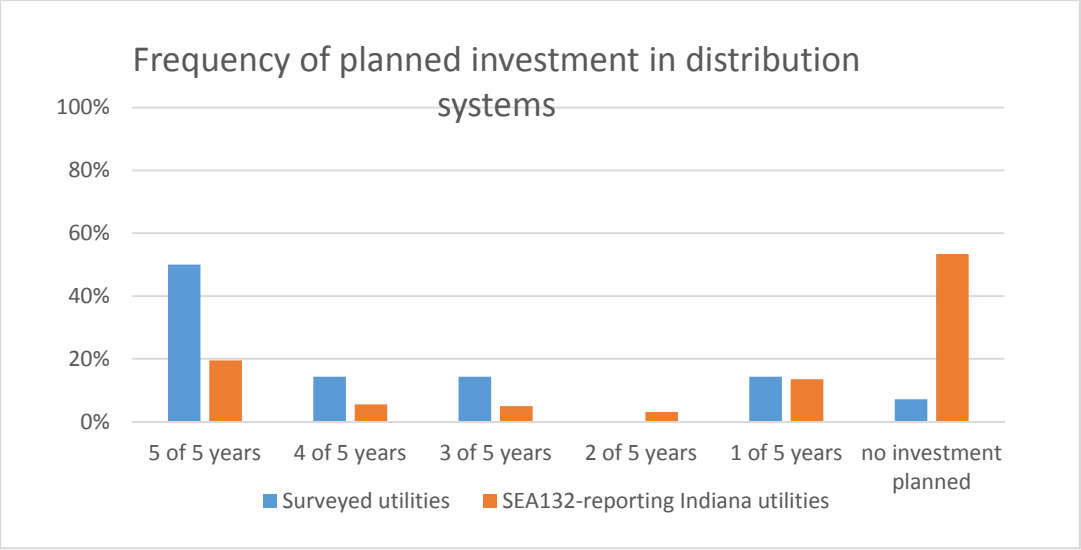


Figure 8. Planned investment in transmission and distribution infrastructure for surveyed and SEA 132-reporting utilities (Indiana Utility Regulatory Commission , 2015).

There isn't a single replacement rate for distribution mains or other utility infrastructure that is appropriate for every utility. In the Midwest, the wave of replacement has arrived and the peak is projected to occur in the 2030's (AWWA, 2012). The estimated cost of main replacement per customer by size of utility in the Midwest is indicated in Figure 9. Every system has its unique profile of historical

investment, pipe materials, soil types, operating conditions, and other factors that determine the service life of pipes and the rate and pattern over time in which they will require replacement.

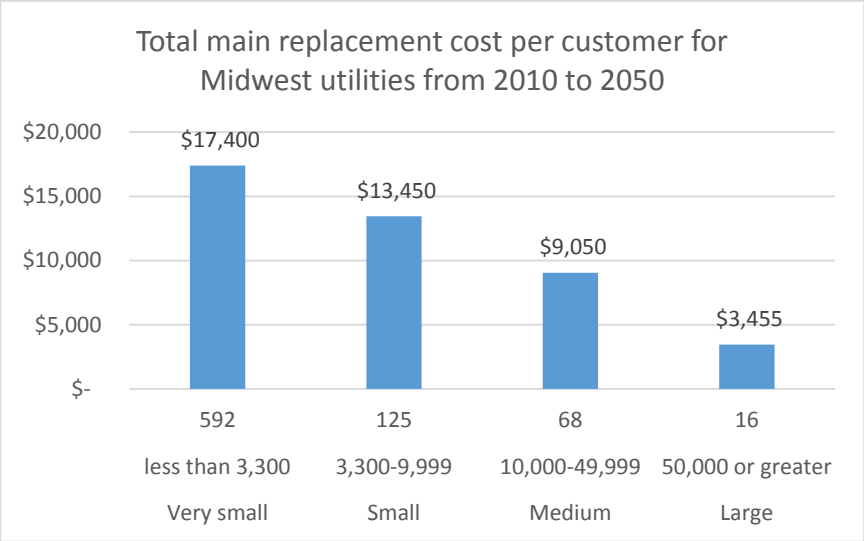


Figure 9. Estimated total cost per customer of main replacement for Midwest water utilities by utility size and number of Indiana utilities in each size category (AWWA, 2012).

The OUCC has recently required utilities to develop asset management plans through the rate approval process, including at least one of the surveyed utilities.

4.3 Conclusions: asset management practices

The following summarizes observations, best practices, and conclusions related to the asset management practices of the surveyed utilities and utilities in Indiana as a whole.

Observations:

- Some regulatory agencies are beginning to require asset management planning, including the OUCC for rate increases, SRF for CWSRF as required by WRRDA, and NPDES renewal in some states
- Most utilities in Indiana are late getting started, some are doing nothing, others are aware but not yet able to muster resources to make a meaningful effort. It is important to start now to prevent deferred costs from accumulating until they are unmanageable.
- For some utilities, the ramp-up of water main replacement programs is constrained by funding required for mandated LTCP investments in sewer systems.
- Less than two-thirds of surveyed utilities systematically plan for replacement of aging water mains, and less than one-third have what would be considered a well-developed program that allows accurate forecasting of needs and prioritization of investments
- The highest main replacement rates reported by surveyed utilities were 0.7% of total length of main per year (equivalent renewal rate of 143 years) for one utility, followed by 0.35% (equivalent renewal rate of 286 years) for the next highest. Both of these utilities indicated that while significantly increased from historical levels, current levels of investment were not fully adequate. All other surveyed utilities were farther behind.

- The surveyed utilities with well-developed programs were generally aware of the specific needs for their systems, but all felt that they are currently unable to secure adequate funding to fully meet those needs.
- Data from SEA 132 indicate that more than half of the utilities in Indiana have no plans to invest in their distribution systems within the next 5 years. This suggests that a large number of utilities in Indiana are either currently not planning to address aging infrastructure, are severely constrained in terms of funding, or both.
- Only half of the surveyed utilities and one-fifth of the SEA 132-reporting utilities plan annual distribution investments and those that do feel that they do not have adequate funding to fully meet needs. It can be concluded that most utilities in Indiana are underinvesting in infrastructure renewal.
- It is likely that underinvestment can be attributed in some degree to a lack of information available to utilities regarding the extent and timing of needs associated with aging infrastructure.

Best practices of surveyed utilities:

- Benchmarking by a couple of utilities to set goals for main break frequency, replacement rates, and control of water loss
- Well-developed programs at a couple of utilities that use assessment of asset condition, performance, and risk for budgeting and prioritizing main replacements
- Collection of main break data by a couple of utilities for use to more accurately predict performance and probability of failure of different age and material cohorts of water mains.
- Coordination of water, sewer and street work to reduce overall costs of infrastructure renewal
- Several utilities indicated that they had hired or designated staff dedicated to developing and implementing asset management plans
- Evaluation of all assets, including aging supply and treatment assets in addition to water mains
- Consideration of other drivers (regulatory, resiliency, security, etc.) when considering whether to renew existing assets or replace with infrastructure better suited to present needs

Conclusions:

- The majority of utilities in Indiana are not proactively planning to manage aging infrastructure
- A combination of requirements, incentives, and funding is needed to kick-start asset management by Indiana utilities to begin managing already-increasing main replacement needs.
- The need for asset management planning is urgent in order to prevent deterioration of service levels, increased water loss, and higher than otherwise necessary long-term costs and rates
- Water utilities need training, tools, and support to improve asset management practices
- A couple of the surveyed utilities have asset management programs that could be studied and used as examples of best practices
- Improved asset management practices will result in more complete estimates of infrastructure needs in future USEPA Drinking Water Infrastructure Needs Surveys
- The cost of renewal and replacement of infrastructure is expected to be much higher for small utilities than large ones.

- Adding total length of main to the data requested annually under SEA 132 would facilitate the assessment of the potential funding needs and asset management practices of the state's utilities.

5 Water rates and ratepayer protection

Pricing that reflects the full cost of service is fundamental to fiscal sustainability. This section describes various factors related to water utility rates and ratepayer protection including planned rate increases, operation and maintenance expenses, water loss, the rate-setting process, affordability, and financing.

5.1 Current utility rates

The current volumetric rates of the surveyed utilities vary considerably. The minimum, maximum and median volumetric rates per 1,000 gallons are shown in Table 4.

Table 4. Summary of volumetric water rates of surveyed utilities

	Minimum	Maximum	Median
Volumetric Rate ($ per 1,000 gallons)	$ 0.44	$ 6.35	$ 4.06

Of the nineteen surveyed utilities, ten (53%) increased rates effective in 2015. Four utilities (21%) last increased rates between 2011 and 2014, and five utilities (26%) last increased rates in 2010 or before. Water rates in the US have increased an average of 5.5% annually since 2004 (AWWA and Raftelis Financial Consultants, 2015). The median and maximum number of years since the last rate increase for the surveyed utilities are five and 32 years, respectively. Over those periods of time, average water utility rates in the US have seen corresponding increases of approximately 35% and 350%.

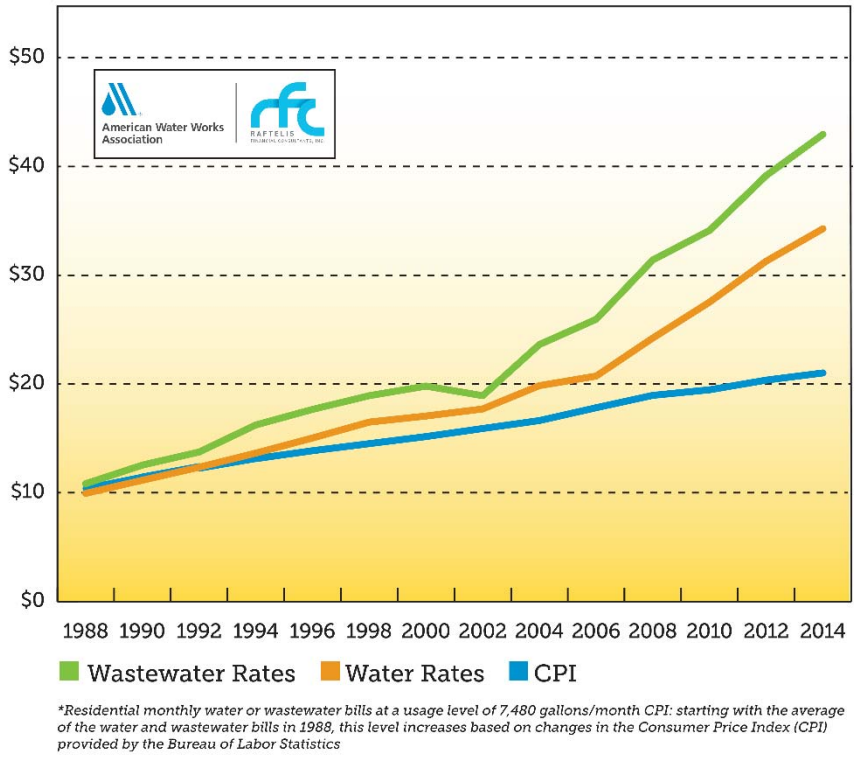


Figure 10. Typical monthly water and wastewater rates compared to CPI. (AWWA and Raftelis Financial Consultants, 2015)

As shown in Figure 10, water and sewer rates have increased at rates above inflation for many years, a trend that is expected to continue. Many of the surveyed utilities indicated that sewer rate increases required to comply with mandates have resulted in pressure to defer and minimize water rate increases.

Figure 11 illustrates the plans of SEA 132-reporting utilities to increase rates between 2015 and 2019. The majority of utilities report that they are uncertain whether they will raise rates in any given year. It is not known how many of the utilities that reported "maybe" will in fact raise rates.

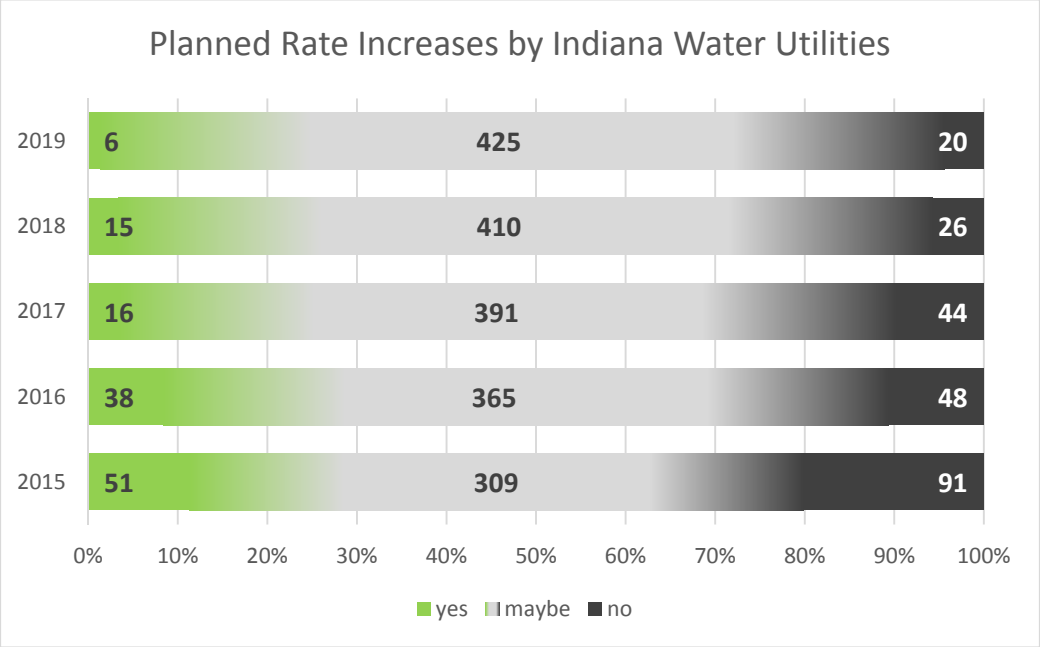


Figure 11. Planned rate increases by Indiana water utilities (Indiana Utility Regulatory Commission , 2015).

The available data do not allow for a good assessment of the frequency with which Indiana utilities adjust rates. Given the long-standing trend of utility rates increasing faster than inflation and the growing needs related to aging infrastructure, it can generally be stated that utilities should adjust rates frequently in order to avoid customer "rate shock" and to avoid revenue shortfalls in-between adjustments. Operating with insufficient revenue inevitably leads to deferral of needed maintenance and investment, which will result in long term rates that are higher than necessary.

5.2 Required revenue and cost of service

There are two generally accepted and practiced methods of determining required revenue - the *Cash-Needs Approach* and the *Utility Approach*.

The *Cash-Needs Approach* includes operation and maintenance expenses, debt service payments and related reserves, and capital expenditures. Operation and maintenance expenses may include salaries, wages and benefits, power, water, chemicals, rent, services, materials and supplies, and overhead costs. Capital expenditures generally include routine annual replacements, routine annual extensions and improvements, and major capital replacement and improvements. The *Cash-Needs Approach* is used by most municipal utilities. The *Utility Approach* differs in that an allowed rate of return is earned on capital

investment in utility plant. Utilities that use this approach also typically pay taxes and other fees to the municipality (AWWA, 2012).

Once the required revenue has been determined, costs are allocated to different classes of customers according to their characteristics. Because much utility infrastructure is designed and constructed for peak demands, customers that drive those demands disproportionately drive infrastructure costs.

Table 5 summarizes average water sales, peaking factors, and operation and maintenance cost per million gallons of water produced for the surveyed utilities. The peaking factor is the ratio of the maximum day demand to the average day demand. As noted in Table 1, much of a utilities' infrastructure must be sized for maximum day and maximum hour demands. Higher peaking factors require that infrastructure be built with greater capacity to meet high demands during a limited period of time. The rest of the time, much of the capacity goes unused. Efforts to reduce peak demands can result in significant savings by reducing the capacity of needed infrastructure and potentially deferring future expansion projects. Equitable rate designs allocate the cost for this peak-driven capacity to the users that create the peak demands.

Table 5. Summary of water sold, demand ratios, and OPEX for surveyed utilities

		Minimum	**Maximum**	**Median**
Volume of water sold, average	mgd	0.61	103.27	6.86
Demand ratio, max to average day		1.11	2.73	1.36
Operation and maintenance cost	$ per million gallons produced	$ 1,025	$ 4,049	$ 2,071

For comparison, the median operation and maintenance (O&M) cost per million gallons for all SEA 132-reporting Indiana utilities was $3,926.47 for the year 2013, nearly double that of the surveyed utilities. In general, O&M costs for small utilities are higher than those of larger utilities. This explains the difference in median O&M cost of the surveyed utilities, which are larger, and that of the state's utilities as a whole.

A very significant and new challenge for utilities is the increase in rates that will be required over the coming decades to cover the increasing cost to replace aging infrastructure. Ensuring that adequate revenue is generated to keep ahead of the replacement wave will be critical to the fiscal sustainability of water utilities in the coming years. As reported in AWWA's 2015 State of the Water Industry Survey, utility managers in the US are concerned about their ability to cover the full cost of providing water service. Figure 12 illustrates their assessment of their own utility's ability to cover the full cost of service. In general, concerns increase as they look to the future. Careful long-term planning and public education will play key roles in successfully addressing this challenge.

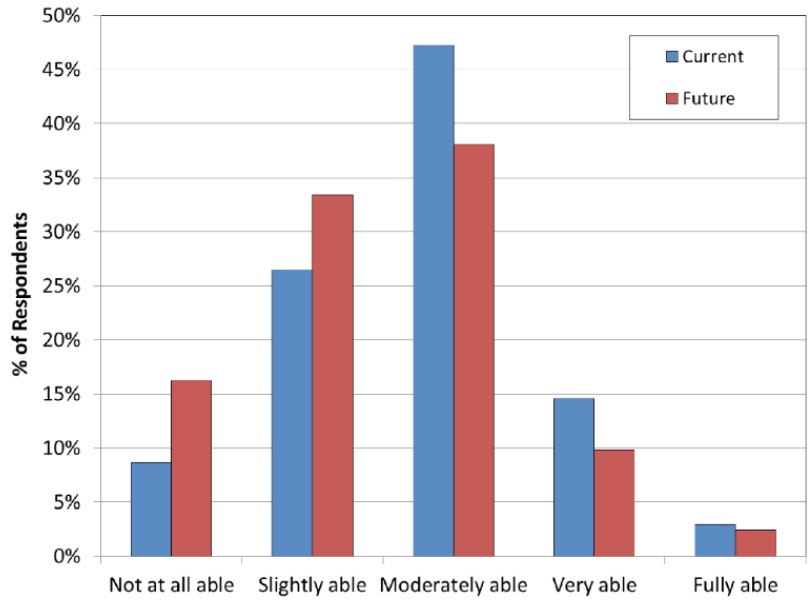


Figure 12. Responses (as % of total) from all participants regarding whether (their own) water and waste water utilities can cover the full cost of providing service (n=1,507) (AWWA, 2015)

5.3 Water loss

Every utility inevitably loses some of the water that it produces and treats to leaks in the distribution system. Water loss management is an important component of ensuring fiscal sustainability. In addition to pipe condition, leakage is directly related to the length of the distribution system and the pressure in the system. Some amount of leakage is unavoidable, and as pipes and service lines age the rate of leakage increases. The best practice for water loss accounting is found in the American Water Works Association's *Manual M36 Water Audits and Loss Control Programs*. Figure 13 illustrates how water produced by a utility is accounted for to determine apparent and real losses.

Data available from SEA 132 allows water loss to be calculated by subtracting the volume of water sold from the volume produced. Table 6 summarizes the range of water loss reported by the surveyed utilities, as well as the associated prorated operating expenses. Water losses may be *real* in the case of leaks or *apparent* in the case of inaccurate metering. The median percentage of water loss for all SEA 132-reporting Indiana utilities was 22.6% for the year 2013, somewhat lower than the median of the surveyed group.

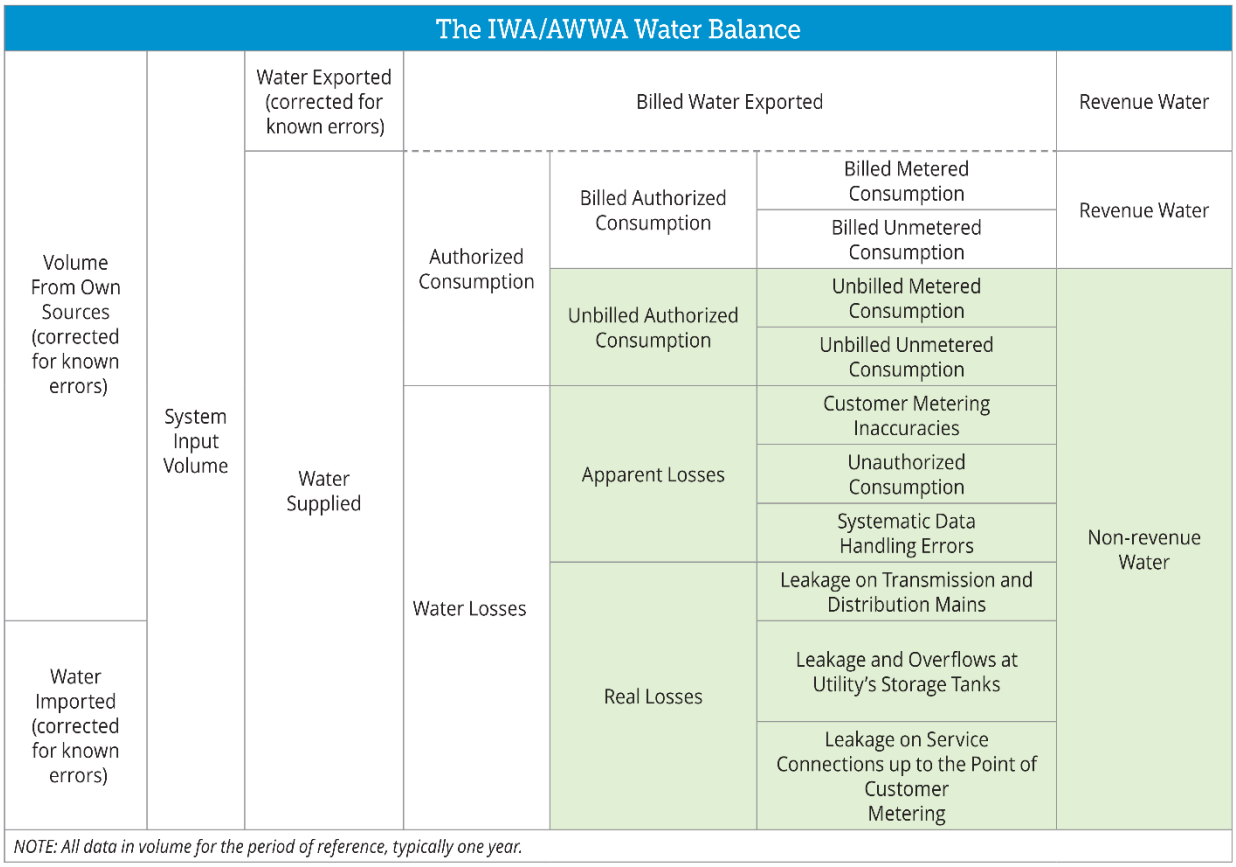


Figure 13. IWA/AWWA Water Balance (AWWA, 2009)

Table 6. Summary of water loss for surveyed utilities

		Minimum	Maximum	Median
Water loss	% of volume of water produced	0.2%	39.9%	26.6%
Prorated OPEX associated with water loss	$ per million gallons produced	$6	$1,320	$541

Note: Water loss percentages below 5% in SEA 132 data are most likely below the level of unavoidable water loss and are suspect, likely due to inaccurate measurement or recordkeeping errors.

Utilities should attempt to achieve an economic level of leakage (ELL) at which the total cost of lost water and cost to detect and repair leaks is minimized. There is no single water loss percentage that is optimal for every utility.

The cost or value of water loss depends on the utility's circumstances, as indicated in Table 7. The cost of lost water should be used by utilities to make decisions about appropriate levels of spending on leak detection and repair efforts. Note that if a major capital project is needed to increase capacity, the value of water loss reduction may be quite high if it enables the project to be deferred or downsized.

Table 7. Value of water loss control

	Cost of lost water
Supply far exceeds demand	Variable costs (power, chemicals, residuals handling)
Supply could be exceeded by peak demands	Retail cost of water, if supply limits sales
Capacity expansion is required to meet demands	Variable or retail costs, plus avoided cost of capacity expansion

5.4 Process for establishing water rates

Three quarters of the surveyed utilities are subject to regulation of rates by the IURC. These utilities prepare petitions to the IURC to raise rates. Rates are approved by the IURC after testimony by both the utility and the Indiana Office of the Utility Consumer Counsel (OUCC) on behalf of utility customers. For municipal utilities, separate approval by local government or utility boards is generally also required. Surveyed utilities reported that the cost to prepare for and complete a rate case can be quite high. Two of the surveyed utilities reported costs exceeding one million dollars for recent rate cases.

The mission statement of the Indiana Utility Regulatory Commission (IURC) is to *assure that utilities and others use **adequate planning and resources** for the provision of **safe and reliable utility service** at reasonable cost* (Indiana Utility Regulatory Commission, 2015).

The mission statement of the Indiana Office of Utility Consumer Counselor (OUCC) is *to represent all Indiana consumers to ensure **quality, reliable utility services** at the **most reasonable prices possible** through dedicated advocacy, consumer education and creative problem solving* (Indiana Office of Utility Consumer Counselor, 2015).

"Quality reliable utility service" and "safe and reliable utility service" requires investment that is adequate to sustain long-term service levels without burdening future ratepayers with the costs of deferred investment and deteriorating service. Sacrificing adequate investment for the sake of short term cost savings will result in higher costs for utility customers in the long-term. Reasonable prices are achieved by ensuring that the adequate level of investment is made efficiently and responsibly through planning, efficiency, and cost controls, not by deferring needed investment or maintenance. Adequate planning and asset management are critical to determine the least long-term cost combination of maintenance, replacement and renewal of aging infrastructure.

Utilities that are not subject to regulation of rates by the IURC increase rates with local government or utility board approval.

5.5 Ratepayer protection

Long-term, ratepayer protection is best addressed when utilities, regulators, and local officials are guided by principles of fiscal sustainability.

Of the surveyed municipal utilities, 58.7% reported that political influence has resulted in delayed and insufficient rate increases, resulting in deferred maintenance and investment. The "catch-up" rate increases are frequently dramatic and controversial. Several of the surveyed utilities commented that a lack of utility knowledge by local officials presents an obstacle to obtaining adequate resources.

Affordability is best achieved with focused assistance programs for the lowest-income households, and wise water use education to help customers manage their water consumption and utility bills.

5.6 Financing

Indiana utilities use a variety of sources to finance capital investments. Figure 14 indicates the sources of debt for SEA 132-reporting utilities by utility type. A few of the surveyed utilities indicated that they finance small capital investments on a pay-as-you-go basis, and borrow or issue bonds only for large capital projects. One utility noted that USDA loans carry covenants that prohibit actions by others that could impinge on the utility's ability to repay the loans, and that these covenants provide some protection against actions by others that could negatively impact their fiscal sustainability. Some utilities noted that they plan for and maintain a capital reserve. A few of the larger utilities noted that while they

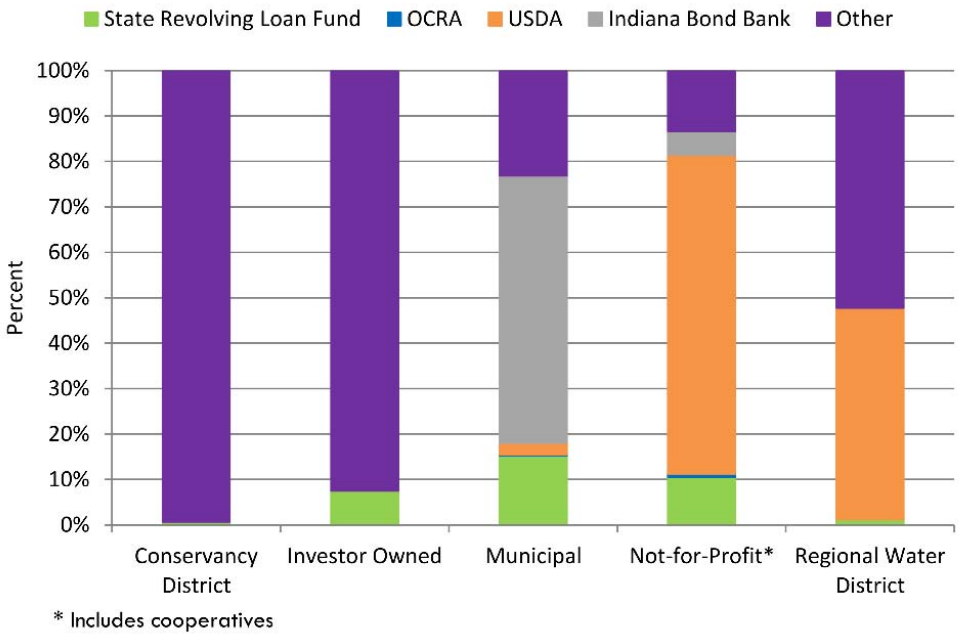


Figure 14. Sources of debt based on utility type in 2013 (Indiana Utility Regulatory Commission, 2014)

have utilized State Revolving Fund (SRF) loans in the past, alternative low-cost financing from other sources is preferred due to the additional effort required to administer and report on SRF financing. Some surveyed utilities noted that their ability to borrow is constrained by overall municipal debt.

5.7 Conclusions: water rates and ratepayer protection

The following summarizes observations, best practices, and conclusions related to water rates and ratepayer protection for the surveyed utilities and utilities in Indiana as a whole.

Observations:

- Some utilities reported that property tax caps have resulted in deferral of infrastructure investment. Reliance on property tax revenue indicates that utility rates are inadequate to cover the full cost of service.
- Political influence over rate increases was reported by multiple utilities as a problem that prevents them from having the funds to make necessary investments. The result is deferred investment and maintenance, and less frequent but dramatic and controversial rate increases.

- Several IURC-regulated utilities noted that having an independent “referee” is advantageous.
- Most of the utilities regulated by the IURC commented that the cost and time required for the rate approval process is a burden.
- Several utilities perceive that the OUCC commonly advocates to remove investments and maintenance from rates that the utility deems necessary, resulting in inadequate revenue.
- Water and sewer are frequently on the same bill. Customers view the cost of water and sewer service, and proposed rate increases together not separately.
- Several utilities commented that lack of knowledge of utility operations and needs by board members and local officials is an obstacle to obtaining adequate resources.
- IURC-regulated municipal utilities expressed interest in the ability to use DSIC, though local government approval would still be required
- Flat or declining demand results in revenue shortfalls for many utilities
- One utility by statute has to give up “excess” funds to local government. Due to property tax caps, local government has become more and more dependent on these funds for operations.
- Several municipal utilities held referendums to opt out of IURC jurisdiction, but they were all defeated. Reported lack of public trust is an issue.
- Several utilities noted that they have had to postpone needed water rate increases due to LTCP-driven sewer rate increases.

Best practices of surveyed utilities:

- Raise rates regularly and gradually to avoid sudden rate shocks
- One utility alternates “across the board” and cost study-based rate increases to reduce the cost of rate studies
- Testing and replacement of meters to maintain accuracy and maximize revenue
- Leak detection for water loss control
- Set aside funds in a capital reserve
- Inclining block rates for wholesale customers to encourage conservation
- AWWA water audits
- Wise water use education targeted to low-income customers to help control cost of water service

Conclusions:

- Median water loss is greater than 22% in the state, based on data reported for SEA 132. The level of water loss should be expected to increase in systems that defer replacement of aging infrastructure and decrease to economical levels in systems that engage in main and service line replacement programs.
- The AWWA Water Audit methodology is the preferred method for evaluating water loss and informing decisions about leak detection and repair to minimize the total cost to ratepayers.
- Collection of minimal additional data through SEA 132 would facilitate a much improved assessment of water loss for the state’s utilities.
- With a few notable exceptions, most of the surveyed utilities had recently adjusted rates and had plans in the near future to do so again.

- Only 28% of the state's utilities indicated with certainty that they plan to raise rates in the next 5 years. Considering the general rate of increase in water utility rates nationwide, this suggests that utilities in Indiana may not cover the full-cost of water service.
- There is significant variability in operation and maintenance expense among Indiana utilities. Regional cooperation may enable utilities to share cost benefits and economies of scale to manage water rates.
- Ratepayers are protected when utilities have adequate technical and managerial capacity, there is transparency in planning and rate setting, and they are represented by advocates either in state or local government that are guided by principles of long-term fiscal sustainability.

6 Regional cooperation

There are many opportunities for cooperation among water utilities in the same region. These include consolidation, wholesale water supply agreements, shared technical expertise or ownership of facilities, system interconnections, collaboration on resource planning and protection, and emergency preparedness. In some areas of the state, the most cost effective water supply solutions may require the collaboration and cooperation of multiple utilities in order to realize their benefits.

Regional cooperation can offer many benefits including lower overall operation and maintenance cost; greater technical, managerial, and financial capacity; enhanced ability to attract and retain qualified staff; better emergency response; more reliable service; and an enhanced ability to plan on a watershed basis.

Among the surveyed utilities, there were notable examples of regional cooperation. Some of the utilities were engaged in regional county-level planning efforts, others collaborated on water quality monitoring and source water protection, and 10 of the 19 surveyed utilities currently supply water to other utilities under wholesale contracts.

This section will discuss examples of regional cooperation and further potential among the surveyed utilities and Indiana utilities as a whole.

6.1 Regionalization and de-regionalization

The decision to develop a new water supply requires committing significant investment to study, design and construct wells or an intake, treatment, pipeline, and storage facilities. Unless the water source is nearby, the cost for a pipeline to connect the supply to the system may be high. Additional staff may be required to operate the new facility. There are significant economies of scale for water supply and treatment infrastructure. While many municipalities and utilities prefer to directly control their own supplies, significant long-term savings may be realized by exploring options to interconnect and purchase water from other utilities with excess capacity, or by collaborating to jointly expand or develop new supplies. Fair evaluation of all options to identify least life-cycle cost alternatives helps to ensure that limited state funds are used effectively and ratepayers are protected.

Several of the surveyed utilities described situations in which former wholesale customers elected to develop their own independent supplies and allow their water purchase agreements to lapse. Infrastructure built by the wholesale provider to serve the former customer is left underutilized, and the loss of revenue requires that an additional burden be imposed on the remaining customers of the wholesale provider in order to remain fiscally sustainable. Currently, the economic impact of these decisions to the ratepayers of the wholesale provider are not taken into account.

6.2 Potential for regional cooperation in Indiana

Figure 15 shows the surveyed utilities and all neighboring utilities whose service territory boundaries come within 10 miles of those of the surveyed utilities. According to USEPA, nationally 86% of water systems are within five miles of the closest system, and 98% are within 10 miles of the closest system (USEPA, 2002).

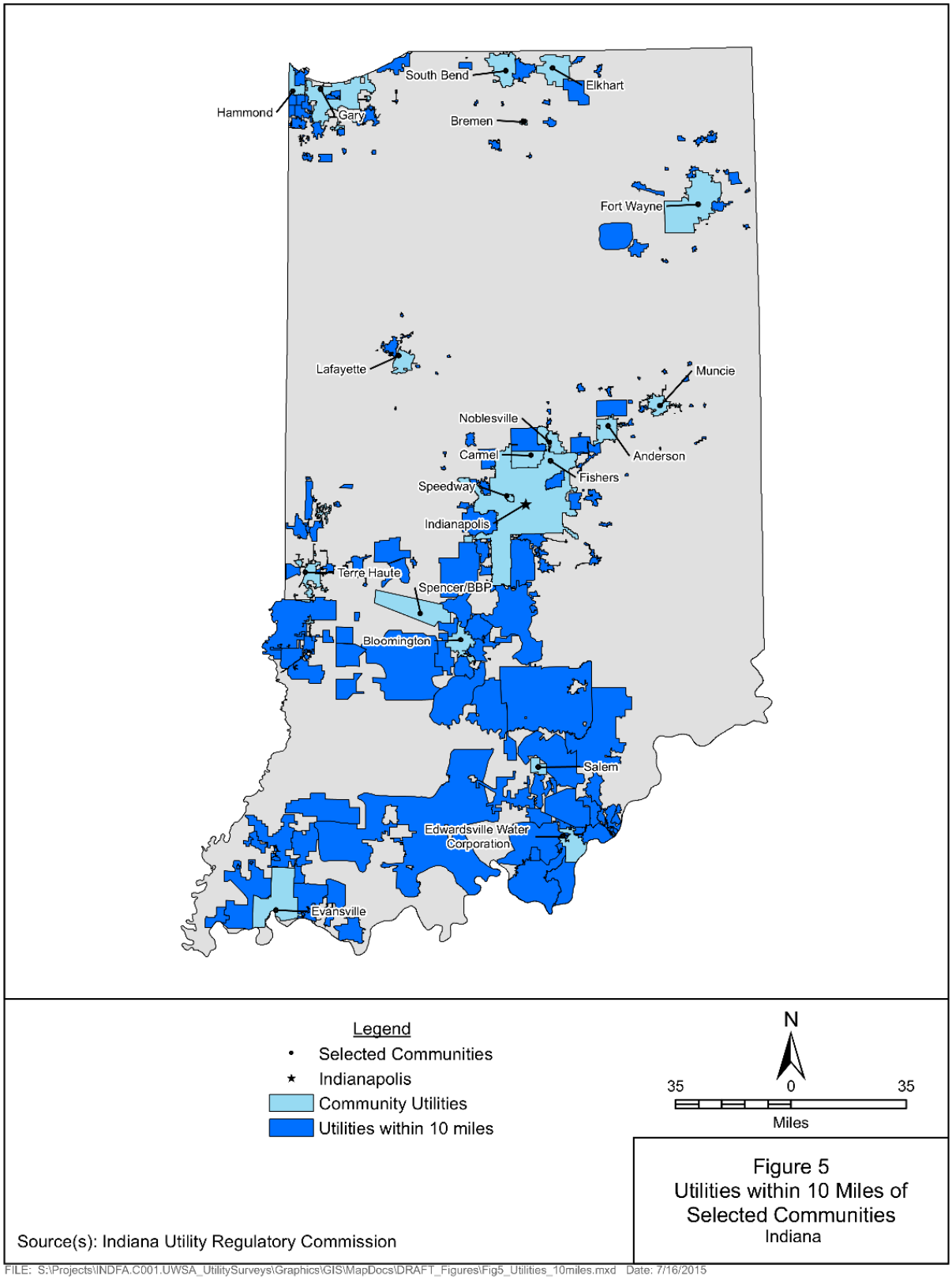


Figure 15. Service territories of surveyed utilities and neighboring utilities within 10 miles (Indiana Utility Regulatory Commission , 2015)

Five of nineteen (26.3%) surveyed utilities and 53.9% of SEA 132-reporting Indiana utilities indicated that they do not have a plan to obtain additional water resources in the event of a water shortage or contamination of supply (Figure 16).

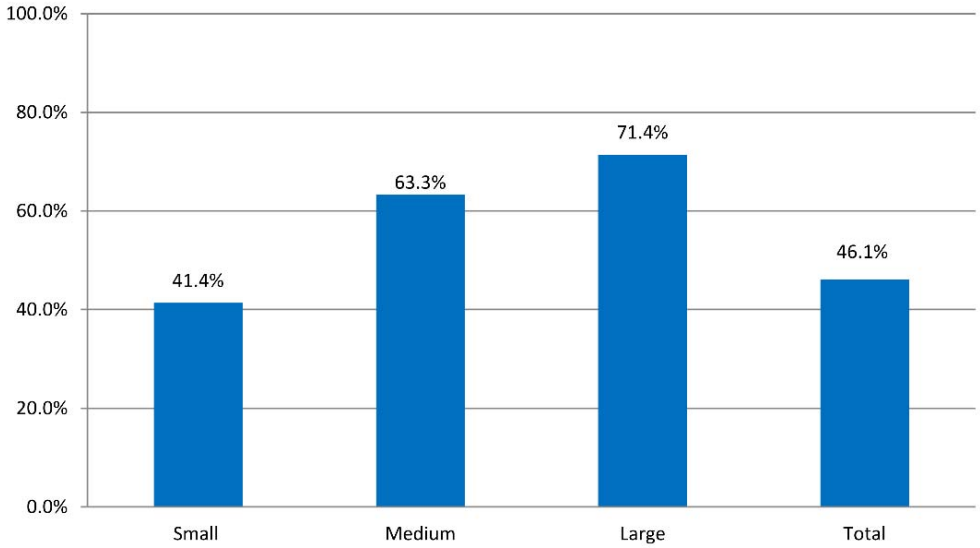


Figure 16. Utilities with a plan for additional resources in the event of a water shortage or contamination of supply based on utility size (Indiana Utility Regulatory Commission, 2014).

There appears to be potential for regional cooperation by the surveyed utilities. Figure 17 summarizes the median numbers of neighboring utilities within 10 miles of the surveyed utilities, with greater comparative O&M expense, and without reported plans for backup supplies. The feasibility of interconnection depends on many factors, not the least of which is cost, but in many cases it may be a viable option for neighboring utilities to obtain additional supplies or achieve greater resiliency.

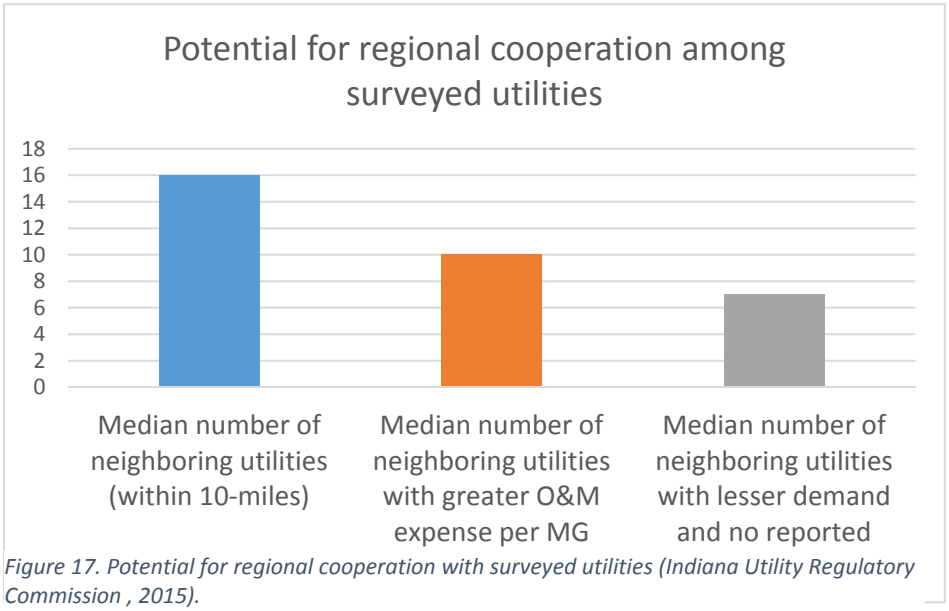


Figure 17. Potential for regional cooperation with surveyed utilities (Indiana Utility Regulatory Commission , 2015).

6.3 Conclusions: regional cooperation

The following summarizes observations, best practices, and conclusions related to regional cooperation for the surveyed utilities and utilities in Indiana as a whole.

Observations:

- Some mistrust exists within smaller utilities of regional planning efforts led by larger utilities. There is a need for impartial facilitation of regional planning efforts
- Multiple utilities reported instances of former wholesale customers that severed ties and developed their own supplies, placing a financial burden on the supplying utility's customers.
- There are small utilities that could benefit from integration into regional systems or wholesale water sales, but construction of needed infrastructure is not financially feasible based on revenue from customers
- Competition for resources in some areas
- Planning for regional infrastructure is longer-term than utility level planning, but is critical to inform utility level planning.

Best practices of surveyed utilities:

- One utility is collaborating with a major wholesale customer to finance the cost of supply improvements that will benefit both
- One utility has taken advantage of their lower cost water to become a major regional supplier to numerous wholesale customers, with cost benefits to their retail customers
- State wide tariff allows smoothing of rate increases among larger customer base, facilitates investment in smaller utilities
- Regional planning efforts in Boone County
- Source water protection efforts in Hamilton and Marion counties
- InWARN

Conclusions:

- Significant benefits could be achieved through increased regional cooperation
- Many utilities associate regional cooperation with consolidation, or sale of their utility. There is a need to educate utilities and local officials of the various options for regional cooperation. Education and facilitation of regional cooperation efforts should be led by the state or other parties viewed as not having a vested interest in a particular outcome.
- Less than half of the utilities in Indiana have a plan for backup supply in the event of water shortage or contamination of their water source. Utilities should be encouraged to incorporate resiliency into their planning.
- Currently, there are few effective guidelines or mechanisms for review of major proposed utility investments that have the potential to impose significant cost burdens on other utilities by stranding previously made infrastructure investments and/or reducing the revenue base required to cover the cost of utility service.
- Funding is needed for regional planning
- Support evaluation and development of regional solutions that have the potential to confer significant long-term cost savings to customers of multiple utilities

7 Recommendations

In this section, the recommendations from our analysis are summarized in four general areas of opportunity. Also provided are recommendations specific to the IURC's annual collection of utility data authorized by SEA 132 to further enhance the value of this data for evaluating the planning practices of Indiana's water utilities.

7.1 Improve infrastructure planning practices of Indiana's water utilities

- Establish best practices and recommended standards for planning for Indiana water utilities.
- Support benchmarking of utilities to evaluate capacity, identify training needs, and highlight best practices.
- Support efforts to provide utilities with tools and training to initiate asset management programs.
- Strengthen support for small utilities that do not have the technical and managerial capacity of larger utilities.

7.2 Strengthen support and incentive for utilities to achieve fiscal sustainability

- Establish principles for the fiscal sustainability of utilities and require that revenue requirements and rates be based on these principles.
- Strengthen the alignment of regulatory and funding agency practices with the goal of long-term fiscal sustainability and ratepayer protection.
- Support education of local officials on cost of utility service, infrastructure needs, and full-cost water rates.
- Evaluate improved criteria and methods for evaluating affordability of water utility service.
- Support focused affordability programs for low-income households.
- Facilitate access to additional funding sources to assist utilities with increasing infrastructure replacement needs.
- Encourage or require some level of asset management planning for access to funding in order to ensure that funds are invested responsibly and that the resulting infrastructure will be well managed.

7.3 Improve public understanding of the value of water resources and infrastructure

- Improve public understanding of the value of water resources and infrastructure in order to build support for necessary investment.
- Support public education and outreach regarding the cost of utility service, infrastructure needs, and full-cost water rates.

7.4 Provide support for regional cooperation of utilities

- Ensure that project funding decisions do not undermine the financial underpinning of previous investments by other utilities.
- Support regional investment in infrastructure with the potential to improve resiliency and reduce long-term costs for multiple utilities.
- Evaluate potential solutions for small utilities that face the highest future costs per customer for infrastructure renewal and continued regulatory compliance.

- Encourage utilities to consider resiliency in their planning efforts to reduce the number of utilities in the state that do not have contingency plan in the event of water shortage or contamination of supply.
- The state should fill the role of impartial facilitator and promoter of regional cooperation in order to overcome barriers between utilities.

7.5 Further improve data collection

The Indiana Utility Regulatory Commission (IURC) annually collects data from water utilities that is a valuable tool for state-level planning. Senate Enrolled Act 132 (SEA 132) requires all utilities, including those not regulated by the IURC, to provide information to the IURC on a number of topics including water resources used, operational and maintenance (O&M) costs, utility plant in service (UPIS), number of customers, service territory, and the amount and type of funding received. The data are a very useful tool.

In the 2014 Water Utility Resource Report, the IURC recommended that the Legislature continue to review SEA 132 to determine if reporting requirements and the scope of the annual report should be updated (Indiana Utility Regulatory Commission, 2014).

For the purpose of evaluating fiscal sustainability and ratepayer protection, we recommend that the SEA 132 reporting requirements be amended to include the following information:

- Total water rate for 5,000 gallons/month for residential customers within municipal limits
- Year and amount (%) of last rate increase
- Miles of water main in distribution system
- Miles of planned water main replacement
- In addition to the current question regarding whether (yes/no/maybe) the utility plans to increase rates in each of the next 5 years, also ask whether the utility plans to increase its rates at any point during the next 5 years.

8 References

Indiana State Legislature. (2015). Senate Bill No. 474. *Analysis of water utility planning and needs*.

Association of Metropolitan Water Agencies, et al. (2008). *Effective Utility Management: A Primer for Water and Wastewater Utilities.* Washington DC: Association of Metropolitan Water Agencies, American Public Water Association, American Water Works Association, National Association of Clean Water Agencies, National Association of Water Companies, Water Environment Federation.

AWWA. (2009). *M36 Water Audits and Loss Control Programs.* Denver CO: American Water Works Association.

AWWA. (2012). *Buried No Longer: Confronting America's Water Infrastructure Challenge.* Denver: American Water Works Association.

AWWA. (2012). *M1 Principles of Water Rates, Fees and Charges.* Denver CO: American Water Works Association.

AWWA. (2015). *AWWA State of the Water Industry Report.* Denver: AWWA.

AWWA. (2015). *Benchmarking Performance Indicators for Water and Wastewater: 2013 Survey Data and Analysis Report.* Denver: AWWA.

AWWA and Raftelis Financial Consultants. (2015). *Water and Wastewater Rates.* Retrieved from American Water Works Association: http://www.awwa.org/resources-tools/water-and-wastewater-utility-management/water-wastewater-rates.aspx

Beecher, J. A. (2010). *Water Pricing Primer for the Great Lakes Region.* Chicago IL: Alliance for Water Efficiency.

Beecher, J. A. (2011). *Primer on Water Pricing.* East Lansing: MSU Institute of Public Utilities.

Government Finance Officers Association. (2012). The Public Finance Officer's Role in Supporting Fiscal Sustainability. *GFOA Best Practice*. Chicago, IL: GFOA.

Indiana Office of Utility Consumer Counselor. (2015). *Indiana Office of Utility Consumer Counselor*. Retrieved from About the OUCC: http://www.in.gov/oucc/2364.htm

Indiana Utility Regulatory Commission . (2015). SEA132 Water Utility Database. Indianapolis.

Indiana Utility Regulatory Commission. (2014). *2014 Water Utility Resource Report.* Indianapolis: IURC.

Indiana Utility Regulatory Commission. (2015). *Mission Statement, History & Responsibility*. Retrieved from Indiana Utility Regulatory Commission: http://www.in.gov/iurc/2451.htm

Indiana-American Water Company, Inc. (2014). Petition to Increase Rates IURC Cause No 44450. Indianapolis.

Martin, D. (2012). *Affordability and Capability Issues of Small Water and Wastewater Systems: A Case for Regionalization of Small Systems.* Washington DC: Rural Cummunity Assistance Partnership.

Matichich, M., Hasit, Y. J., Yeager, F., Englesmith, J., Paralez, L., Francisco, W., & Greenwood, R. (2014). *Performance Benchmarking for Effectively Managed Water Utilities.* Denver: Water Research Foundation.

National Consumer Law Center. (2014). *Review and Recommendations for Implementing Water and Wastewater Affordability Programs in the United States.* Boston: NCLC.

Olstein, M. A., Jennings, J. D., Geist, R., & King, R. (2009). *Improving Water Utility Capital Efficiency.* Denver: Water Research Foundation.

San Diego County Water Authority. (2015). Fiscal Sustainability Guiding Principles. San Diego, CA: SDCWA.

Standard and Poor's Ratings Services. (2014). *U.S. Public Finance Waterworks, Sanitary Sewer, and Drainage Utility Systems: Methodology and Assumptions.* New York: McGraw Hill Financial.

Stratus Consulting. (2013). *Affordability Assessment Tool for Federal Water Mandates.* Boulder, CO: U.S. Conference of Mayors, American Water Works Association, and Water Environment Federation.

USEPA. (2002). *System Partnership Solutions to Improve Public Health Protection.* Washington DC: USEPA.

USEPA. (2002). *The Clean Water and Drinking Water Infrastructure Gap Analysis.* Washington DC: United States Environmental Protection Agency.

USEPA. (2006). *Expert Workshop on Full Cost Pricing of Water and Wastewater Service.* Washington DC: EPA.

USEPA. (2012). *Planning for Sustainability, A Handbook for Water and Wastewater Utilities.* Seattle: EPA.

USEPA. (2013). *Drinking Water Infrastructure Needs Survey and Assessment, Fifth Report to Congress.* Washington DC: EPA.

USEPA. (2015, August 30). Retrieved from USEPA SDWISFED Drinking Water Data: http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/pivottables.cfm

WERF. (2014). *Water Infrastructure Asset Management Primer.* Alexandria VA: Water Environment Research Foundation and IWA Publishing.

Appendix E. Proposal for Consolidation of Indiana's Water Regulatory Programs

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.

Mitchell E. Daniels Jr.
Governor

Thomas W. Easterly
Commissioner

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Indianapolis, Indiana 46204
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To: Mitchell E. Daniels, Jr.

From: Thomas W. Easterly

Subject: Proposal for Consolidation of Indiana's Water Regulatory Programs

The attached document represents the joint report of your department heads from ISDA, ISDH, IDHS, DNR and IDEM to consolidate Indiana's Water Regulatory Programs. Due to a lack of complete consensus, there are three issues that remain to be resolved.

1. The report is silent on whether the consolidated water regulatory program would stand alone or be consolidated within either IDEM or DNR. Both IDEM and DNR management are interested in managing the consolidated water regulatory program.

2. The report makes no recommendation on the location of the consolidated Water Non-Regulatory Programs (mostly grants). The three most likely prospects are the ISDA, DNR or Indiana Finance Authority.

3. ISDH currently believes that it should retain permitting authority for Commercial Onsite Sewage Systems. IDEM, however, believes that keeping the split in this program (municipal onsite systems at the consolidated agency and commercial onsite systems at ISDH) continues the regulatory confusion for the public.

The recommendations in the report will require changes by state agencies that report directly to you.

The report does not recommend changes to address two significant issues raised by various non-government stakeholders:

1. Moving the residential septic system regulation from ISDH to IDEM. ISDH does not support this move and the actual program implementation is by the local health departments which have an established working relationship with ISDH, but much less so with IDEM.
2. Oversight of drainage which is currently the responsibility of the county surveyors.

I look forward to your guidance on whether to proceed with any of the recommendations in this report.

Attachments

cc: Earl Goode
Gloria Downham
Robert Carter, Jr., Director, Indiana Department of Natural Resources
Joseph Kelsay, Director, Indiana State Department of Agriculture
Gregory Larkin, MD, Commissioner, Indiana State Department of Health
Joseph Wainscott, Jr., Director, Indiana Department of Homeland Security

Proposal for Consolidation of Indiana's Water Regulatory Programs

Executive Summary

Project History: The January 7, 2009, Report of the Lieutenant Governor's Indiana Agriculture Regulatory Structure Task Force contained a number of recommendations including:

> "The General Assembly should transfer authority of residential septic system regulation from ISDH to IDEM in order to eliminate duplication and to make implementation more efficient."
>
> and
>
> "The Governor should commission a study of combining water related programs into a "Department of Water Management" to determine the long-term feasibility, efficiency and effectiveness of combining programs or altering program implementation in order to eliminate overlaps, plug gaps and streamline permitting process."

On July 11, 2011, the Director of the Indiana State Department of Agriculture, the Commissioner of the Indiana Department of Environmental Management, the State Health Commissioner of the Indiana State Department of Health, the Executive Director of the Indiana Department of Homeland Security and the Director of the Indiana Department of Natural Resources jointly commissioned a Water Management Program Workgroup to develop a proposal for a consolidated water management program.

This group (renamed the Water Issues Group) met bi-weekly from July to December 2011 to determine whether there is a better way for Indiana state government to organize water programs to serve Hoosiers more effectively.

After consideration of the report of the Water Issues Group, a draft of this Proposal for Consolidation of Indiana's Water Regulatory Programs was circulated for review by the executives of the six convening agencies. This document represents the best consensus recommendations of the six agencies, but four significant issues remain to be resolved:

1. The report is silent on whether the consolidated water regulatory program would stand alone as a roughly 385 person agency or be consolidated within either IDEM which has about 200 of the current water program staffing or DNR which has about 100 of the current water program staffing. Both IDEM and DNR

management are interested in managing the consolidated water regulatory program.

2. The report makes no recommendation on the location of the consolidated Water Non-Regulatory Programs (mostly grants). The three most likely prospects are the ISDA, DNR or Indiana Finance Authority.

3. ISDH currently believes that it should retain permitting authority for Commercial Onsite Sewage Systems. IDEM, however, believes that keeping the split in this program (municipal onsite systems at the consolidated agency and commercial onsite systems at ISDH) continues the regulatory confusion for the public.

4. The report does not adopt the recommendation to move residential septic system regulation from ISDH to IDEM. ISDH does not support this move and the actual program implementation is by the local health departments which have an established working relationship with ISDH, but much less so with IDEM. Leaving this program at ISDH is consistent with previous decisions on the lead paint and radon programs that ISDH deals with individual Hoosiers, while IDEM deals with businesses and municipalities. Similarly, this report does not recommend that the permitting of residential drinking water wells be moved from ISDH (local health departments) to IDEM.

Document Outline:

The Case for Consolidating Indiana's Water Regulatory Programs

Water in the appropriate quantity and quality is essential for life. The universal need for water makes it important to almost every aspect of our society and has resulted in at least 5 Indiana cabinet level executive branch agencies developing over twenty independent programs to manage or regulate various aspects of our water resources. Each of these programs has merit, but in spite of sincere efforts to coordinate the actions of each agency, the resulting regulatory structure is difficult for the public to understand and includes both significant overlap and lost opportunities. The current Indiana government water management structure stands in stark contrast to the air regulatory structure which is centralized in one agency. The Indiana Agriculture Regulatory Structure Task Force recognized the challenges of multiple agencies trying to manage various aspects of a common resource and in their January 7, 2009, report to the Lieutenant Governor recommended consideration of combining water related programs into a "Department of Water Management." In addition, the current draft of the report of the Indiana Sustainable Natural Resources Task Force recommends: "To optimize and manage conflicting goals and needs the state has regarding water we propose consolidating state authority for three distinct water-related tasks in one entity." (Note: This proposal does not address one of the three functions—oversight of drainage which is currently the responsibility of the county surveyors.)

In Indiana, the responsibility for implementing water programs is spread among several state agencies, including the State Department of Health, the State Department of Agriculture, the Department of Homeland Security, the Department of Natural Resources, and the Department of Environmental Management. There are at least three compelling reasons for considering a reorganization of water programs in the state.

First, the current regulatory system for granting water permits of all types is unclear. Many businesses who want to locate facilities in the state must obtain permits from several agencies. Even the most experienced environmental professionals sometimes fail to get a permit for an activity simply because they must go to several agencies to obtain permits for the same activities and it is unclear as to which permits are required or what agency issues them. Even when we all do our jobs properly and coordinate in advance for a particular project, approvals may be inconsistent partly because they are located in different areas of state government.

Second, the current water organizational structure does not take advantage of synergies that could exist if water related programs were located in the same place. For example, water quality and water quantity issues are handled by separate agencies. Generally speaking, IDEM handles water quality issues, and DNR tackles water quantity issues. Yet, in the real world, water quantity issues are not neatly separated from water

quality issues. The drought this summer highlights this point. Large water withdrawals, which are regulated by DNR, have implications for water quality in drought conditions. Joining these programs in one agency would encourage consideration of water quality and water quantity issues together. Similar synergies exist between other currently separated programs.

Third, because water programs are operated in different state agencies, some issues are inevitably missed because each state agency may believe the other has authority over an issue and it is difficult to identify true programmatic gaps. State agencies have, over the past eight years, increased coordination and cooperation, yet dispersed responsibility for water programs leads to some issues falling through the cracks.

There are at least two solutions to the first issue (the unclear permitting requirements). The state of Indiana could add a buffer between the public and the various permitting agencies. This buffer would be responsible for understanding the various permitting requirements and making sure that each member of the public is guided through the process. This is somewhat of a band aid, rather than a true solution and it will add cost due to the need for this additional communications layer. The other solution, which also addresses the second and third issues, is to bring these water programs together in one place to increase transparency and clarify that Hoosiers need to go to only one agency for water issues. Consolidation will increase cooperation and coordination and create synergies that did not previously exist. Consolidation will help the state identify and correct program gaps and prevent issues from falling through the cracks. A consolidated water program will promote making balanced decisions based on sound science; will create cross-training opportunities for staff; will increase prompt and accurate communication; and will allow the state to more easily problem solve water related issues.

The rest of this document presents a straw proposal for a unified “Office of Water” consisting of functional areas:

Permitting including traditional wastewater discharges, subsurface discharges, animal agricultural permitting, storm water permitting, and requirements for construction in or near waters;

Permit Compliance including inspections and reporting related to permitted activities;

Planning including standards development, water monitoring activities, and public outreach on water quality and quantity issues;

Water Supply including water quantity management and drinking water;

Program support including administration, district creation, licensing and enforcement; and

Water non-regulatory programs including various grant and conservation programs—Note: as long as it is managed to support the regulatory program, this function may work better if it is separated from the regulatory programs listed above.

Proposed Office of Water Organizational Structure

Introduction

If the water regulatory programs are to be consolidated, how would the new Office of Water be structured? This section proposes a possible organizational structure for consideration and provides some of the reasons for this structure. This organization could be appended to an existing agency, or operate as a stand-alone "Department of Water" as recommended by the Indiana Agriculture Regulatory Structure Task Force.

The Office of Water would consist of separate divisions that organize water regulatory programs in a way that best joins like programs that would be manageable, takes advantage of synergies, increases transparency, and creates efficiencies. These divisions are:

- Water Planning Division
- Water Permits Division
- Water Compliance Division
- Water Supply Division
- Program Support Division

In addition, all grant related programs would be consolidated into the Water Non-regulatory or Grants Programs—these programs do not need to be part of the consolidated water regulatory program. This document describes the different divisions and the reasons for including specific programs in each division.

Water Planning Division

The state has two major reasons for examining the condition of its waters. First, under the Clean Water Act, Indiana is required to list waters that do not meet water quality standards and then take actions meant to improve water quality in those waters. Second, and perhaps more importantly, the residents of the state fish and swim in Indiana lakes, rivers, and streams and need to know under what conditions they should be concerned about swimming or eating fish caught in Indiana waters. Due to the

important impact water quantity (floods and droughts) has on the condition of Indiana's waters, this division will also include the planning component of water quantity management including flood and drought management.

Activities designed to determine the condition of our waters and the fish in those streams are spread through different state agencies. IDEM conducts sampling of streams and compiles assessments of their conditions under the Clean Water Act. But other monitoring activities, including some beach monitoring, are conducted by ISDH. Recent concerns about potential health consequences from recreating in waters with Blue Green Algae have caused IDEM to sample reservoirs to determine toxin levels. Yet, ISDH provides public health announcements about the existence of Blue Green Algae. And training for volunteers who wish to sample waters is conducted by DNR's Hoosier River Watch. Consolidating all of these monitoring activities in one place would increase coordination and help leverage existing resources. The Water Planning Division would include a Monitoring Branch that would coordinate these currently disparate activities.

Indiana is also engaged in several efforts to put in place strategies to improve water quality. Currently the Indiana State Department of Agriculture is working to create holistic strategies to reduce loadings of nutrients to Indiana waters. IDEM is required by the Clean Water Act to produce reports called Total Maximum Daily Loads (TMDLs) that analyze the source of pollutants in impaired waters and propose methods for reducing them. DNR currently manages the water quantity planning that directly impacts the success of these other planning efforts. These initiatives, taken as a whole, can help set an overall state strategy for improving waters, but because they are located in separate agencies it is possible to miss an opportunity to create a comprehensive strategy. This proposal includes a Water Strategy Branch that would join these initiatives into one location.

Finally, the state also conducts outreach efforts to individuals, organizations, and schools to educate and provide resources that would help efforts to improve water quality around the state. IDEM's team of Watershed Specialists assists Watershed Groups who wish to put in place Watershed Plans to improve local water quality. The DNR conducts programs such as Project Wet and Project Wild that provide educators with materials and assistance in explaining water quality and wildlife issues in schools. Joining these diverse programs in one area would improve our efforts to reach the public.

The Water Planning Division would join like programs in one area that would leverage monitoring resources, develop comprehensive strategy for improving water, and coordinate outreach efforts.

Water Permits Division

Neither the public nor businesses seeking to develop in Indiana can be blamed for not understanding how Indiana deals with water quality. Both the novice and the experts have difficulty understanding what permits are required or where to go to get those permits. Some permits are issued by IDEM, while others are issued by ISDH, and still others are issued by DNR. State regulatory agencies have worked to increase coordination among the various water permitting programs, but this coordination is no substitute for a one-stop shop for obtaining all water permits. This proposal for a revamped Office of Water includes a consolidated Water Permits Division.

The division would house all water related permits, except those for individual residences, together. The division would be composed of five different branches.

1. The first branch would be the National Pollutant Discharge Elimination System (NPDES) Permits Branch. These permits, currently issued by IDEM through delegation from EPA under the Clean Water Act, regulate discharges from municipalities and industries that discharge to Indiana waters.

2. The second branch would consist of all other wastewater permits, except those for individual homes. On-site commercial systems and mobile home park approvals, currently conducted by ISDH would be consolidated with IDEM's state permits for the construction of wastewater facilities. This branch would be comprised primarily of engineers who examine the technical aspects of all wastewater facilities and would allow for the leverage of engineering resources that are currently spread in two different state agencies.

3. Agricultural permits, while officially part of the NPDES program, are unique. Currently these permits, which are granted to Concentrated Animal Feeding Operations (CAFOs) and Confined Feeding Operations (CFOs), are issued in IDEM's Office of Land Quality. Because they are permits to protect water, they should be issued by the Office of Water. Yet, because of the unique nature of these discharge prevention permits, they should be issued by a separate branch dedicated to agricultural issues. Land Application permits should be issued out of the same branch.

4. Storm water permits, while officially part of the NPDES program, are also unique. There are over 4000 storm water permits issued by the state to developers, industries, and municipalities. Most storm water discharges are authorized under general permits that have terms and conditions oriented toward putting in place best management practices to prevent pollutants from running off to rivers and streams. Therefore, these permits, while already issued by IDEM, would be accorded their own branch within the division.

5. Often, development involves building structures in places that may impact wetlands or other waterways. These activities currently can possibly require water quality certifications from IDEM as well as one of a number of permits from DNR. While IDEM and DNR have worked to coordinate their activities and notify applicants of the requirements for permits from different agencies, there are times when even experienced people do not obtain all of the permits necessary for development. Locating these permit programs in the same area would dramatically reduce the likelihood of confusion and would minimize delays in permitting caused by the failure to apply for the correct permits. That is why it is essential to create a branch that would issue permits for construction in or near waters that may also have 401 water quality certification requirements.

The creation of a Water Permits Division would increase transparency, efficiency, and leverage resources and would decrease confusion about regulatory requirements.

Water Compliance Division

All of the permit programs listed above contain corresponding compliance programs. For most programs, compliance activities include both the collection and analysis of data submitted by permitted facilities as well as inspectors that visit facilities or work sites to evaluate compliance on site.

The Water Compliance Division would be comprised of branches that mirror the corresponding permits programs. The NPDES Compliance Branch would evaluate data from and inspect facilities with individual NPDES permits. The Agricultural Compliance Branch would respond to complaints and inspect facilities regulated as CAFOs or CFOs. The Storm Water Compliance Branch would review submissions of Storm Water Pollution Prevention Plans and inspect facilities and developments to assure compliance. The 401 Compliance Branch would inspect activities related to the compliance with 401 certifications or various permits issued by the Construction in Near Waters Branch.

Water Supply Division

Regulating water use to ensure an adequate supply of water for recreation, agricultural and industrial use, and as clean and safe drinking water for Hoosiers is a top priority for the state of Indiana. Yet the responsibility for overseeing water use today is divided between IDEM and DNR. DNR maintains a registry of water wells that withdraw over 100,000 gallons per day, permits water well construction, licenses well drillers, and oversees Indiana's obligations under the Great Lakes Compact. IDEM oversees the formation and regulation of water systems in Indiana. IDEM also manages ground water contamination that is impacted by water withdrawals. The separation of these activities into different agencies breaks the very real connection between water

withdrawals and the availability of clean water for agricultural, industrial and drinking water purposes. This plan aims to bring those staff members at DNR who work on water quantity issues together with those staff members at IDEM who regulate drinking water to ensure the provision of safe and clean water for human consumption. The result will be an increased understanding of the relationship between water quality and water quantity.

The Water Supply Division would consist of the Water Quantity Branch and the Drinking Water Branch. The Water Quantity Branch would include the High Capacity Water Withdrawal registry, the programs that deal with water well construction, and the Great Lakes Compact. The Drinking Water Branch would consist of the Capacity Development Program, the Compliance Program, the Ground Water Program, and inspections. Joining these programs into one Water Supply Division would allow the state to better understand the ramifications of water use decisions and would help set policy for future water use which is increasingly important in light of dry conditions throughout the state.

Program Support Division

Consolidation of programs into one Office of Water would necessitate the consolidation of operational activities. For example, many of the programs listed in this plan include licensing activities. Wastewater and drinking water treatment plant operators are currently licensed by IDEM and well drillers are currently licensed through DNR. Consolidating these activities into an operations division could lead to streamlined processes through the Professional Licensing Agency. Vehicle management, budgetary issues, grant management, and regional districts would all be managed out of this division.

Additionally, enforcement activities for all programs would be centralized into this division. Centralizing enforcement activities into a division separate from the other programmatically focused divisions allows for cross training of enforcement staff in a wider variety of programs, streamlines the enforcement process, and helps build consistency among differing programs.

Water Non-regulatory or Grants Programs

Non-regulatory and grant programs are currently dispersed around different state agencies. Grant programs including the Healthy Rivers Initiative and Lake and River Enhancement Program are housed in the DNR. Clean Water Indiana and the Conservation Enhancement Reserve Program are located at ISDA. Section 205j and Section 319 grants are administered by IDEM. While these grant programs may have different conditions for qualification for grants or somewhat different emphasis, all of them have the broader goal of improving water quality. If targeted in a coordinated

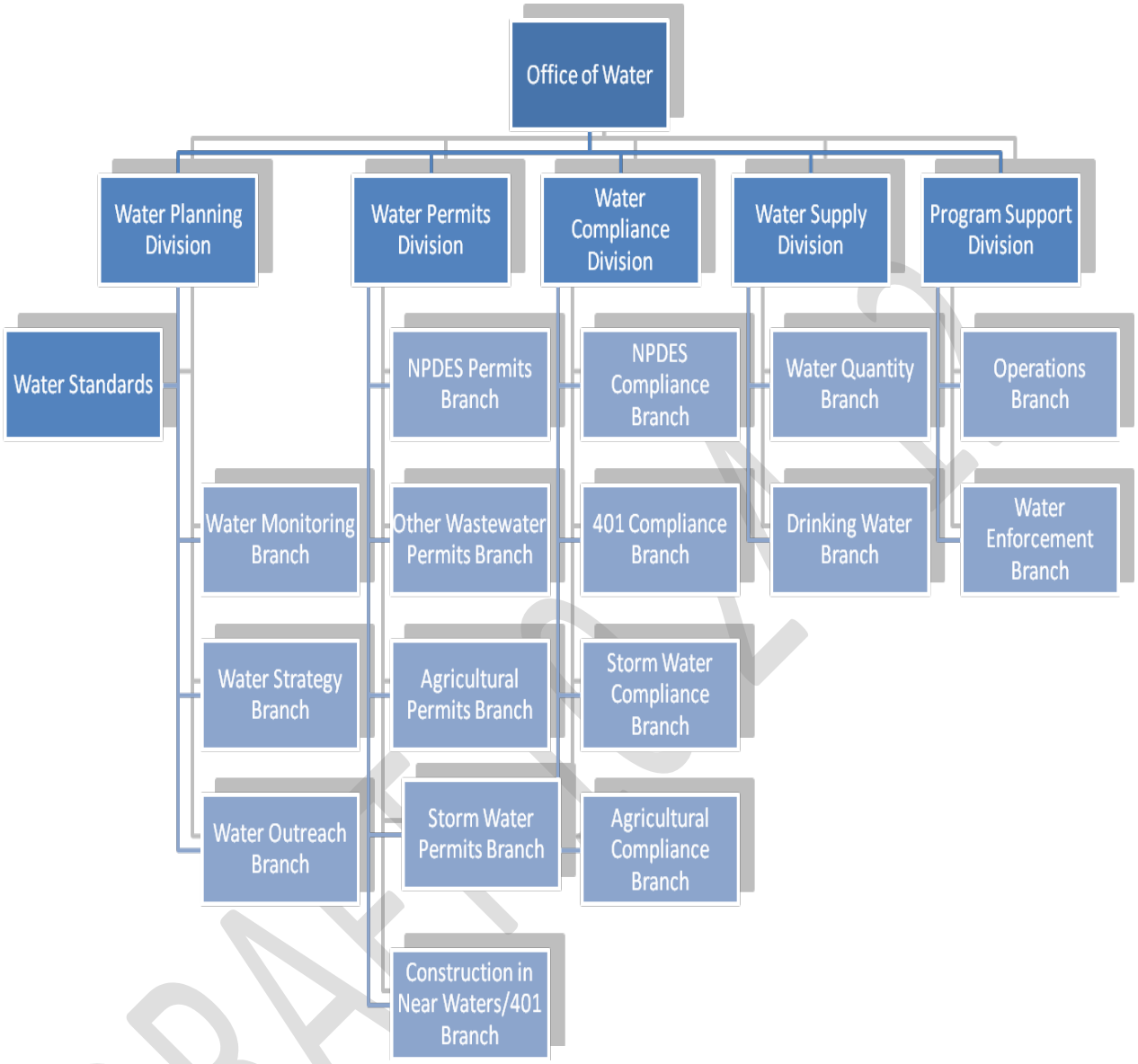
fashion, these grant dollars could be focused on a specific geographic area or a specific water quality issue, resulting in a larger impact than when the money is dispersed. Currently, state agencies meet to make each other aware of their efforts and to coordinate as best as possible. But housing these programs under one roof could create strategic, administrative, and financial advantages.

Perhaps most importantly, locating these programs in one place would allow the state to take a more deliberate approach to funding specific grant projects to focus dollars in a more coordinated manner. Secondly, if grant programs were located together, administrative staff could be shared, reducing the use of grant dollars on administrative tasks and increasing the amount of money devoted to improving water quality. Third, locating programs together might—to the extent permitted under law—allow staff to find ways to better leverage each others' programs for specific projects.

As long as these programs are properly targeted, there is no reason that they need to be located or managed with the new Office of Water's regulatory programs. For example, the Indiana Finance Authority (IFA) currently administers the State Revolving Fund (SRF) program and the Brownfields program. Both programs make loans at below market interest rates to communities for environmental improvements. One option would be for the IFA to broaden its scope of environmental activities to include water grant programs. Another option would be to locate the combined grants and non-regulatory programs into any of the agencies that currently have a water related grant program. Consolidating the existing water grant programs would allow for the professional financial administration of these grant programs and may create leveraging opportunities that currently do not exist because the grant programs are located in different agencies around the state.

Conclusion

Consolidating water related regulatory programs and consolidating water grant programs would increase transparency, eliminate confusion, encourage synergies to develop among like programs, and could create administrative efficiencies that would benefit Hoosiers and Water Quality.


Office of Water
Water Planning Division
Water Permits Division
Water Compliance Division
Water Supply Division
Program Support Division
Water Standards
NPDES Permits Branch
NPDES Compliance Branch
Water Quantity Branch
Operations Branch
Water Monitoring Branch
Other Wastewater Permits Branch
401 Compliance Branch
Drinking Water Branch
Water Enforcement Branch
Water Strategy Branch
Agricultural Permits Branch
Storm Water Compliance Branch
Water Outreach Branch
Storm Water Permits Branch
Agricultural Compliance Branch
Construction in Near Waters/401 Branch

Water Planning Division. The Water Planning Division would be responsible for monitoring and assessing water quantity and quality, establishing water quality standards, conducting Total Maximum Daily Load (TMDL) analyses, and building partnerships with water stakeholders.		
Program	**Current Location**	**Reason for Consolidation**
Water Standards	IDEM	Standards are the cornerstone for protecting water quality
Water Monitoring Branch		
Surface Water Monitoring	IDEM	Monitoring is necessary for determining condition of waters and for determining permit requirements
Surface Water Assessments (303d/305b)	IDEM	Clean Water Act requirement that states assess water quality and IDEM assesses waters based on those sampling.
Fish Consumption Advisory	ISDH/IDEM/DNR	The scientific work supporting advisories is already done at IDEM.
Hoosier River Watch	DNR	This program trains volunteers to monitor stream water quality. IDEM conducts 'official' monitoring and uses volunteer generated data and therefore this program should be housed in the same agency that conducts water monitoring.
Beach Monitoring	Beach monitoring program on Lake Michigan at IDEM; others ISDH	Consolidating all beach monitoring in one location is more efficient than spread among different agencies.
Algae Monitoring	IDEM	IDEM has training, equipment and staffing to conduct monitoring.
Harmful Algal Bloom Warnings	ISDH	ISDH and IDEM Coordinate based on IDEM monitoring.

Water Strategy Branch		
Flood and Drought Planning	IDHS, DNR, IDEM	Three different agencies must coordinate to plan for floods and droughts.
Gulf Hypoxia Task Force	ISDA	Work on the Gulf Hypoxia Task Force directly impacts monitoring and standard setting which are done at IDEM
State Nutrient Reduction Strategy	ISDA	Nutrient reduction strategy will involve point and nonpoint sources, and will involve development of Water Quality Standards. Including this program at IDEM will allow for greater coordination among standards setting, sampling, and permitting staff.
Total Maximum Daily Load Program	IDEM	Where waters have been declared by IDEM to be impaired, this program helps determine the potential causes of those impairments and the results of studies are used to set limitations on pollutant discharges in permits IDEM issues.
Water Outreach Branch		
Watershed Specialists	IDEM	Watershed specialists build partnerships with stakeholders, educate and assist watershed groups, and communicate with the public water quality issues.
Project Wet	DNR	Educates public about water issues through schools

Water Permits Division. The Water Permits Division would be responsible for issuance of all wastewater related permits. This would increase transparency and public awareness of what kind of permits are required for any water-related activity.

Program	Current Location	Reason for Consolidation
NPDES Permits Branch		
NPDES Individual Industrial Permits	IDEM	EPA has delegated, under the Clean Water Act, authority to IDEM.
NPDES Individual Municipal Permits	IDEM	EPA has delegated, under the Clean Water Act, authority to IDEM.
Combined Sewer Related Permitting	IDEM	Requirements are already part of an NPDES individual permit.
NPDES General Permits	IDEM	Authority granted by Clean Water Act to IDEM.
Other Wastewater Permits Branch		
On-site Commercial Systems	ISDH	Directly related to wastewater permitting. IDEM permits community on-site systems and ISDH currently permits commercial systems.
Mobile Home Community waste water construction approval	ISDH	ISDH currently approves as part of their approval of the entire plan for development of a mobile home park.
Construction Permitting	IDEM	IDEM issues construction permits for wastewater treatment plants and collection system pipes. ISDH approval amounts to a similar activity.
Agricultural Permits Branch		
CAFO/CFO Permits	IDEM OLQ	Currently in OLQ due to staffing issues, but is actually an NPDES permit
Land Application Permits	IDEM OLQ	Currently in OLQ, but is a water quality related issue.
Storm Water Permits Branch		
Storm Water Associated with Construction Activity	IDEM	EPA has delegated, under Clean Water Act, authority to IDEM.
Storm Water Associated with Industrial Activity	IDEM	EPA has delegated, under Clean Water Act, authority to IDEM.
Municipal Separate Storm Sewer	IDEM	EPA has delegated, to IDEM.

Construction in or Near Waters/401 Branch		
Ditch construction, tile installation, pipeline installation within ½ mile of lake shoreline (Lowering of Ten Acres Lake Act)	DNR	These programs have overlapping permit requirements with 401 so should be together with them.
Navigable Waterways Act requires permits for placement of permanent structure in navigable waters	DNR	Some of these also require 401 certifications therefore should be in the same place.
Construction of Channels	DNR	While water quantity issue has overlap and projects may also require 401.
Sand and Gravel Permits Act	DNR	Regulates the taking of sand, gravel, or stone from under the bed of navigable water
Construction in a Floodway	DNR	Related to the other programs
401 Water Quality Certification	IDEM	Some of the same waters that require 401 certifications also require the other permits listed above
Regulatory Review of Regulated Drains	DNR	Reconstruction or maintenance of regulatory drains may require a 368 review that provides information about what conditions might be required in a 404 or 401 permit.

Water Compliance Division. The Water Compliance Division would be charged with the oversight of activities permitted under the Water Permits Division. This Division would be comprised of NPDES Compliance, 404 Compliance, and permits issued for construction in or near waters. Activities would involve inspection and data evaluation as well as compliance assistance activities.		
NPDES Compliance Branch		
NPDES Compliance Data Evaluation	IDEM	EPA has delegated, under the Clean Water Act, NPDES permitting and compliance to IDEM.
NPDES Compliance Inspection	IDEM	EPA delegated, under the Clean Water Act, NPDES permitting and compliance to IDEM.
401 Compliance Branch		
401 Certification Compliance	IDEM/USACE/EPA	Compliance activities for Section 401 Certifications have been delegated to IDEM.
Construction in or near waters	IDEM/USACE/EPA/DNR	Inspection activities for the Lowering of the Ten Acres Lakes Act, Navigable Waterways Act, Construction of Channels, and Sand and Gravel Permits Act would be done here.
Storm Water Compliance Branch		
Storm Water Associated with Construction Activity	IDEM	EPA has delegated, under the Clean Water Act, NPDES permitting and compliance to IDEM.
Storm Water Associated with Industrial Activity	IDEM	EPA has delegated, under the Clean Water Act, NPDES permitting and compliance to IDEM.
Municipal Separate Storm Water	IDEM	EPA has delegated, under the

		Clean Water Act, NPDES permitting and compliance to IDEM.
Agricultural Compliance Branch		
CAFO/CFO Compliance	IDEM OLQ	EPA has delegated, under the Clean Water Act, NPDES compliance activities to IDEM. OLQ has handled these due to past resource issues, but they should be consolidated with Water programs.
Land Application Compliance	IDEM OLQ	Land Application compliance should be included with other Agricultural compliance activities.

Water Supply Division. The Water Supply Division would be charged with regulating water quantity and Drinking Water issues. It would elevate flood and drought matters as well as manage requirements of the Great Lakes Compact.		
Water Quantity Branch		
Flood and Drought Management	IDHS, DNR, IDEM	Three different agencies must coordinate to make critical decisions regarding droughts and the state positions.
High Capacity Water Withdrawal Facilities	DNR	Registration of high capacity water wells (>100,000gpd) has an effect on ground water supplies and therefore ought to be included in water supply division activities.
Water Rights and Use	DNR	This area deals with water well construction, well driller licensing, which might be best combined with construction permitting and certification.
Great Lakes Compact	DNR	Currently in DNR as the compact regulates water withdrawals from the basin; encourages development of water conservation and efficiency programs, and provides regional review for new or increased consumptive uses from the Great Lakes of 5 million gallons or more per day in a ninety day period.
Drinking Water Branch		
Capacity Development/Permitting	IDEM	EPA , under the Safe Drinking Water Act, delegates determinations about systems' capacity to operate to IDEM.

		IDEM also issues construction permits for facilities.
Compliance	IDEM	EPA, under the Safe Drinking Water Act, has delegated responsibility to oversee systems to IDEM.
Ground Water	IDEM/DNR	Underground injection wells are handled by DNR currently. Ground water monitoring is conducted by the IDEM Ground Water Section as is wellhead protection, Hoosier Water Guardian.
Drinking Water Inspections	IDEM	EPA, under the Safe Drinking Water Act, has delegated authority to oversee drinking water systems to IDEM.

Program Support Division. The Program Support Division would be responsible for the consolidation of operations activities within the Water Program. Most notably, licensing programs would be consolidated and moved to IDEM. Regional District and Conservancy District programs are different enough that it makes sense to keep them in their respective agencies. Additionally, enforcement activities would be housed in this Division.		
Operations Branch		
Grants/Contracts	IDEM	These functions remain and would need to remain for operation of divisions.
Vehicle Management	IDEM	These functions remain and would need to remain for operation of divisions.
Budget	IDEM	These functions remain and would need to remain for operation of divisions.
District Creation: Regional Water and Sewer Districts Conservancy Districts	IDEM for Water and Sewer Districts DNR for Conservancy Districts	While this seems like a combination of like programs, Conservancy Districts are created by an order from a judge and Regional Districts are created by order of the Commissioner or IDEM.
Licensing Programs: DW Operator License WWTP Operator License. Water Well Drilling License.	IDEM/DNR	Licensing includes drinking water and wastewater certification and continuing education as well as Licensing Water Well Drilling Contractors. In the long run, should this all be run in PLA?
Water Enforcement Branch. Enforcement programs are conducted in the different agencies in accordance with their own programs. This consolidation initiative would envision IDEM conducting all enforcement of programs moved to IDEM. Enforcement would be its own section due to the unique nature of its activities.		
NPDES Enforcement	IDEM	Program remains at IDEM and

		would be enforced by IDEM
Drinking Water Enforcement	IDEM	Program remains at IDEM and would be enforced by IDEM
401/Construction in or Near Waters Enforcement	IDEM/EPA/DNR	Enforcement could be consolidated to one agency increasing efficiency and coordination.

Water Non-regulatory or Grants Programs. Non-regulatory or grant programs are currently run from different agencies and although they may have different requirements for the use of grant funds, their goal is water quality improvement. Synergies could be realized by placing all of the funding programs in one area to allow for the programs to be managed in new ways that leverage existing resources to improve water quality.		
Healthy Rivers Initiative	DNR	Conservation initiative partnership of resource agencies and organizations to protect 43,000 acres in the floodplain of the Wabash River and Sugar Creek as well as 26,000 acres of Muscatatuck River bottomlands.
Lake and River Enhancement Program	DNR	Provides technical and financial assistance for projects that help monitor, determine problems affecting a lake or stream segment, manage invasive species and aquatic vegetation, as well as to cost share with land users for nutrient and sediment reducing practices.
Clean Water Indiana	ISDA	Provides financial assistance to landowners and conservation groups to support conservation practices to reduce nonpoint source pollutants. Also provides matching funds for Conservation Reserve Enhancement Program
Conservation Enhancement Reserve Program (CREP)	ISDA	Conservation program addresses agricultural-related environmental concerns. Provides financial incentives to voluntarily enroll in the Conservation Reserve Program (CRP)

Section 205(j) Grants	IDEM	Named after the section of the Clean Water Act, these grants are to be used for water quality management and planning including identifying point and nonpoint source measures that help meet water quality standards, developing implementation plans, and determining the nature and extent of the problems. Fundable projects gather and map information on point and nonpoint sources.
Section 319(h) Grants	IDEM	Provides funding for projects that reduce nonpoint source water pollution. Funds are used for education and outreach, development of watershed management plans, implementation of watershed management plans through a cost share program for Best Management Practice implementation.

Appendix F. Agency Survey

Indiana Finance Authority Water Planning Questionnaire for Agencies

Agency/Organization: _____

1. Currently, is your agency responsible for any of the following?
(1=no responsibility 2=limited responsibility 3=core responsibility)

a.	Data collection	1	2	3
b.	Hydrogeologic interpretation and mapping?	1	2	3
c.	Hydrologic modeling for yield?	1	2	3
d.	Interaction with local water users and planners?	1	2	3
e.	Water supply and resources management?	1	2	3
f.	Water resources research?	1	2	3
g.	Other: _____	1	2	3

2. Do you see any overlap with other agencies in regard to your mission or data collection/management? If yes, circle the degree of overlap.
(1=no overlap 2=some overlap 3=substantial overlap)

		Mission			Data		
a.	IDEM, Drinking Water Branch	1	2	3	1	2	3
b.	IDNR, Division of Water	1	2	3	1	2	3
c.	IGS	1	2	3	1	2	3
d.	IURC	1	2	3	1	2	3
e.	IFA	1	2	3	1	2	3
f.	Purdue Water Center (IWRRC)	1	2	3	1	2	3
g.	USGS	1	2	3	1	2	3
h.	USACE	1	2	3	1	2	3

3. Does your agency provide or receive data or funding to (from) the agencies below?
(N=no P=provide R=receive)

		Data			Funding		
a.	IDEM, Drinking Water Branch	N	P	R	N	P	R
b.	IDNR, Division of Water	N	P	R	N	P	R
c.	IGS	N	P	R	N	P	R
d.	IURC	N	P	R	N	P	R
e.	IFA	N	P	R	N	P	R
f.	Purdue Water Center (IWRRC)	N	P	R	N	P	R
g.	USGS	N	P	R	N	P	R
h.	USACE	N	P	R	N	P	R

4. Describe the data you share (and with whom) and the data you receive (and from whom)_____
_____
_____

5. Identify the greatest need for the state in water resource planning and management?
_____
_____
_____

6. Do you meet with other agencies involved with water resources regularly to develop strategy? YES NO

7. Do you meet with policy makers frequently enough to understand your agency's role in the larger statewide strategy? YES NO

8. Is it important that Indiana develop a statewide water resource plan? YES NO
    a. If no, why not?
    _____
    _____
    b. If yes, outline the elements and purpose of the plan.
    _____
    _____
    _____
    c. How should it be managed? _____
    d. How should it be implemented? _____
    _____
    e. What is the most realistic revenue source for funding this work?
    _____

9. Describe the role you see for your agency in the future of water resources planning.
_____
_____

Appendix G. Spatial Analysis of 20 Selected Water Utilities in Indiana (19 pages)

Spatial analysis of 20 selected water utilities in Indiana

EXECUTIVE SUMMARY

This study was undertaken to provide the Indiana Finance Authority some insight into the accuracy of locations, and therefore, our understanding of the associated hydrogeologic and landscape characteristics of wells and intakes that provide water to 20 selected water utilities in Indiana. This portion of the study is an inquiry into not only the locational accuracy of the facilities, but also of the institutional protocols that obtain and curate the locations.

To obtain accurate locations of groundwater wells and surface-water intakes in the Indiana Department of Natural Resources (IDNR), Division of Water (DOW), Significant Water Withdrawal Facility (SWWF) database, location data in an Indiana Department of Environmental Management (IDEM) public-water supply location database was used. Differences in the original and correct locations were calculated, as were examples of the potential repercussions of the location errors to understanding the water resource around these facilities. For all utilities, the error ranged between 3.9 and 8,038.7 feet, with an average error of 578.9 feet.

The manual matching of the two databases was very time consuming. The number of wells and intakes studied for the selected water systems represented only 10.8% (221 wells, 24 intakes) of all active public water supplies. To obtain accurate location information for the remainder of municipal water system wells and intakes, it is estimated that it would take between 9 and 12 40-hour work weeks to link the IDNR water-use data with the location data in the IDEM database, as well as make the important linkage to the US Environmental Protection Agency (USEPA) Safe Drinking Water Information System (SDWIS) water-quality database.

Manually collecting locations using high resolution imagery or GPS technology for wells and intakes used for other purposes (e.g., irrigation, industry) is the only way to achieve accurate coordinates for the remainder of the SWWF pumps. However, if in-person location data collection is needed (i.e., through a GPS-collected coordinate), site access for facilities not subject to or obligated by regulatory oversight might be problematic. However, many facilities might be in the position to provide quite accurate GPS locations, if requested, as the technology is much more ubiquitous now than in the past.

Errors in well location, elevation, capacity, and well construction information have potential negative repercussions for the accuracy of future groundwater modeling. Such water-resource stress testing will likely be needed for examining scenarios of population increase or drought-resiliency testing for water-resource planning efforts in the state.

1 LOCATION ANALYSIS OF WELLHEADS AND SURFACE-WATER INTAKES

1.1 BACKGROUND AND OBJECTIVES

This study was undertaken to provide the Indiana Finance Authority some insight into the accuracy of locations, and therefore, our understanding of the associated hydrogeologic and landscape characteristics of wells and intakes that provide water to 20 selected water utilities in Indiana. This portion of the study is an inquiry into not only the locational accuracy of the facilities, but also of the institutional protocols that obtain and curate the locations.

The 20 water utilities examined in this portion of the study are presented in Table 1.

Table 1. Table of the 20 water utilities considered in this study. The first 15 are the largest communities in Indiana, followed by 5 smaller communities.

Community	Utility Name	System Type
Indianapolis	Citizens Energy Group	Blend
Fort Wayne	Fort Wayne City Utilities	Surface water
Evansville	Evansville Water and Sewer Utility	Surface water
South Bend	South Bend Water Works	Groundwater
Hammond	Hammond Water Work Department	Surface water
Bloomington	City of Bloomington Utilities	Surface water
Gary	Indiana American Water Northwest Operations	Surface water
Carmel	Carmel Utilities	Groundwater
Fishers	Citizens Energy Group / Indiana American Water Noblesville	Groundwater
Muncie	Indiana American Water Muncie	Blend
Lafayette	Lafayette Water Works	Groundwater
Terre Haute	Indiana American Water Terre Haute	Groundwater
Anderson	Anderson Water Department	Groundwater
Noblesville	Indiana American Water Noblesville	Groundwater
Elkhart	Elkhart Public Works and Utilities	Groundwater
Speedway	Speedway Water Works Department	Blend
Edwardsville	Edwardsville Water Corporation	Groundwater
Spencer	BBP Water Corporation	Groundwater
Salem	Salem Water Works	Surface water
Bremen	Bremen Water Department	Groundwater

1.2 METHODS

For this portion of the spatial analysis, databases were obtained from the Indiana Department of Natural Resources (IDNR), Division of Water (DOW) and the Indiana Department of Environmental Management (IDEM), Ground Water Section. The Water Rights and Use Section of the IDNR-DOW provided the database of the Significant Water Withdrawal Facilities (SWWF) upon an e-mail request. The IDEM locational database for public water supplies was obtained by an e-mail request, and was fulfilled after signing a confidentiality agreement (Appendix 1A).

The IDNR SWWF database compiles data from the registrations of all facilities capable of producing at least 100,000 gallons per day (equivalent to ~70 gallons per minute, GPM) per Indiana Code 14-25-7-15. The users of these data include industry, community, and academic researchers who seek to understand the quantity, timing, and sector partitioning of water use in Indiana. The sectors tracked by IDNR include:

- Public water supply (PS)
- Irrigation (IR)
- Industry (IN)
- Rural use (RU)
- Energy production (EP)
- Miscellaneous (MI)

The SWWF database contains three data tables: (1) facility information (e.g., facility name and type [e.g., irrigation, public supply], general location information, and the initial registration date), (2) a database of "sources" (groundwater wells or surface water intakes, their capacities, and construction information), and (3) a database of reported water-use information by month. The metadata for this database are shown in Appendix 1B. Locations in this database are typically described in map or sketch form (Figures 1, 2, and 3). IDNR staff identify the described locations on 1:24,000 quadrangle maps and assign a coordinate in the Universal Transverse Mercator (UTM) projection, with North American Datum (NAD) 1927, Zone 16. Very occasionally, georeferenced high resolution imagery has been used to identify well locations. The 2014 IDNR SWWF database contains 4,069 facilities and 8,552 active "sources" (wells or intakes). Of the active public water supply sources, there are 2,252 wells or intakes. However, facilities such as schools and mobile home parks are included in this sector, not just municipal water supplies.

The IDEM locational database has been constructed over time to record accurate coordinates for public water supply systems. There are 2,510 records in this database (greater than the number of active public water supplies in the IDNR SWWF database). These locations and other information (e.g., active status, well field name, well construction information, etc.) have been garnered from inspections of the water utility facilities through sanitary and well-site surveys conducted by IDEM. These data are gathered in support of water-quality data reporting to the U.S. Environmental Protection Agency (USEPA) and are stored in a database called the Safe Drinking Water Information System (SDWIS). The location data are collected for wellheads and intakes using geographic positioning system (GPS) technology and following IDEM spatial data collection standards (Appendix 1C). The coordinates are recorded in latitude and longitude, as well as UTM, NAD 1983, Zone 16. These data are considered

restricted and are not shared, except upon a public information request, as in this project. Therefore, IDNR does not have a copy of the IDEM locational database.

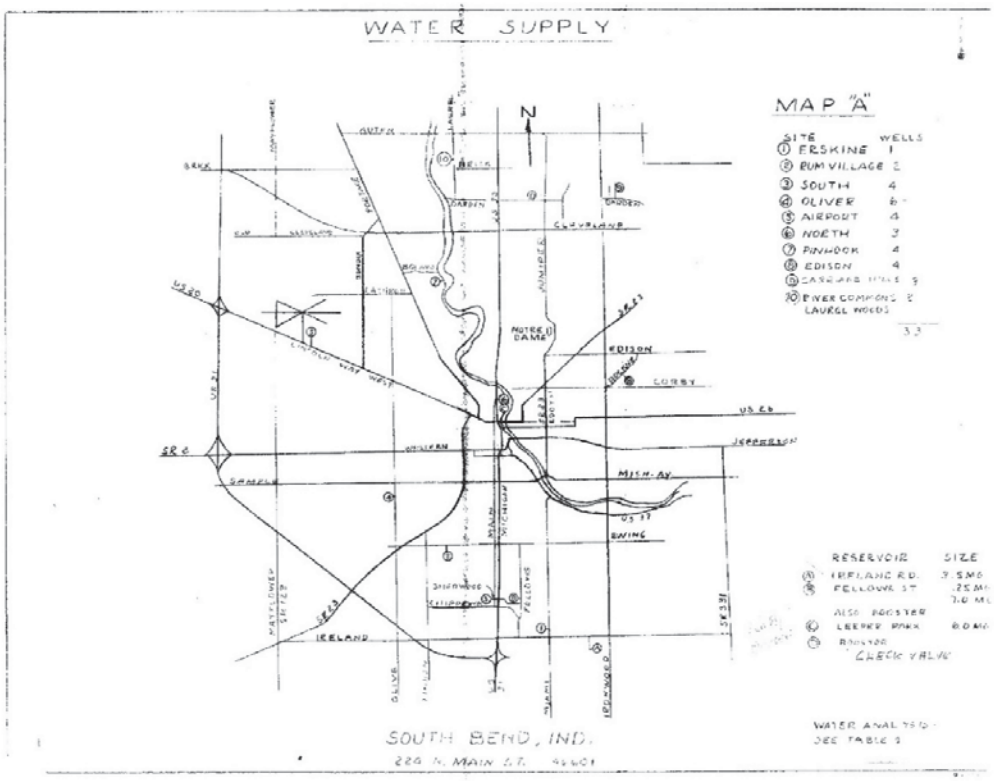


Figure 1. An example of a very generalized location map for a well field submitted by a water utility (South Bend) to IDNR in support of registration of significant water withdrawal facilities. The locations are for well fields, not individual wells.

Figure 2. An example of a well location map for a well field in Elkhart, Indiana. This location map was submitted on a 1:24,000 USGS topographic quadrangle base. The size of each point on the map is equivalent to ~100 ft (30 m), therefore the location accuracy can be no better than that, and is usually much worse.

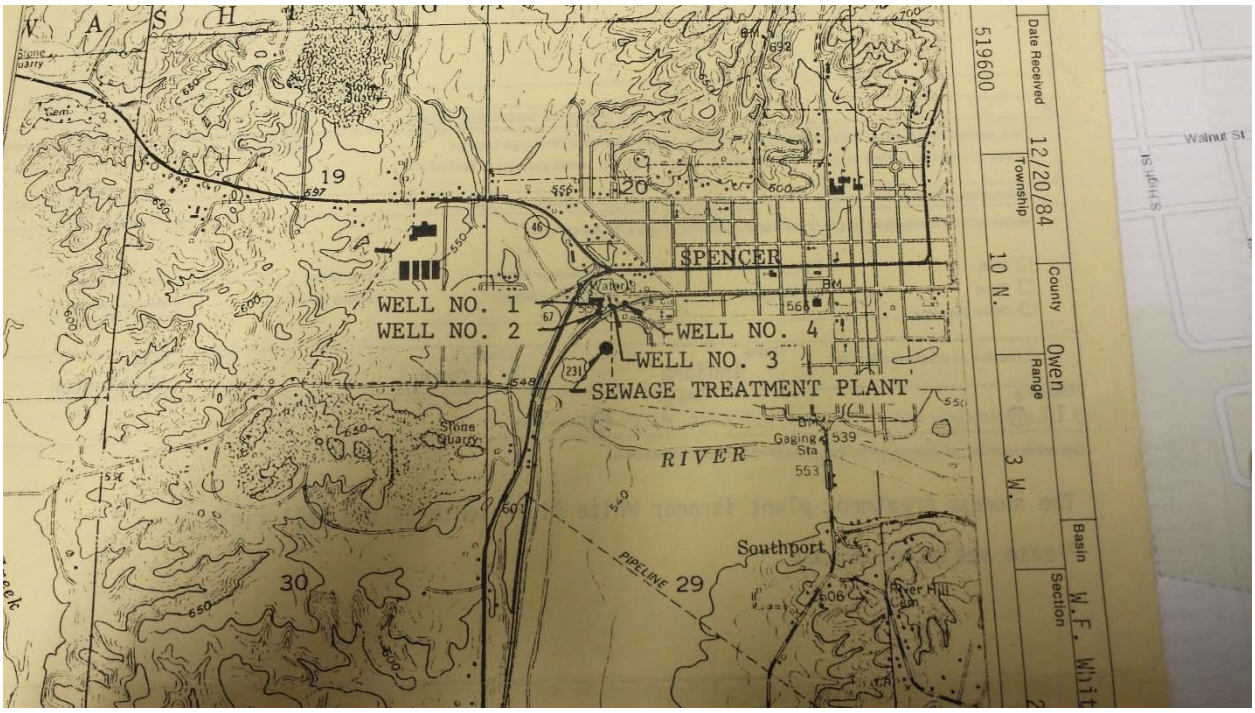


Figure 3. An example of a well location map for a well field in Spencer, Indiana. This location map was also submitted on a 1:24,000 USGS topographic quadrangle base. The well numbering when the registration was first submitted was changed in later years (see figures 6A and 6B below), causing confusion when trying to match up the wells with the IDEM location database.

Initially, a join field was presumed to be the way to merge the locations from the IDEM public water supply location database to the records for wells and intakes in the IDNR SWWF database; however, no unique field was in common. The lack of any fields in common also precluded deriving a unique field by concatenating other common fields. Therefore, an internal project identifier was assigned to all wells in the IDNR SWWF database, and a manual process of matching the associated records in the IDEM database was undertaken.

In most cases, the IDNR SourceID and the IDEM LocalName fields were close enough to provide a match, although the pairing could not be automated (e.g., SW01 versus SW-01, or 1R versus 1 Ranney, etc.). If a match couldn't initially be made because of duplicate Source IDs, for example, mapped locations from both databases were used to (1) identify well fields in the IDNR database that might narrow the search, and (2) identify wells that were mapped close together. This was not always helpful, as the example in Figure 4 shows.

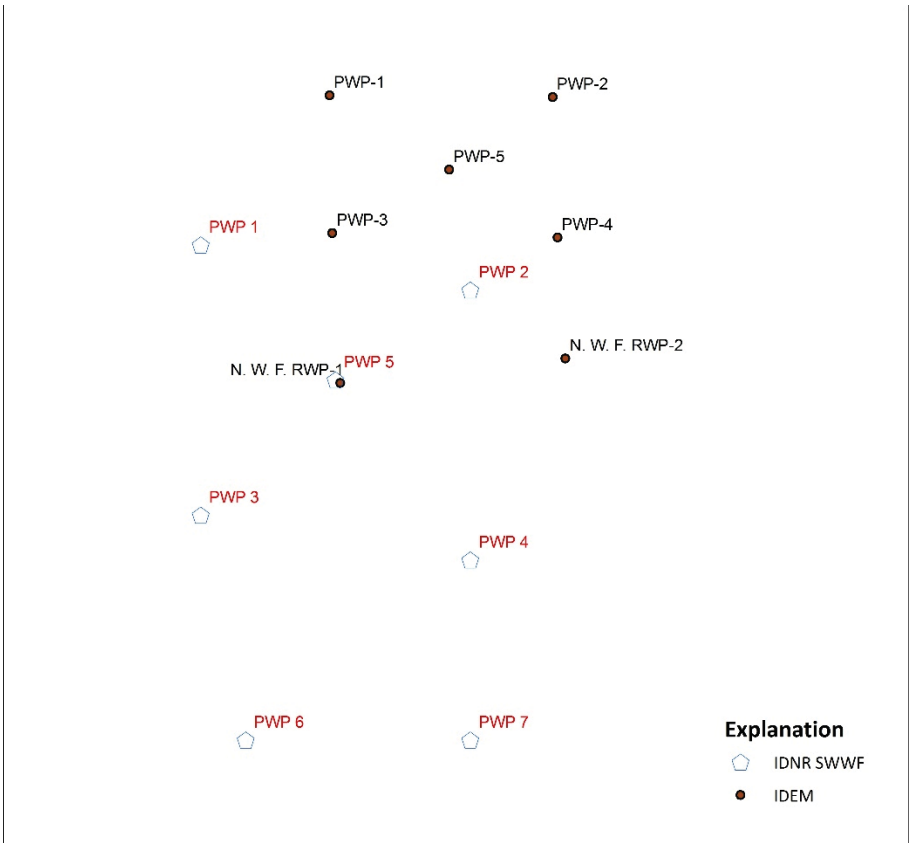


Figure 4. Distribution of wells in an unidentified community (no reference information is provided to adhere to a confidentiality agreement). As can be seen, the pattern of the wells in the IDNR SWWF database is correct, but the actual locations are incorrect. If relying on the proximity of wells in the two databases, NWF RWP-1 and PWP-5 would have been paired; however, NWF RWP-1 and PWP-6 are the true pairs.

For the remainder of well and intake records that remained unmatched, I worked with IDEM staff (Ground Water Section) to look up well site surveys, and used the maps therein to narrow the geographic area of the well or intake. I then used georeferenced high resolution aerial imagery to verify and assign a coordinate (UTM, NAD 1983, Zone 16).

Some wells were too new (installed in late 2014 or early 2015) to be in the IDEM database; therefore, high resolution imagery, together with location maps and sketches in the IDNR files were used to identify the well heads and provide accurate coordinates.

Table 2 lists the number of active wells and intakes for each of the 20 utilities studied. Some inactive wells were included in the locational analysis if the records could be matched between the IDNR and IDEM databases (see Appendix 1D).

Table 2. A listing of the active wells and surface-water intakes at the 20 water utilities in this study (as of early 2015). There are a total of 221 wells and 24 intakes.

Community	Utility Name	Wells	Intakes
Indianapolis	Citizens Energy Group	68	4
Fort Wayne	Fort Wayne City Utilities		3
Evansville	Evansville Water and Sewer Utility		6
South Bend	South Bend Water Works	29	
Hammond	Hammond Water Works		2
Bloomington	City of Bloomington Utilities Department		1
Gary	Indiana-American Water Co Inc		2
Carmel	Carmel Municipal Water	20	
Fishers	Citizens Energy Group/Indiana-American Water	3	
Muncie	Indiana-American Water Co Inc	3	2
Lafayette	City of Lafayette Water Works	14	
Terre Haute	Indiana-American Water Co Inc	5	
Anderson	Anderson Water Department	17	
Noblesville	Indiana-American Water Co Inc	9	
Elkhart	Elkhart Public Works and Utilities	28	
Speedway	Town of Speedway	13	2
Edwardsville	Edwardsville Water Corporation	2	
Spencer	Bean Blossom Patricksburg Water Corp.	7	
Salem	Salem Water Works		2
Bremen	Town of Bremen	3	

1.3 ISSUES

A number of issues arose that affected the accurate linking of the two primary databases.

IDNR SWWF database

1. There is no unique identifier for each well or intake other than that provided by the water utility (which may or may not be unique within a single well field).
2. One public water supply identification code is used for well fields, usually located on a single USGS 24,000 topographic quadrangle. The names of well fields are not recorded.
3. Well intakes for a single water utility, if located in different counties (e.g., Gary: Borman Park, Ogden Dunes) are assigned different public water supply identification codes and are difficult to assign to the proper utility.
4. Pump capacities or well construction information can be revised (Figure 5), sometimes annually. It is not known if pump-capacity changes are the result of pump replacement, well testing, or well development and re-testing. IDNR initially attempted to mark these changes in the database, and eventually decided to simply record the initial pump capacity when the facility was first registered (internally referred to as the “baseline” capacity). Some versions of the database have duplicate records for wells and intakes with the capacity changes marked.

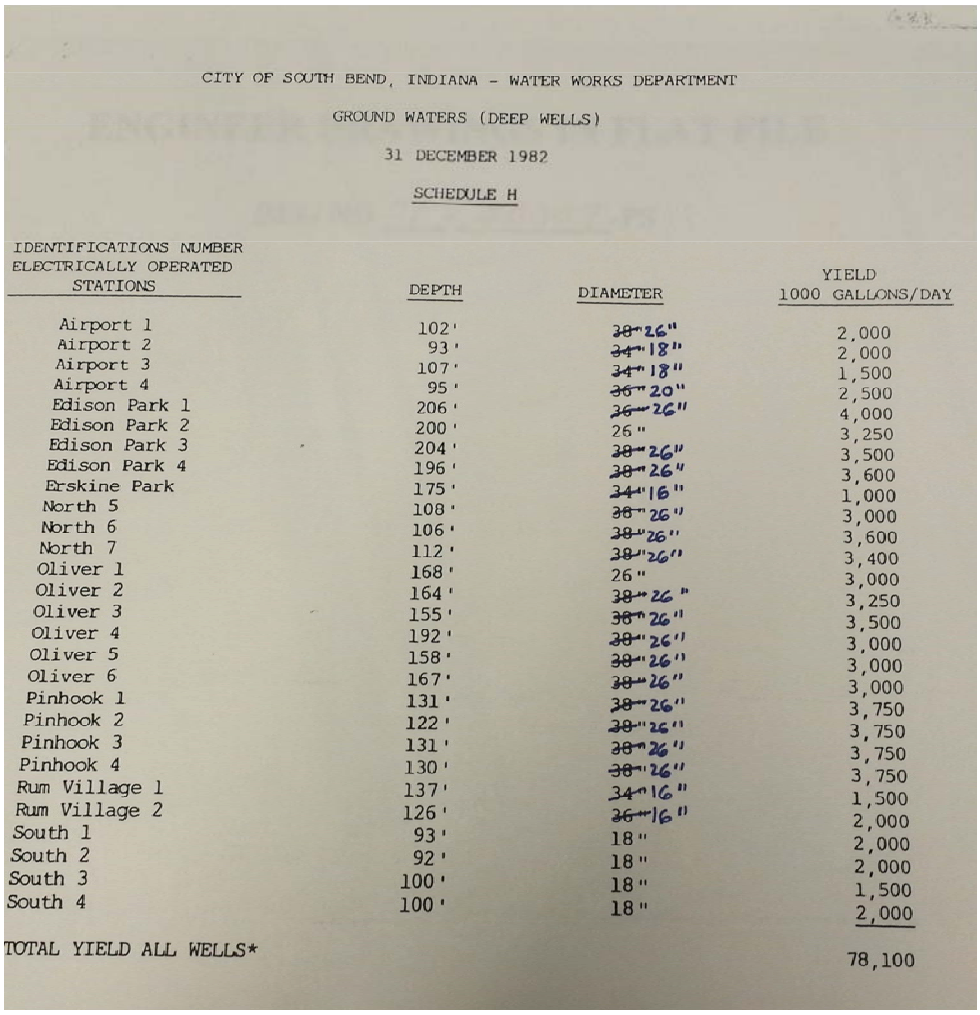
5. Water use is often reported as a total number for a single well field, not per well/pump. Although the total water use for the CO-#####-PS identifier appears to be used in tabulations of water use for a county or the state, the total amount is also often recorded for *each* pump in the database.
6. Intake locations are estimated, but an attempt is made to identify the location of the intake and not just the location of the facility.
7. Multiple pumps are located at some intake locations. Occasional multiple records (pumps) appear for wells, too. To get the total capacity for intakes, especially, multiple records must be identified.
8. There is no field in the IDNR database that denotes whether a source is active or inactive, but there is an "end date" field in the facilities table, if a facility closes, and there is a field in the SWWF database that provides a source end date, if a well or intake is removed from service.

IDEM public water supply location database

1. There is no consistent unique identifier for wells or intakes, although some records are linked to the USEPA SDWIS ID, where available. But entire well fields (e.g., Indianapolis: River Side Field, South Well Field, Waverly Well Field) or portions of well fields (e.g., Indianapolis: Geist Well Field) have no assigned SDWIS ID.
2. Surface-water intakes are usually represented by one coordinate unless the intakes are separated by great distances (e.g., Gary: Borman Park, Ogden Dunes).
3. Elevations collected by GPS units in many cases deviate quite a bit from the 2011-2013 LiDAR data, and even 1:24,000 topographic contours, despite spatial data collection accuracy standards.

Issues that apply to both databases

1. The name of the well by the water utility (IDNR: SourceID; IDEM: LocalName) is not consistent with those on well records, on location maps, and not consistent with those in either the IDNR or the IDEM databases. In addition, they are not consistent with those used by well drillers, who appear to be using internal identifiers or those used in the well-field planning process.
2. The name of wells (IDNR: SourceID; IDEM: LocalName) can be changed by the water utility (see the community of Spencer, Figures 6A and 6B), which if not updated in the databases of both agencies, can link the wrong location to the wrong well name.
3. Water well record assignments are sparse and often don't agree with the assignments made by the other agency.
4. Well construction information is provided by the utilities, and often has no correspondence with the well construction information on the associated well log.



CITY OF SOUTH BEND, INDIANA - WATER WORKS DEPARTMENT

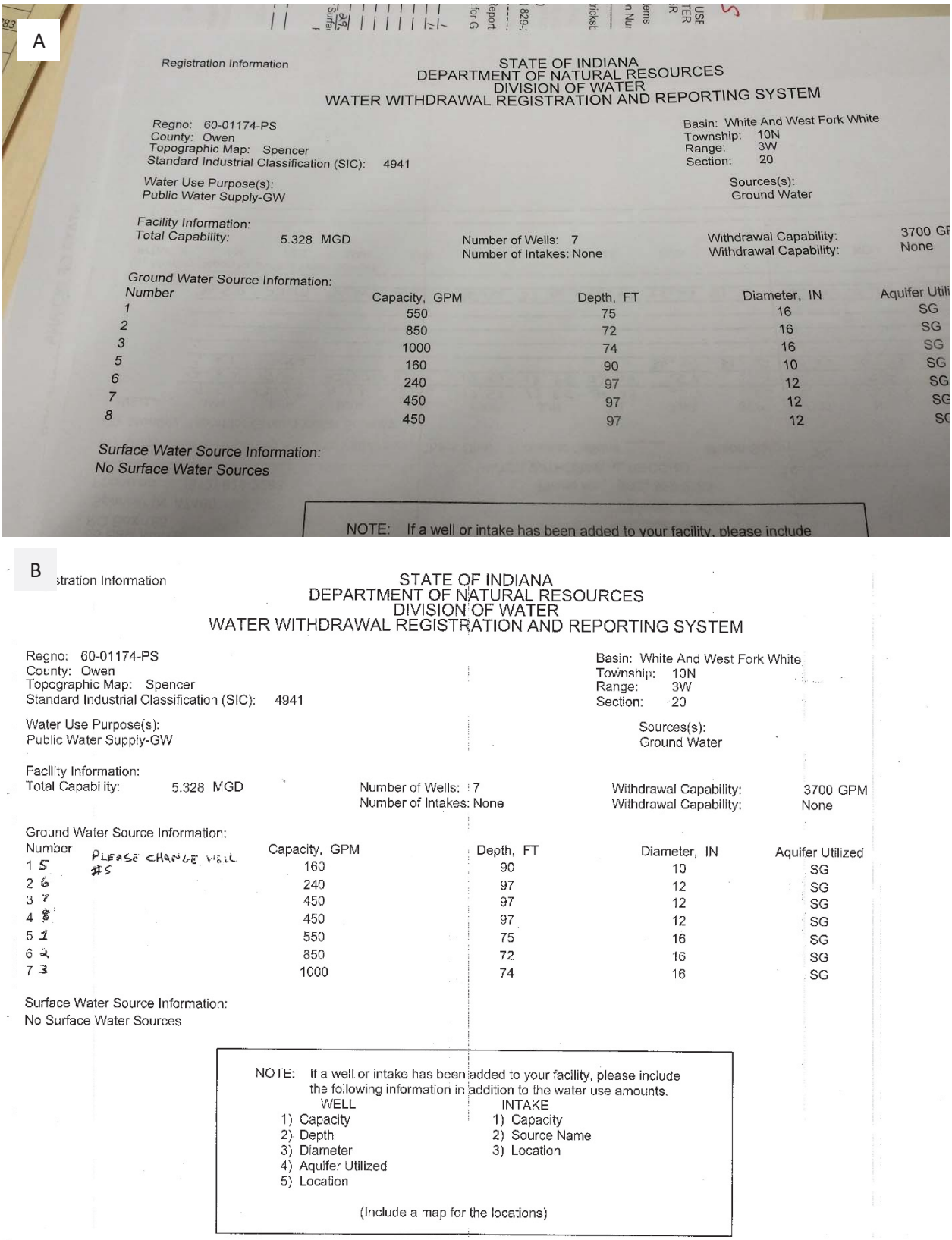
GROUND WATERS (DEEP WELLS)

31 DECEMBER 1982

SCHEDULE H

IDENTIFICATIONS NUMBER ELECTRICALLY OPERATED STATIONS	DEPTH	DIAMETER	YIELD 1000 GALLONS/DAY
Airport 1	102'	~~38"~~ 26"	2,000
Airport 2	93'	~~34"~~ 18"	2,000
Airport 3	107'	~~34"~~ 18"	1,500
Airport 4	95'	~~36"~~ 20"	2,500
Edison Park 1	206'	~~36"~~ 26"	4,000
Edison Park 2	200'	26"	3,250
Edison Park 3	204'	~~38"~~ 26"	3,500
Edison Park 4	196'	~~38"~~ 26"	3,600
Erskine Park	175'	~~34"~~ 16"	1,000
North 5	108'	~~38"~~ 26"	3,000
North 6	106'	~~38"~~ 26"	3,600
North 7	112'	~~38"~~ 26"	3,400
Oliver 1	168'	26"	3,000
Oliver 2	164'	~~38"~~ 26"	3,250
Oliver 3	155'	~~38"~~ 26"	3,500
Oliver 4	192'	~~38"~~ 26"	3,000
Oliver 5	158'	~~38"~~ 26"	3,000
Oliver 6	167'	~~38"~~ 26"	3,000
Pinhook 1	131'	~~38"~~ 26"	3,750
Pinhook 2	122'	~~38"~~ 26"	3,750
Pinhook 3	131'	~~38"~~ 26"	3,750
Pinhook 4	130'	~~38"~~ 26"	3,750
Rum Village 1	137'	~~34"~~ 16"	1,500
Rum Village 2	126'	~~36"~~ 16"	2,000
South 1	93'	18"	2,000
South 2	92'	18"	2,000
South 3	100'	18"	1,500
South 4	100'	18"	2,000
TOTAL YIELD ALL WELLS*			78,100

Figure 5. An example of an annual water-use report update (South Bend, Indiana), including revising well construction information, in this case, well diameters.



A

Registration Information

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
WATER WITHDRAWAL REGISTRATION AND REPORTING SYSTEM

Regno: 60-01174-PS
County: Owen
Topographic Map: Spencer
Standard Industrial Classification (SIC): 4941

Basin: White And West Fork White
Township: 10N
Range: 3W
Section: 20

Water Use Purpose(s):
Public Water Supply-GW

Sources(s):
Ground Water

Facility Information:
Total Capability: 5.328 MGD

Number of Wells: 7
Number of Intakes: None

Withdrawal Capability: 3700 GP
Withdrawal Capability: None

Ground Water Source Information:

Number	Capacity, GPM	Depth, FT	Diameter, IN	Aquifer Utili
1	550	75	16	SG
2	850	72	16	SG
3	1000	74	16	SG
5	160	90	10	SG
6	240	97	12	SG
7	450	97	12	SG
8	450	97	12	SG

Surface Water Source Information:
No Surface Water Sources

NOTE: If a well or intake has been added to your facility, please include

B

stration Information

STATE OF INDIANA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
WATER WITHDRAWAL REGISTRATION AND REPORTING SYSTEM

Regno: 60-01174-PS
County: Owen
Topographic Map: Spencer
Standard Industrial Classification (SIC): 4941

Basin: White And West Fork White
Township: 10N
Range: 3W
Section: 20

Water Use Purpose(s):
Public Water Supply-GW

Sources(s):
Ground Water

Facility Information:
Total Capability: 5.328 MGD

Number of Wells: 7
Number of Intakes: None

Withdrawal Capability: 3700 GPM
Withdrawal Capability: None

Ground Water Source Information:

Number		Capacity, GPM	Depth, FT	Diameter, IN	Aquifer Utilized
1 5	PLEASE CHANGE WELL #5	160	90	10	SG
2 6		240	97	12	SG
3 7		450	97	12	SG
4 8		450	97	12	SG
5 1		550	75	16	SG
6 2		850	72	16	SG
7 3		1000	74	16	SG

Surface Water Source Information:
No Surface Water Sources

NOTE: If a well or intake has been added to your facility, please include the following information in addition to the water use amounts.

WELL
1) Capacity
2) Depth
3) Diameter
4) Aquifer Utilized
5) Location

INTAKE
1) Capacity
2) Source Name
3) Location

(Include a map for the locations)

Figure 6. Figure 6A (top) shows the registration of 7 wells (Spencer, Indiana) with original well numbers. Figure 6B (bottom) shows a later water-use report with renumbered wells. These seemingly small complexities can confound properly relating the more accurate locations in the IDEM database to the wells in the IDNR SWWF database.

1.4 RESULTS

After the process of matching the records in each of the databases, confirming accurate locations, and following up by determining locations for the remaining wells, coordinates were converted to a standard projection (UTM, NAD 1983, Zone 16) and the Euclidean distance between the "original" (IDNR) and "correct" (IDEM or IU Center for Geospatial Data Analysis, CGDA) location was determined for each well. The detailed results are presented in Appendix 1E. For all utilities, the error ranged between 3.9 and 8,038.7 feet, with an average error of 578.9 feet. The average error for each utility is presented in Table 3 below. Figure 7 shows the spatial distribution of the average errors for each facility (all wells and well fields were combined for a single community).

Typically, the largest errors are ones of well-name transposition (e.g., two wells with swapped/incorrect names in the IDNR ["SourceID"] or IDEM ["LocalName"] database); however, some large errors were just very substantial mislocations.

Table 3. Average location error in the IDNR SWWF database for wells. Appendix 1X contains a detailed listing of each original and correct coordinate, along with the resolved error in feet.

Community	**Facility**	**Average location error (ft)**
Indianapolis	Citizens Energy Group	349.3
South Bend	South Bend Water Works	475.6
Carmel	Carmel Municipal Water	732.5
Fishers	Citizens Energy Group	340.0
Muncie	Indiana-American Water Co Inc	111.8
Lafayette	City of Lafayette Water Works	271.4
Terre Haute	Indiana-American Water Co Inc	217.9
Anderson	Anderson Water Department	1,667.2
Noblesville	Indiana-American Water Co Inc	408.8
Elkhart	Elkhart Public Works and Utilities	501.3
Speedway	Town of Speedway	367.2
Edwardsville	Edwardsville Water Corporation	115.2
Spencer	Bean Blossom Patricksburg Water Corp.	1,744.5
Bremen	Town of Bremen	2,396.5

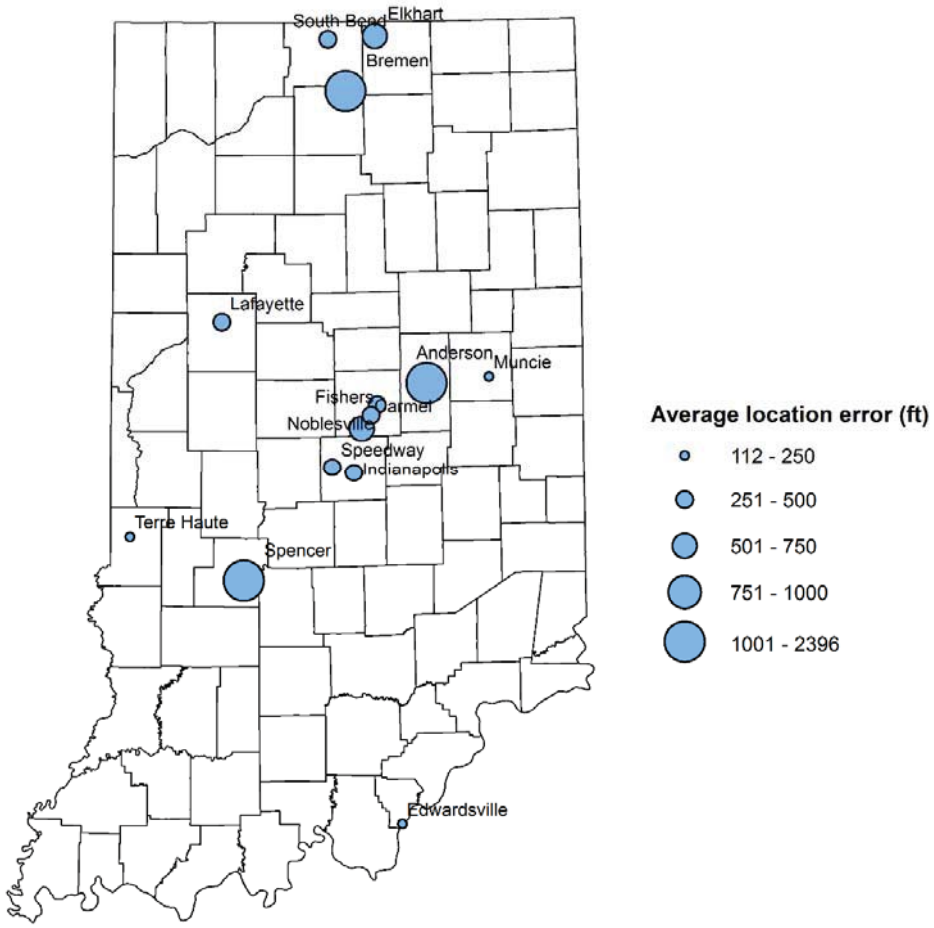


Figure 7. Average location error for wells in community well fields in this study. The size of the symbols represents the scale of the location error. The average location errors are also presented in Table 3.

Using high resolution elevation data (Light Detection and Ranging, LiDAR, collected 2011-2013), the elevations of the original and correct well head locations were also compared (Appendix 1F). The error varied between 0 and 46.9 feet, with an average error of 3.2 feet. As noted in the "issues" section, some of the IDEM GPS elevations also had significant errors; it isn't known if this is the result of problems with real time (RTK) locations, post-processing differential correction, elevations collected with an offset (e.g., holding the receiver rather than obtaining a ground elevation), or another reason. However, it is recommended that the standard LiDAR elevation data be used for well head locations. The implications of incorrect surface elevations can be propagated into subsurface geologic interpretations, causing incorrect correlations to be made between wells and in geologic cross sections, in geologic framework models, and therefore in groundwater models.

Appendix 1G tabulates the inconsistencies between the IDNR SWWF and IDEM location databases with respect to well reference number and well construction information (e.g., diameter, depth). It is quite common for IDNR and IDEM to assign different well records to wells in their databases. In addition, the well construction information in both databases is not derived from the well records, and is instead provided by the utilities (sometimes apparently providing different information to each agency for the same source). As noted in the Issues section (1.3) above, the agreement of the IDNR and IDEM

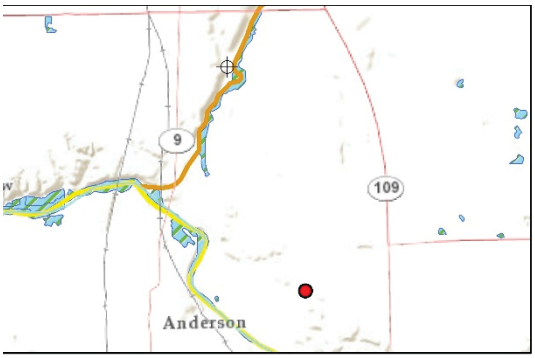
databases on well construction details is inconsistent at best. If conducting detailed groundwater modeling, having imperfect details of wells penetrating significant aquifers, or sharing an aquifer with an adjacent well, could affect the results of the analysis. Further, inconsistencies in the understanding of well or pump capacity could also affect well-field yield-potential analyses.

The next part of the analysis was to examine a few hydrogeologic attributes that might be affected if the incorrect location of a well were used in an analysis. For example, Appendix 1H and Table 4 show that for eight wells, the location errors were significant enough to place them in the wrong 12-digit Hydrologic Unit Code watershed in the National Hydrology Dataset. Although regional groundwater flow is likely more important than local flow for municipal water supplies, these errors could change the understanding of the placement of the well in the overall flow system. Incorrect upstream runoff and recharge characteristics could also affect analyses of the water resource at these locations.

Table 4. Out of all of the facilities, eight wells had location errors significant enough to place them in the wrong HUC12 watershed.

Community	Water Utility	Original HUC12	Original HUC12 Watershed	Correct HUC12	Correct HUC12 Watershed
Indianapolis	Citizens Energy Group	051202010904	Devon Creek-Fall Creek	051202011006	Howland Ditch-White River
Indianapolis	Citizens Energy Group	051202011205	Dollar Hide Creek-White River	051202011206	Pleasant Run Creek
South Bend	South Bend Water Works	040500012206	Judy Creek	040500012208	Dutch Corners-St Joseph River
Carmel	Carmel Municipal Water	051202011001	Cool Creek	051202011002	Vestal Ditch-White River
Carmel	Carmel Municipal Water	051202011001	Cool Creek	051202011003	Carmel Creek-White River
Anderson	Anderson Water Department	051202010308	Turkey Creek-White River	051202010307	Moon Branch-Killbuck Creek
Bremen	Town of Bremen	071200010302	Kline Rouch Ditch-Yellow River	071200010309	Lake of the Woods-Yellow River
Bremen	Town of Bremen	071200010302	Kline Rouch Ditch-Yellow River	071200010309	Lake of the Woods-Yellow River

Figure 8 below shows a small case study of a poorly located well in the Anderson well field, and the implications to the hydrogeologic interpretation of the conditions around the original and correct locations of the well. This is an extreme case in the database, as the error was 8,038.7 feet, over 1.5 miles from the correct location; however extreme, it is not an isolated case as there were a number of wells with significant location errors. The factors include proximity to water bodies (including contaminated or impaired water bodies), geologic parent material (here, derived from a soils database), aquifers, neighboring wells (interference, cones of depression), and the elevation of the water table.

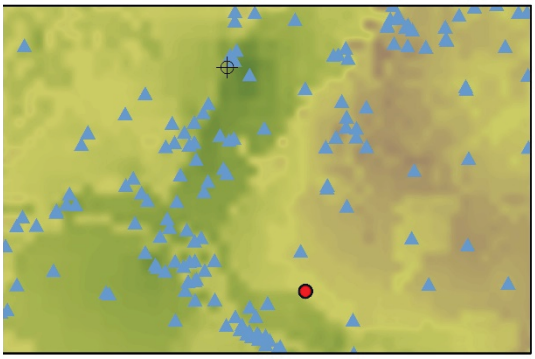


Number of water-quality impairments (IDEM)

- 1
- 2
- 3
- Wetlands (NWI)

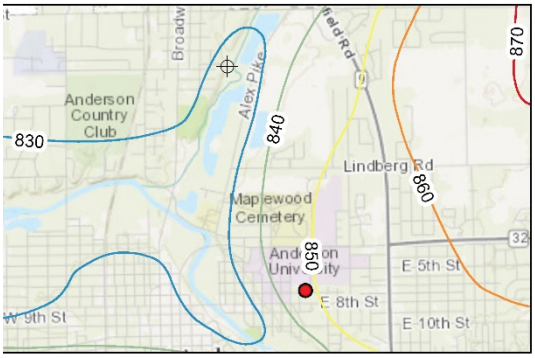
Soil parent material (NRCS)

- Water
- Lacustrine
- Loamy till
- Alluvium
- Outwash
- Glaciofluvial deposits



Estimated aquifer recharge (in/year) (CGDA)

- High : 14
- Low : 0
- Water wells (IDNR)



Potentiometric surface (ft elevation) (IDNR)

- 820 - 830
- 830 - 840
- 840 - 850
- 850 - 860
- 860 - 870
- Water utility (correct location)
- Water utility (original location)

1:65,000

Figure 8. Case study of various hydrogeologically relevant variables that would be poorly estimated using the original IDNR locations for an example well in the Anderson well field.

Appendix 1I tabulates the surface-water intakes (active and inactive) for the 20 water utilities in the study. As noted in the Issues section above (1.3), accurate locations for the surface-water facilities were collected by IDEM, but when verified by high resolution imagery, they were usually single locations for the facility where the intake water was brought in, and not for the estimated locations of the intakes themselves (e.g., multiple Ohio River intakes in Evansville). Therefore, for this study, the locations from the IDNR SWWF database were used as the "correct" locations.

To demonstrate a use of some information in the databases, using the reported pump capacities (which, as noted in the Issues section, 1.3, above, can change from year to year) for both the surface and groundwater sources in the systems studied, the total pump capacity is shown in millions of gallons per day in Figure 9 and in gallons per minute in Figure 10 below. Figure 11 (and Appendix 1J) incorporates information on the population served by each utility to evaluate the capacity per capita. This gives an indication of the potential resiliency or flexibility of a water system to adjust to population increases or water-resource issues arising from climatic perturbations.

Figure 11 shows that some of the smaller systems have abundant resources (e.g., Speedway, Salem, Bremen), whereas the largest system (Indianapolis-Fishers-Noblesville) has relatively smaller capacity per capita than many of the 20 water utilities studied.

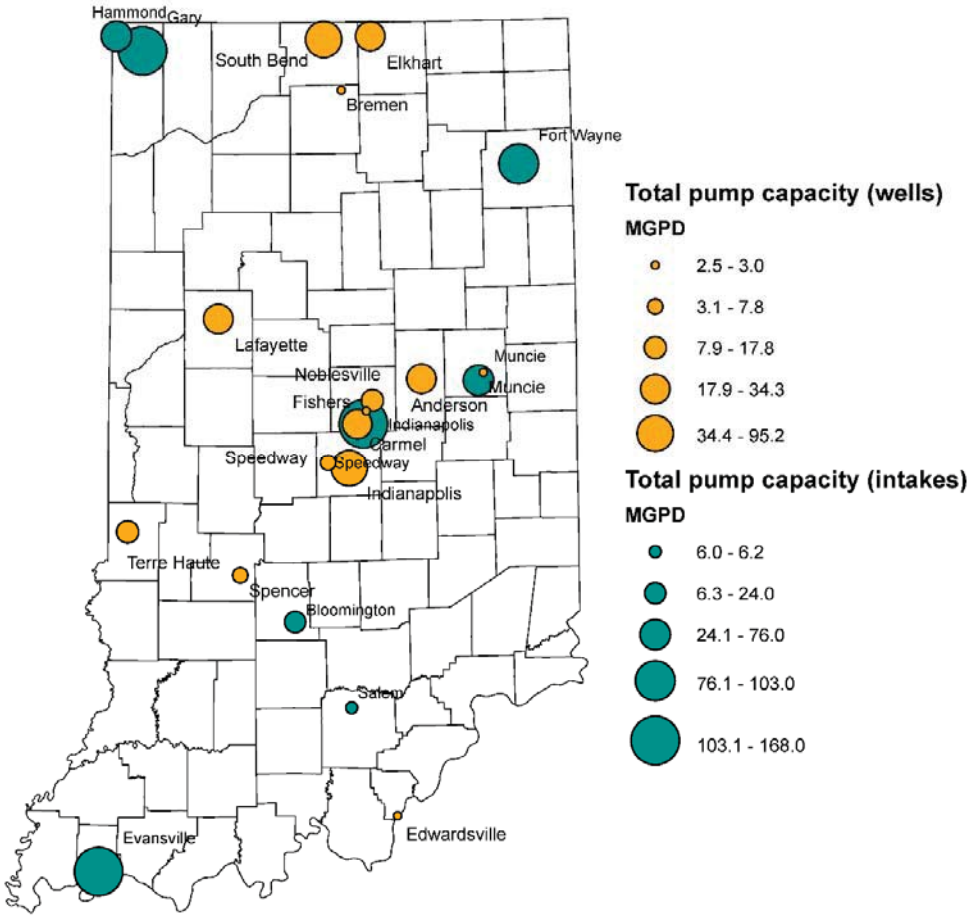


Figure 9. Spatial distribution of the total pump capacity for 20 water utilities in Indiana. The total pump capacity (GPM) for each utility, as well as the proportion of groundwater and surface water for blended systems, are also presented in Figure 10.

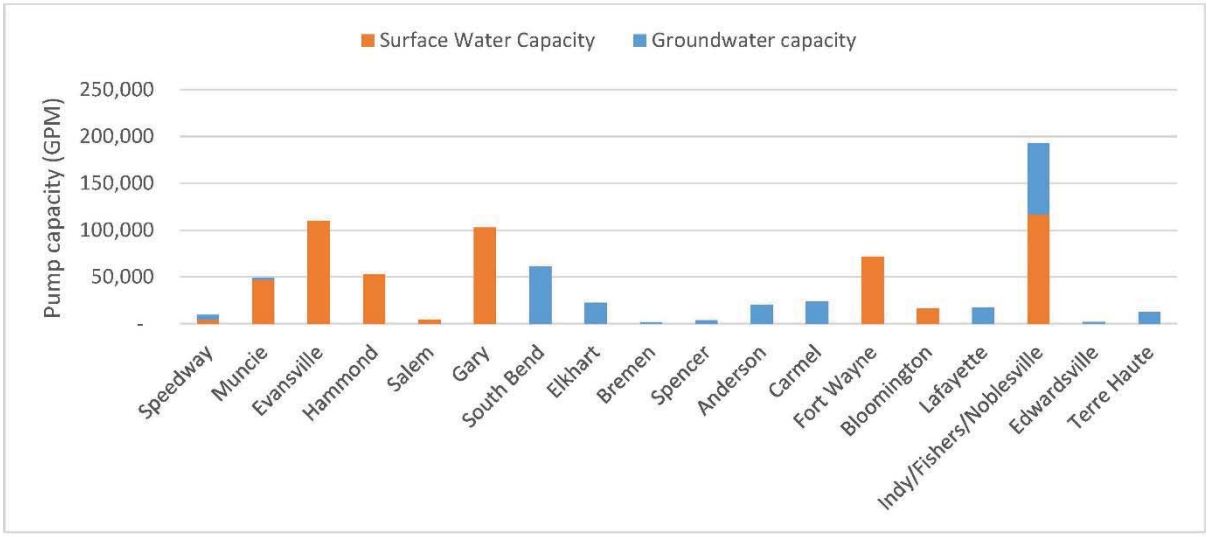


Figure 10. This figure presents the total pump capacity for each utility, as well as the proportion of groundwater and surface water for blended systems (Speedway, Muncie, and Indianapolis). The order of the utilities is the same as for Figure 11, which is sorted in order of decreasing pump capacity per capita.

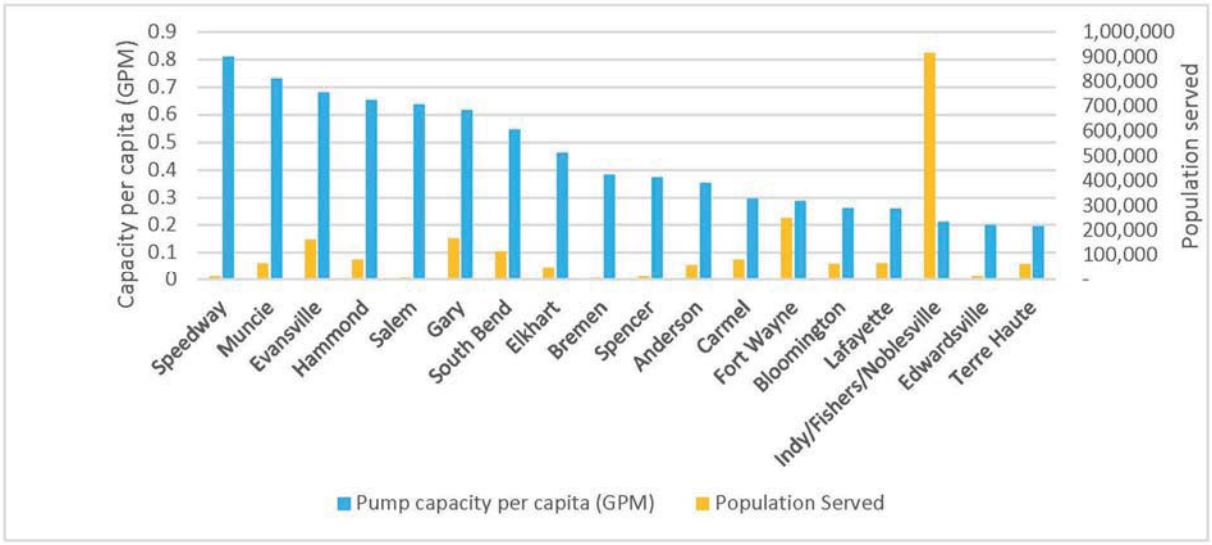


Figure 11. This figure shows the total pump capacity (groundwater and surface water) in gallons per minute per capita (population served, as reported by the utilities) for the communities in this study. The communities are sorted in order of decreaing pump capacity per capita. These values can change from year to year based on the population served, as well as by changing pump capacities.

1.5 Conclusions

The manual matching of the two databases was very time consuming. The number of wells studied for the selected water systems represented only 10.8% (221 wells, 24 intakes) of all active public water supplies. It is unknown how many of the public water supplies represent municipalities (of the greater population of “community” systems); however, if an estimate of 60% is used, it is estimated that it would take between 9 and 12 40-hour work weeks to link the IDNR water-use data with the location

data in the IDEM database, as well as make the important linkage to the USEPA SDWIS water-quality database. For all public water supplies, including smaller community systems, the estimate would be between 19 and 23 40-hour work weeks. An estimate for manually collecting the data via site visits with a GPS unit is not available. IDEM collected the bulk of their location data between 1999 and 2001, collecting 1,864 coordinates (out of 2,510).

Manually collecting locations using high resolution imagery or GPS technology for wells and intakes used for other purposes (e.g., irrigation, industry) is the only way to achieve accurate coordinates for the remainder of the SWWF pumps. However, if in-person location data collection is needed (i.e., through a GPS-collected coordinate), site access for facilities not subject to or obligated by regulatory oversight might be problematic. However, many facilities might be in the position to provide quite accurate GPS locations, if requested, as the technology is much more ubiquitous now than in the past.

The only unique identifier for the public water supply sources (wells and intakes) in Indiana is the USEPA SDWIS code. Although it would be a challenge to match up all of the IDNR SWWF public water-supply sources with the IDEM/SDWIS identifier, this would link the important details of both IDNR and IDEM databases. This, however, would only allow ongoing tracking of water-use and water-quality data for public water supplies, as USEPA and the SDWIS database do not track other types of water withdrawal facilities.

In any case, a strong recommendation to IDNR would be to assign a unique identifier to each groundwater well or surface-water intake source. For all water-use sectors, having a discrete identifier linked to the location and water-use data, as well as well construction and pump capacity data, would be useful for those needing spatially explicit water-resource information. The addition of a well field name in the IDNR SWWF database would facilitate linking the sources to their counterparts in the IDEM public-water supply locational database.

Elevation data extracted from the continuous LiDAR dataset is recommended for ground elevations at well heads and near intakes. Subsurface information is likely more reliable for more recent wells entered into the IDNR SWWF registration database because many utilities submit well logs for new wells; however, the sparse and problem-ridden population of the IDNR well record reference number in both (IDNR and IDEM) databases is problematic for understanding the subsurface geology in and around each well.

Errors in well location, elevation, capacity, and well construction information have potential negative repercussions for the accuracy of future groundwater modeling. Such water-resource stress testing will likely be needed for examining scenarios of population increase or drought-resiliency testing for water-resource planning efforts in the state.