



# Financial Needs for Stormwater Infrastructure and Programming in Indiana (2017-2036)



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# Executive Summary

In drafting 2018 HEA 1267, the Indiana General Assembly assigned stormwater as one of the topics to be addressed by the newly established Water Infrastructure Task Force. The law also directed the Indiana Finance Authority to study water needs, including stormwater infrastructure and programming. This report provides a 20-year cost estimate of stormwater infrastructure (capital) and programming needs.

## Stormwater Management

Communities develop stormwater infrastructure and other programming elements to manage both flooding (quantity) and the effects of nonpoint source pollution on water bodies (quality). This includes interacting with the Indiana Department of Environmental Management (IDEM) on a number of state administrative rules governing stormwater quality: Rule 5 (327 IAC 15-5) regulating construction and land disturbing activities; Rule 13 (327 IAC 15-13) governing municipal separate storm sewer systems (MS4) in urbanized communities; and Rule 6 (327 IAC 15-6) governing industrial facilities for which the industrial processes are exposed to stormwater and runoff is discharged to waters of the state. Stormwater and wastewater utilities, and engineering, public works, planning and building departments often have roles in the installation and maintenance of stormwater infrastructure and the implementation of non-capital programming.

## Stormwater Needs (2017-2036)

The 20-year working estimate of statewide stormwater capital and programming needs is \$6.36 billion. The 20-year working estimate of statewide capital needs for stormwater infrastructure is \$1.83 billion. The median county 20-year capital need is \$7.0 million. County capi-

tal needs range from \$653 million (Marion County) to \$410,000 (Brown County). The 20-year working estimate of statewide stormwater programming needs is \$4.53 billion. The median county 20-year programming need is \$17.3 million. Among counties, Marion County (\$1.6 billion) and Brown County (\$1.0 million) had the most and the least estimated programming needs, respectively.

Estimated 20-year needs were calculated using annual cost per acre guidelines established by Treadway and Reese (2000) and land cover data maintained by the Multi-Resolution Land Characteristics Consortium (2011). The Construction Cost Index (ENR, 2018) and the Consumer Price Index for All Urban Consumers (BLS, 2018) were used to adjust historic capital and programming cost data for inflation, respectively.

The resulting estimates include only public costs (local government and utility) to serve public and private land. The estimates do not address the cost of compliance with Rule 5 or other MS4 regulations for builders and developers or the cost for industrial facilities to comply with Rule 6. For example, if a developer installed a retention pond to comply with local post-construction MS4-related regulations, the costs associated with the public storm sewers into which the pond drains are included, but the costs to the developer to install the private pond are not. Infrastructure needs for combined sewer overflows (CSOs) also are not addressed here. These needs are estimated separately (Palmer & Schmidt, 2016).

### Statewide Stormwater Needs (2017-2036)

Infrastructure Needs	\$1.83 Billion
+ Programming Needs	\$4.53 Billion
<b>= Total Needs</b>	<b>\$6.36 Billion</b>

## Introduction

2018 HEA 1267 directed the Indiana Finance Authority to accomplish a study of water needs of, “the state, political subdivisions of the state, and other public and private entities in Indiana, including entities engaged in construction activity or industrial activity arising from the National Pollutant Discharge Elimination System (NPDES) stormwater program” (Indiana General Assembly). ***Financial Needs for Stormwater Infrastructure and Programming in Indiana (2017-2036)*** addresses part of this charge and is also, in part, an update of the study published by the Indiana Advisory Commission on Intergovernmental Relations (IACIR) in late 2016 (Palmer & Schmidt, 2016).

The text that follows includes updated 20-year estimates of infrastructure (capital) needs and new programming needs for stormwater systems. It addresses principally public investments in infrastructure and the other elements of stormwater management. Capital and infrastructure are terms used interchangeably throughout this report. Programming refers to the remaining elements of stormwater management.

## Stormwater Management

Communities develop stormwater infrastructure and other programming elements to manage both flooding (quantity) and the effects on nonpoint source pollution on water bodies (quality). More specifically, local stormwater management typically include capital (infrastructure) investment and programming elements, such as “administration and financial management, operations and maintenance, regulation and enforcement, engineering and planning ... water quality, public involvement and education, technology, and other miscellaneous activities” (Treadway & Reese, 2000). Capital investments for stormwater include grey infrastructure investments such as curbs and storm sewers, as well as green infrastructure investments that “use vegetation, soils and other elements and practices” ... to mimic natural processes to soak up and store water (US EPA, n.d.). Engineering studies directly related to specific projects or infrastructure elements often are included as a capital cost.

A number of local agencies play a part in local stormwater programming including stormwater and wastewater utilities, and engineering, public works, planning, and building departments. Local government capital investments and other programs also include the implementation of state administrative rules governing water quality. All communities are subject to the Indiana Department of Environmental Management’s (IDEM) Rule 5 (327 IAC 15-5) regulating construction and land disturbing activities. Rule 5 requires the management of sediment on construction projects and land disturbances of one (1) or more acres (IDEM, n.d., a). Urbanized communities with municipal separate storm sewer systems (MS4) also are subject to IDEM’s Rule

13 (327 IAC 15-13). These communities must address six minimum control measures: public education and outreach, public participation and involvement, illicit discharge detection and elimination, construction site stormwater runoff control, post construction stormwater runoff control, and municipal operations pollution prevention and good housekeeping. MS4 communities must have a construction program that is at least as strict as Rule 5 and includes “procedures for construction plan review, site inspection, and when necessary, enforcement” (IDEM, n.d., c). Industrial facilities for which the industrial processes are exposed to stormwater and the runoff is discharged to waters of the state are subject to IDEM’s Rule 6 (327 IAC 15-6) (IDEM, n.d., b).

## Estimating Stormwater Needs

Currently, there is no comprehensive compilation of stormwater infrastructure or programming needs in Indiana. The 2012 Clean Watersheds Needs Survey (CWNS) contains a very limited set of needs for stormwater systems principally needs derived from plans prepared by communities required to have National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer systems (MS4) programs (U.S. Environmental Protection Agency, 2015b and 2016).

The limited coverage of the 2012 CWNS necessitates an alternative approach to estimate stormwater infrastructure needs. Infrastructure (capital) and programming needs were calculated using guidelines established by Treadway and Reese (2000) as guidance for communities anticipating municipal separate storm sewer systems (MS4) regulations (Table 1). Estimated ranges of annual costs per acre were developed for each of five levels of service, from incidental/baseline to exceptional. While Treadway and Reese (2000) do not provide specific estimates of capital costs associated with each level of service, Andrew Reese estimated (personal communication, October 25, 2002) that 25 percent of the annual stormwater costs went toward capital costs. Programming costs then are 75 percent annual stormwater management costs.

Estimates of developed land by county were produced using land cover data maintained by the Multi-Resolution Land Characteristics Consortium (2011), specifically, using three specific land covers: *Developed- Low Intensity*, *Developed- Medium Intensity*, and *Developed-High Intensity*. These data are a proxy for the amount of impervious surface. Cost estimates for capital were adjusted to current dollars using the Construction Cost Index (Engineering News-Record [ENR], 2018). Costs for programming were adjusted the Consumer Price Index for all Urban Consumers (U.S. Bureau of Labor Statistics [BLS], 2018).

**Table 1. Typical annual aggregate costs of stormwater capital investments and other programming by acre and level of service (2000)**

Level of service	Stormwater costs \$/acre/year	Typical program features
Incidental	\$15-\$30	Reactive incidental maintenance, and regulation as part of other programs
Minimum	\$30-\$60	Above and add: right-of-way maintenance, better regulation and inspection, more staff, and erosion control
Moderate	\$60-\$90	Above and add: additional maintenance programs and levels of service, better regulation and inspection, some planning, minor capital programs, and general upgrade of capabilities
Advanced	\$90-\$150	Above and add: maintenance (of some sort) of the whole system, master planning, regional treatment, some water quality, data collection, multi-objective planning, strong control of development and other programs, and utility funding
Exceptional	Over \$150	Above and add: stormwater quality, advanced flood control, advanced levels of service for maintenance, aesthetics become more important, and public programs

Source: Reprinted from Treadway & Reese, 2000.

Stormwater needs for each county at each level of service were estimated by multiplying developed acres by 25 percent (capital) and 75 percent (programming) of the level of service annual cost midpoint and then adjusted to 2017 dollars and 20 years. All needs were rounded to \$10,000. Statewide needs are the aggregate of county needs. The calculated capital and programming needs by level of service are shown in Appendix A (Tables A1 and A2).

**Table 2. Adjusted annual costs of stormwater management per acre (2017)**

Level of service	Infrastructure costs \$/acre/year	Programming costs \$/acre/year
Advanced	\$51.78	\$128.07

Sources: The historic annual costs for capital investment and programming developed by Treadway & Reese (2000) were adjusted for inflation using the Construction Cost Index (ENR, 2018) and the Consumer Price Index for all Urban Consumers (BLS, 2018), respectively.

The advanced level of service was chosen for the estimates for capital and programming in each county because it approximates a balance between the needs of urbanized and nonurbanized communities. The advanced and exceptional levels of service include programs to manage control pollutants in urban stormwater runoff, particularly as defined in the National Pollutant Discharge Elimination System (NPDES) MS4 program (Tables 1 and 2). Professional experience suggests that the Treadway and Reese (2000) estimates are fairly conservative for MS4 communities. All communities, however, are not subject to all of the MS4 requirements. At the advanced level of service, the adjusted annual per acre cost of stormwater capital is \$51.78, and the adjusted annual per acre cost of stormwater programming is \$128.07 (Table 2).

## Stormwater Needs (2017-2036)

Table 3 and Maps 1 and 2 summarize stormwater capital and programming needs statewide and by county. The 20-year working estimate of statewide stormwater capital and programming needs is \$6.36 billion. The 20-year working estimate of statewide capital needs for stormwater infrastructure is \$1.83 billion. Across counties, Marion County (\$653 million) and Brown County (\$410,000) had the most and least capital needs, respectively. The median county capital needs are \$7.0 million. The 20-year working estimate of statewide stormwater programming needs is \$4.53 billion. Across counties, Marion County (\$1.6 billion) and Brown County (\$1.0 million) again had the most and the least estimated programming needs, respectively. The median county programming needs were \$17.3 million.

<sup>4</sup>Several changes in methodology were made from previous IACIR estimates of needs (2003, 2006 and 2016): (1)The current report does not adjust the estimated needs for the cost of debt. While this is a reality that communities must plan for, U.S. EPA does not account for these costs in the most current CWNS (2012) or in the most recent Drinking Water Needs Survey (DWNS). While previous IACIR needs reports have made such an adjustment, they are excluded from this report for consistency with the needs estimates for other types of water infrastructure; (2)Previous estimates subtracted the cost of capital at the incidental level of service from each higher estimate of capital needs. This report includes the costs associated with the incidental level of service to ensure a complete estimate of needs; and (3)The Construction Cost Index (ENR, 2018) was selected for the adjustment of capital costs for inflation because it reflects changes in the prices of construction goods better than the Consumer Price Index (Eskaf, 2018; BLS, 2018). The Construction Cost Index bundle of goods includes labor, structural steel, Portland cement, and lumber.

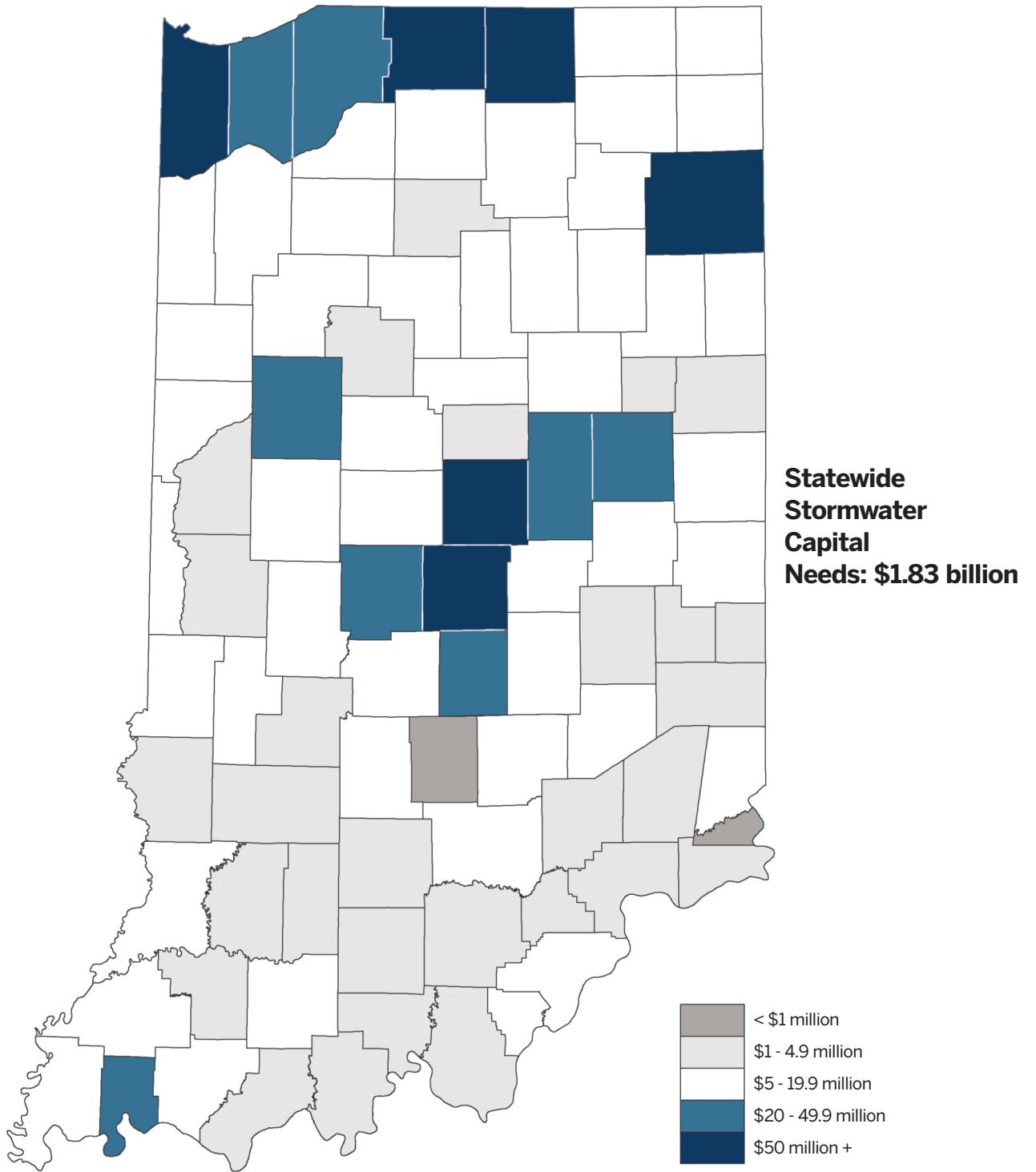
**Table 3. 20-year stormwater capital and programming estimates by county in thousands (2017 dollars)**

Counties	20-year stormwater capital needs	20-year stormwater programming needs	TOTAL 20-year stormwater needs
<b>All counties</b>	<b>\$1,832,140</b>	<b>\$4,531,510</b>	<b>\$6,363,650</b>
Adams	\$6,540	\$16,180	\$21,570
Allen	\$85,120	\$210,530	\$280,710
Bartholomew	\$12,090	\$29,900	\$39,870
Benton	\$7,910	\$19,550	\$26,070
Blackford	\$2,470	\$6,120	\$8,160
Boone	\$12,020	\$29,740	\$39,650
Brown	\$410	\$1,000	\$1,330
Carroll	\$3,660	\$9,060	\$12,080
Cass	\$7,500	\$18,560	\$24,750
Clark	\$18,590	\$45,980	\$61,310
Clay	\$5,130	\$12,700	\$16,930
Clinton	\$6,360	\$15,730	\$20,970
Crawford	\$1,440	\$3,560	\$4,750
Daviess	\$4,700	\$11,630	\$15,510
Dearborn	\$6,250	\$15,470	\$20,630
Decatur	\$7,200	\$17,810	\$23,750
DeKalb	\$9,510	\$23,510	\$31,350
Delaware	\$21,950	\$54,290	\$72,390
Dubois	\$6,850	\$16,940	\$22,590
Elkhart	\$63,580	\$157,260	\$209,680
Fayette	\$3,780	\$9,340	\$12,450
Floyd	\$8,840	\$21,860	\$29,150
Fountain	\$3,800	\$9,390	\$12,520
Franklin	\$2,480	\$6,140	\$8,190
Fulton	\$4,030	\$9,970	\$13,290
Gibson	\$8,300	\$20,520	\$27,360
Grant	\$14,970	\$37,030	\$49,370
Greene	\$3,650	\$9,030	\$12,040
Hamilton	\$65,030	\$160,840	\$214,450
Hancock	\$13,360	\$33,050	\$44,070
Harrison	\$2,610	\$6,460	\$8,610
Hendricks	\$31,050	\$76,810	\$102,410
Henry	\$9,010	\$22,270	\$29,690
Howard	\$17,750	\$43,900	\$58,530
Huntington	\$8,010	\$19,800	\$26,400
Jackson	\$7,360	\$18,210	\$24,280
Jasper	\$17,560	\$43,430	\$57,910
Jay	\$4,470	\$11,050	\$14,730
Jefferson	\$4,110	\$10,170	\$13,560
Jennings	\$3,340	\$8,270	\$11,030
Johnson	\$27,940	\$69,110	\$92,150
Knox	\$8,040	\$19,870	\$26,490
Kosciusko	\$13,370	\$33,060	\$44,080
LaGrange	\$10,110	\$24,990	\$33,320
Lake	\$127,750	\$315,970	\$421,290
LaPorte	\$28,350	\$70,130	\$93,510
Lawrence	\$4,900	\$12,120	\$16,160
Madison	\$26,630	\$65,870	\$87,830

Counties	20-year stormwater capital needs	20-year stormwater programming needs	TOTAL 20-year stormwater needs
Marion	\$653,430	\$1,616,170	\$2,154,890
Marshall	\$9,860	\$24,380	\$32,510
Martin	\$1,940	\$4,790	\$6,390
Miami	\$7,750	\$19,180	\$25,570
Monroe	\$10,790	\$26,680	\$35,570
Montgomery	\$7,400	\$18,290	\$24,390
Morgan	\$7,750	\$19,160	\$25,550
Newton	\$10,440	\$25,830	\$34,440
Noble	\$7,000	\$17,310	\$23,080
Ohio	\$780	\$1,940	\$2,590
Orange	\$1,920	\$4,750	\$6,330
Owen	\$1,030	\$2,560	\$3,410
Parke	\$2,820	\$6,970	\$9,290
Perry	\$2,540	\$6,280	\$8,370
Pike	\$3,200	\$7,910	\$10,550
Porter	\$35,140	\$86,910	\$115,880
Posey	\$5,420	\$13,400	\$17,870
Pulaski	\$6,990	\$17,280	\$23,040
Putnam	\$5,640	\$13,950	\$18,600
Randolph	\$5,210	\$12,900	\$17,200
Ripley	\$4,360	\$10,800	\$14,400
Rush	\$3,460	\$8,560	\$11,410
St. Joseph	\$74,480	\$184,220	\$245,630
Scott	\$2,700	\$6,670	\$8,890
Shelby	\$8,760	\$21,660	\$28,880
Spencer	\$3,550	\$8,780	\$11,710
Starke	\$6,380	\$15,780	\$21,040
Steuben	\$10,600	\$26,210	\$34,950
Sullivan	\$4,130	\$10,220	\$13,630
Switzerland	\$1,140	\$2,820	\$3,760
Tippecanoe	\$29,020	\$71,770	\$95,690
Tipton	\$3,580	\$8,860	\$11,810
Union	\$1,270	\$3,150	\$4,200
Vanderburgh	\$33,960	\$83,990	\$111,990
Vermillion	\$6,780	\$16,770	\$22,360
Vigo	\$19,260	\$47,620	\$63,490
Wabash	\$6,510	\$16,110	\$21,480
Warren	\$5,580	\$13,800	\$18,400
Warrick	\$9,370	\$23,190	\$30,920
Washington	\$1,990	\$4,920	\$6,560
Wayne	\$13,800	\$34,130	\$45,510
Wells	\$5,670	\$14,010	\$18,680
White	\$13,330	\$32,970	\$43,960
Whitley	\$5,530	\$13,680	\$18,240

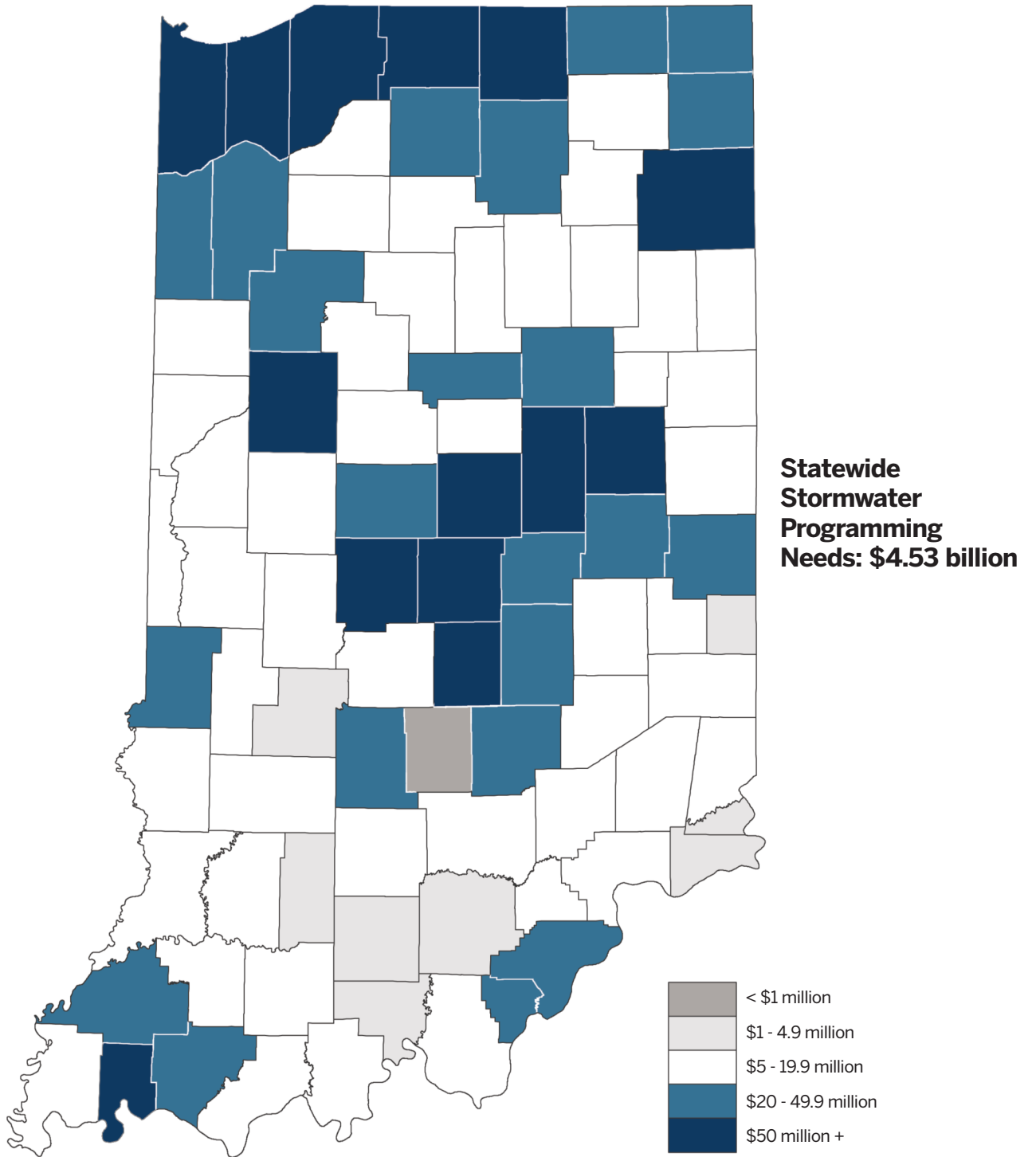
Sources: Needs were calculated using developed acres from the Multi-Resolution Land Characteristics Consortium, 2011 Land Cover Database and spending estimates by level of service developed by Treadway and Reese (2000). Historic costs for capital investment and programming were adjusted for inflation using the Construction Cost Index (ENR, 2018) and the Consumer Price Index for all Urban Consumers (BLS, 2018), respectively.

Map 1. 20-year stormwater infrastructure needs by county (2017 dollars)





Map 2. 20-year stormwater programming needs (2017 dollars)



## Limitations

These needs address only public infrastructure and programming costs (local government and utility). This includes public infrastructure and programming that serves both public and private land. It does not address the private sector cost of compliance with Rule 5, other MS4 regulations for builders and developers, or Rule 6 for industrial facilities. For example, if a developer installed a retention pond to comply with local post-construction MS4-related regulations, the costs associated with the public storm sewers into which the pond drains would be included, but the costs to the developer associated with installing the private pond would not. Infrastructure needs for combined sewer overflows (CSOs) also are not addressed here. Those needs are estimated separately (Palmer & Schmidt, 2016).

These estimated needs also may be conservative for a number of reasons. First, the estimates are not based on site or community specific information. Second, the Treadway and Reese model (2000) assumes that communities make regular investments in stormwater infrastructure and programming. If communities have underspent on these elements in the past, the model may not capture the entirety of these deferred costs. Third, estimates of developed land based on satellite imagery may underestimate developed land uses as defined by community land use planning and zoning. The most current land cover data available were for 2011 and may not account for new development that has occurred since then. Estimates for 2013 and 2016 are expected to be available in late 2018.

## References

- Bureau of Labor Statistics. (2018, June). Historical consumer price index for all urban consumers (CPI-U): U.S. city average, all items. Washington DC: U.S. Department of Labor. Retrieved from [www.bls.gov/cpi/tables/supplemental-files/historical-cpi-u-201806.pdf](http://www.bls.gov/cpi/tables/supplemental-files/historical-cpi-u-201806.pdf)
- Engineering News-Record*. (2018). Construction Cost Index History. Retrieved from [www.enr.com/economics/historical\\_indices/construction\\_cost\\_index\\_history](http://www.enr.com/economics/historical_indices/construction_cost_index_history)
- Eskaf, S. (2018, May 16 (update); 2012, September 16 (original)). Using an index to help project capital costs into the future. Retrieved from [efc.web.unc.edu/2012/09/26/using-an-index-to-help-project-capital-costs-into-the-future/](http://efc.web.unc.edu/2012/09/26/using-an-index-to-help-project-capital-costs-into-the-future/)
- Indiana Department of Environmental Management. (n.d., a). *Construction/land disturbance permitting*. Indianapolis. Retrieved from [www.in.gov/idem/stormwater/2331.htm](http://www.in.gov/idem/stormwater/2331.htm)
- Indiana Department of Environmental Management. (n.d., b). *Industrial storm water permitting*. Indianapolis. Retrieved from [www.in.gov/idem/stormwater/2332.htm](http://www.in.gov/idem/stormwater/2332.htm)
- Indiana Department of Environmental Management. (n.d., c). *Municipal separate storm sewer systems (MS4)*. Indianapolis. Retrieved from [www.in.gov/idem/stormwater/2333.htm](http://www.in.gov/idem/stormwater/2333.htm)
- Indiana General Assembly. (2018). 2018 HEA 1267. Indianapolis. Retrieved from [iga.in.gov/legislative/2018/bills/house/1267#document-0135a3a2](http://iga.in.gov/legislative/2018/bills/house/1267#document-0135a3a2)
- Lindsey, G., Worgan, A. and Palmer, J. (2003). *Financial needs for wastewater and water infrastructure in Indiana*. Indianapolis: Indiana Advisory Commission on Intergovernmental Relations.
- Multi-Resolution Land Characteristics Consortium. (2011). *Developed land cover* [Data file]. National Land Cover Database. Retrieved from [www.mrlc.gov/nlcd11\\_data.php](http://www.mrlc.gov/nlcd11_data.php)
- Palmer, J., Lindsey, G., and Worgan, A. (2006). *Financial needs for wastewater and water infrastructure in Indiana*. Indianapolis: Indiana Advisory Commission on Intergovernmental Relations.
- Palmer, J., and Schmidt, K. (2016). *Financial needs for water and wastewater infrastructure in Indiana (2015-2034)*. Indianapolis: Indiana Advisory Commission on Intergovernmental Relations
- Treadway, E and Reese, A. (2000, February). Financial strategies for stormwater management. *American Public Works Association Reporter*.
- U.S. Environmental Protection Agency. (2016). *Clean Watersheds Needs Survey 2012: Report to Congress*. Retrieved from [https://www.epa.gov/sites/production/files/2015-12/documents/cwns\\_2012\\_report\\_to\\_congress-508-opt.pdf](https://www.epa.gov/sites/production/files/2015-12/documents/cwns_2012_report_to_congress-508-opt.pdf)
- U.S. Environmental Protection Agency. (2015a). 2014 *Clean Water State Revolving Fund National Information Management System Reports – Indiana*. Retrieved from [www.epa.gov/cwsrf/clean-water-state-revolving-fund-cwsrf-national-information-management-system-reports](http://www.epa.gov/cwsrf/clean-water-state-revolving-fund-cwsrf-national-information-management-system-reports)
- U.S. Environmental Protection Agency. (2015b). 2012 *Clean Watersheds Needs Survey* [data file]. Retrieved from [ofmpub.epa.gov/apex/cwns2012/f?p=134:25:](http://ofmpub.epa.gov/apex/cwns2012/f?p=134:25:)
- U.S. Environmental Protection Agency. (n.d). *What is green infrastructure?* Retrieved from [www.epa.gov/green-infrastructure/what-green-infrastructure](http://www.epa.gov/green-infrastructure/what-green-infrastructure)

# Appendix A: 20-year Capital and Programming Needs by Level of Service and by County

Table A1. 20-year stormwater capital needs by level of service and by county in thousands (2017 dollars)

Counties	Incidental/Baseline	Minimum	Moderate	Advanced	Exceptional
<b>All counties</b>	<b>\$343,590</b>	<b>\$687,130</b>	<b>\$1,144,990</b>	<b>\$1,832,140</b>	<b>\$2,289,980</b>
Adams	\$1,230	\$2,450	\$4,090	\$6,540	\$8,180
Allen	\$15,960	\$31,920	\$53,200	\$85,120	\$106,390
Bartholomew	\$2,270	\$4,530	\$7,560	\$12,090	\$15,110
Benton	\$1,480	\$2,960	\$4,940	\$7,910	\$9,880
Blackford	\$460	\$930	\$1,550	\$2,470	\$3,090
Boone	\$2,250	\$4,510	\$7,510	\$12,020	\$15,030
Brown	\$80	\$150	\$250	\$410	\$510
Carroll	\$690	\$1,370	\$2,290	\$3,660	\$4,580
Cass	\$1,410	\$2,810	\$4,690	\$7,500	\$9,380
Clark	\$3,490	\$6,970	\$11,620	\$18,590	\$23,240
Clay	\$960	\$1,930	\$3,210	\$5,130	\$6,420
Clinton	\$1,190	\$2,390	\$3,970	\$6,360	\$7,950
Crawford	\$270	\$540	\$900	\$1,440	\$1,800
Daviess	\$880	\$1,760	\$2,940	\$4,700	\$5,880
Dearborn	\$1,170	\$2,350	\$3,910	\$6,250	\$7,820
Decatur	\$1,350	\$2,700	\$4,500	\$7,200	\$9,000
DeKalb	\$1,780	\$3,570	\$5,940	\$9,510	\$11,880
Delaware	\$4,120	\$8,230	\$13,720	\$21,950	\$27,440
Dubois	\$1,280	\$2,570	\$4,280	\$6,850	\$8,560
Elkhart	\$11,920	\$23,850	\$39,730	\$63,580	\$79,470
Fayette	\$710	\$1,420	\$2,360	\$3,780	\$4,720
Floyd	\$1,660	\$3,310	\$5,520	\$8,840	\$11,050
Fountain	\$710	\$1,420	\$2,370	\$3,800	\$4,740
Franklin	\$470	\$930	\$1,550	\$2,480	\$3,100
Fulton	\$760	\$1,510	\$2,520	\$4,030	\$5,040
Gibson	\$1,560	\$3,110	\$5,190	\$8,300	\$10,370
Grant	\$2,810	\$5,610	\$9,360	\$14,970	\$18,710
Greene	\$680	\$1,370	\$2,280	\$3,650	\$4,560
Hamilton	\$12,190	\$24,390	\$40,640	\$65,030	\$81,280
Hancock	\$2,510	\$5,010	\$8,350	\$13,360	\$16,700
Harrison	\$490	\$980	\$1,630	\$2,610	\$3,260
Hendricks	\$5,820	\$11,650	\$19,410	\$31,050	\$38,820
Henry	\$1,690	\$3,380	\$5,630	\$9,010	\$11,260
Howard	\$3,330	\$6,660	\$11,090	\$17,750	\$22,190
Huntington	\$1,500	\$3,000	\$5,000	\$8,010	\$10,010
Jackson	\$1,380	\$2,760	\$4,600	\$7,360	\$9,200
Jasper	\$3,290	\$6,590	\$10,970	\$17,560	\$21,950
Jay	\$840	\$1,680	\$2,790	\$4,470	\$5,580
Jefferson	\$770	\$1,540	\$2,570	\$4,110	\$5,140
Jennings	\$630	\$1,250	\$2,090	\$3,340	\$4,180
Johnson	\$5,240	\$10,480	\$17,460	\$27,940	\$34,930
Knox	\$1,510	\$3,010	\$5,020	\$8,040	\$10,040
Kosciusko	\$2,510	\$5,010	\$8,350	\$13,370	\$16,710
LaGrange	\$1,890	\$3,790	\$6,320	\$10,110	\$12,630
Lake	\$23,960	\$47,910	\$79,840	\$127,750	\$159,670
LaPorte	\$5,320	\$10,630	\$17,720	\$28,350	\$35,440

(Continued on next page)

**Table A1. 20-year stormwater capital needs by level of service and by county in thousands (2017 dollars)** (Continued from previous page)

Counties	Incidental/Baseline	Minimum	Moderate	Advanced	Exceptional
Lawrence	\$920	\$1,840	\$3,060	\$4,900	\$6,120
Madison	\$4,990	\$9,990	\$16,640	\$26,630	\$33,290
Marion	\$122,530	\$245,070	\$408,360	\$653,430	\$816,730
Marshall	\$1,850	\$3,700	\$6,160	\$9,860	\$12,320
Martin	\$360	\$730	\$1,210	\$1,940	\$2,420
Miami	\$1,450	\$2,910	\$4,850	\$7,750	\$9,690
Monroe	\$2,020	\$4,050	\$6,740	\$10,790	\$13,480
Montgomery	\$1,390	\$2,770	\$4,620	\$7,400	\$9,240
Morgan	\$1,450	\$2,910	\$4,840	\$7,750	\$9,680
Newton	\$1,960	\$3,920	\$6,530	\$10,440	\$13,050
Noble	\$1,310	\$2,620	\$4,370	\$7,000	\$8,750
Ohio	\$150	\$290	\$490	\$780	\$980
Orange	\$360	\$720	\$1,200	\$1,920	\$2,400
Owen	\$190	\$390	\$650	\$1,030	\$1,290
Parke	\$530	\$1,060	\$1,760	\$2,820	\$3,520
Perry	\$480	\$950	\$1,590	\$2,540	\$3,170
Pike	\$600	\$1,200	\$2,000	\$3,200	\$4,000
Porter	\$6,590	\$13,180	\$21,960	\$35,140	\$43,920
Posey	\$1,020	\$2,030	\$3,390	\$5,420	\$6,770
Pulaski	\$1,310	\$2,620	\$4,370	\$6,990	\$8,730
Putnam	\$1,060	\$2,120	\$3,520	\$5,640	\$7,050
Randolph	\$980	\$1,960	\$3,260	\$5,210	\$6,520
Ripley	\$820	\$1,640	\$2,730	\$4,360	\$5,460
Rush	\$650	\$1,300	\$2,160	\$3,460	\$4,320
St. Joseph	\$13,970	\$27,930	\$46,550	\$74,480	\$93,090
Scott	\$510	\$1,010	\$1,690	\$2,700	\$3,370
Shelby	\$1,640	\$3,280	\$5,470	\$8,760	\$10,940
Spencer	\$670	\$1,330	\$2,220	\$3,550	\$4,440
Starke	\$1,200	\$2,390	\$3,990	\$6,380	\$7,980
Steuben	\$1,990	\$3,970	\$6,620	\$10,600	\$13,240
Sullivan	\$770	\$1,550	\$2,580	\$4,130	\$5,160
Switzerland	\$210	\$430	\$710	\$1,140	\$1,430
Tippecanoe	\$5,440	\$10,880	\$18,130	\$29,020	\$36,270
Tipton	\$670	\$1,340	\$2,240	\$3,580	\$4,480
Union	\$240	\$480	\$800	\$1,270	\$1,590
Vanderburgh	\$6,370	\$12,740	\$21,220	\$33,960	\$42,440
Vermillion	\$1,270	\$2,540	\$4,240	\$6,780	\$8,470
Vigo	\$3,610	\$7,220	\$12,030	\$19,260	\$24,070
Wabash	\$1,220	\$2,440	\$4,070	\$6,510	\$8,140
Warren	\$1,050	\$2,090	\$3,490	\$5,580	\$6,970
Warrick	\$1,760	\$3,520	\$5,860	\$9,370	\$11,720
Washington	\$370	\$750	\$1,240	\$1,990	\$2,490
Wayne	\$2,590	\$5,180	\$8,620	\$13,800	\$17,250
Wells	\$1,060	\$2,130	\$3,540	\$5,670	\$7,080
White	\$2,500	\$5,000	\$8,330	\$13,330	\$16,660
Whitley	\$1,040	\$2,070	\$3,460	\$5,530	\$6,910

Sources: Needs calculated using developed acres from the Multi-Resolution Land Characteristics Consortium, 2011 Land Cover Database and spending estimates by level of service developed by Treadway and Reese (2000). Historic costs were adjusted for inflation using the Construction Cost Index (ENR, 2018).

**Table A2. 20-year stormwater programming needs by level of service and by county in thousands (2017 dollars)**

Counties	Incidental/Baseline	Minimum	Moderate	Advanced	Exceptional
<b>All counties</b>	<b>\$849,730</b>	<b>\$1,699,460</b>	<b>\$2,832,350</b>	<b>\$4,531,510</b>	<b>\$5,664,360</b>
Adams	\$3,030	\$6,070	\$10,110	\$16,180	\$20,220
Allen	\$39,480	\$78,950	\$131,590	\$210,530	\$263,160
Bartholomew	\$5,610	\$11,210	\$18,690	\$29,900	\$37,380
Benton	\$3,670	\$7,330	\$12,220	\$19,550	\$24,440
Blackford	\$1,150	\$2,290	\$3,820	\$6,120	\$7,650
Boone	\$5,580	\$11,150	\$18,590	\$29,740	\$37,170
Brown	\$190	\$380	\$630	\$1,000	\$1,260
Carroll	\$1,700	\$3,400	\$5,660	\$9,060	\$11,330
Cass	\$3,480	\$6,960	\$11,600	\$18,560	\$23,200
Clark	\$8,620	\$17,240	\$28,740	\$45,980	\$57,480
Clay	\$2,380	\$4,760	\$7,940	\$12,700	\$15,870
Clinton	\$2,950	\$5,900	\$9,830	\$15,730	\$19,660
Crawford	\$670	\$1,330	\$2,220	\$3,560	\$4,450
Daviess	\$2,180	\$4,360	\$7,270	\$11,630	\$14,530
Dearborn	\$4,410	\$5,800	\$9,670	\$15,470	\$19,330
Decatur	\$2,900	\$6,680	\$11,130	\$17,810	\$22,270
DeKalb	\$3,340	\$8,820	\$14,690	\$23,510	\$29,390
Delaware	\$10,180	\$20,360	\$33,940	\$54,290	\$67,870
Dubois	\$3,180	\$6,350	\$10,590	\$16,940	\$21,170
Elkhart	\$29,490	\$58,980	\$98,290	\$157,260	\$196,570
Fayette	\$1,750	\$3,500	\$5,840	\$9,340	\$11,670
Floyd	\$4,100	\$8,200	\$13,660	\$21,860	\$27,320
Fountain	\$1,760	\$3,520	\$5,870	\$9,390	\$11,740
Franklin	\$1,150	\$2,300	\$3,840	\$6,140	\$7,680
Fulton	\$1,870	\$3,740	\$6,230	\$9,970	\$12,470
Gibson	\$3,850	\$7,700	\$12,830	\$20,520	\$25,650
Grant	\$6,940	\$13,890	\$23,140	\$37,030	\$46,280
Greene	\$1,690	\$3,390	\$5,640	\$9,030	\$11,290
Hamilton	\$30,160	\$60,320	\$100,530	\$160,840	\$201,060
Hancock	\$6,200	\$12,390	\$20,660	\$33,050	\$41,310
Harrison	\$1,210	\$2,420	\$4,040	\$6,460	\$8,070
Hendricks	\$14,400	\$28,810	\$48,010	\$76,810	\$96,010
Henry	\$4,180	\$8,350	\$13,920	\$22,270	\$27,840
Howard	\$8,230	\$16,470	\$27,440	\$43,900	\$54,880
Huntington	\$3,710	\$7,430	\$12,380	\$19,800	\$24,750
Jackson	\$3,410	\$6,830	\$11,380	\$18,210	\$22,760
Jasper	\$8,140	\$16,290	\$27,150	\$43,430	\$54,290
Jay	\$2,070	\$4,140	\$6,910	\$11,050	\$13,810
Jefferson	\$1,910	\$3,810	\$6,350	\$10,170	\$12,710
Jennings	\$1,550	\$3,100	\$5,170	\$8,270	\$10,340
Johnson	\$12,960	\$25,920	\$43,200	\$69,110	\$86,390
Knox	\$3,730	\$7,450	\$12,420	\$19,870	\$24,840
Kosciusko	\$6,200	\$12,400	\$20,660	\$33,060	\$41,330
LaGrange	\$13,150	\$9,370	\$15,620	\$24,990	\$31,240
Lake	\$4,690	\$118,500	\$197,490	\$315,970	\$394,960
LaPorte	\$59,250	\$26,300	\$43,830	\$70,130	\$87,660

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**Table A2. 20-year stormwater programming needs by level of service and by county in thousands (2017 dollars)** (Continued from previous page)

Counties	Incidental/Baseline	Minimum	Moderate	Advanced	Exceptional
Lawrence	\$2,270	\$4,540	\$7,570	\$12,120	\$15,140
Madison	\$12,350	\$24,700	\$41,170	\$65,870	\$82,330
Marion	\$303,060	\$606,110	\$1,010,150	\$1,616,170	\$2,020,210
Marshall	\$4,570	\$9,140	\$15,240	\$24,380	\$30,470
Martin	\$900	\$1,800	\$3,000	\$4,790	\$5,990
Miami	\$3,600	\$7,190	\$11,990	\$19,180	\$23,970
Monroe	\$5,000	\$10,010	\$16,680	\$26,680	\$33,350
Montgomery	\$3,430	\$6,860	\$11,430	\$18,290	\$22,870
Morgan	\$3,590	\$7,190	\$11,980	\$19,160	\$23,950
Newton	\$4,840	\$9,690	\$16,150	\$25,830	\$32,290
Noble	\$3,250	\$6,490	\$10,820	\$17,310	\$21,640
Ohio	\$360	\$730	\$1,210	\$1,940	\$2,420
Orange	\$890	\$1,780	\$2,970	\$4,750	\$5,930
Owen	\$480	\$960	\$1,600	\$2,560	\$3,200
Parke	\$1,310	\$2,610	\$4,360	\$6,970	\$8,710
Perry	\$1,180	\$2,350	\$3,920	\$6,280	\$7,840
Pike	\$1,480	\$2,970	\$4,940	\$7,910	\$9,890
Porter	\$16,300	\$32,600	\$54,320	\$86,910	\$108,640
Posey	\$2,510	\$5,030	\$8,380	\$13,400	\$16,750
Pulaski	\$3,240	\$6,480	\$10,800	\$17,280	\$21,600
Putnam	\$2,620	\$5,230	\$8,720	\$13,950	\$17,440
Randolph	\$2,420	\$4,840	\$8,060	\$12,900	\$16,120
Ripley	\$2,020	\$4,050	\$6,750	\$10,800	\$13,490
Rush	\$1,600	\$3,210	\$5,350	\$8,560	\$10,690
St. Joseph	\$1,250	\$69,090	\$115,140	\$184,220	\$230,270
Scott	\$4,060	\$2,500	\$4,170	\$6,670	\$8,340
Shelby	\$1,650	\$8,120	\$13,540	\$21,660	\$27,070
Spencer	\$34,540	\$3,290	\$5,490	\$8,780	\$10,970
Starke	\$2,960	\$5,920	\$9,860	\$15,780	\$19,730
Steuben	\$4,910	\$9,830	\$16,380	\$26,210	\$32,760
Sullivan	\$1,920	\$3,830	\$6,380	\$10,220	\$12,770
Switzerland	\$530	\$1,060	\$1,760	\$2,820	\$3,530
Tippecanoe	\$13,460	\$26,920	\$44,860	\$71,770	\$89,710
Tipton	\$1,660	\$3,320	\$5,540	\$8,860	\$11,070
Union	\$590	\$1,180	\$1,970	\$3,150	\$3,940
Vanderburgh	\$15,750	\$31,500	\$52,500	\$83,990	\$104,990
Vermillion	\$3,140	\$6,290	\$10,480	\$16,770	\$20,960
Vigo	\$8,930	\$17,860	\$29,770	\$47,620	\$59,530
Wabash	\$3,020	\$6,040	\$10,070	\$16,110	\$20,140
Warren	\$2,590	\$5,180	\$8,630	\$13,800	\$17,250
Warrick	\$4,350	\$8,700	\$14,490	\$23,190	\$28,980
Washington	\$920	\$1,850	\$3,080	\$4,920	\$6,160
Wayne	\$6,400	\$12,800	\$21,330	\$34,130	\$42,670
Wells	\$2,630	\$5,260	\$8,760	\$14,010	\$17,520
White	\$6,180	\$12,370	\$20,610	\$32,970	\$41,220
Whitley	\$2,570	\$5,130	\$8,550	\$13,680	\$17,100

Sources: Needs calculated using developed acres from the Multi-Resolution Land Characteristics Consortium, 2011 Land Cover Database and spending estimates by level of service developed by Treadway and Reese (2000). Historic costs were adjusted for inflation using the Consumer Price Index for all Urban Consumers (BLS, 2018).

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