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3.2.4 Recreational Areas

Recreational areas can be found throughout the Big Walnut Watershed (Figures J1-J5, Appendix A). These include such areas as city or county parks, golf courses, or water/motor sport activities. Greencastle and Putnam County are home to the majority of these features within the watershed. The county is home to two golf courses, two motor sport racetracks, a minimum of four recreational parks, a trail system, and a number of lakes. Jamestown, located in Boone County is also home to Tomahawk Hills Golf Course. Finally, McCloud Nature Park is located in North Salem, in Hendricks County.

3.2.5 Historic Structures

There are 15 structures located in the Big Walnut Watershed that are listed on the National Register of Historic Places and/or the State Register of Historic Places. One is located in Boone County and 14 in Putnam County. Table 4 indicates the historic feature, its location, historic significance, and period of significance. Historic features are an important part to the fabric of many rural counties. Their presence may limit or dictate surrounding land use and has the potential to impact the type of projects that may be undertaken in certain areas due to their status as protected resources.

4.0 EXISTING ENVIRONMENTAL CONDITIONS

4.1 State – 303d List

A search of the Indiana Department of Environmental Management (IDEM) Section 303(d) List of Impaired Waters for 2006 revealed that 29 segments of stream within the Big Walnut Watershed are listed (Figure N, see Appendix D for complete list by segment). Of the 29 listed, all but two are listed for *E. coli*. These two are listed for impaired biotic communities; one is listed as an impaired biotic community as well as *E. coli*. Seven streams are listed for fish consumption advisory (FCA) for Mercury.

Recent approval of the 2008 Section 303(d) List of Impaired Waters also lists 29 segments of stream within the Big Walnut Watershed. Of the 29 listed, all but two are listed for *E. coli*. These two are listed for impaired biotic communities; one is listed as an impaired biotic community as well as *E. coli*. Two streams are listed for fish consumption advisory (FCA) for Mercury.

4.2 Research Conducted by Dr. James Gammon

Dr. James Gammon, professor emeritus of Biological Sciences at DePauw University, has conducted much research on Big Walnut Creek. His work, focused primarily on fish

Table 4: Historic Places

Historic Place	Historic Place (Other Names)	Location	Historic Significance	Period of Significance
Andrew B. VanHuys Round Barn	Kincaid Barn	Boone County	Architecture/Engineering; Event	1900-1949
Appleyard	Alexander C. Stevenson Farm; Ballard Farm	Putnam County	Person	1825-1899
The Boulders	James Orville Cammack and Adelene Buston House	Putnam County	Architecture/Engineering	1900-1949
Brick Chapel United Methodist Church	Montgomery Chapel	Putnam County	Event	1825-1974
Courthouse Square Historic District	Courthouse Square District	Putnam County	Architecture/Engineering; Event	1800-1949
Delta Kappa Epsilon Fraternity House		Putnam County	Event; Architecture/Engineering	1925-1949
East College of DePauw University	East College of Indiana Asbury University	Putnam County	Event; Architecture/Engineering	1850-1899
Alfred Hirt House		Putnam County	Architecture/Engineering; Person	1875-1949
McKim Observatory, DePauw University		Putnam County	Event; Architecture/Engineering	1875-1899
F.P. Nelson House		Putnam County	Architecture/Engineering	1850-1874
James Edington Montgomery O'Hair House	J.E.M. O'Hair House	Putnam County	Architecture/Engineering	1825-1899
Putnam County Bridge No. 159	Reelsville Bridge	Putnam County	Architecture/Engineering; Event	1925-1949
Putnamville Presbyterian Church	Putnamville Methodist Church; Putnamville United Methodist Church	Putnam County	Architecture/Engineering; Event	1825-1849
Lycurgus Stoner House	Edna Brown House	Putnam County	Architecture/Engineering	1875-1899
William C. VanArsdel House	The Elms	Putnam County	Architecture/Engineering	1900-1924

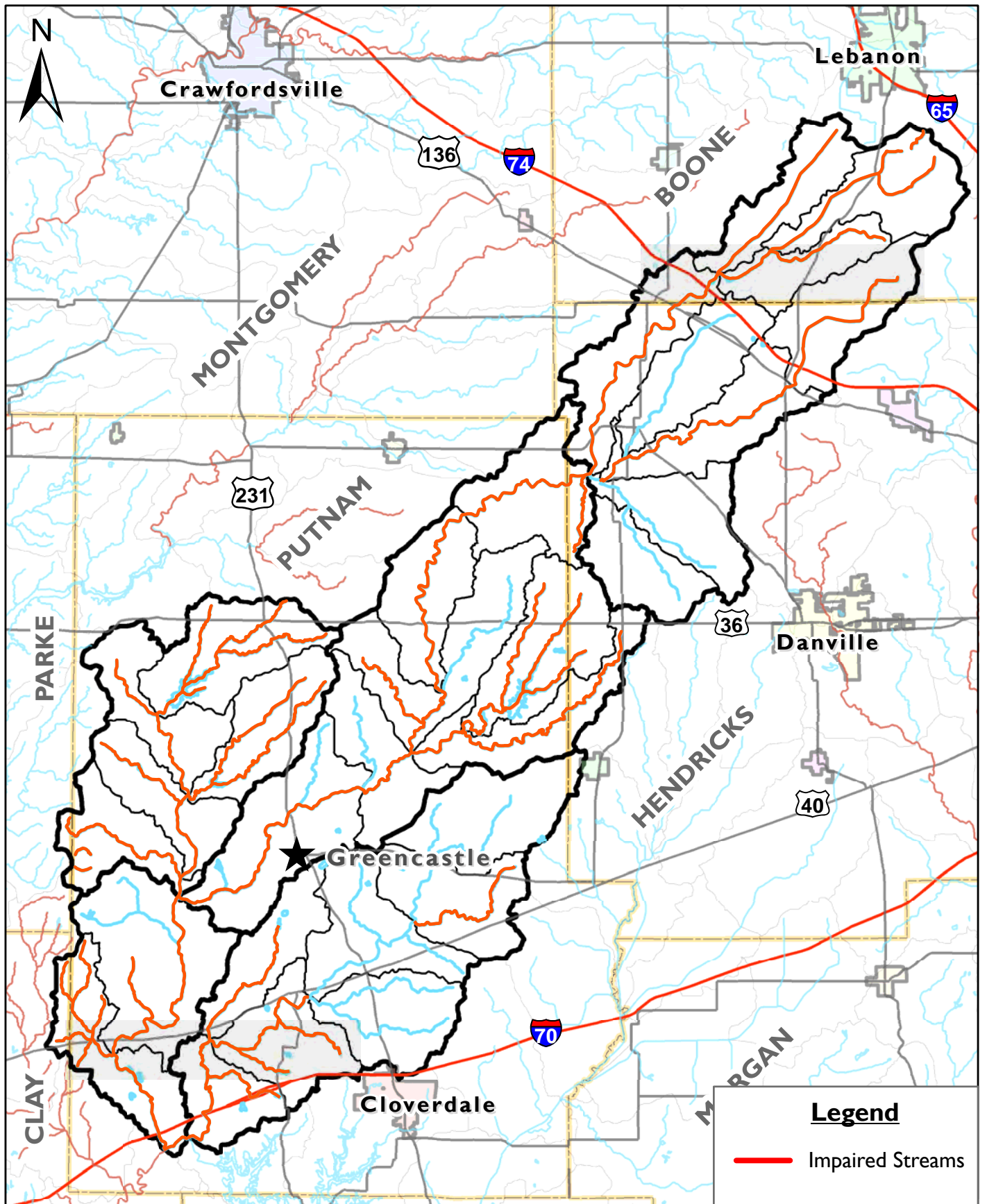


Figure N - Impaired Streams

Big Walnut Creek Watershed
Boone, Clay, Hendricks, Parke, & Putnam Counties, Indiana

assemblages, but also including macroinvertebrates and aquatic plants, dates back to the late 1960's. He continued assessments and analyses into the late 1990's. His work during the 1990's in the Big Walnut Creek Watershed led to the assessment of critical areas within the watershed (compilation of several references used, see References Section). Dr. Gammon's observations and assessments were summarized and geographically interpreted by authors of this plan. Critical areas identified by summarizing Dr. Gammon's work were based solely on fish IBIs (Index of Biotic Integrity). This analysis was made in order to render subwatershed conclusions for comparative purposes to current subwatershed conditions/critical areas, as well as to aid in restoration prioritization (Figure O). This illustration shows the most critical areas (subwatersheds) in red, moderate areas in yellow, and low priority areas in green.

Two of the three identified critical areas are located in Boone County at the headwaters of Big Walnut Creek. This area is known to be largely agricultural. The third critical area is located in the area of Deer Creek in Putnam County. This area is also largely agricultural and is home to several confined animal feeding operations.

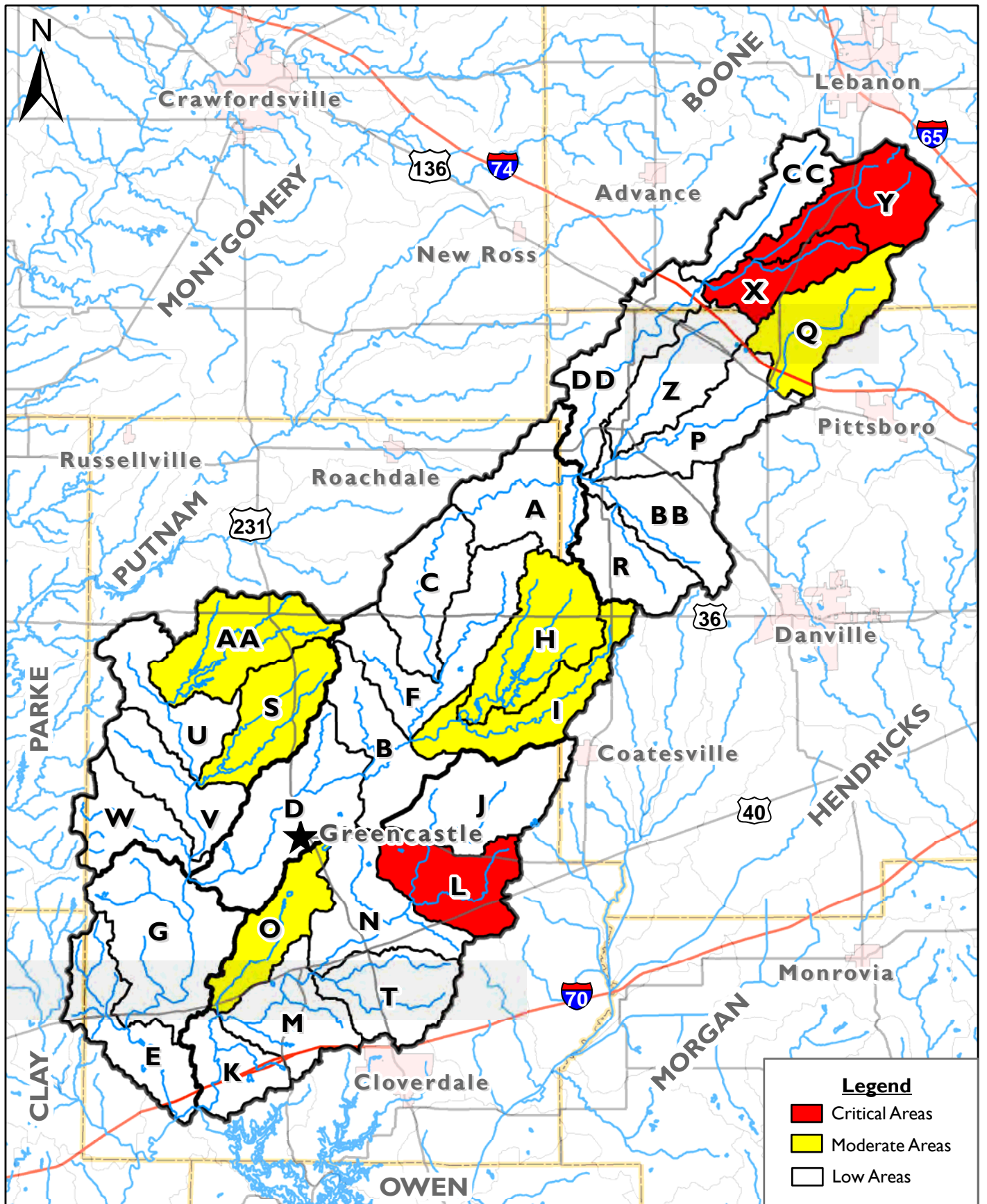
4.3 Regulated Environmental Issues

A search of IDEM's Office of Land Quality records located areas/sites within the Big Walnut Watershed that could pose a threat to the environment and are therefore regulated entities. The search revealed the following regulated environmental issues within the watershed: Permitted Solid Waste – 1, Brownfields – 1, Confined Feeding Operations (CFO) – 27, Open Dumps – 2, National Pollutant Discharge Elimination System (NPDES) Pipes – 17, Waste Septage Sites – 3, Leaking Underground Storage Tanks (LUST) – 32. Figures P1-P5 (Appendix A) present these findings and the locations of the environmental issues.

4.4 Additional Regulated Entity Information

Further research was conducted on NPDES dischargers (noted above). The Environmental Protection Agency's (EPA) Envirofacts Warehouse and Enforcement and Compliance History Online (ECHO) give listings of dischargers by county. There are 21 listed dischargers in the Big Walnut Watershed. Half of these NPDES dischargers are for sewerage systems or water supplies. The remainders of the permits are for industries or schools. These NPDES sites and a summary of their recent compliance records are shown in Figure Q and are listed in Table 5. This analysis provides important perspective when interpreting current water quality data in upcoming sections of this plan. Regular non-compliance of some NPDES dischargers could result in elevated concentrations of pollutants that may otherwise be attributed to non-point sources of pollution, including those being investigated and targeted as part of this plan.

The Indiana Department of Natural Resources (IDNR) Division of Water maintains a database of Significant Water Withdrawal Facilities (SWWF). This database lists all facilities that withdrawal significant amounts of ground and surface water. The database has information from 2004 to 2006. There are 14 facilities with the Big Walnut Creek Watershed that are listed as SWWFs. Of these 14 facilities, four are of notable interest, pumping over 100,000 gallons of water annually. Figure R maps the location of these facilities. Table 6 lists the facilities with corresponding numbers to the map locations, along with water source, well depth, annual pumping, and other additional information. Consideration of these facilities aids in understanding demands and pressures on groundwater supplies and base flows in Big Walnut



**Figure O - Critical Areas
Determined by Dr. Gammon**

Big Walnut Creek Watershed
Boone, Clay, Hendricks, Parke, & Putnam Counties, Indiana

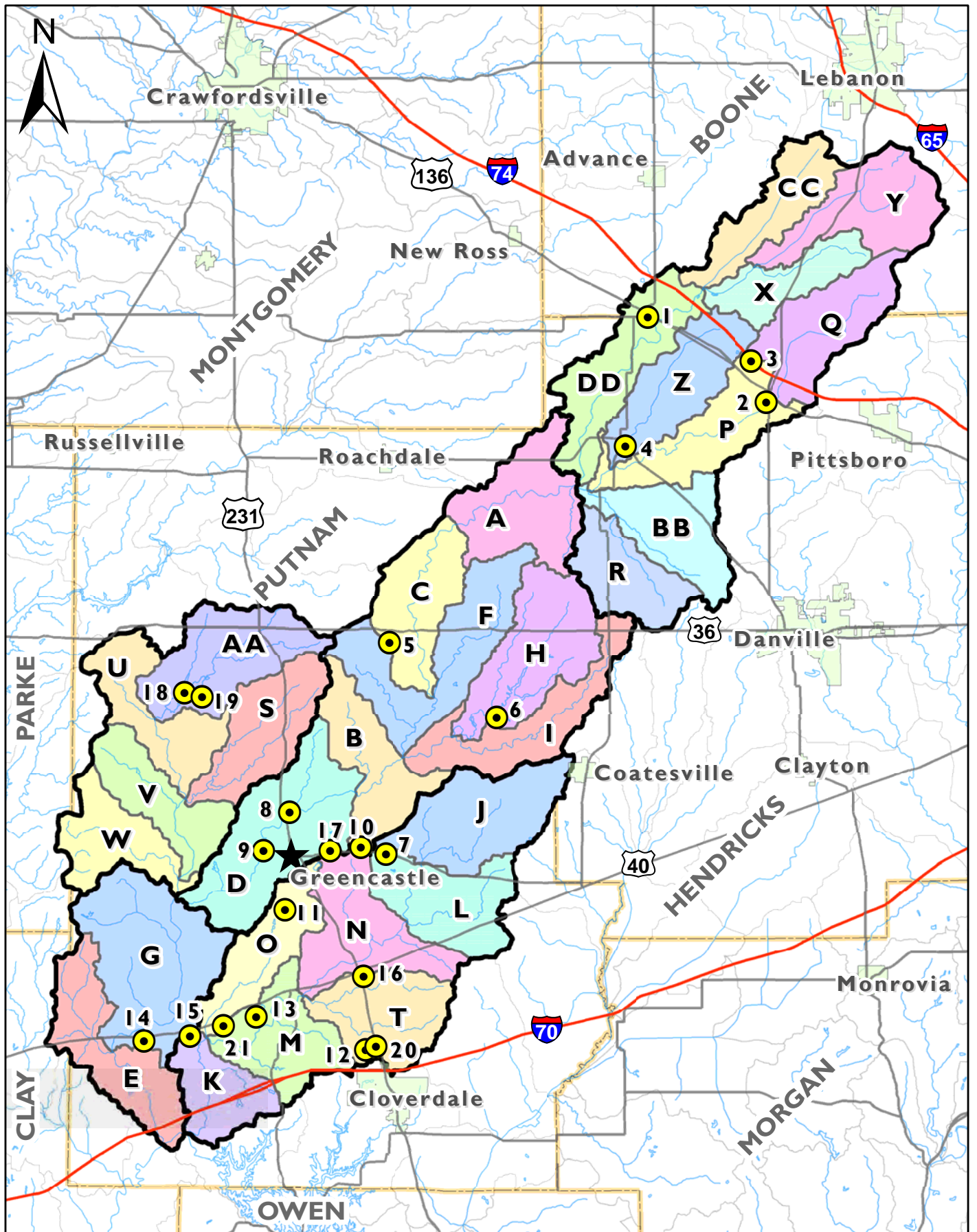


Figure Q - EPA NPDES Dischargers

Big Walnut Creek Watershed

Boone, Clay, Hendricks, Parke, & Putnam Counties, Indiana

Table 5: NPDES Dischargers

Site	Discharger	NPDES Discharge Category	County	Quarters of Non-Compliance (out of 12 qtrs- current as of Oct-Dec 07)	Violation
1	Jamestown WWTP	Sewerage System	Boone	3	Chlorine, Nitrogen, DO, TSS
2	Lizton Municipal STP	Sewerage System	Hendricks	10	Nitrogen, E. coli, TSS
3	Lizton Rest Areas I-74	Regulation & Administration of Transportation Systems	Hendricks	n/a	n/a
4	North Salem WWTP	Sewerage System	Hendricks	1	TSS
5	Bainbridge Municipal WWTP	Sewerage System	Putnam	8	pH, BOD
6	Clear Creek Conservancy District	Sewerage System	Putnam	3	Nitrogen, E. coli, TSS
7	Crown Point Equipment Corporation	Motor Vehicle Parts and Accessories	Putnam	n/a	n/a
8	Greencastle Department of Water	Water Supply	Putnam	7	n/a
9	Greencastle Municipal STP	Sewerage System	Putnam	8	Nitrogen
10	IBM (Int'l Business Machines) Corporation	Die Cut Paper - Paperboard and Cardboard	Putnam	0	
11	Lone Star Industries Landfill	Cement, Hydraulic	Putnam	7	TSS
12	Martin Marietta Cloverdale 524	Crushed and Broken Limestone	Putnam	2	TSS
13	Putnamville Correctional Facility	Correctional Institutions	Putnam	5	pH, BOD, E. coli, TSS
14	Reelsville Elementary School	Elementary and Secondary Schools	Putnam	10	missed schedule, BOD
15	Reelsville Water Treatment Plant	Water Supply	Putnam	n/a	n/a
16	South Putnam High School	Elementary and Secondary Schools	Putnam	8	BOD, TSS
17	United (Speedway) 6022	Gasoline Service Station	Putnam	n/a	n/a
18	Van Bibber Lake Conservancy District	Sewerage System	Putnam	4	Missed Schedule
19	Van Bibber Water Treatment Plant	Water Supply	Putnam	4	pH, E. coli
20	Altra Indiana, LLC		Putnam	n/a	n/a
21	Buzzi Unicem - Manhattan Shale Mine		Putnam	n/a	n/a

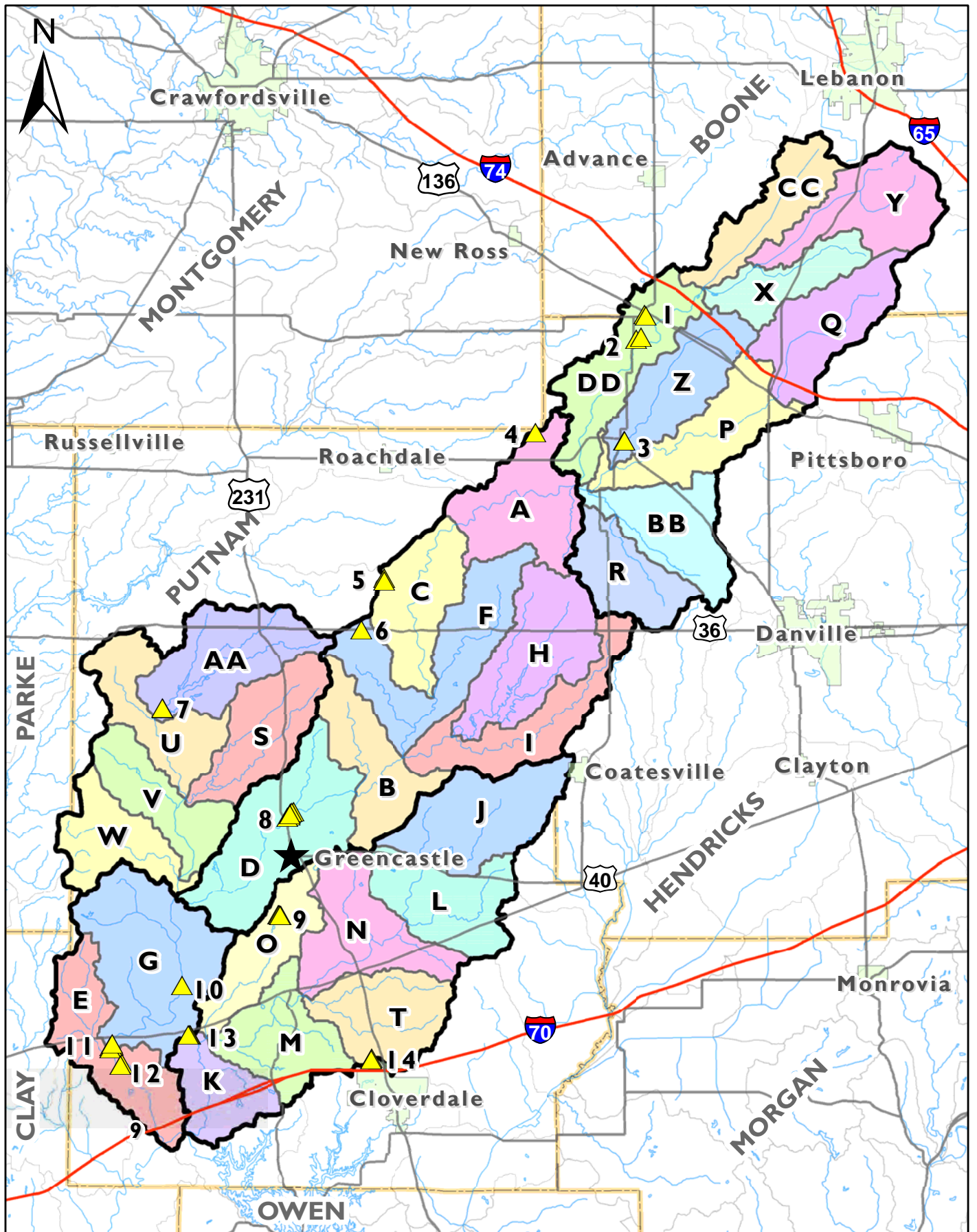


Figure R - Significant Water Withdrawal Facilities

Big Walnut Creek Watershed

Boone, Clay, Hendricks, Parke, & Putnam Counties, Indiana

Table 6: Significant Water Withdrawal Facilities

SITE	USER	CATEGORY	SOURCE	DEPTH (FEET)	AQUIFER/WATER SOURCE	PUMPING CAPACITY (GPM)	YEAR	PUMPED ANNUALLY
1	Jamestown Mun Water Works	Public Supply	WELL	31	Sand and Gravel	40	2004	0
1	Jamestown Mun Water Works	Public Supply	WELL	31	Sand and Gravel	40	2005	0
1	Jamestown Mun Water Works	Public Supply	WELL	31	Sand and Gravel	40	2006	0
1	Jamestown Mun Water Works	Public Supply	WELL	63	Sand and Gravel	30	2004	0
1	Jamestown Mun Water Works	Public Supply	WELL	64	Sand and Gravel	30	2005	0
1	Jamestown Mun Water Works	Public Supply	WELL	65	Sand and Gravel	30	2006	0
2	Tomahawk Hills GC	Irrigation	INTAKE		Unknown Lake	300	2004	3957
2	Tomahawk Hills GC	Irrigation	WELL	160	Sand and Gravel	10	2004	0
2	Tomahawk Hills GC	Irrigation	INTAKE		Unknown Lake	300	2004	3957
2	Tomahawk Hills GC	Irrigation	WELL	160	Sand and Gravel	10	2004	0
2	Tomahawk Hills GC	Irrigation	INTAKE		Unknown Lake	300	2004	3957
2	Tomahawk Hills GC	Irrigation	WELL	160	Sand and Gravel	10	2004	0
3	North Salem Water Corp	Public Supply	WELL	100	Sand and Gravel	100	2004	8345
3	North Salem Water Corp	Public Supply	WELL	96	Sand and Gravel	150	2004	8338
3	North Salem Water Corp	Public Supply	WELL	100	Sand and Gravel	100	2004	8345
3	North Salem Water Corp	Public Supply	WELL	96	Sand and Gravel	150	2004	8338
3	North Salem Water Corp	Public Supply	WELL	100	Sand and Gravel	100	2004	8345
3	North Salem Water Corp	Public Supply	WELL	96	Sand and Gravel	150	2004	8338
4	Britton Farms	Irrigation	WELL	240	Sand and Gravel	1100	2004	0
4	Britton Farms	Irrigation	WELL	240	Sand and Gravel	1100	2005	0
4	Britton Farms	Irrigation	WELL	240	Sand and Gravel	1100	2006	0
5	North Putnam School Corp	Public Supply	WELL	298	Sand and Gravel	110	2004	4176
5	North Putnam School Corp	Public Supply	WELL	298	Sand and Gravel	110	2005	4110

Table 6: Significant Water Withdrawal Facilities (cont)								
SITE	USER	CATEGORY	SOURCE	DEPTH (FEET)	AQUIFER/WATER SOURCE	PUMPING CAPACITY (GPM)	YEAR	PUMPED ANNUALLY
5	North Putnam School Corp	Public Supply	WELL	298	Sand and Gravel	110	2006	3619
5	North Putnam School Corp	Public Supply	WELL	290	Unknown	110	2004	0
5	North Putnam School Corp	Public Supply	WELL	290	Unknown	110	2005	0
5	North Putnam School Corp	Public Supply	WELL	290	Unknown	110	2006	0
6	Town of Bainbridge	Public Supply	WELL	159	Limestone	100	2004	7737
6	Town of Bainbridge	Public Supply	WELL	159	Limestone	100	2005	12850
6	Town of Bainbridge	Public Supply	WELL	159	Limestone	100	2006	11300
7	Van Bibber Lake Conservancy	Public Supply	WELL	43	Sand and Gravel	100	2004	0
7	Van Bibber Lake Conservancy	Public Supply	WELL	43	Sand and Gravel	100	2005	0
7	Van Bibber Lake Conservancy	Public Supply	WELL	43	Sand and Gravel	100	2006	0
7	Van Bibber Lake Conservancy	Public Supply	WELL	46	Sand and Gravel	100	2004	24274
7	Van Bibber Lake Conservancy	Public Supply	WELL	46	Sand and Gravel	100	2005	24274
7	Van Bibber Lake Conservancy	Public Supply	WELL	46	Sand and Gravel	100	2006	24274
8	Greencastle Water Dept	Public Supply	WELL	54	Sand and Gravel	1000	2004	666800
8	Greencastle Water Dept	Public Supply	WELL	54	Sand and Gravel	1000	2005	666800
8	Greencastle Water Dept	Public Supply	WELL	54	Sand and Gravel	1000	2006	666800
8	Greencastle Water Dept	Public Supply	WELL	55	Sand and Gravel	200	2004	0
8	Greencastle Water Dept	Public Supply	WELL	55	Sand and Gravel	200	2005	0
8	Greencastle Water Dept	Public Supply	WELL	55	Sand and Gravel	200	2006	0
8	Greencastle Water Dept	Public Supply	WELL	54	Sand and Gravel	600	2004	0
8	Greencastle Water Dept	Public Supply	WELL	54	Sand and Gravel	600	2005	0

Table 6: Significant Water Withdrawal Facilities (cont)								
SITE	USER	CATEGORY	SOURCE	DEPTH (FEET)	AQUIFER/WATER SOURCE	PUMPING CAPACITY (GPM)	YEAR	PUMPED ANNUALLY
8	Greencastle Water Dept	Public Supply	WELL	54	Sand and Gravel	600	2006	0
8	Greencastle Water Dept	Public Supply	WELL	49	Sand and Gravel	1000	2004	0
8	Greencastle Water Dept	Public Supply	WELL	49	Sand and Gravel	1000	2005	0
8	Greencastle Water Dept	Public Supply	WELL	49	Sand and Gravel	1000	2006	0
8	Greencastle Water Dept	Public Supply	WELL	55	Sand and Gravel	1000	2004	0
8	Greencastle Water Dept	Public Supply	WELL	55	Sand and Gravel	1000	2005	0
8	Greencastle Water Dept	Public Supply	WELL	55	Sand and Gravel	1000	2006	0
8	Greencastle Water Dept	Public Supply	WELL	48	Sand and Gravel	650	2004	0
8	Greencastle Water Dept	Public Supply	WELL	48	Sand and Gravel	650	2005	0
8	Greencastle Water Dept	Public Supply	WELL	48	Sand and Gravel	650	2006	0
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2004	400
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2005	400
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2006	400
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2004	64700
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2005	64400
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2006	63600
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2004	65100
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2005	64500
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2006	63700
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2004	65540
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2005	65600
9	Lone Star Industries	Industry	INTAKE		Unnamed Quarry	850	2006	63400
10	Oakalla Valley Partnership	Irrigation	INTAKE		Big Walnut Creek	350	2004	0
10	Oakalla Valley Partnership	Irrigation	INTAKE		Big Walnut Creek	350	2005	0
10	Oakalla Valley Partnership	Irrigation	INTAKE		Big Walnut Creek	350	2006	0

Table 6: Significant Water Withdrawal Facilities (cont)								
SITE	USER	CATEGORY	SOURCE	DEPTH (FEET)	AQUIFER/WATER SOURCE	PUMPING CAPACITY (GPM)	YEAR	PUMPED ANNUALLY
11	City of Brazil	Public Supply	WELL	55	Sand and Gravel	600	2004	34400
11	City of Brazil	Public Supply	WELL	55	Sand and Gravel	600	2005	67400
11	City of Brazil	Public Supply	WELL	55	Sand and Gravel	60	2006	0
11	City of Brazil	Public Supply	WELL	54	Sand and Gravel	600	2004	135700
11	City of Brazil	Public Supply	WELL	54	Sand and Gravel	600	2005	134800
11	City of Brazil	Public Supply	WELL	54	Sand and Gravel	600	2006	149600
11	City of Brazil	Public Supply	WELL	54	Sand and Gravel	600	2004	135700
11	City of Brazil	Public Supply	WELL	54	Sand and Gravel	600	2005	134800
11	City of Brazil	Public Supply	WELL	54	Sand and Gravel	600	2006	149600
11	City of Brazil	Public Supply	WELL	60	Sand and Gravel	1260	2004	135700
11	City of Brazil	Public Supply	WELL	60	Sand and Gravel	1260	2005	134800
11	City of Brazil	Public Supply	WELL	60	Sand and Gravel	1260	2006	149600
11	City of Brazil	Public Supply	WELL	56	Sand and Gravel	787	2004	238400
11	City of Brazil	Public Supply	WELL	56	Sand and Gravel	787	2005	202200
11	City of Brazil	Public Supply	WELL	56	Sand and Gravel	787	2006	299300
12	A & C Products	Industry	INTAKE		Unknown Pit	2800	2004	241600
12	A & C Products	Industry	INTAKE		Unknown Pit	2800	2005	90600
12	A & C Products	Industry	INTAKE		Unknown Pit	2800	2006	271800
12	A & C Products	Industry	INTAKE		Unknown Pit	800	2004	0
12	A & C Products	Industry	INTAKE		Unknown Pit	800	2005	0
12	A & C Products	Industry	INTAKE		Unknown Pit	800	2006	0
13	Reelsville Water	Public Supply	WELL	92	Sand and Gravel	543	2006	72800
13	Reelsville Water	Public Supply	WELL	95	Sand and Gravel	543	2006	72800
13	Reelsville Water	Public Supply	WELL	62	Sand and Gravel	577	2006	72900
14	American Aggregates	Industry	INTAKE		Unnamed Quarry	1175	2004	179300
14	American Aggregates	Industry	INTAKE		Unnamed Quarry	1175	2005	124300
14	American Aggregates	Industry	INTAKE		Unnamed Quarry	1175	2006	166500
14	American Aggregates	Industry	INTAKE		Unnamed Quarry	3000	2004	35700
14	American Aggregates	Industry	INTAKE		Unnamed Quarry	3000	2005	38900
14	American Aggregates	Industry	INTAKE		Unnamed Quarry	3000	2006	26200

Creek. These SWWFs also represent important stakeholders in the protection and management of Big Walnut Creek.

5.0 WATER QUALITY ASSESSMENTS – EXISTING AND CURRENT

5.1 IDEM Data

A request was submitted to IDEM requesting both chemical and biological data that has been collected on the Big Walnut and Deer Creek Watersheds. Data was received from IDEM dating from 2002 to 2006. These sites were monitored on regular basis, but the frequency at which the site was monitored varies from site to site. Chemical and metal data was collected at four sites, fish data was collected at eight sites, and macroinvertebrate data at fifteen sites (Figure S). IDEM's Site 1 for chemical and metal data shows consistently high concentrations of nitrate. Site 1 also had high sediment concentrations. Site 1 is present in Subwatershed E. IDEM's Sites 3 and 4 for the chemical and metal data are the only sites reporting *E. coli* data from the collected data that we received from IDEM. These two sites were only sampled for *E. coli* during June of 2006 and show high *E. coli* concentrations. Site 3 is in Subwatershed D and Site 4 is in Subwatershed W. As noted in Section 4.1, twenty-nine segments of stream within the Big Walnut Watershed are listed for impairments according to the 303d list. Obviously, additional data was collected by IDEM to arrive at these listings; however, it was not made available to authors of this report as part of the data request.

5.2 Hoosier Riverwatch Data

Hoosier Riverwatch is a volunteer program run through IDNR Division of Fish and Wildlife. The purpose of the program is to increase public awareness of water quality throughout the State of Indiana by training volunteers to monitor the quality of local stream's water.

There has been little data regularly collected for the Big Walnut Creek Watershed (Eel 8-digit HUC). Available data dates from 2000 to 2007 and includes chemical, biological, habitat, and stream flow data. This data can be referenced in Table 7.

5.3 Current Data

Water quality monitoring was conducted within the watershed to identify nonpoint source pollution and critical areas. The sampling site locations covered the three primary counties, Boone, Hendricks, and Putnam. A number of these monitoring locations were located along streams segments that been identified as impaired. IDEM also conducted *E. coli* monitoring during five events (weekly) in October, 2007. Sample locations for monitoring associated with this plan, as well as IDEM's additional *E. coli* monitoring are shown on Figure T.

Current water quality monitoring conducted as part of this project consisted of chemical and macroinvertebrate sampling. Chemical sampling was conducted quarterly, beginning in May 2007 and macroinvertebrate sampling began in April 2007. Twenty-four sites within the watershed were sampled a total of six times for chemical parameters and twice for biological parameters. The water quality criteria analyzed included dissolved oxygen, biochemical oxygen demand, pH, total phosphate, nitrates, flow, total suspended solids, and *E. coli*. Collected samples of *E. coli* were cultured in the Commonwealth Biomonitoring laboratory for analysis.