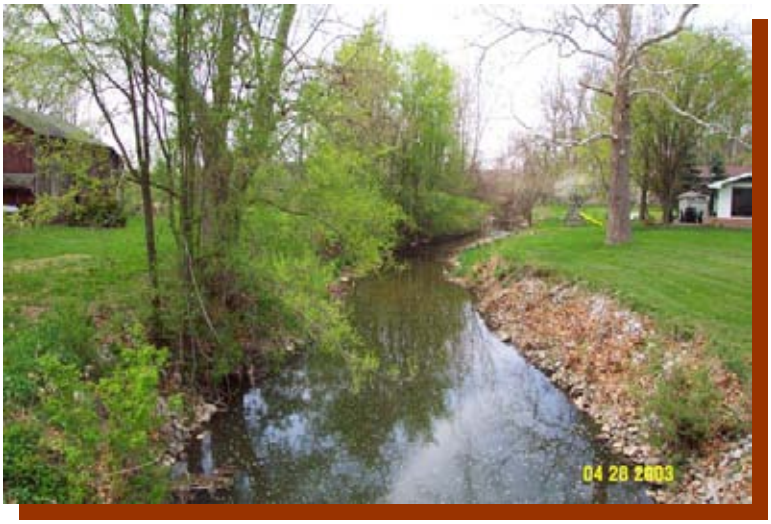
Elkhart County Commissioners

319 Grant – Problematic Waste Disposal Systems Education, Detection, Elimination and Monitoring

Yellow Creek (Lower) Watershed Management Plan



July, 2003

WATERSHED MANAGEMENT PLAN FOR:

YELLOW CREEK (LOWER) WATERSHED

ELKHART COUNTY, INDIANA

JULY, 2003

Prepared For:

ELKHART COUNTY COMMISSIONERS
319 GRANT – PROBLEMATIC WASTE DISPOSAL SYSTEMS EDUCATION, DETECTION, ELIMINATION AND MONITORING

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Date

YELLOW CREEK (LOWER)
WATERSHED MANAGEMENT PLAN

ELKHART COUNTY COMMISSIONERS
319 GRANT – PROBLEMATIC WASTE DISPOSAL SYSTEMS
EDUCATION, DETECTION, ELIMINATION AND MONITORING

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YELLOW CREEK (LOWER)
WATERSHED MANAGEMENT PLAN

ELKHART COUNTY COMMISSIONERS
319 GRANT – PROBLEMATIC WASTE DISPOSAL SYSTEMS
EDUCATION, DETECTION, ELIMINATION AND MONITORING

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D. Sanitary Survey Inspection Sheets and Results

i. Acronyms and Abbreviations

BMP – Best Management Practice
BOD – Biological Oxygen Demand
CL_2 - Chlorides
CMP – Corrugated Metal Pipe
CR – County Road
CRP – Conservation Reserve Program
DO – Dissolved Oxygen
E. Coli – Escherchia coli
ECC – Elkhart County Commissioners
ECHD – Elkhart County Health Department
ECPD – Elkhart County Planning Department
EQIP – Environmental Quality Incentive Program
FEMA – Federal Emeregency Management Agency
GIS – Geographic Information System
HUC – Hydrologic Unit Code
IAC – Indiana Administrative Code
IBI – Index of Biotic Integrity
IDEM – Indiana Department of Environmental Management
IDNR – Indiana Department of Natural Resources
LARE – Lake and River Enhancement Program
LRR – Lateral Recession Rate
MACOG – Michiana Area Council of Governments
MBAS – Surfactants
MDEQ – Michigan Department of Environmental Quality
Mg/L – milligrams per liter
mls – milliters
MPN – most probable number
NH_3-N – Ammonia Nitrogen
NO_4-N – Nitrate Nitrogen
NPDES – National Pollutant Discharge Elimination System
NRCS – National Resource Conservation Service
ppm – parts per million
PTI – Mitchell and Stapp Pollution Tolerance Index
PVC - Polyvinylchloride
QAPP – Quality Assurance Project Plan
SRF – State Revolving Fund
SWCD – Soil and Water Conservation District
TDS – Total Dissolved Solids
TKN – Total Kjeldahl Nitrogen
TSS – Total Suspended Solids
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WISE – Watershed Initiative for a Safer Environment

ii. ***Planholders***

Elkhart County Commissioners

Elkhart County Administrator

Elkhart County Health Department

Elkhart County Department of Planning and Zoning

Elkhart County Surveyor's Office

Elkhart County Soil and Water Conservation District Office

Elkhart County Purdue Cooperative Extension Office

Indiana Department of Environmental Quality – Office of Water Quality Management

City of Elkhart Department of Public Works

St. Joseph River Basin Commission

Elkhart County Public Library – Concord Branch

I. Introduction

A. General

The purpose of this document is to provide guidance and information to Elkhart County and other entities interested in the water quality of Yellow Creek. The planning process for the Watershed Management Plan was initiated by the Elkhart County Commissioners as part of a larger IDEM 319 Grant Project. The goal of the grant project was to address water quality issues related to problematic on-site wastewater systems. The Yellow Creek (lower) Watershed was then identified as the pilot watershed for a Watershed Management Plan. The vision and mission statements developed for this planning endeavor are stated below:

Vision: *Improved water quality within Yellow Creek to support aquatic resources, protect public health and provide an enhanced aesthetic environment.*

Mission: *Provide the framework by which to reduce contaminants to the Yellow Creek (lower) Watershed and to work closely with other watershed groups whose focus is on improving the water quality within the Elkhart River and St. Joseph River Basins.*

B. Watershed Introduction

Most of the Yellow Creek (lower) Watershed is located within the unincorporated area of Elkhart County. The northern portion of the watershed is within the City of Elkhart limits, and a portion of the eastern watershed is within the City of Goshen limits. The watershed area is 4,988 acres and is primarily agricultural and residential in nature. The watershed is shown in Figure 1. A portion of the watershed is classified as an urban area (population density of 500 per square mile or greater), which will be subject to the NPDES Phase II Stormwater Regulations, as administered by IDEM through Indiana Rule 13. Yellow Creek discharges to the Elkhart River, which is tributary to the St. Joseph River that discharges into Lake Michigan. The southern portion of the watershed is primarily agricultural with some rural residential development. The eastern and northern portions of the watershed are a mixture of residential and commercial developments.

C. Concerns

A number of concerns have been raised regarding water quality within the Yellow Creek watershed throughout the watershed management planning process as well as prior to the initiation of this watershed management plan. The following provides a summary of the concerns that have been raised by various entities:

- The effect of increased development on water quality with respect to use of on-site wastewater disposal systems. (Elkhart County Health Department and Elkhart County Commissioners).

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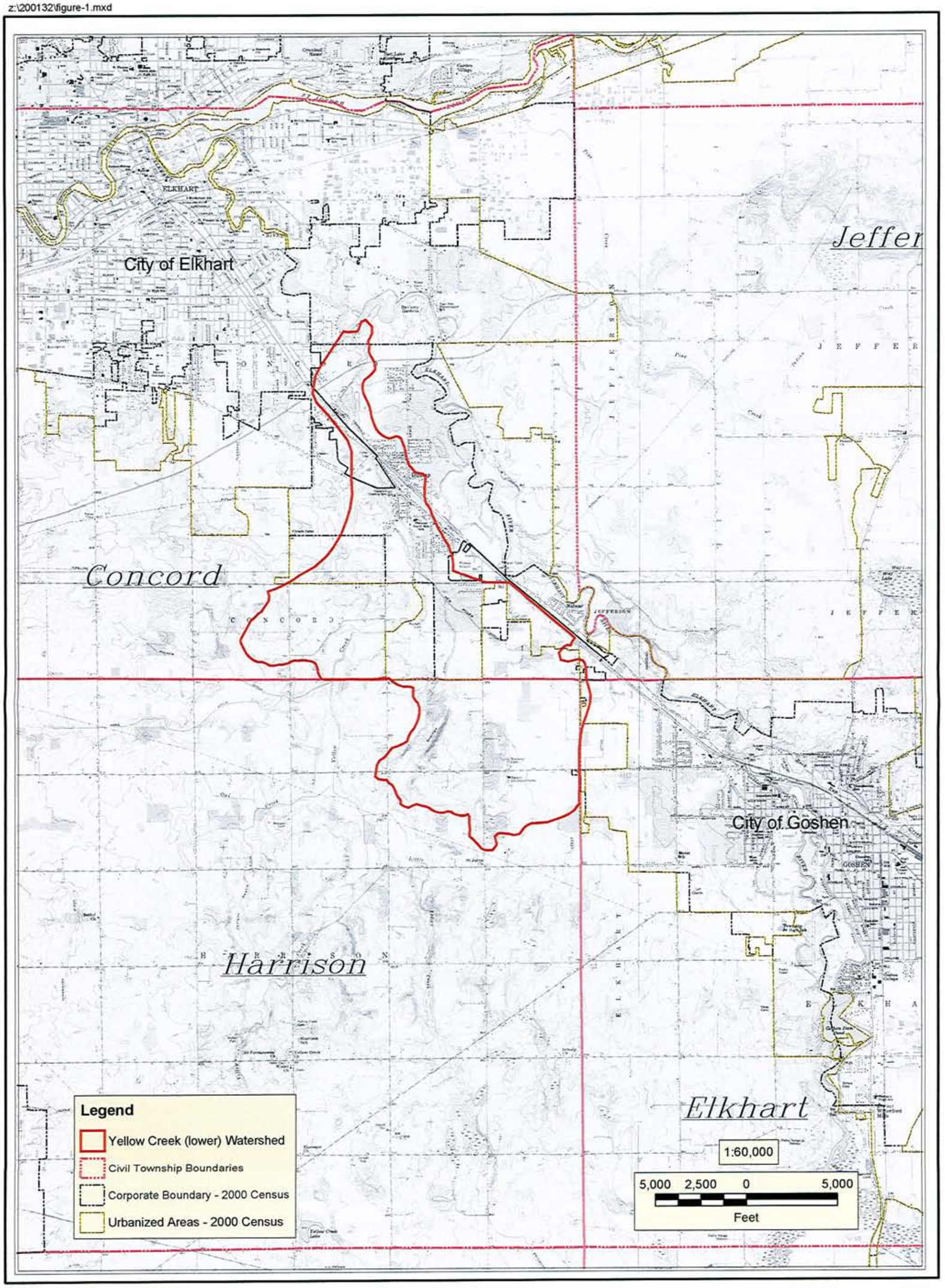

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Figure 1

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N W E S

Elkhart County, Indiana
Yellow Creek (lower)
Watershed Management Plan

Yellow Creek (lower) Watershed

- The effect of agricultural practices on the water quality of Yellow Creek, including the use of fertilizers and pesticides, livestock management and surface runoff. (Soil and Water Conservation District and Local Residents).

- The effect of increased development on water quality related to construction activities and increased impervious areas. (Elkhart County Health Department).

- Direct discharge of septic tank effluent to creeks and ditches. (Elkhart County Health Department and Local Residents).

- Failing on-site wastewater disposal systems. (Elkhart County Health Department and Local Residents).

- The effect of increased development on the volume of stormwater runoff, possibly contributing to increased peak flows and erosion potential. (Elkhart County Government).

D. ***Partnerships***

Throughout the watershed planning process, a number of partnerships were developed. A list of the various stakeholders follows:

- Elkhart County Commissioners (ECC)
- Elkhart County Health Department (ECHD)
- Elkhart County Department of Planning and Zoning
- Elkhart County Surveyor's Office
- Elkhart County Soil and Water Conservation District (ECSWCD)
- Elkhart County Extension Service
- Elkhart County Natural Resource Conservation Service
- Joint Watershed Steering Committee:
  - Michiana Area Council of Governments (MACOG)
  - City of Elkhart
  - City of Mishawaka
  - City of South Bend
  - St. Joseph River Basin Commission

The Joint Watershed Steering Committee is a group of stakeholders that are conducting watershed projects within the St. Joseph River Basin. The projects include:

- Problematic Domestic Waste Disposal Systems – Education, Detection, Elimination and Monitoring

- St. Joseph River Watershed Initiative for a Safer Environment (WISE)
  City of Elkhart, City of Mishawaka, City of South Bend

- Baugo Creek Watershed Project (MACOG)

The mission of the Joint Steering Committee is to provide general direction and input on the watershed projects. The goal of each meeting is to keep the committee members updated on the progress of each project, obtain input on feasible control measures, and develop support for the recommended strategies to be included in the individual watershed management plans. Additionally, the committee forum provides an opportunity to share data and ideas, and coordinate water sampling and investigation efforts in such a way as to provide the most benefit to the St. Joseph River Watershed.

E. Public Involvement

The public has been involved throughout the watershed planning process, through a number of neighborhood meetings, as well as the quarterly planning meetings of the Joint Steering Committee.

A series of three neighborhood meetings were held at the beginning of the planning process, to discuss the 319 Grant Project, an overview of water quality issues (point and non-point source pollution, the watershed planning process and on-site sewage systems). Brochures discussing the care and maintenance of on-site disposal systems were distributed at the neighborhood meetings.

- April 8, 2002: Turkey Creek – Swoveland Ditch Watershed, New Paris Elementary School, New Paris

- April 15, 2002: Yellow Creek (lower) Watershed, Elkhart County Environmental Services, Goshen

- April 22, 2002: Yellow Creek – Headwaters Watershed, Harrison Christian School, Goshen

A second set of three neighborhood meetings was held at the conclusion of the planning process to discuss the results of the water quality monitoring and the Watershed Management Plan.

- May 28, 2003: Turkey Creek – Swoveland Ditch Watershed, New Paris Elementary School, New Paris

- May 14, 2003: Yellow Creek (lower) Watershed, Elkhart County Public Services Building, Goshen

- May 18, 2003: Yellow Creek – Headwaters Watershed, Harrison Christian School, Goshen

An initial public meeting for the Yellow Creek (lower) Watershed Management Plan was held at the Elkhart County Health Department on September 9, 2002. At this meeting, a Joint Steering Committee was established with two other

ongoing grant projects in the St. Joseph River Basin, the St. Joseph River Watershed Initiative for a Safer Environment (WISE) and Planning for a Changing Watershed – Baugo Creek. Four planning meetings were held of the Joint Steering Committee. These meetings were held on:

September 17, 2002
December 15, 2002
March 26, 2003
June 11, 2003

Items discussed at the meetings included water quality results, sanitary survey results and watershed planning progress. Public meeting notices, agendas and handouts are included in Appendix A.

In addition to the Neighborhood Meetings and the Planning Meetings, the Elkhart County 319 Grant Project was presented and discussed at the annual Indiana Land Use Consortium Seminar titled "Communities at the Crossroads V, Affordable Housing and Smart Growth". The seminar was held in Goshen on October 20, 2002. The presentation included a discussion of the Elkhart County 319 Grant Project, the issues of development utilizing on-site systems for wastewater disposal and a tour of the Yellow Creek watershed. This topic was presented as part of the "Environmental Protection in an Agricultural Landscape Program". Other programs included "Affordable Housing from Your Point of View" and "Regional/Urban Development and Tourism".

II. Background

A. Elkhart County

Most of Elkhart County is located within the St. Joseph River-Lake Michigan Watershed (H.U.C. 04050001). This basin is shown in Figure 2. The Elkhart River is a major tributary to the St. Joseph River. The St. Joseph River and the Elkhart River are both listed on Indiana's 303(d) list for *E. coli*. In addition, nearly 100% of Elkhart County is included in the priority area delineated on the Unified Watershed Assessment Map for Indiana. The land use in unincorporated Elkhart County is primarily agricultural with a small percentage of single-family residential, commercial and industrial areas.

Although runoff from animal feed lots may contribute to the *E. coli* concentration of the waters of Elkhart County, it is suspected that domestic waste contributions result in high background *E. coli* conditions during dry weather.

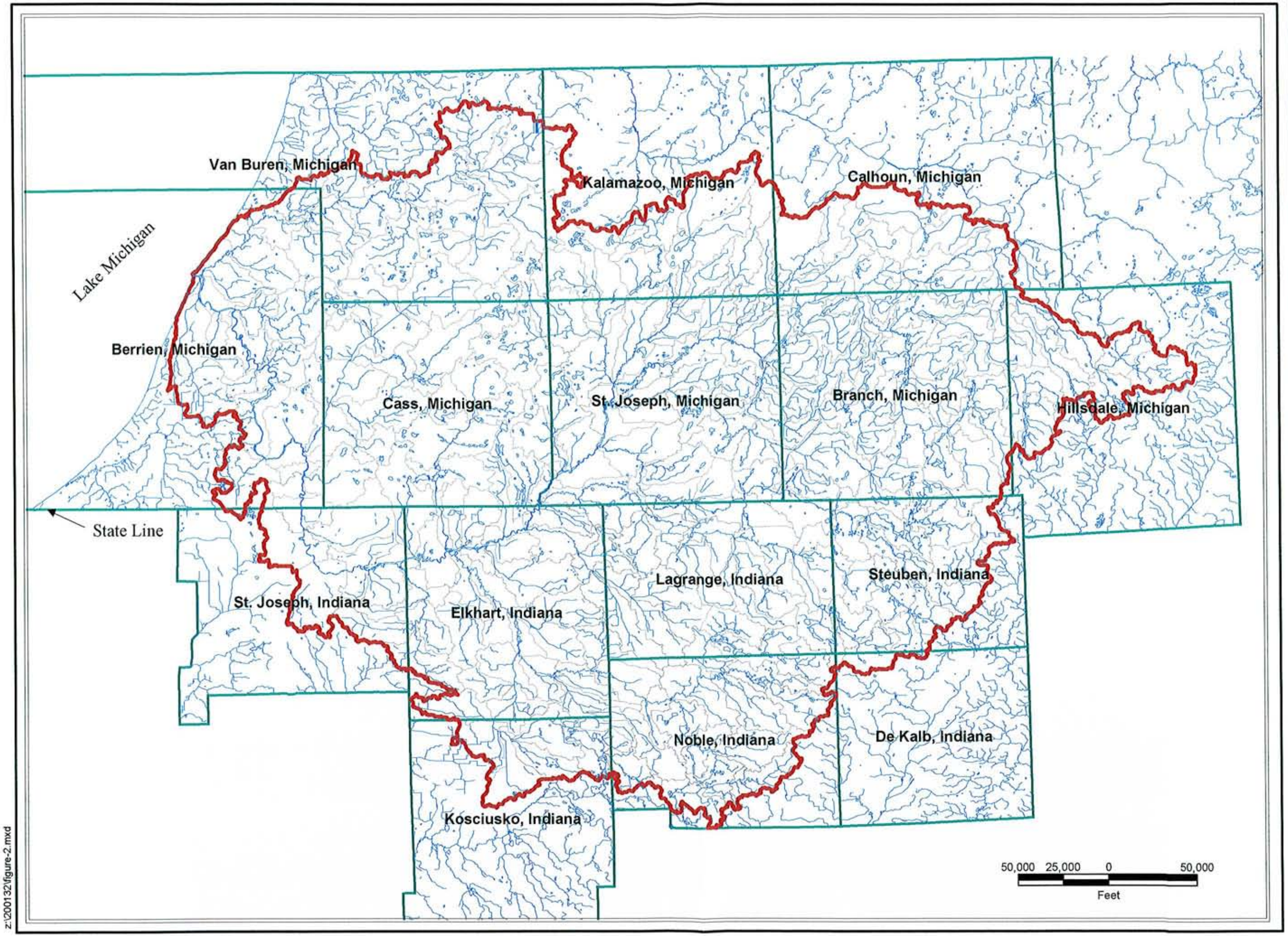
B. Problematic Waste Disposal Systems 319 Grant

A 319 Grant Project to address Problematic Waste Disposal Systems was undertaken by the Elkhart County Commissioners. The Project is intended to address problematic waste disposal systems in Elkhart County. Such systems include problematic on-site sewage septic systems, as well as sewage disposal configurations in which untreated waste is directly conveyed to surface waters and indirectly discharged to groundwater. These systems not only pose a serious health threat, but also are a potential cause of water quality problems associated with pathogens and elevated nutrient levels. The primary goal of this Project is to identify those watersheds that are impaired due to Problematic Waste Disposal Systems.

The first phase of the project was to evaluate existing water quality, septic tank permit, land use and soil data to identify the 10 watersheds within the County that may be impaired due to Problematic Waste Disposal Systems. The existing information was converted into a Geographical Information System (GIS) format for analysis. The ten watersheds identified are listed in Table 1:

Table 1
Ten Watersheds Identified for Phase I Water Quality Sampling

Watershed	*14-Digit Hydrological Unit Code*
Yellow Creek – Headwaters	4050001210050
Elkhart River – Yellow Creek	4050001210060
Turkey Creek – Swoveland Ditch	4050001200100
Baugo Creek – Rogers Ditch	4050001230040
Elkhart River – Whetten Ditch	4050001190070
Elkhart River – Dry Run	4050001190040
Rock Run Creek – Horn Ditch	4050001210030
Elkhart River – Leedy Ditch	4050001210040
Stony Creek – Phillips Ditch	4050001190030
Elkhart River – Ligonier	4050001190020



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Elkhart County, Indiana
Yellow Creek (lower)
Watershed Management Plan

St. Joseph River Basin

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Figure 2

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Water quality sampling was conducted in each of the ten watersheds during two wet weather events and two dry weather events. Two sample locations in each watershed were chosen, an upstream location and a downstream location. Sampling locations are shown in Figure 3. The sampling procedures are described in detail in the Quality Assurance Project Plan (QAPP) for Problematic Domestic Waste Disposal Systems – Education, Detection, Elimination and Monitoring, Elkhart County Indiana ARN 01-254 (November 2001). The samples were analyzed for the following parameters:

Dissolved Oxygen (DO)
Temperature
pH
Conductivity
Total Dissolved Solids (TDS)
Total Suspended Solids (TSS)
Ammonia-Nitrogen (NH_3-N)
Nitrate-Nitrogen (NO_3-N)
Total Kjeldahl Nitrogen (TKN)
Orthophosphate
Total Phosphorus
Surfactants (MBAS)
E. Coli

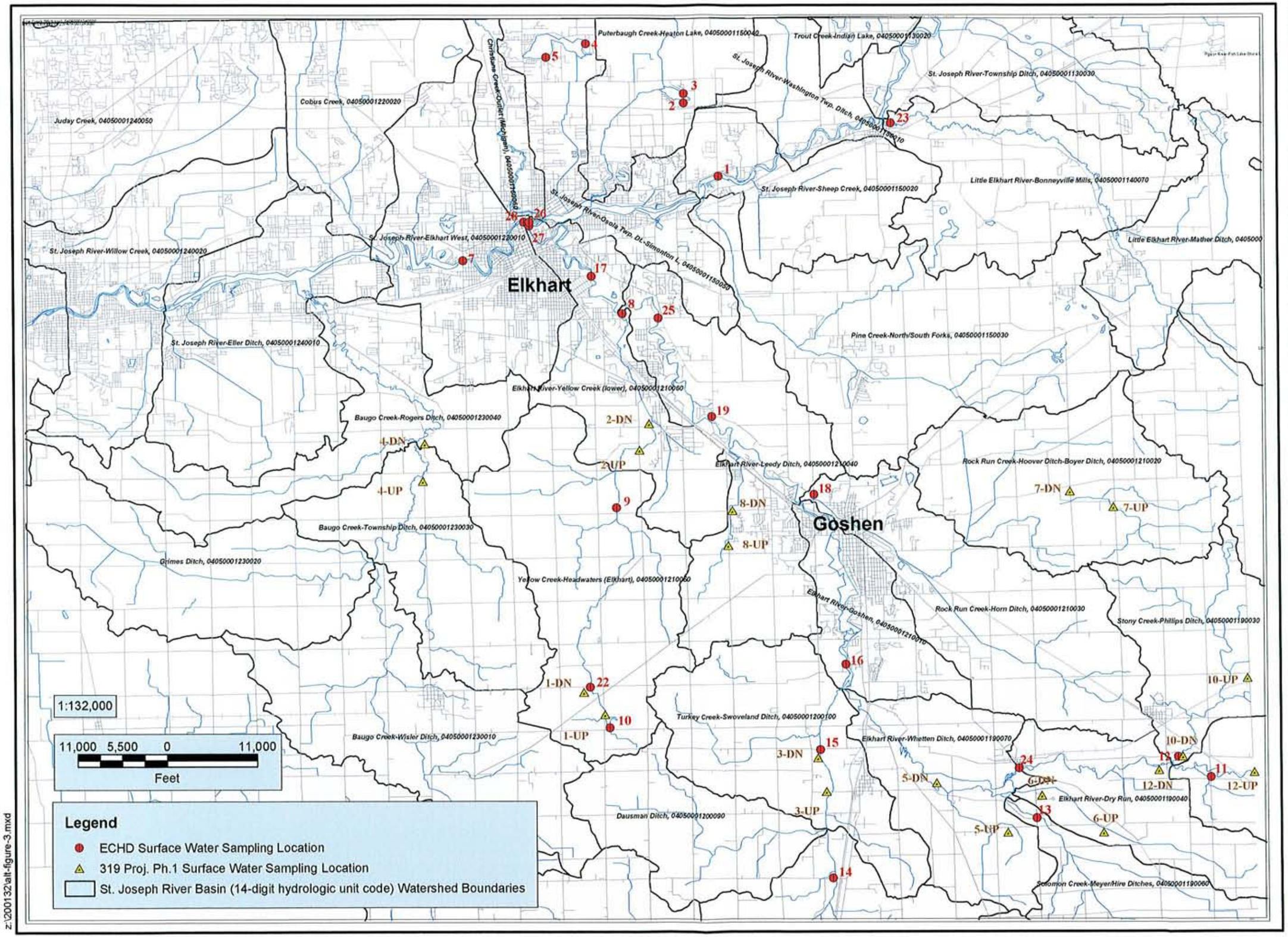
An analyses of the laboratory data from the Phase I sampling combined with land use, septic permit and soils data resulted in the identification of three priority watersheds. The priority watersheds are the watersheds most likely to be impaired by problematic waste disposal systems. The watershed determined to be most impaired of the three priority watersheds was then selected as the Pilot Watershed for a Watershed Management Plan. The three priority watersheds are listed below in Table 2.

Table 2
Three Priority Watersheds

Watershed	*14-Digit Hydrological Unit Code*
Yellow Creek – Headwaters	4050001210050
Elkhart River – Yellow Creek *	4050001210060
Turkey Creek – Swoveland Ditch	4050001200100

* The Yellow Creek portion of the watershed is the Pilot Watershed.

Sanitary surveys were conducted in each of the priority watersheds. The sanitary survey also provided an opportunity for sampling site selection for the Pilot Watershed. A second phase of sampling was conducted within the Priority Watershed, the Yellow Creek portion of the Elkhart-Yellow Creek Watershed (HUC 4050001210060). Water sampling was conducted at five locations, during two dry weather and two wet weather events. This sampling is discussed in more detail in Section IV.


Elkhart County, Indiana
Yellow Creek (lower)
Watershed Management Plan
ECC 319 Project - Phase I
Sampling Locations
Elkhart
Goshen
Puterbaugh Creek-Heaton Lake, 04050001150040
Trout Creek-Indian Lake, 04050001130020
St. Joseph River-Township Ditch, 04050001130030
St. Joseph River-Washington Twp. Ditch, 04050001130010
Cobus Creek, 04050001220020
Juday Creek, 04050001240050
Christiana Creek-Outlet (Michigan), 04050001150060
St. Joseph River-Sheep Creek, 04050001150020
Little Elkhart River-Bonneyville Mills, 04050001140070
St. Joseph River-Osolo Twp. Dt.-Simonton L, 04050001150050
St. Joseph River-Elkhart West, 04050001220010
St. Joseph River-Willow Creek, 04050001240020
Little Elkhart River-Mather Ditch, 0405000
St. Joseph River-Eller Ditch, 04050001240010
Pine Creek-North/South Forks, 04050001150030
Elkhart River-Yellow Creek (lower), 04050001210060
Baugo Creek-Rogers Ditch, 04050001230040
Elkhart River-Leedy Ditch, 04050001210040
Rock Run Creek-Hoover Ditch-Boyer Ditch, 04050001210020
Baugo Creek-Township Ditch, 04050001230030
Grimes Ditch, 04050001230020
Yellow Creek-Headwaters (Elkhart), 04050001210050
Elkhart River-Goshen, 04050001210010
Rock Run Creek-Horn Ditch, 04050001210030
Stony Creek-Phillips Ditch, 04050001190030
Turkey Creek-Swoveland Ditch, 04050001200100
Baugo Creek-Wisler Ditch, 04050001230010
Elkhart River-Whetten Ditch, 04050001190070
Elkhart River-Dry Run, 04050001190040
Dausman Ditch, 04050001200090
Simonton Creek-Meyer/Hire Ditches, 04050001190060
2-DN
4-DN
2-UP
4-UP
8-DN
8-UP
7-DN
7-UP
1-DN
1-UP
3-DN
3-UP
5-DN
5-UP
6-DN
6-UP
10-DN
10-UP
12-DN
12-UP
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Feet
Legend
ECHD Surface Water Sampling Location
319 Proj. Ph.1 Surface Water Sampling Location
St. Joseph River Basin (14-digit hydrologic unit code) Watershed Boundaries
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Figure 3
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III. Watershed Characteristics

A. Climate

Elkhart County experiences four well defined seasons. Air from both tropical and polar origin bring frequent changes in both temperature and humidity. The region experiences 36.7 inches of rainfall annually (period of record 1971-2000, Goshen, Indiana). Summer rainfall is normally experienced in afternoon thunderstorms. Although severe storms are rare, 26 tornadoes were reported in Elkhart County according to the National Climatic Data Center for the period of 1950 to 2002. Snowfall has occurred as early as October and as late as May. Typically, the largest amount of snowfall is in February. The normal maximum monthly temperature ranges from 31.5° F in January to 84.5°F in July. The normal minimum monthly temperature ranges from 17°F in January to 62.8°F in July. The maximum temperature recorded at Goshen, Indiana was 102°F on June 25th 1998. The minimum temperature recorded is –24°C on January 21, 1984. The maximum precipitation is 5.84" on July 8, 1951. The maximum calendar day snowfall is 14.0" on January 26th 1978.

B. Geology

The consolidated rocks underlying the watershed are of Ordovician age. These rocks consist of dolomite, dolomitic limestone and shale and are overlain by dolomitic limestone, shale and dolomite of Silurian age.[1]

The bedrock is overlain by thick, unconsolidated glacial deposits. These deposits are the results of several glacial periods, but predominantly the Wisconsin Glaciation and the subsequent recessions of the Saginaw Lobe. The thickness of the deposits ranges from 150 to 250 feet within the Yellow Creek Watershed.[1]

There is a surficial aquifer in the northern portion of the watershed.[1] The southern portion is characterized by a discontinuous sand and gravel aquifer.[1] In much of the watershed, the groundwater is within a few feet of the surface, especially during the wet season. With a high groundwater table, the creeks and ditches are typically fed by the groundwater in addition to surface runoff.[4]

C. Soils

There are four primary soil types within the Yellow Creek (lower) watershed. The northern portion of the watershed is characterized by Brookston Loam (0-1%) and Coloma Sands.[4] The central and southern portion of the watershed is characterized by Crosier Loams.[4] Small areas of Cosperville Loam, Desker Sandy Loam and Del Ray Silty Clay Loam are also present.[4] The soil types are illustrated in Figure 4. Table 3 presents the soil types within the watershed and their suitability for various uses.

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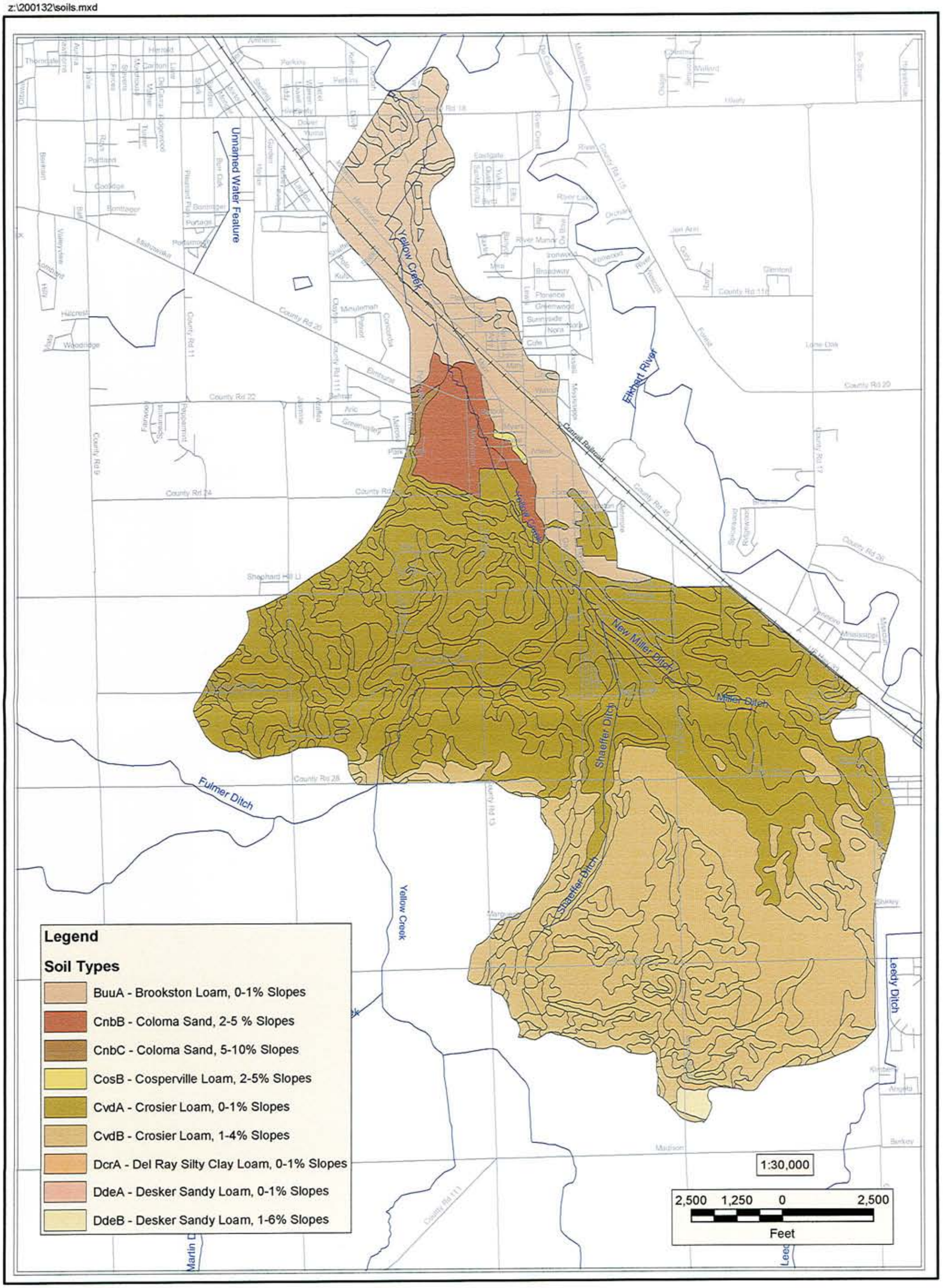

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Figure 4

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N W E S

Elkhart County, Indiana
Yellow Creek (lower)
Watershed Management Plan

Soils

Table 3
Watershed Soil Types

Soil Type	*Acreage*	*% of Watershed*	*Farming*	*Sanitary*
Brookston Loam, 0-1%	657	13.2%	Prime Farmland, if drained	Very Limited, Ponding, Depth to Saturated Zone, Restricted Permeability
Coloma Sand, 2-5%	174	3.5%	Not Prime Farmland	Very Limited, Filtering Capacity
Coloma Sand, 5-10%	11	0.2%	Not Prime Farmland	Very Limited, Filtering Capacity
Cosperville Loam, 2-5%	6	0.1%	Prime Farmland	Very Limited, Restricted Permeability, Filtering Capacity, Depth to Saturated Zone
Crosier Loam, 0-1%	2454	49.1%	Prime Farmland, if drained	Very Limited, Restricted Permeability, Depth to Saturated Zone
Crosier Loam, 1-4%	1674	33.5%	Prime Farmland, if drained	Very Limited, Restricted Permeability, Depth to Saturated Zone
Del Ray Silty Clay Loam, 0-15	4	0.1%	Prime Farmland	Very Limited, Restricted Permeability, Depth to Saturated Zone
Desker Sandy Loam, 0-1%	0.5	-	Prime Farmland	Very Limited, Filtering Capacity
Desker Sandy Loam, 1-6%	15	0.3%	Prime Farmland	Very Limited, Filtering Capacity

Reference: Soil Survey of Elkhart County, Indiana, USDA and NRCS, 1997.

Table 3 shows that all soils within the Yellow Creek (lower) Watershed are designated as very limited for on-site waste disposal systems. They are designated as 'Very Limited' either due to excessive permeability that limits the treatment potential, or due to restrictive permeability and high water table. Approximately 95% of the watershed are Brookston and Crosier Loams, that are both designated 'Very Limited' with respect to on-site disposal due to restricted permeability and depth to the saturated zone.[4] According to the Elkhart County Soil Survey (USDA and NRCS, 1997), Brookston Loam has an apparent high water table depth from 0 to 1 foot of the surface, and experiences brief periods of ponding from December through May. The Crosier Loam soils have a perched water table within 0.5 – 2 feet of the ground surface from December through April.[4] Often, when constructing on-site disposal systems in these conditions, specialized on-site systems are required, including mound systems or pressure dosed systems. These systems can be quite costly compared to the conventional on-site systems.

Soil erodibility has a direct effect on water quality. Erodible soils can be transported through wind and water erosion to surface waters. Nutrients and other pollutants are transported with the soils. Erodibility of the soils can be estimated using the factor Kw and Kf in the Universal Soil Loss Equation. K factors range from 0.02 being least susceptible to sheet and rill erosion by water to 0.69 being most susceptible to sheet and rill erosion by water.[4] The K factors vary with soil depth.[4] For Brookston Loams (13% of the soils), the Kw ranges from 0.24-0.43, and Kf ranges from 0.24-0.49.[4] For the Crosier Loams (49% of the soils), Kw ranges from 0.32-0.37, and Kf ranges from 0.37-0.43.[4] From these values, the soils are moderately susceptible to sheet and rill erosion by water.

The soils are also moderately susceptible to wind erosion. Wind erodibility values range from 1 (most susceptible) to 8 (least susceptible).[4] Brookston and Crosiers are both in soil group 5.[4]

D. Hydrology

The primary stream within the watershed is Yellow Creek. Yellow Creek is fed at its headwaters by Yellow Lake, also known as Mud Lake. Yellow Creek is fed, along its length from groundwater as well as surface water runoff. Over the years, the path of the Creek has been channelized. Yellow Creek discharges into the Elkhart River north of County Road 18 (Hively Street) and east of the railroad. New Miller-Stutzman Ditch discharges into Yellow Creek north of County Road 26. Shaffer Ditch is a tributary of New Miller-Stutzman Ditch, and combines with New Miller-Stutzman Ditch south of County Road 26. Yellow Creek and its tributaries are Legal Drains under the jurisdiction of the County Surveyor's Office. Yellow Creek was established as a legal drain in 1889 by Elkhart County. The last major dredging project of Yellow Creek was in approximately 1980.

There are small wetlands areas within the watershed, as identified in the National Wetlands Inventory. These are shown in Figure 5. The National Wetlands Inventory abbreviation, description, and acreage of each type of wetland within the watershed are shown in Table 4.

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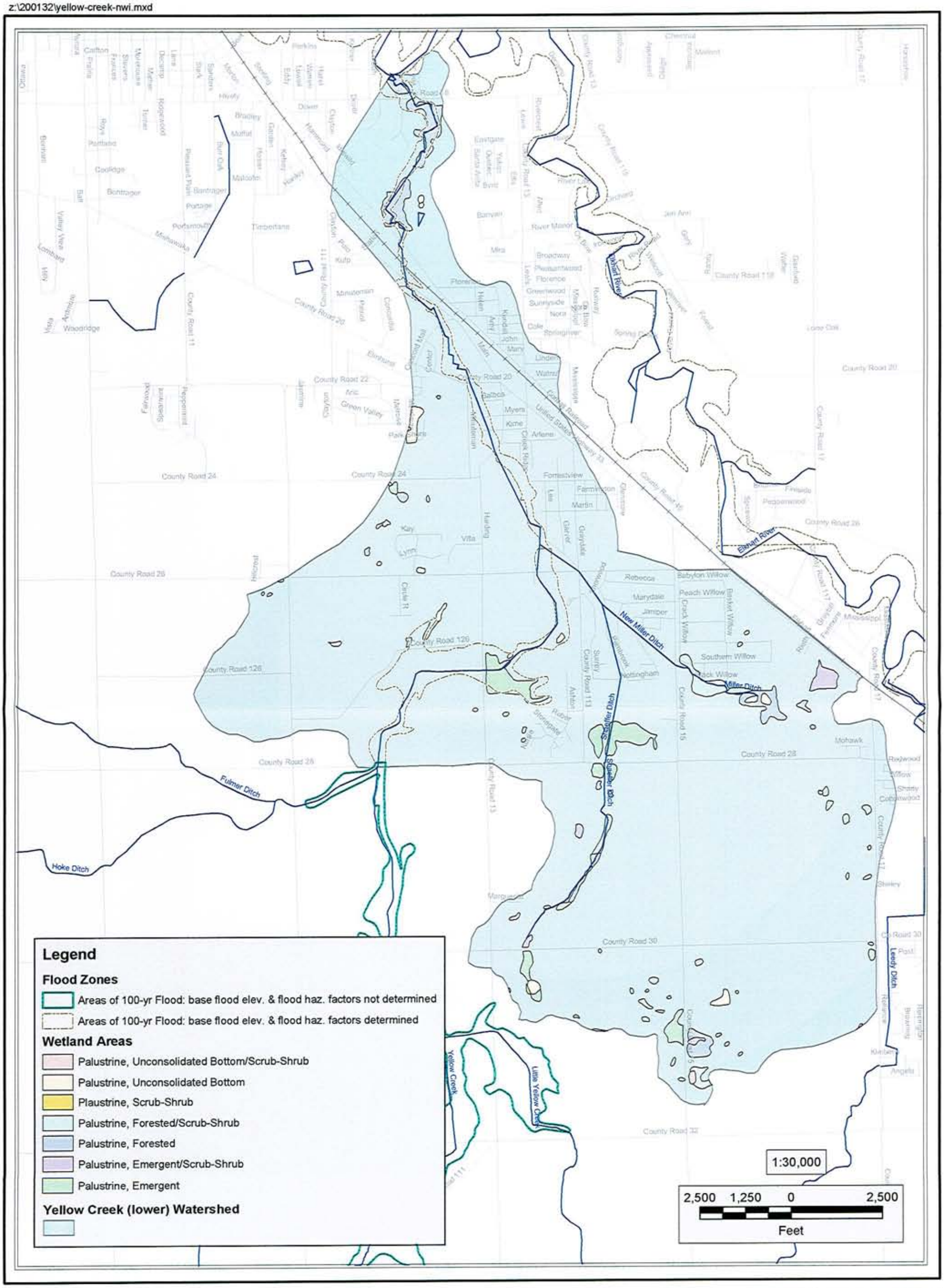

200132	Figure 5	LAWSON-FISHER ASSOCIATES P.C. CONSULTING ENGINEERS 525 W. WASHINGTON AVENUE SOUTH BEND, INDIANA 46601 PH. (574) 234-3167	N W E S			Elkhart County, Indiana Yellow Creek (lower) Watershed Management Plan Hydrology, Wetlands and Flood Zones Map

Table 4
Wetlands within Yellow Creek (lower) Watershed

Wetlands System and Classification	*Acres, within Yellow Creek (lower) Watershed*
Palustrine Emergent	83.0
Palustrine Emergent/Scrub-Shrub	14.0
Palustrine Forested	68.1
Palustrine Forested/Scrub-Shrub	20.0
Palustrine Scrub-Shrub	0.4
Palustrine Unconsolidated Bottom	19.7
Palustrine Unconsolidated	1.3
Total	206.5 Acres

Wetlands make up approximately 4% of the total watershed.

According to the FEMA Flood Insurance Rates Maps, Yellow Creek and adjacent areas are within the 100-year flood elevation. The limits of the 100-year flood plain are shown in Figure 5. The 100-year flood elevation ranges in width from a few hundred feet to approximately 2,000 feet within the Yellow Creek (lower) watershed boundaries. A detailed study of Yellow Creek was conducted in the Flood Mapping, from its discharge point at the Elkhart River to County Road 28 (the upper limit of the lower watershed). The 100-year flood elevation at County Road 28 is 782 feet NGVD 29 and the 100-year flood elevation at point of discharge into the Elkhart River is 746 feet NGVD 29. The New Miller-Stutzman Ditch and Schaffer Ditch are not shown to be within the 100-year flood area.

E. Topography

The topography of the area is typically characterized by gently rolling hills, with steeper areas adjacent to the banks of Yellow Creek, Shaffer Ditch and New Miller-Stutzman Ditch. The elevation of the watershed ranges from elevation 745 near the discharge point at Elkhart River to 860 in the upper reaches of the watershed.

F. Land Use

The existing land use varies within the watershed. The lower reaches of the watershed are primarily residential with some commercial development. The upper portions of the watershed are primarily agricultural or undeveloped. Figure 6 shows the land use within the watershed. Table 5 summarizes the land use by type. This land use information was developed as part of the St. Joseph River Watershed Initiative for a Safer Environment 205(j) grant project, using 1998 aerial photography, and field verified as part of the 319 Grant Project.

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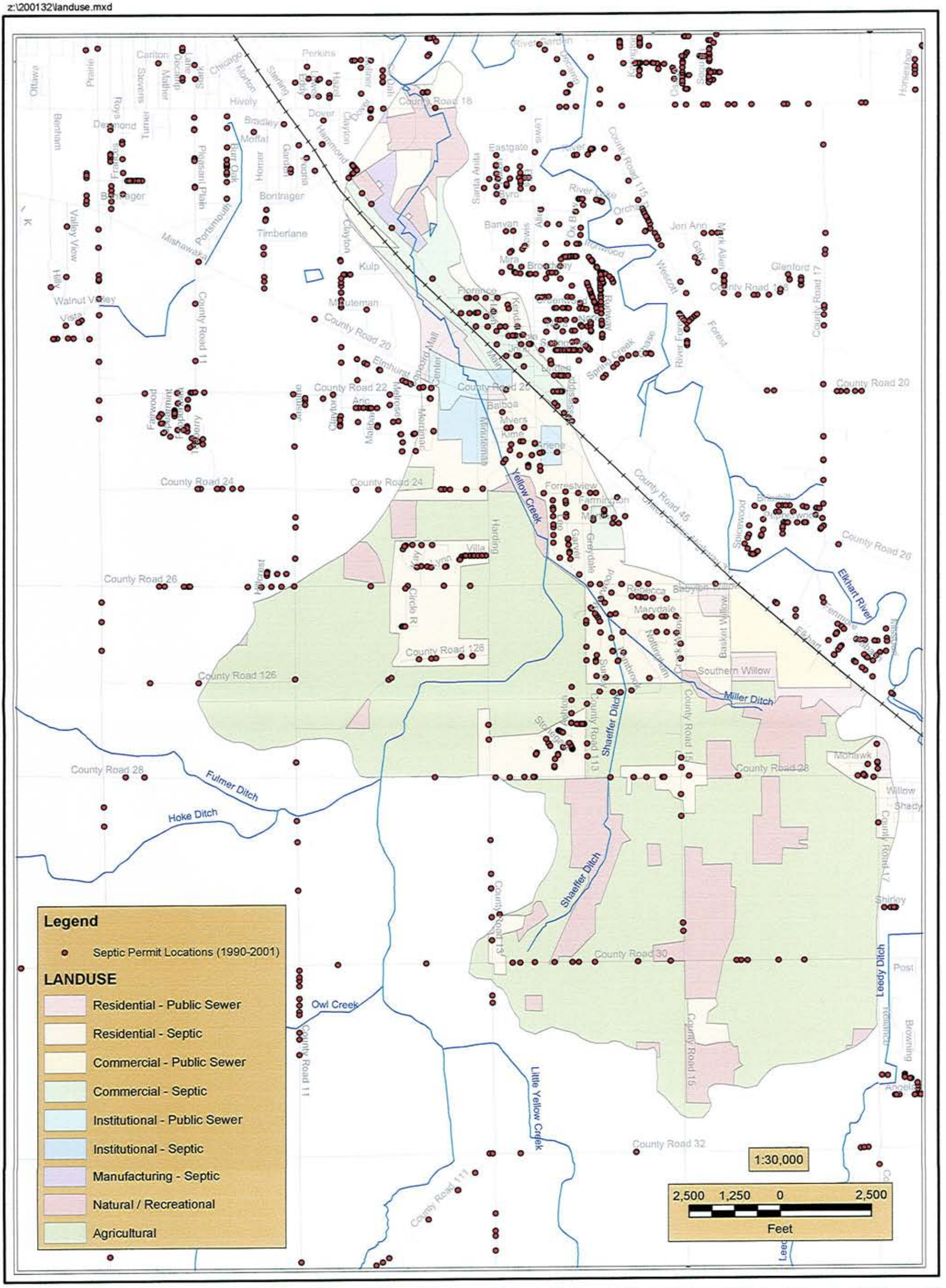

200132	Figure 6	LAWSON-FISHER ASSOCIATES P.C. CONSULTING ENGINEERS 525 W. WASHINGTON AVENUE SOUTH BEND, INDIANA 46601 PH. (574) 234-3167	N W E S			Elkhart County, Indiana Yellow Creek (lower) Watershed Management Plan Existing Landuse and Septic Permit Locations (1990-2001)

Table 5
Land Use

Land Use	Acreage	Percent
Residential Public Sewer	126	3%
Residential Septic	1,091	22%
Commercial Public Sewer	96	2%
Commercial Septic	192	4%
Institutional Public Sewer	38	1%
Institutional Septic	63	1%
Manufacturing Septic	33	1%
Natural/Recreational	618	12%
Agriculatural	2,735	55%
Total	4,993	100%

The developed portions of the watershed are divided by land use (residential, commercial, manufacturing and institutional) and by public sewer or septic system. The public sewered areas are served by either the City of Elkhart wastewater system or the City of Goshen wastewater system.

The agricultural land use is primarily crops (soybeans and corn). There is some livestock within the Yellow Creek (lower) Watershed including a few smaller cattle farms, and horses for recreational use. There are no major livestock farms within the lower watershed.

The locations of septic permit applications filed with the Elkhart County Health Department from 1990 to 2001 are also shown in Figure 6. The data from the septic permits are incorporated into a database and geocoded for their placement on the Figures. A review of the septic permit database for permits within the Yellow Creek (lower) Watershed show that there were 387 permits filed in the period of 1990 through 2001. Of these permits, approximately 48% of the permits were for the repair of an existing failed or failing septic system. Comparing the septic permit data with the land use data shows that there was one permit issued for a septic system repair for every 7 acres of developed land not served by a public sewer system. As can be seen by the number of new permits issued, there has been significant residential development in the unsewered areas of the watershed. Much of the land being developed was previously agricultural in nature. According to the Elkhart County Soil Survey, approximately 1,740 acres per year is being converted to urban land uses in Elkhart County.

Also of note, approximately 7% of the permits were mound systems, 64% were conventional systems with the remaining either being flood dosed or not specified.

The zoning is shown in Figure 7. The acreage of each zone classification is shown below in Table 6. In comparing the actual land use with the zoning classifications, it can be seen that there is more land that is developed than is zoned for development (commercial, manufacturing or residential).

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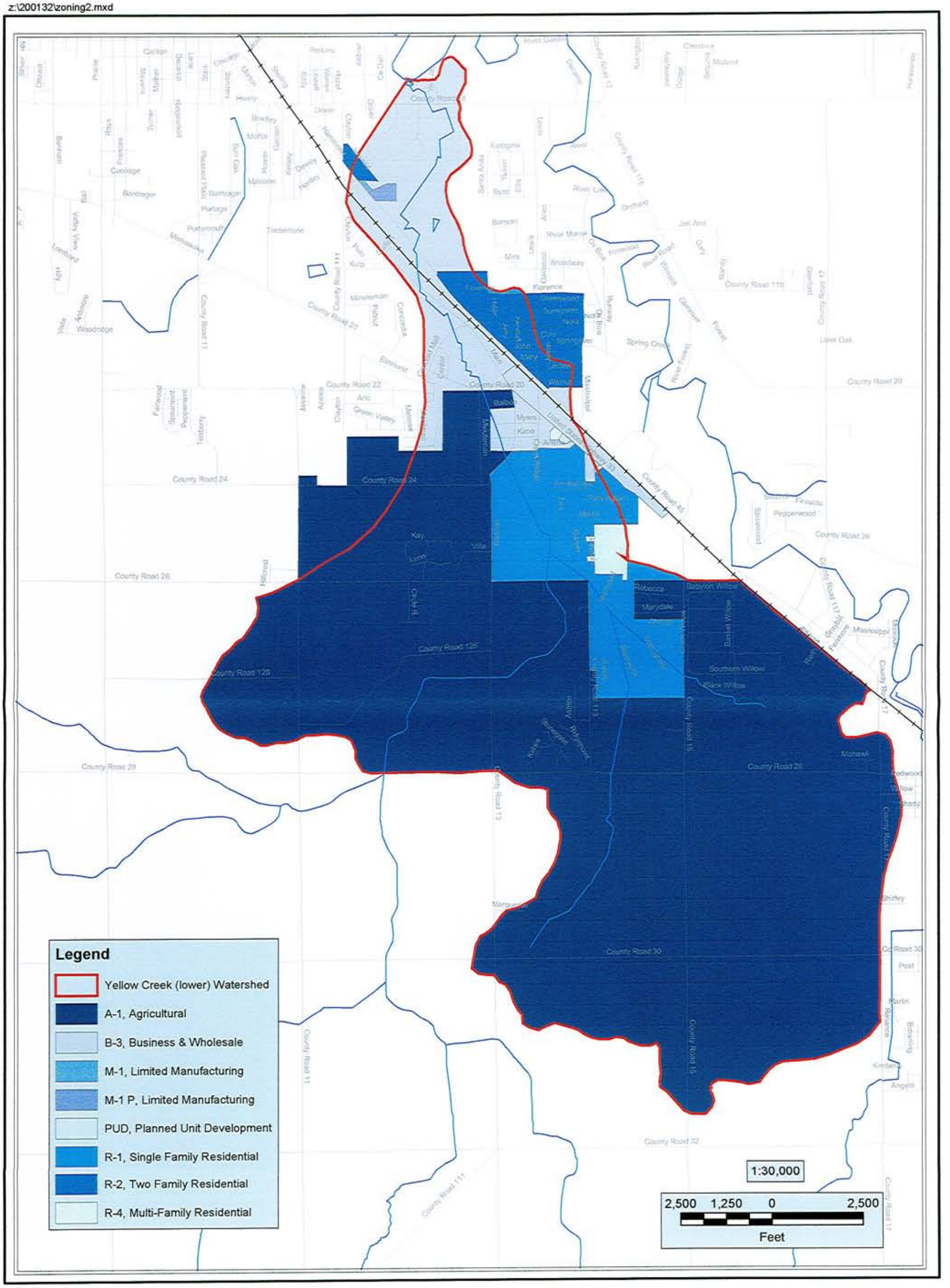

200132	Figure 7	LAWSON-FISHER ASSOCIATES P.C. CONSULTING ENGINEERS 525 W. WASHINGTON AVENUE SOUTH BEND, INDIANA 46601 PH. (574) 234-3167	N W E S			Elkhart County, Indiana Yellow Creek (lower) Watershed Management Plan Zoning Map

Table 6
Zoning

Zone	Acreage	Percent
Agricultural	3,897	78.0%
Commercial	542	10.9%
Manufacturing	8	0.2%
PUD	1	<0.1%
Single Family	414	8.3%
Two-Family	99	2.0%
Multi Family	32	0.6%

G. History

Prior to the exploration and settlement by the Europeans, the Miami Indians resided in what is now Elkhart County. The area was explored by France's Sieur de La Salle in about 1680. The area was later settled by French settlers. The French were displaced by English settlers following the French and Indian War (1754-1763). After the American Revolutionary War, what is now Elkhart County was conquered for the United States as part of the Indiana Territory.[2] Elkhart County was established by the Indiana Legislature in 1830, with the County seat being Dunlap (located immediately east of the Yellow Creek (lower) Watershed.

The watershed is located within Concord and Harrison Civil Townships. Concord Township was established in 1830, and Harrison Township was established in 1836. At the time of its establishment, Harrison Township was home to ten families.[3] The watershed area historically has been primarily agricultural, with early crops being onions and mint. The primary crops are now corn and soybeans.

H. Endangered Species

The Indiana Department of Natural Resources provides information on endangered, rare or threatened species, high quality natural areas and natural areas in Indiana in its Natural Heritage Center Database. The Indiana Natural Heritage Data Center database is designed to provide information about Indiana's diversity of natural ecosystems, species, landscape features, and outdoor amenities, and to assure adequate methods for evaluating this information and setting sound land protection priorities. The inventory is a continuous process, becoming an increasingly valuable tool for decision makers and scientists as it progresses. Because the IDNR relies on observations from individuals, it does not document every occurrence of a particular species or habitat. Conversely, a listing of a species does not guarantee that the particular species is present.

The results of the database search for the Yellow Creek (lower) watershed are included in Appendix B. The database records recent sitings of River Redhorse and Greater Redhorse (fish) in 1999 and 2000. The River Redhorse is classified by the State of Indiana as a species of special concern. The Greater Redhorse is classified by the State of Indiana as an Endangered Species. Neither are Federally listed. The database shows a less recent siting (1971) of the Star-Nosed Mole (mammal), classified as a species of special concern in Indiana, but not Federally listed.

IV. Identified Problems

A. Water Quality Assessment

The water quality within the Yellow Creek Watershed was evaluated using a variety of sources, water quality sampling results from the 319 Grant Project, historical water quality sampling results and previous studies.

2001 – 2003 ECC 319 Grant Project Water Quality Sampling

The watershed was sampled at 7 locations during the project. Two of the locations were sampled during the Phase I and II Sampling and three locations were only sampled during Phase II Sampling. The sampling locations are described in Table 7. The sampling locations are shown in Figure 8.

Table 7
Yellow Creek (lower) Water Quality Sampling Locations

Site #	*Phase*	*Location*	*Stream Name*
2 Up	Phase I	County Road 13	Yellow Creek
2 Down	Phase I	County Road 26	Yellow Creek
1	Phase II	Arlene Drive	Yellow Creek
2	Phase II	County Road 26	Yellow Creek
3	Phase II	County Road 13	Yellow Creek
4	Phase II	County Road 28	Yellow Creek
5	Phase II	County Road 126/Creekstone Subdivision	Unnamed Ditch

During both Phase I and Phase II Sampling, samples were collected for two dry weather events and two wet weather events. The sampling procedures are described in detail in the Quality Assurance Project Plan (QAPP) for Problematic Domestic Waste Disposal Systems – Education, Detection, Elimination and Monitoring, Elkhart County Indiana ARN 01-254 (November 2001).

Samples were analyzed for the following parameters:

Dissolved Oxygen (DO)
Temperature
pH
Conductivity
Total Dissolved Solids (TDS)
Total Suspended Solids (TSS)
Ammonia-Nitrogen (NH_3-N)
Nitrate-Nitrogen (NO_3-N)
Total Kjeldahl Nitrogen (TKN)
Orthophosphate
Total Phosphorus
Surfactants
E. Coli

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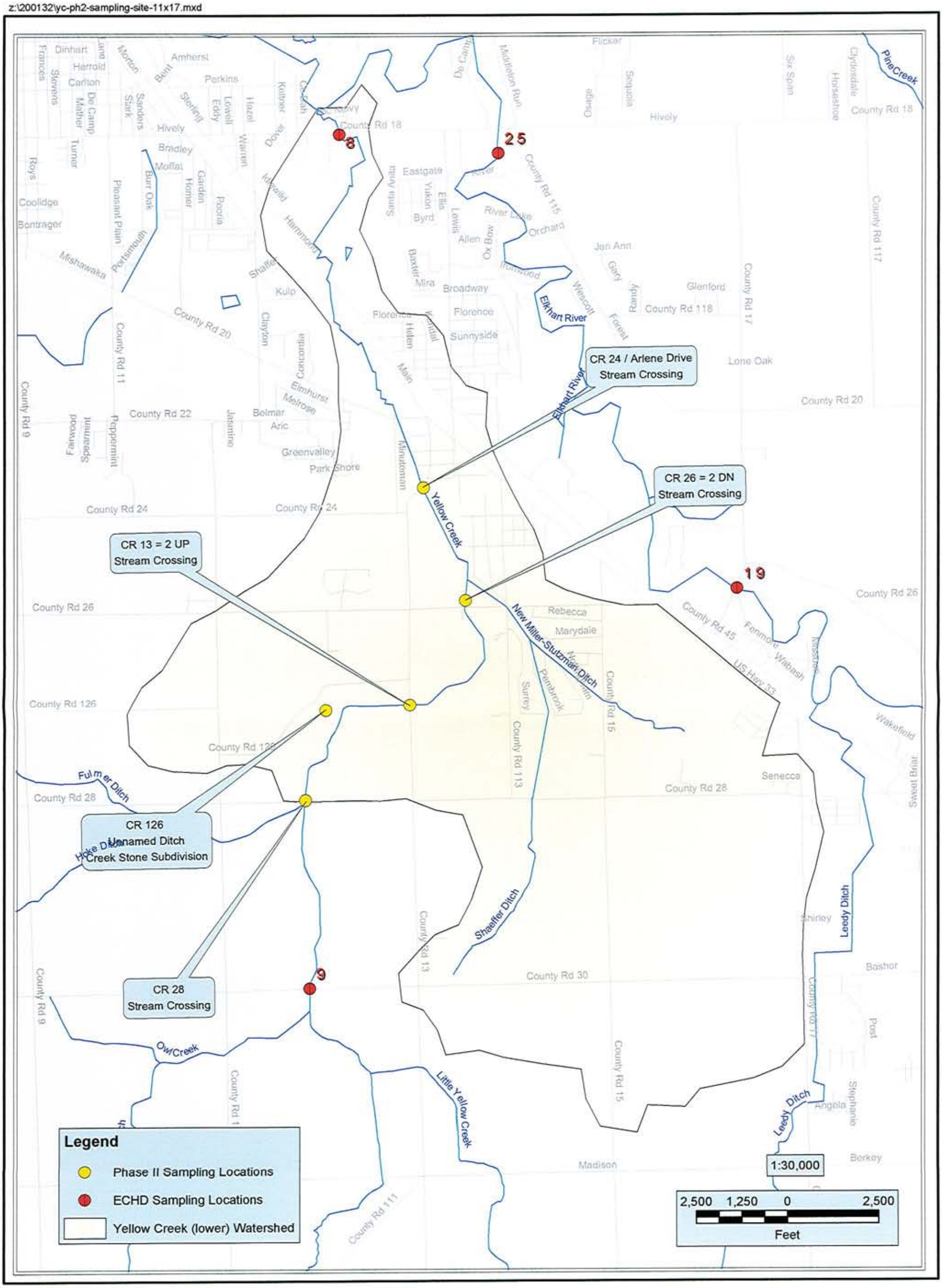


200132	Figure 8	LAWSON-FISHER ASSOCIATES P.C. CONSULTING ENGINEERS 525 W. WASHINGTON AVENUE SOUTH BEND, INDIANA 46601 PH. (574) 234-3167	N W E S			Elkhart County, Indiana Yellow Creek (lower) Watershed Management Plan Yellow Creek - PH II - Sampling Locations and ECHD Sampling Locations

The sampling events for both Phase I and Phase II are summarized below in Table 8.

Table 8
Phase I and Phase II Sampling Event Summary

Date	*Phase*	*Rainfall (inches)**	*Type*
11/7/01	Phase I	-	Dry
12/12/01	Phase I	-	Dry
2/20/02	Phase I	0.40	Wet
6/26/02	Phase I	1.37	Wet
10/2/02	Phase II	-	Dry
10/30/02	Phase II	-	Dry
12/18/02	Phase II	0.44	Wet
5/1/03	Phase II	0.54	Wet

*48 hour total.

The results of the sampling are summarized in Table 9. Water quality data is included in Appendix C.

Elkhart County Health Department – Ongoing Water Sampling

The Elkhart County Health Department conducts an ongoing sampling program throughout the County during the ice-free months of the year. Samples are collected at several locations along Yellow Creek. Elkhart County Health Department sampling locations are listed below and shown on Figure 8.

County Road 18
County Road 40
County Road 30
County Road 11

The samples are analyzed for the following water quality parameters:

pH
Temperature
Dissolved Oxygen
Total Dissolved Solids
Nitrates
Orthophosphate
Cl_2
E. Coli

Results of the sampling are summarized in Table 10.

Table 9
Elkhart County Commissioners
319
Yellow Creek Results

Phase I No.	*Sampling Location*	*Date*	*Time*	*Temp.*	*Weather*	*pH*	*Water Temp.*	*Cond.*	*TDS*	*Color*	*DO*	*DO (%)*	*TKN*	*Nitrate*	*MBAS*	*TSS*	*Ammonia*	*Phosphorus*	*Orthophosphorus*	*E. Coli*	*Wet/Dry*
	Arlene Drive/CR 24	10/2/2002	11:30 AM	70	Cloudy	7.87	19.3	700	359	Clear	3.65	40.1	2	0.75	<0.1	4	<0.1	0.12	0.07	770	Dry
	Arlene Drive/CR 24	10/30/2002	8:45 AM	45	Cloudy	8.05	6	720	367	slightly cloudy	8.19	69.4	0.78	1.1	<0.1	4	<0.1	0.28	0.05	2600	Dry
	Arlene Drive/CR 24 Duplicate	10/30/2002	8:45 AM										0.46	1.1	<0.1	5	<0.1	0.2	0.04	3800	Dry
	Arlene Drive/CR 24	12/18/2002	10:30 AM	50	Rain	8.57	3.9	796	404		7.55	61.9	0.11	1.3	0.1	6	0.1	0.14	0.06	675	Wet
	Arlene Drive/CR 24	5/1/2003	10:00 AM	70	Cloudy	7.8	15.6	702	357	Cloudy/Green	8.1	80.9	4.0	3.6	<0.1	15	1.6	0.34	0.23	8000	Wet
2DWN	CR 26	11/7/2001	7:55	53	Cold & Sunny	8.06	7.2	461	230	Clear/Sl. Yel.	10.1	84.0	0.65	4.9	<0.1	25	0.1	0.17	0.15	270	Dry
2DWN	CR 26	12/12/2001	10:50	40	Slight Rain	7.91	5.7	724	367	clear	10.6	85.0	0.52	4.3	<0.1	10	0.1	0.12	0.09	330	Dry
2DWN	CR 26	2/20/2002	11:00	40	Rainy (Stopped)	7.66	9.6	2.3		Cloudy	10.34		1.6	4.4	0.12	28	0.7	0.33	0.26	5200	Wet
2DWN	CR 26	6/26/2002	13:40	75	Sunny	7.11	22.1	620	316	Very Light Brown	3.94	45	1.1	9.8	<0.1	48	0.3	0.41	0.24	62400	Wet
2DWN	CR 26	10/2/2002	9:30 AM	70	Cloudy	7.77	18.7	717	365	Clear	3.8	37	0.98	0.74	<0.1	10	<0.1	0.13	0.06	1450	Dry
2DWN	CR 26	10/30/2002	9:10 AM	45	Cloudy	7.88	6.2	715	364	Clear	7.27	58.7	0.32	1.1	<0.1	6	<0.1	0.21	0.04	390	Dry
2DWN	CR 26	12/18/2002	11:00 AM	55	Rain	7.86	4.7	690	351	slightly cloudy	8.21	64.8	0.46	1.4	<0.1	6	0.2	0.16	0.1	725	Wet
2DWN	CR 26 Duplicate	12/18/2002	11:00 AM										0.42	1.4	<0.1	6	0.2	0.14	0.11	605	Wet
2DWN	CR 26	5/1/2003	10:50 AM	70	Partly Sunny	7.9	16.1	704	358	Brownish Green	9.2	93.9	3.3	4.2	0.1	13	1.3	0.36	0.24	6000	Wet
2UP	CR 13	11/7/2001	8:30	51	Cold & Sunny	7.90	8.0	442	220	Clear/Sl. Yel.	7.8	66.6	0.92	4.9	<0.1	17	0.1	0.27	0.23	330	Dry
2UP	CR 13	12/12/2001	11:10	40	Slight Rain	7.77	5.7	731	371	clear	10.1	80.5	0.82	4	0.18	10	0.2	0.12	0.1	320	Dry
2UP	CR 13	2/20/2002	11:10	40	Rainy (Stopped)	7.64	9.3	2		Cloudy/Yellow	9.39		1.9	4.6	<0.1	44	1.3	0.48	0.37	4000	Wet
2UP	CR 13	6/26/2002	13:30	75	Sunny	7.64	22.1	617	314	Cloudy/Yellow	3.24	37.2	1.7	10	<0.1	52	0.3	0.44	0.27	36000	Wet
2UP	CR 13	10/2/2002	9:50 AM	70	Cloudy	7.83	19.1	710	359	Yellow	4.2	45.5	3.8	0.73	<0.1	970	<0.1	6.61	0.1	2300	Dry
2UP	CR 13	10/30/2002	9:20 AM	45	Cloudy	7.94	6.4	719	367	Clear	7.86	65.1	0.39	1.3	<0.1	7	<0.1	0.28	0.21	385	Dry
2UP	CR 13	12/18/2002	11:20 AM	55	Rain	7.77	4.7	694	353		8.8	70.5	0.75	1.5	<0.1	11	0.3	0.32	0.2	1800	Wet
2UP	CR 13	5/1/2003	11:05 AM	70	Partly Sunny	7.94	16.4	705	359	Greenish Brown	10.25	105	2.8	4.8	<0.1	7	1.4	0.41	0.27	9800	Wet
	CR 28	10/2/2002	10:30 AM	70	Cloudy	8.01	19.7	697	354	Clear	4.26	47.1	1.5	1.1	<0.1	15	<0.1	0.2	0.12	795	Dry
	CR 28 Duplicate	10/2/2002	10:30 AM										2	1.1	<0.1	13	<0.1	0.21	0.13	960	Dry
	CR 28	10/30/2002	9:40 AM	45	Cloudy	8.02	6.2	726	370	Clear	9.06	72.5	0.4	1.5	<0.1	5	<0.1	0.18	0.06	230	Dry
	CR 28	12/18/2002	11:30 AM	55	Rain	8.1	4.7	736	374		10.7	79.8	0.29	2.1	<0.1	26	0.2	0.15	0.09	1460	Wet
	CR 28	5/1/2003	11:50 AM	70	Cloudy	7.94	17.3	778	396	Light Brown	10.1	106	6.0	3.8	0.1	15	2.7	0.54	0.38	14400	Wet
	CR 28 Duplicate	5/1/2003	11:05 AM										5.2	3.8	0.1	20	2.8	0.55	0.39	14800	Wet
	CR 126 Ditch	10/2/2002	11:00 AM	70	Cloudy	7.1	20.3	2315	1179	Black	0.31	3.6	26	<0.1	<0.1	240	24.2	163.37	29.43	60000	Dry
	CR 126 Ditch	10/30/2002	10:00 AM	45	Cloudy	7.2	10.3	3223	1643	Black	2.8	17.5	32	<0.1	2.7	260	32.6	37.17	27.8	52000	Dry
	CR 126 Ditch	12/18/2002	12:00 PM	55	Rain	7.32	7.5	376	191		8.12	68.1	12	3.6	1.6	1048	3.7	5.6	4.27	72000	Wet
	CR 126 Ditch	5/1/2003	11:30 AM	70	Cloudy	7.2	12.6	1268	646	Brown	6.9	65.1	4.2	1.6	0.62	22	2.0	1.87	0.97	79000	Wet

Table 10
Elkhart County Health Department and St. Joseph River
WISE Project Sampling Results

No.	Sampling Location	By	Type	Time	Date	pH	Temp	DO	NO_3	PO_4	CL_2	TDS	E. Coli
8	CR 18 Yellow Creek	ECHD	WET	7:50	5/21/96	7.04	18.1	7		0.4	35	244	58500
8	CR 18 Yellow Creek	ECHD	WET	7:50	5/28/96	7.99	15.6	10.5	8.98	0.65	50	316	7450
8	CR 18 Yellow Creek	ECHD	DRY	7:50	6/4/96	8.25	17.5	11.9	6.45	0.6	55	262	465
8	CR 18 Yellow Creek	ECHD	WET	7:50	6/11/96	8.84	19.6	9.7	0.98	0.9	20	100	18000
8	CR 18 Yellow Creek	ECHD	WET	7:55	6/18/96	8.14	22.8	8	2.37	1.2	25	107	240000
8	CR 18 Yellow Creek	ECHD	WET	8:00	6/25/96	8	19.3	14.2	2.84	0.8	55	344	1350
8	CR 18 Yellow Creek	ECHD	DRY	7:55	7/2/96	7.96	19.9	11.8	3.24	0.9	65	407	157
8	CR 18 Yellow Creek	ECHD	DRY	7:50	7/9/96	8.63	18.9	10	1.66	1.4	85	424	533
8	CR 18 Yellow Creek	ECHD	DRY	7:50	7/16/96	8.61	21.1	12.5	1.27	1.2	75	389	980
8	CR 18 Yellow Creek	ECHD	DRY	7:55	7/23/96	8.03	20.6	9.7	3.4	1.2	65	399	2100
8	CR 18 Yellow Creek	ECHD	WET	7:55	7/30/96	8.78	20.9	12	2.29	0.9	40	197	9275
8	CR 18 Yellow Creek	ECHD	DRY	7:50	8/6/96	8.11	23.4	9.9	7.53	0.7	85	413	900
8	CR 18 Yellow Creek	ECHD	DRY	7:50	8/13/96	9.1	22.1	9	1.61	0.6	80	451	315
8	CR 18 Yellow Creek	ECHD	WET	7:50	8/20/96	7.84	21.9	15	1.01	1	90	428	410
8	CR 18 Yellow Creek	ECHD	DRY	7:55	8/27/96	6.28	19.9	9.6	0.84	0.6	75	586	730
8	CR 18 Yellow Creek	ECHD	DRY	7:50	9/3/96	7.56	19.2	5.8	5.78	0.3	75	561	483
8	CR 18 Yellow Creek	ECHD	DRY	9:45	9/10/96	7.32	21	10	2.97	0.6	65	430	No sample
8	CR 18 Yellow Creek	ECHD	DRY	7:55	9/17/96	7.17	16.8	9.8	4.1	0.4	75	588	443
8	CR 18 Yellow Creek	ECHD	DRY	8:20	9/24/96	6.67	17.7	9	6.49	0.4	95	540	3700
8	CR 18 Yellow Creek	ECHD	WET	3:35	5/9/95	8.53	18	13	2.89	1	70	370	105
8	CR 18 Yellow Creek	ECHD	DRY	9:40	5/16/95	7.92	17.8	9.6	2.54	3	70	374	350
8	CR 18 Yellow Creek	ECHD	DRY	10:15	5/23/95	8.04	18.7	10.8	1.55	0	75	391	493
8	CR 18 Yellow Creek	ECHD	WET	10:05	5/30/95	7.81	18.3	11.8	6.17	4	70	358	415
8	CR 18 Yellow Creek	ECHD	DRY	9:30	6/6/95	7.88	20.9	8.6	3.91	3	70	401	395
8	CR 18 Yellow Creek	ECHD	DRY	9:50	6/13/95	8.21	19.1	7	2.9	3	75	471	427
8	CR 18 Yellow Creek	ECHD	DRY	9:45	6/20/95	8.16	25.4	7.6	1.69	1	80	416	>150000
8	CR 18 Yellow Creek	ECHD	WET	9:50	6/27/95	7.56	20.5	9.2	20.5	2	55	295	1320
8	CR 18 Yellow Creek	ECHD	DRY	10:00	7/3/95	7.92	19.4	8.4	8.78	1	65	350	1340
8	CR 18 Yellow Creek	ECHD	DRY	9:55	7/11/95	7.69	21.9	8.8	5.56	3	70	346	2600
8	CR 18 Yellow Creek	ECHD	WET	9:40	7/18/95	8.05	22.5	7	7.12	2	70	332	5150
8	CR 18 Yellow Creek	ECHD	WET	9:45	7/25/95	7.89	22.5	7	6.53	3	60	287	870
8	CR 18 Yellow Creek	ECHD	DRY	9:45	8/1/95	8.15	25.4	7	1.42	2	80	369	1260
8	CR 18 Yellow Creek	ECHD	WET	9:50	8/8/95	7.45	23.4	6.5	4.75	1	65	315	613
8	CR 18 Yellow Creek	WISE	DRY		7/18/02								370
8	CR 18 Yellow Creek	WISE	DRY		7/25/02								1140
8	CR 18 Yellow Creek	WISE	DRY		8/8/02								435
8	CR 18 Yellow Creek	WISE	DRY		8/29/02								645
8	CR 18 Yellow Creek	WISE	DRY		9/5/02								595
8	CR 18 Yellow Creek	WISE	DRY		9/12/02								221
8	CR 18 Yellow Creek	WISE	DRY		9/19/02								450

Table 10
Elkhart County Health Department and St. Joseph River
WISE Project Sampling Results (Continued)

No.	Sampling Location	By	Type	Time	Date	pH	Temp	DO	NO_3	PO_4	CL_2	TDS	E Coli
8	CR 18 Yellow Creek	WISE	DRY		9/26/02								256
8	CR 18 Yellow Creek	WISE	DRY		10/3/02								237
8	CR 18 Yellow Creek	WISE	DRY		10/10/02								144
8	CR 18 Yellow Creek	WISE	DRY		10/17/02								145
8	CR 18 Yellow Creek	WISE	DRY		10/24/02								160
8	CR 18 Yellow Creek	WISE	DRY		10/31/02								208
8	CR 18 Yellow Creek	WISE	DRY		11/14/02								38
8	CR 18 Yellow Creek	WISE	DRY		11/21/02								68
8	CR 18 Yellow Creek	WISE	DRY		1/16/03								14
8	CR 18 Yellow Creek	WISE	DRY		3/6/03								260
8	CR 18 Yellow Creek	WISE	DRY		3/20/03								77
8	CR 18 Yellow Creek	WISE	WET		7/30/02								715
8	CR 18 Yellow Creek	WISE	WET		8/14/02								780
8	CR 18 Yellow Creek	WISE	WET		8/20/02								725
8	CR 18 Yellow Creek	WISE	WET		11/6/02								920
8	CR 18 Yellow Creek	WISE	WET		12/19/02								366
8	CR 18 Yellow Creek	WISE	WET		3/13/03								630
9	CR 30 Yellow Creek	ECHD	WET	4:00	5/9/95	8.78	19.3	13.8	3.96	1	45	300	
9	CR 30 Yellow Creek	ECHD	DRY	9:55	5/16/95	7.54	16.6	9.8	2.89	1	60	342	
9	CR 30 Yellow Creek	ECHD	DRY	10:35	5/23/95	8.02	18.5	10	2.12	5	60	363	
9	CR 30 Yellow Creek	ECHD	WET	10:30	5/30/95	7.69	17.4	10	6.58	5	60	361	
9	CR 30 Yellow Creek	ECHD	DRY	9:55	6/6/95	7.83	20.9	9.6	5.22	3	50	364	
9	CR 30 Yellow Creek	ECHD	DRY	10:10	6/13/95	8.75	17.8	11	4.22	2	55	436	
9	CR 30 Yellow Creek	ECHD	DRY	10:15	6/20/95	8.07	25.4	9.4	3.21	2	60	409	
9	CR 30 Yellow Creek	ECHD	WET	10:40	6/27/95	7.27	21.3	7.6	24.4	2	65	370	
9	CR 30 Yellow Creek	ECHD	DRY	10:30	7/3/95	7.73	19.1	9.4	9.8	0	45	342	
9	CR 30 Yellow Creek	ECHD	DRY	10:15	7/11/95	7.6	23.5	9.8	7.47	2	75	356	
9	CR 30 Yellow Creek	ECHD	WET	10:10	7/18/95	8.14	23.1	9	6.76	1	65	311	
9	CR 30 Yellow Creek	ECHD	WET	10:05	7/25/95	7.93	22.8	8.6	5.64	3	55	303	
9	CR 30 Yellow Creek	ECHD	DRY	10:00	8/1/95	8.26	26.1	7.5	1.71	2	50	330	
9	CR 30 Yellow Creek	ECHD	WET	10:10	8/8/95	7.48	24.9	7.3	5.15	1	55	320	
8	CR 18 Yellow Creek	ECHD	WET	8:15	5/20/97	7.6	14.4	10	2.55	1.2	45	383	40000
8	CR 18 Yellow Creek	ECHD	DRY	8:15	5/27/97	8.88	14.9	9	12.2	0.45	60	304	4075
8	CR 18 Yellow Creek	ECHD	WET	8:15	6/3/97	8.66	17	9.1	12.4	0.5	45	334	3000
8	CR 18 Yellow Creek	ECHD	DRY	8:15	6/10/97	8.37	18.1	7	1.3	0.6	60	370	528
8	CR 18 Yellow Creek	ECHD	WET	8:10	6/17/97	7.98	22.1	7	67.6	0.7	35	317	39250
8	CR 18 Yellow Creek	ECHD	DRY	8:20	6/24/97	8.9	22.2	6	8.78	0.6	30	282	2900
8	CR 18 Yellow Creek	ECHD	DRY	8:15	7/1/97	9.06	21.5	6.4	3.36	0.8	65	396	2150
8	CR 18 Yellow Creek	ECHD	WET	8:15	7/8/97	8.89	20.1	8.6	8.53	0	35	294	6800

Table 10
Elkhart County Health Department and St. Joseph River
WISE Project Sampling Results (Continued)

No.	*Sampling Location*	*By*	*Type*	*Time*	*Date*	*pH*	*Temp*	*DO*	*NO_3*	*PO_4*	*CL_2*	*TDS*	*E Coli*
8	CR 18 Yellow Creek	ECHD	WET	8:15	7/15/97	9.19	21.5	6.8	3.13	0.6	60	366	4300
8	CR 18 Yellow Creek	ECHD	WET	8:20	7/22/97	8.55	21.1	5.4	3.53	0.7	70	364	40000
8	CR 18 Yellow Creek	ECHD	WET	8:24	7/29/97	6.91	20.1	6.8	2.61	0.5	65	411	483
8	CR 18 Yellow Creek	ECHD	DRY	8:25	8/5/97	7.03	18.8	6.2	3.52	0.3	70	422	790
8	CR 18 Yellow Creek	ECHD	WET	8:11	8/12/97	6.99	20.1	7.2	2.07	0.5	60	360	2150
8	CR 18 Yellow Creek	ECHD	DRY	8:15	8/19/97	7.73	19.4	7.8	2.5	0.4	40	248	3150
8	CR 18 Yellow Creek	ECHD	WET	9:55	8/26/97	7.29	20.2	9	4.72	0.8	55	351	2250
8	CR 18 Yellow Creek	ECHD	DRY	8:25	9/2/97	7.73	20.6	6	5.12	0.1	70	403	473
8	CR 18 Yellow Creek	ECHD	WET	8:28	9/9/97	7.82	18.8	6.2	1.75	0.6	60	234	2250
8	CR 18 Yellow Creek	ECHD	DRY	8:15	9/16/97	7.79	19.2	9.4	1.38	0.4	75	402	1070
8	CR 18 Yellow Creek	ECHD	DRY	7:40	5/19/98	7.48	19	9.6	1	0.5	110	417	420
8	CR 18 Yellow Creek	ECHD	WET	7:40	5/26/98	8.71	17.1	10	2.5	0.5	90	400	2600
8	CR 18 Yellow Creek	ECHD	DRY	7:55	6/2/98	8.92	19.2	9.2	0.6	0.8	80	538	300
8	CR 18 Yellow Creek	ECHD	DRY	7:50	6/16/98	8.81	20.2	9.8	2.2	0.6	75	513	435
8	CR 18 Yellow Creek	ECHD	WET	7:45	6/30/98	7.7	19.6	8.8	3.83	0.8	65	485	680
8	CR 18 Yellow Creek	ECHD	DRY	7:50	7/14/98	8.99	19.5	13.6	0.71	0.8	80	484	940
8	CR 18 Yellow Creek	ECHD	DRY	8:10	7/28/98	9.06	23.8	10.6	1	0.4	75	378	493
8	CR 18 Yellow Creek	ECHD	WET	7:40	8/11/98	8.06	21.1	7.2	2.5	0.5	80	360	1400
8	CR 18 Yellow Creek	ECHD	WET	7:40	8/11/98	8.06	21.1	7.2	2.5	0.5	80	360	1400
8	CR 18 Yellow Creek	ECHD	WET	8:05	8/25/98	7.93	22.1	8	1.32	0.3	25	95	146800
8	CR 18 Yellow Creek	ECHD	WET	9:45	9/8/98	7.24	18.1	7	0.91	0	95	419	425

St. Joseph River Watershed Initiative for a Safer Environment Sampling (WISE)

As part of the St. Joseph River WISE 205(j) grant project, monthly samples were taken from Yellow Creek at CR 18 (Hively Avenue), just before the creek discharges to the Elkhart River. These samples were analyzed for *E. coli*. The results of this sampling are also included in Table 10.

Water Quality Discussion

There are various standards and guidelines for some of the parameters monitored for the watershed management plan. The water quality standards for the parameters tested are shown in Table 11. Some of these standards are not appropriate for the regulation of the Yellow Creek (such as drinking water standards, since the Creek is not used as a source of drinking water) however, they provide a standard by which to evaluate the water quality.

Table 11
Water Quality Standards/Guidelines

Water Quality Parameter	*Standard*	*Source/Standard*
Dissolved Oxygen	5 mg/L daily average 4 mg/L minimum	327 IAC 2
Temperature	Varies by month	327 IAC 2
Total Dissolved Solids	750 mg/L	327 IAC 2
Chlorides	860 mg/L Maximum	327 IAC 2
pH	6-9	327 IAC 2
E. Coli	235 col/100 mls Primary Contact Max Daily Conc.	327 IAC 2
	125 col/100 mls Primary Contact 30 Day Geometric Mean	327 IAC 2
Nitrate	10 ppm	Drinking Water Standards
Ammonia	Varies with pH and Temperature	327 IAC 2
Total Phosphorus	0.04 mg/L Daily Maximum	327 IAC 2 – evaluated during IDEM triennial review at Great Lakes drinking water intakes (not a wq standard)

E. Coli

E. coli measured during the Elkhart County 319 Grant Project sampling exceeded the standard of 235 col/100 mls maximum daily concentration in all but one sample. *E. coli* results from the ongoing Elkhart County Health Department monitoring also often exceed the 235 col/100 ml standard. *E. coli* is an indicator organism which may indicate the presence of human or animal wastes. The presence of *E. coli* within Yellow Creek are most likely due to a number of sources, including failed septic systems, livestock and or wildlife. However, the E. coli contribution from the Yellow Creek (lower) Watershed is most likely from domestic sources, not agricultural. The Yellow Creek (lower) Watershed has a significant number of residences on septic systems, and relatively small amount of livestock within the watershed. The E. coli contribution from the Yellow Creek Headwaters Watershed is a combination of both domestic and agricultural sources as there are significant livestock operations and residential development with septic systems. *E. coli* concentrations increase from County Road 28 (the most upstream sampling location) to County Road 13, during both wet and dry weather sampling, indicating a source of contamination. The CR 126 Ditch is located between these two sites, and is most likely a major source of the increased *E. coli* levels. *E. coli* concentrations were shown to decrease between CR 13 and CR 26. This indicates a dilution of the stream flow from surface and groundwater that does not contain significant concentrations of *E. coli*. The results from CR 26 to Arlene Drive are mixed, showing a decrease in *E. coli* concentration during one dry weather event, a significant increase during the second dry weather event and remaining the same during the wet weather event. In all cases, the wet weather *E. coli* concentrations were significantly higher than the dry weather concentrations, indicating a significant contribution of *E. coli* from surface runoff. E. coli results from ECHD and St. Joseph River WISE project at County Road 18 exceeded the standard in all but seven samples. Figure 9 shows E. coli results as a function of stream mile.

Total Dissolved Solids

In all cases, the measurements for Yellow Creek were less than the standard of 750 mg/L for total dissolved solids. The results from samples in CR 126 Ditch, however, ranged from 191 mg/L to 1,643 mg/L, exceeding the standard in all but one sample. High total dissolved solids can be an indication of domestic wastewater pollution or pollution associated with livestock or wildlife.

Nutrients

In general, the nitrogen and phosphorus levels within Yellow Creek are moderate to high. This is not unexpected due to the level of agricultural land use within the watershed.

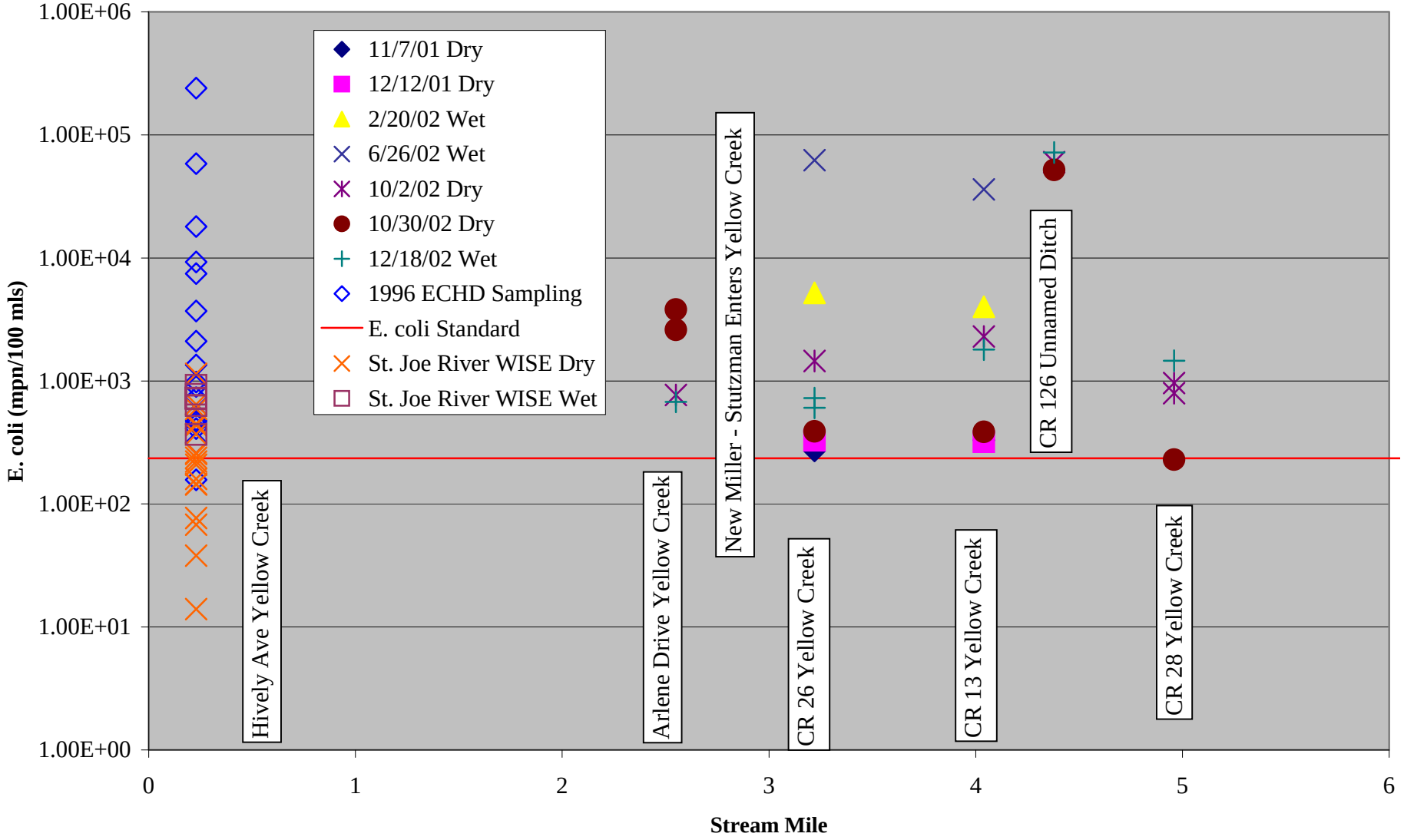
- *Nitrogen*

  On one occasion, a result of 10 mg/L was measured at CR 13 for Nitrates, the drinking water standard. The remaining results were all less than 10 mg/L. There are several potential sources of nitrates in surface waters.

Figure 9

Elkhart County 319 Grant

E.Coli by Stream Mile



Nitrates are a primary component of most fertilizers. Additionally, nitrates are formed by the oxidation of ammonia (NH_3-N) a component of human and animal wastes.

A number of the ammonia results were less than the detection limit of 0.1 mg/L. However, the remaining results were all above the water quality standards for unionized ammonia, which ranges from 0.0075 mg/L at a pH of 6.5 and temperature of 0 C, to 0.2137 mg/L at a pH of 9 and a temperature of 30 C. While these values do not meet the standard, the concentrations, in general, do not increase throughout the Yellow Creek (lower) Watershed. The exception is the increase between the CR 28 sampling point and the CR 13 sampling location. However, the CR 126 ditch discharges into Yellow Creek between these two sampling locations, and the CR 126 ditch consistently had very high levels of NH_3-N. A primary source of ammonia nitrogen is the urea component of human and animal wastes.

Total Kjehldahl Nitrogen (TKN) is a measure of NH_3-N and organic nitrogen. While there is no standard on TKN, a comparison of the TKN and NH_3-N results provides an insight on the amount of organic nitrogen.

- *Phosphorus*

  There is no Indiana State Standard for phosphorus within Yellow Creek. However, phosphorus is monitored during IDEMs triannual review process at drinking water intakes in Lake Michigan. The daily maximum for this review is 0.04 mg/L. The total phosphorus results exceeded the 0.04 mg/L in all samples. High levels of phosphorus can contribute to algal blooms in lakes. However, similar to ammonia-nitrogen, the only significant increase along the creek within the watershed was between CR 28 and CR 13, where it appears that the CR 126 ditch may be a source of phosphorus. Sources of phosphorus include human and animal wastes, fertilizers and decaying organic matter (i.e. leaves and foliage).

Temperature

All temperature measurements were within the monthly temperature standards set forth in the IAC.

Dissolved Oxygen

Dissolved oxygen did not meet the state standards during the June 26, 2002 sampling event or the October 2, 2002 sampling events. Dissolved oxygen at the CR 126 ditch sampling location, tributary to Yellow Creek, was below the standard during all sample events. Dissolved oxygen is critical to the health of aquatic species in a water body. Low dissolved oxygen can be an indication of a pollutant source, especially human and animal wastes.

Elkhart County Health Department – 1993, 1994 and 1995 Yellow Creek Projects

Studies were conducted within the Yellow Creek Watershed (both lower and headwaters) during 1993, 1994 and 1995 by the Elkhart County Health Department. Most of the studies focused on the headwaters portion of the Yellow Creek Watershed, the information provided gives some insight to the water quality within the lower portion of the Yellow Creek Watershed. The following paragraphs provide a description and summary of each years study.

- *Yellow Creek 1993 Water Quality Report*

  During the 1993 study, water quality sampling was conducted at 15 locations within the Yellow Creek Watershed (lower and headwaters). The survey, however, focused on the headwaters portion of the Yellow Creek. One sampling location, CR 18, is within the lower Yellow Creek Watershed, and was sampled weekly during the 1993 study. The geometric mean *E. coli* for this sampling location was 17,702 colonies per 100 ml.

  Additionally, a sanitary survey was conducted from CR 38 to CR 40, within the Yellow Creek Headwaters watershed. The results of the study determined that sources of contamination exist in the upper Yellow Creek watershed from both agricultural and domestic activities.

- *Yellow Creek Survey, 1994*

  The 1994 survey focused on the portions of Yellow Creek near the unincorporated town of Southwest, within the Yellow Creek Headwaters watershed. A sanitary survey was conducted to determine which areas may need further investigation. Based on the results of the sanitary survey, dye testing was conducted at 18 residences to determine potential septic system failure and subsequent contamination to Yellow Creek. The results of the dye testing were that 11 were found to have failing septic systems.

- *Yellow Creek Project, 1995*

  A sanitary survey was conducted along a one-mile stretch of Yellow Creek, north of the town of Southwest. During the survey, 21 tiles were located and 13 sampled throughout the summer when they were active. Of the tiles sampled, seven exceeded the *E. coli* limit of 235 MPN/100 mls. Based on the results of the sampling and dye testing, three of the tiles were conclusively septic.

  Dye testing was conducted, for homes in the Yellow Creek Headwaters Area. Of the fifteen homes tested, two were found to have failing septic systems.

A macroinvertebrate study was also conducted at the following 5 sites, during two sampling events:

- CR 11
- CR 38
- CR 32
- CR 30
- CR 13

The Mitchell and Stapp Pollution Tolerance Index (PTI) was used to evaluate quality of the water based on the number and species of macroinvertebrates collected at each sample location. The PTI scale classifies a score of greater than or equal to 23 as excellent; a score of 17-22 as good; a score of 11-16 as fair; and a score less than or equal to 10 as poor. During the June collection event, four of the collection sites rated fair and one site, CR 32, rated good. The July collection event resulted in increased PTIs at 4 sites by a margin of 5 to 12. During the July event, three sites were classified as excellent, 1 as good and 1 as fair.

The Studies conducted during 1993 through 1995 by the Elkhart County Health Department suggest that both agricultural and domestic activities in the Yellow Creek Headwaters Watershed are contributing to the impaired water quality of Yellow Creek. It should be noted that during these studies, when evidence of failing septic systems were found, that the County Health Department worked with the property owners to remedy the problems.

Elkhart Public Works and Utilities Fish Community Monitoring – 2001 Annual Report

Elkhart Public Works and Utilities conducted a series of studies monitoring the fish communities of St. Joseph River, Elkhart River and their tributaries. Yellow Creek was one of the tributaries sampled. The Index of Biotic Integrity or IBI was determined at various locations and is a tool that is used to assess water quality using fish community information. The IBI is useful in translating complex fish community information into a more understandable format for non-biologists. In this study, Yellow Creek was evaluated for its IBI at three locations, County Road 32, near Concord High School, and the US 20 ByPass. Two of these locations were monitored annually from 1999 through 2001. The Concord High School location was only monitored in 2001. IBI scores can range from 12 (being very poor) to 60 (being very good). The IBI scores for Yellow Creek are shown below:

Table 12
Fish Community Monitoring Index of Biotic Integrity for Yellow Creek Locations

Site	*1999 IBI*	*2000 IBI*	*2001 IBI*	*Average IBI*
County Road 32	34	37	36	36
Concord High School			32	
US 20 ByPass	43	29	28	36

The results of the sampling indicate a decline in the fish community at the US 20 ByPass location over the three year period. IBI scores less than 37 are considered 'poor'.

B. Sanitary Survey

The sanitary survey conducted in the Yellow Creek (lower) Watershed documents the potential sources for introduction of contaminants into Yellow Creek within the defined study reach. The Yellow Creek (lower) sanitary survey study reach was defined from County Road 28 to County Road 13. Figure 9 presents the limits of the study reach. The Yellow Creek survey consisted of physically walking the length of each study reach to visually locate all pipes and tiles. Six pipes were identified within the study reach, as well as one suspect ditch. Water samples were not collected, as none of the identified pipes were discharging at the time of the survey. The location of each pipe was identified using GPS (global positioning system). The outfall locations were then incorporated into GIS, and plotted on Figure 10. The sanitary survey inspection sheets are included in Appendix D. These pipes are listed below in Table 13:

Table 13
Yellow Creek (lower) Sanitary Survey Results

Pipe Number	*Size and Type*	*Flowing*	*Sample Taken?*	*Comments*
STR 001	24" CMP	No	No	Most likely bridge drainage.
DT 002	10" Clay	No	No	
DT 003	12" Clay	No	No	Some erosion at outfall.
DT 004	10" CMP	No	No	
DT 005	4" CMP	No	No	Discoloration of soil.
DT 006	2" PVC	No	No	Could be sump pump outfall.

Based on the sanitary survey, it is most likely that the pipes identified are not from septic systems. None of the pipes were flowing, nor were there noticeable odors or evidence of septage (i.e. toilet paper). However, during the survey, a ditch was identified that appeared to have septic wastewater, as it was darkly discolored and had a septic odor. A sample was collected at this location and resulted in high levels of *E. Coli*, surfactants and nutrients, indicative of domestic wastewater. One of the Phase II sampling locations was selected based on this information.

In addition to the Sanitary Survey, the condition of the Yellow Creek was observed during numerous site visits, on the portions of the Creek that can be seen from Public Roadways. In general, the Creek banks are in good condition, however, the following issues are noted:

- The banks of the Creek between Concord Mall and US 33 are sloughing, and show signs of erosion.

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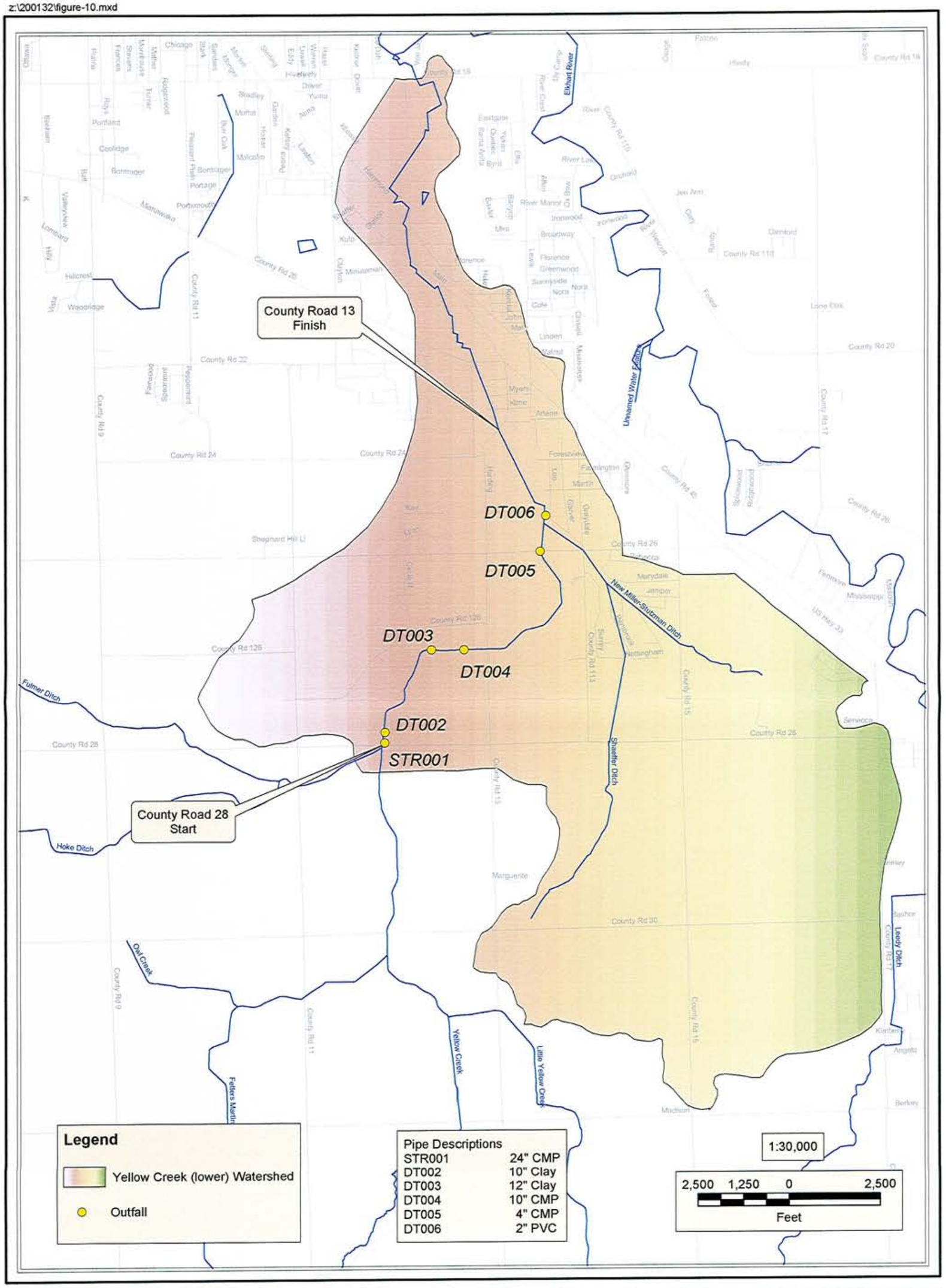

200132	Figure 10	LAWSON-FISHER ASSOCIATES P.C. CONSULTING ENGINEERS 525 W. WASHINGTON AVENUE SOUTH BEND, INDIANA 46601 PH. (574) 234-3167	N W E S			Elkhart County, Indiana Yellow Creek (lower) Watershed Management Plan 2002 Sanitary Survey

C. Pollutant Sources and Stressors

- *Failing On-Site Septic Systems*

  The water quality sampling indicates fairly high levels of *E. coli*, an indicator of human or animal wastes. Additionally, in some areas, the high *E. coli* levels are combined with elevated MBAS (surfactants) indicating the presence of domestic wastes (soaps and detergents). The limited capacity of the existing soils for septic systems also leads to the conclusion that there may be failing septic systems within the area. With a limited depth to water table, septic tank effluent may intercept groundwater or surface water sources, without receiving adequate treatment, resulting in contaminated ground or surface waters. The number of repair permits in the area (approximately 185 or 48% of the total permits filed within the watershed in a 11 year period) indicates a high level of septic system repair. As development increases and on-site systems are used, the potential for failing systems increase. While this management plan has focused on the impairments to the Yellow Creek surface water, the groundwater quality is also at risk due to failing on-site septic systems. Most of the homes within the watershed have individual wells as their water supply.

  There is sufficient evidence to suspect a failing septic system(s) near the CR 126 unamed ditch sampling site. This site consistently exhibited very high levels of *E. coli*, nutrients and MBAS, indicating a domestic source of pollution.

- *Direct Discharge of Septic Tank Effluent*

  Because of the poor soils, older residences may have direct discharges of their septic tank effluent to either creeks or ditches. Septic systems or connection to a public sewer are of course required for newer construction and have been required since 1967. Although no direct discharges were identified during the Watershed Management Plan water quality monitoring, a sanitary survey was not conducted in the entire creek system of the watershed. Instances of direct discharges have been identified in previous studies in the Yellow Creek Headwaters watershed.

- *Increased Development*

  Increased development has the potential to adversely affect the surface water quality and quantity. The increased residential development requiring on-site wastewater disposal systems has a significant potential to affect water quality, due to the limited capacity for septic treatment of the existing soils. Additionally, water quality can be affected by construction practices. Higher density development also contributes to water pollution due to many factors, including increased traffic, increased surface water runoff that may cause erosion and higher peak flows.

- *Agricultural Practices*

  A significant portion of the watershed is agricultural, primarily cropland. There is a moderate potential for erosion, due to the nature of the soils within the area, which can impair water quality. Erosion increases the sediment load to surface waters as well as transporting nutrients (phosphorus and nitrogen) from fertilizers.

- *Upstream Sources*

  As shown by the sampling results and the previous studies conducted by the County, Yellow Creek is impaired as it enters the Yellow Creek (lower) Watershed. The Yellow Creek – Headwaters Watershed was also determined to be a priority watershed in the ECC 319 Grant Project. The high *E. coli* concentrations indicated at CR 28 sampling point can be attributed to both domestic and animal wastes. The Headwaters Watershed is primarily agricultural and residential in nature.

D. Identification of Critical Areas

- *CR 126 Ditch*

  Water quality sampling results at CR 126 ditch indicate a high probability of failing septic systems. These samples were extremely high in *E. coli*, nutrients, TDS, TSS and had low DO. These samples also contained higher levels of surfactants, indicating a domestic source (presence of detergents and soaps). This ditch flows into Yellow Creek not far from where the sampling was conducted. This ditch is dry during dry weather (except for ponding at the sampling location).

- *Yellow Creek from CR 28 to CR 13*

  Concentrations of *E. coli* and nutrients fairly consistently increase between CR 28 and CR 13. One source of contaminants is CR 126. However, there may be other sources that contribute within that stretch of the Creek.

- *Yellow Creek between Concord Mall/US 33*

  Erosion and sloughing of the banks of Yellow Creek is evident where the Creek flows between Concord Mall and US 33.

V. Goals and Action Items

A number of goals have been identified throughout the planning process, based on the concerns and subsequent watershed assessment. This section itemizes the goals along with proposed action items by which to achieve the goals.

Goal #1: Reduce E. coli, and Suspected Septic Contamination in CR 126 Ditch

The CR 126 Ditch exhibits very high levels of E. Coli, nutrients, phosphorus, total dissolved solids and surfactants. The existing condition average concentrations are shown below:

CR 126 Ditch – Existing Condition

Parameter	Wet Weather Average Concentration	Dry Weather Average Concentration
E. coli	75,500 col/100 mls	56,000 col/100 mls
TDS	418.5 mg/L	1,411 mg/L
NH_3-N	2.9 mg/L	28.4 mg/L
MBAS	1.11 mg/L	1.4 mg/L

Action Items:

- Identify Specific Source(s) of Septic Waste

  The sampling results in CR 126 ditch indicate high levels of *E. coli*, nutrients and the presence of surfactants, all suggesting contamination from septic systems. A system of dye testing the adjacent homes should be conducted to identify the specific source of the contaminants. It is conceivable that the source or sources may be some distance from the CR 126 ditch sampling site, and is transported through field tiles. The Elkhart County Health Department can conduct these studies, as part of their ongoing septic system program.

- Eliminate Source(s) of Septic Waste

  Once the specific source(s) is found, the County Health Department will work with the property owner to rectify the situation. If public sewer is available, the failing system should be connected to a public sewer. In areas with high concentrations of failing systems, other alternatives to providing wastewater treatment should be explored (see Goal #2).

- Explore Funding Source(s) To Eliminate Septic Waste

  Typically, property owners fund repair to their septic systems. However, the Indiana Department of Environmental Management State Revolving Fund Program is initiating a program to provide financial assistance for nonpoint source projects. Failing septic systems is one nonpoint source of pollution that IDEM envisions funding. Funding is available to cities, towns, counties, townships, non-profit organizations, regional water, sewer or waste districts or conservancy districts. Funding is available as a low interest loan (below market rates) for typically a 20-year period. While these funds are not directly available to the individual homeowner, a separate entity could apply for the funds and administer the funds as appropriate.

Indicators of Success:

There are several indicators of progress associated with Goal #1 including:

- Identification of source or sources of contamination.
- Coordination with property owner or owners to develop a plan to remedy failing septic system or systems.
- Completion of septic system repair/replacement or connection to public sewer.
- Reduced *E. coli*, nutrients, TDS and MBAS (surfactants) concentrations in CR 126 ditch, and subsequent reduced concentrations in Yellow Creek. Due to the consistent presence of surfactants, the source of contamination is of a domestic nature. However, the actual source (which home or homes) is not clear. The source of the waste may be originating from a number of residences or just one residence. Once the source of the flows are identified an actual reduction in pollutant loading can be estimated. However, given the data obtained, it is fairly clear that the elevated concentrations in that area are domestic in nature, and will be significantly reduced once the source or sources of pollutants are identified and removed. Target concentrations for the CR 126 ditch are given below:

CR 126 Ditch – Target Condition

Parameter	*Wet Weather Average Concentration*	*Dry Weather Average Concentration*
E. coli	<7,500 col/100 mls (90% reduction)	< 235 mg/L (State standard)
TDS	< 750 mg/L (State standard)	< 750 mg/L (State standard)
NH_3-N	< 2 mg/L	<0.5 mg/L
MBAS	<0.1 mg/L	<0.1 mg/L

Timeframe:

It is anticipated that the identification of the contamination source and subsequent elimination can be completed within two to three years.

Goal #2: Explore Methods to Plan, Construct, Operate, Maintain and Finance Public Wastewater Systems

Currently, Elkhart County does not have in place, a form of government that provides the ability to finance, operate or maintain a public wastewater system(s). Outside of the municipalities in the area, public wastewater utilities are limited to Conservancy Districts which cover a limited geographic region. Therefore, communities that may have need of an alternative method (to on-site systems) for treating and disposing of their wastewater have limited abilities to provide such alternative methods. At this time, the County Health Department is able to assist the homeowners on a case by case basis. However, there are some areas where a public system (alternative or conventional) may be a more permanent and economically feasible option.

The initial evaluation should be in terms of an identified community that is in need of a public wastewater system. This would provide a pilot project for Elkhart County to address other areas in the future.

Action Items:

- *Evaluate Sanitary District Formation or Conservancy District Formation*

  The increased development within the watershed as well as other areas in Elkhart County is a stress on the water quality of both surface and ground water sources. The Yellow Creek watershed has soil characteristics such that the capacity for on-site disposal systems is limited. In many cases, specialized systems, such as mound systems are required. These systems are quite costly to the individual homeowner. With respect to Yellow Creek (lower) Watershed, the evaluation would most likely be limited to the opportunities for expansion of existing systems (City of Goshen, City of Elkhart) due to their close proximity and the design limitations of existing infrastructure.

- *Discuss Options with Adjacent Public Sewer Systems, the City of Elkhart and the City of Goshen*

  The City of Elkhart and City of Goshen sewer service areas both include a small portion of the Yellow Creek (lower) watershed. Discussions with these Cities on the potential to expand their service areas to minimize nonpoint source pollution due to failing septic systems should be initiated.

- *Explore Funding Sources*

  There are several funding sources available to the County or other public agencies for planning, construction, operation and maintenance of a public sewer system. The types of funding available depend on the type of entity that is operating the system. Grant and loan funds are also available, typically on a competitive basis. Grant and loan funds include but are not limited to SRF Funding and USDA Rural Community Assistance Program.

Indicators of Success:

The primary indicator of success for this goal is the identification of a preferred method to plan, finance, construct, operate and maintain a public wastewater system.

Timeframe:

The evaluation of Sanitary District or Conservancy District Formation as well as discussions with adjacent public sewer systems and exploring funding sources should be conducted within 2 years.

Goal #3: Eliminate Direct Discharges of Septic Tank Effluent from Yellow Creek

This goal is similar to Goal #1, but without a specified target location. The sampling conducted as part of the 319 Grant Project indicated that there are consistent increases of *E. coli*, nutrients and surfactants between CR 28 (upstream) and CR 13 (downstream). The remaining reaches of Yellow Creek are inconsistent, both increasing and decreasing in concentration as you travel downstream from one sample location to the next during both wet and dry weather events indicating that there are sources of wastes that are highly variable. Factors that influence the concentrations include the intensity of the rain events, and groundwater levels. For example, in times of a seasonally high water table, a marginally operating septic system may be impacting the surface waters. In any case, there are reaches of the creek that appear to contain sources of human and/or animal wastes. The following table summarizes the wet and dry weather average concentrations at CR 28, the most upstream point in the watershed and at Arlene Drive, the most downstream sampling point in the watershed. It should be noted that there are significant agricultural and domestic sources of *E. coli* entering the Yellow Creek (lower) Watershed, from the Yellow Creek Headwaters Watershed.

CR 28 and Arlene Drive – Existing Conditions

Parameter	*Wet Weather Average Concentration*	*Dry Weather Average Concentration*
E. coli CR 28	662 col/100 mls	10,220 col/100 mls
E. coli Arlene Drive	4,337 col/100 mls	2,390 col/100 mls
TDS CR 28	362 mg/L	757 mg/L
TDS Arlene Drive	363 mg/L	381 mg/L
NH_3-N CR 28	<0.1 mg/L	1.9 mg/L
NH_3-N Arlene Drive	0.85 mg/L	<0.1 mg/L
MBAS CR 28	<0.1 mg/L	<0.1 mg/L
MBAS Arlene Drive	0.1 mg/L	<0.1 mg/L

Action Items:

- *Continue to Monitor E. coli Levels in Yellow Creek and its Tributaries for Source(s) of Contamination*

  The Elkhart County Health Department will continue to sample for *E. coli* along Yellow Creek. A review of the *E. coli* levels should identify particular stretches of the Creek which may need additional investigation.

- *Complete the Sanitary Survey of Yellow Creek and its Tributaries*

  Only a portion of Yellow Creek was surveyed for outfalls. Additional surveys should be completed to generate a comprehensive inventory of outfalls discharging to the Creek.

  This activity should be coordinated with Elkhart County Health Department, Elkhart County Surveyor's Office and City of Elkhart. This action is also required within the MS4 Urban Areas as part of the NPDES Phase II Stormwater Rules, and IDEM Rule 13.

- *Dye Testing to Identify Source(s) of Septic Tank Effluent*

  Once specific areas of potential septic contamination are identified, a program of dye testing should be conducted to identify which homes or businesses may be contributing to the contamination of the Creek.

- *Eliminate Source(s) of Septic Waste*

  Similar to the action items of Goal 1, once the specific source(s) is found, the County Health Department will work with the property owner(s) to rectify the situation. If public sewer is available, the failing system should be connected to a public sewer. In areas with high concentrations of failing systems, other alternatives to providing wastewater treatment should be explored (see also goal 2).

- *Explore Funding Source(s) to Eliminate Septic Waste*

  Typically, property owners fund repair to their septic systems. However, the Indiana Department of Environmental Management State Revolving Fund Program is initiating a program to provide financial assistance for nonpoint source projects. Failing septic systems is one nonpoint source of pollution that IDEM envisions funding. Funding is available to cities, towns, counties, townships, non-profit organizations, regional water, sewer or waste districts or conservancy districts. Funding is available as a low interest loan (below market rates) for typically a 20-year period. While these funds are not directly available to the individual homeowner, a separate entity could apply for the funds and administer the funds as appropriate.

Indicators of Success:

Similar to Goal #1, there are several indicators of progress associated with Goal #3 including:

- Collection of additional water quality data.

- Identification of source or sources of contamination.

- Coordination with property owner or owners to develop a plan to remedy failing septic system or systems.

- Completion of septic system repair/replacement or connection to public sewer.

- Reduced *E. coli*, nutrients, TSS and MBAS (surfactants) concentrations in Yellow Creek.

The specific source(s) of *E. coli*, nutrients and MBAS are not known at this time, so the exact total target reduction cannot be determined. However, reasonable reduction targets within a 5 year period for goal number 3 are listed in the following table:

Yellow Creek (lower) Target Conditions

Parameter	*Wet Weather Average Concentration*	*Dry Weather Average Concentration*
E. coli	Reduce 30%	Reduce 20%
TDS	Meets WQ Standards	Meets WQ Standards
NH_3-N	Reduce 20%	<0.1 mg/L
MBAS	<0.1 mg/L	<0.1 mg/L

The following table provides an estimated load reduction, per average single family residence with three people, on a septic system repair. The load reduction would vary depending on the severity of the septic system failure. This estimation can be used to determine actual reductions as repairs are made.

Per Household Reductions

Parameter	*Elimination of direct discharge of residential sewage**	*Elimination of discharge of Septic Tank Effluent**
BOD_5	0.38 lb/day	0.18 lb/day
TSS	0.31 lb/day	0.09 lb/day
Total Nitrogen	0.06 lb/day	0.05 lb/day
NH3-N	0.015 lb/day	0.0006 lb/day
NO3-N	0.0007 lb/day	0.0005 lb/day
Total Phosphorus	0.031 lb/day	0.019 lb/day
Fecal Coliform	3.1×10^9 coliform/day	6.2×10^7 coliform/day

*Reduction based on one household with three residents.

Timeframe:

The collection of additional water quality data should be an on-going activity to monitor the watershed for new concerns and identify specific sources as well as to verify the results of the efforts to eliminate pollutant sources. However, once an area of concern is identified, the area should be investigated within one year to identify the specific source. Once source(s) of contamination are identified, it is anticipated that it may take 1 to 2 years to remove the source once it is identified, depending on construction season and planned improvement.

Exploring funding sources should be initiated within one year. However, this activity should be ongoing, as the amount and types of funding available vary from year to year, as well as the requirements to qualify for such funding.

Completion of the sanitary survey for lower Yellow Creek and its tributaries should take place within 5 years.

Goal #4: Discourage Medium to High Density Development Requiring On-site Wastewater Systems Where the Soils are not Adequate to Treat the Septic Effluent in Order to Protect Surface Waters and Groundwater

Currently, new subdivisions and developments are reviewed by the Planning Commission for approval. The developments must meet the requirements of the current subdivision and planning ordinances. Any new on-site systems also must be permitted by the Elkhart County Health Department and meet State Standards.

Action Items:

- Review existing ordinances and policies, and revise as needed, with respect to existing subdivision and zoning regulations.
- Review Watershed Management Plan with Planning Commission to demonstrate issues with on-site wastewater treatment systems in limiting soils.
- Participate with Planning Commission on zoning issues.

Indicators of Success:

- Monitor number, location and type of septic system permits. Compare permit locations with zoning and land use plans.
- With respect to water quality in Yellow Creek, the target for this goal is to see no increase in *E. coli*, NH_3-N or TDS due to new development.

Timeframe:

The timeframe for this goal is to review the existing ordinances and policies and revise as needed within 1 year. Attention to planned development with respect to appropriate uses and protecting water quality should be an ongoing activity.

Goal #5: Use the Yellow Creek (lower) Management Plan as a Template to Address E. coli in Other Elkhart County Watersheds (for example, Yellow Creek Headwaters, Turkey Creek-Swoveland Ditch or Heaton Lake-Putterbaugh Creek)

As identified during the Elkhart County Commissioner's 319 Grant Project, there are several watersheds within Elkhart County that currently experience high E. coli levels due to either development or agricultural practices.

Action Items:

- Continued Sampling by the Elkhart County Health Department to identify areas of water quality impairment.

- Develop a Watershed Management Plan(s) for other areas.

- Explore methods for funding Watershed Management Plans and Water Quality Improvement Projects. Grant funding sources include IDEM 205(j) Grants and IDEM 319 Grants.

Indicators of Success:

Indicators of success for this goal include the development and implementation of Watershed Management Plans for other impaired watersheds.

Timeframe:

Similar to Goal #3, the water quality investigations conducted by the Elkhart County Health Department are an on-going activity to monitor watersheds and identify areas of concern. The initiation of a Watershed Planning Project in another Elkhart County Watershed should occur within 5 years.

Goal #6: Continue to Educate Residents of On-site Wastewater Systems

Action Items:

- Distribute education information at appropriate locations and events. Educational information can be distributed at public locations such as County Buildings, Public Libraries and at Public Meetings addressing water quality. The Elkhart County Fair is also a good location for distribution of these educational materials.

- Continue to educate public through the investigation of failing septic systems.

- Collect educational materials from various sources (i.e. IDEM, USEPA, and National Small Flows Clearinghouse) for use and distribution within the watershed.

- Develop a web-page.

Indicators of Success:

- Web page development.

- Tally events and locations educational information is distributed.

- While providing educational and information opportunities regarding on-site systems does not have a direct effect on water quality in the short term, the long term goal is to increase awareness and better on-site system operation and maintenance resulting in decreased nutrients, *E. Coli* and TDS to the surface waters.

Timeframe:

Goal #6 is an ongoing process to increase awareness and promote good management practices for residences and commercial establishments with on-site disposal systems. This goal should be initiated within 1 year.

Goal #7: Continue an education program on the effects of agricultural practices on water quality and management practices to reduce contaminants to surface waters.

Action Items:

- Encourage a science program within the local school systems to address water quality and watershed issues. The information provided in the Watershed Management Plan could be incorporated as well as a site visit to give a local tie to water quality. The Elkhart County Soil and Water Conservation District can provide educational training, materials and assistance to interested educators for a project, specifically through current programs such as "project wet" and "project wild". The program should be structured such that the state science standards are met. Providing educational opportunities in the classroom not only informs the future generation of agricultural producers, but also provides another avenue for information to be supplied to their parents.

- Recruit an individual or group (this could be a school classroom) to participate in the Hoosier River Watch Program to collect water samples for Yellow Creek. The SWCD would also be involved in the training for water quality sampling in this program.

- Web-page.

- The SWCD/NRCS incorporates their newsletter on a monthly basis into the local (Elkhart County) editions of the Farmer's Exchange Newspaper. An article(s) could be published on the Yellow Creek Watershed Management Plan, as well as updates on the implementation of the plan.

- Newspaper articles on local water quality issues.

- Collect educational materials from various sources (i.e. IDEM, USEPA, IDNR, USDA, National Small Flows Clearinghouse) for use and distribution within the watershed.

- All forms of media (newspaper, radio, television and internet) are an avenue for continuing education.

Indicators of Success:

- Web page development.
- Tally events and locations educational information is distributed.
- Number of classrooms adopting watershed program as part of their science curriculum.
- Hoosier River Watch participation within the watershed.
- While providing educational and information opportunities regarding agricultural practices does not have a direct effect on water quality in the short term, the long term goal is to have a positive effect on agricultural management practices resulting in decreased nutrients, *E. coli* and TDS to the surface waters.

Goal #8: Develop and Implement BMPs to Reduce Agricultural, Commercial and Residential Sources of Contaminants

Action Items:

- Agricultural BMPs

  A number of BMPs are appropriate to reduce sediment and pollutant load to surface waters. BMPs to consider are: Manure Management Plans, Filter Strips, crop management practices and exclusion fencing.

  With respect to crop management, the following table provides existing (2002) conditions in Elkhart County, according to NRCS:

Existing Condition – Cropland Tillage Data

Tillage Practice	*2002 Cropland Tillage Data - Corn*	*2002 Cropland Tillage Data - Soybeans*
No Till – Any direct seeding system, including strip preparation, with minimal soil disturbance.	18%	39%
Mulch Till – Any tillage system leaving greater than 30% crop residue cover after planting, excluding no-till	10%	39%
Conventional – Any tillage system leaving less than 30% crop residue cover after planting.	71%	21%
Nonapplicable – Hay, CRP, fallow or other non-annually seeded crops.	1%	1%

Reference: www.in.nrcs.usda.gov

Increased conservation tillage is dependent on cooperation with the agricultural producers in the area and directly linked to the educational and informational efforts in Goal #7. Increase in conservation tillage practices is also a function of the funding sources available. However, a reasonable target for increased conservation tillage is a 5% increase over 5 years.

With respect to filter strips, approximately 100 acres on average are constructed in Elkhart County per year. A reasonable target for the Yellow Creek (lower) Watershed is construction of 5 acres over 5 years.

- Review County Subdivision and Roadway Standards, incorporate (if necessary) Best Management Practices (BMPs) to address erosion control for both construction and post construction cases.

  BMPs to consider include silt fences, straw bales, catch basins, grassed swales, detention ponds and vegetative filter strips.

  This action item is integral with the NPDES Stormwater Phase II Regulations (IDEM Rule 13) that affects a significant portion of the watershed.

- Stabilize Yellow Creek banks in the vicinity of Concord Mall and US 33.

  Approval from the Elkhart County Drainage Board will be required for any projects affecting a Legal Drain. The Elkhart County Surveryor's office is currently in the design phase for aquatic habitat BMPs in Yellow Creek between CR45 and the US 20 Bypass.

- Explore funding sources for BMPs.

A number of funding sources are available to assist in implementation of BMPs. Several sources are described below:

LARE Funds (Lake and River Enhancement Program) – These funds are available for water quality project implementation when a diagnostic study has been completed for the watershed. The existing water quality sampling results can be augmented to meet the diagnostic study requirements, so that implementation funds can be applied for.

EQIP Funds (Environmental Quality Incentive Program) – These funds are cost sharing programs available to agricultural producers and can be used for filter strips and other agricultural BMPs. These funds are administered by the NRCS, and the amount of funds vary from year to year.

CRP Funds (Conservation Reserve Program) – These funds are cost sharing funds available to agricultural producers and can be used for crop management practices.

IDEM 319 Grants – These funds are grant funds available for water quality improvement projects. There is a requirement for 25% cost sharing of cash or in-kind services with this grant program.

Indicators of Success:

- Tally BMPs implemented within watershed by type and date.

- Agricultural BMPs:

  Implementation of manure management plan(s) will result in decreased nutrients, *E. coli* and TDS concentrations within the Creek. Increased conservation tillage will result in decreased nutrient and solids loading to the Creek. The sediment, nutrient and phosphorus loading reductions can be estimated for the agricultural BMPs, once specific projects are identified. The reductions are typically based on contributing area, soil type and land use. The *Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual*, (MDEQ, June 1999) can be used to estimate pollutant loading reductions for each BMP implemented.

- Residential and Commercial BMPs

  The residential and commercial BMPs suggested are tied most specifically to new construction and future development. As such, they will not have a major impact on existing pollutant loads. However, inclusion of the BMPs in the development standards will minimize impacts of future development on water quality primarily with respect to nutrients, solids and quantity of flows.

- Yellow Creek Bank Stabilization

  Stabilization of the Yellow Creek bank near Concord Mall/US 33 will result in reduced sediment and nutrient loads. An estimate of pollutant load reduction is detailed as follows:

  Based on field observation, approximately 400 feet of stream bank is eroding in the vicinity of Concord Mall. The height of the Yellow Creek bank in this area is approximately 10 feet. Most of the current bank erosion can be classified as moderate, with limited areas severe, in accordance with *Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual*, (MDEQ, June 1999). The lateral recession rate (LRR) is therefore estimated as 0.2 feet per year. The soil type in this area is Brookston Loam. Stabilization of the stream bank will result in reduced sediment, nitrogen and phosphorus loads to the Creek. The sediment and nutrient reduction is estimated using *Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual*, (MDEQ, June 1999) and detailed below:

  Sediment Reduction:

  Sediment Reduction = Length x Height by LRR x soil weight
  Sediment Reduction = 400 ft x 10 ft x 0.2 ft/yr x 0.045 tons/ft^3
  Sediment Reduction = 36 tons per year

Phosphorus and Nitrogen Reduction:

Reduction in Phosphorus = sediment reduction x fraction P x correction factor
Reduction in Phosphorus = 36 ton/yr x 0.0005 lb P/lb sediment x 1.0 x 2000 lb/ton
Reduction in Phosphorus = 36 lbs/yr phosphorus reduction

Reduction in Nitrogen = sediment reduction x fraction N x correction factor
Reduction in Nitrogen = 36 ton/yr x 0.001 lb N/lb sediment x 1.0 x 2000 lb/ton
Reduction in Nitrogen = 72 lbs/yr nitrogen reduction

Once the design of a stabilization project is completed, the actual sediment and nutrient reductions can be more accurately estimated.

- Estimate load reduction based on specific BMPs as they are implemented.

Timeframe:

Encouraging the implementation of BMPs should be an ongoing effort. With respect to specific BMPs, the following timeframes and targets are suggested:

- Conservation Tillage – Increase 5% in 5 years.
- Filterstrips – Construct 5 acres in 5 years.
- Review and Incorporate BMPs in County Standards within 2 Years.
- Stabilize the Yellow Creek Banks near Concord Mall within 4 to 5 years.

Goal #9: Identify a Watershed Coordinator

Action Items:

- A number of water quality and wet weather issues exist within Elkhart County, including the Yellow Creek (lower) Watershed Management Plan and NPDES Stormwater Phase II. It may be appropriate to identify a watershed coordinator within the County or SWCD to oversee the implementation of this Management Plan as well as other water quality issues. The coordinator would provide water quality continuity throughout the County. In absence of a Watershed Coordinator, the Elkhart County Administrator will oversee the implementation of this Plan. It should be noted that Elkhart County is in the process of creating a position for an Urban Conservationist in the Soil and Water Conservation District Office. This position's primary responsibility would be the implementation of the requirements of IDEM's Rule 13 which addresses the new NPDES Stormwater Phase II regulations.

- Explore Funding Sources for a Watershed Coordinator. A logical funding source could be General County Revenues in conjunction with the SWCD.

Indicators of Success:

The indicator of success for this goal is to have a watershed coordinator for this Plan as well as other potential plans within the County.

Timeframe:

A watershed coordinator should be identified within 1 year.

Goal #10: Continue to Work Cooperatively with Other Watershed Groups within the Elkhart River/St. Joseph River Basins

Action Items:

- Attend Joint Steering Committee Meetings.
- Present status updates on the implementation of the Watershed Management Plan at the Committee Meetings.

Indicators of Success:

The indicator of success is a log of meetings and watershed groups.

VI. Implementation Plan

A. Plan and Schedule

Each of the goals and action items detailed in the previous section are summarized in Table 14, along with the entities responsible for carrying out the action items and a proposed timeframe for each action.

B. Calendar of Events and Project Milestones

A list of Watershed Management Plan Events, past and future, and target project milestones is provided in Table 15.

Table 14
Yellow Creek (Lower) Watershed Management Plan
Goals and Action Items

GOALS	*ACTION ITEMS*	*RESPONSIBLITY*	*TIMEFRAME*
Goal #1: Reduce E. coli, and suspect contamination in C.R. 126 Ditch	Identify specfic source(s) of waste: Conduct a systematic dye testing program of adjacent homes.	ECHD	1-Year
	Eliminate source(s) of waste: Once failing system(s) are identified, the ECHD will work with the property owner to repair or replace system. IDEM is promoting State Revolving Fund Loan Program for failing septic systems to be administered by public agencies. Elkhart County is eligible to apply for the funding to help property owners address failing systems.	ECHD, Property Owner.	1-2 Years
Goal #2: Explore methods to plan, construct, operate, maintain and finance public wastewater treatment systems.	Evaluate Sanitary District Formation or Conservancy District Formation. Coordinate with existing public sewer systems (City of Elkhart, City of Goshen).	ECC	2-Years
Goal #3: Eliminate Direct Discharges of Contamination from Yellow Creek	Continue to monitor *E. coli* levels in the Yellow Creek and its tributaries to identify sources of contamination.	ECHD	Ongoing
	Identify specific sources of septic pollution by conducting a systematic dye testing program of adjacent homes.	ECHD	Ongoing
	Eliminate source(s) of waste: Once failing system(s) are identified, the ECHD will work with the property owner to repair or replace system. IDEM is promoting State Revolving Fund Loan Program for failing septic systems to be administered by public agencies. Elkhart County is eligible to apply for the funding to help property owners address failing systems.	ECHD, Property Owner	Ongoing
	Evaluate use of IDEM SRF funding.	ECC, IDEM	1-Year
	Complete sanitary survey of Yellow Creek and tributaries.	ECHD	5-Years
Goal #4: Discourage medium to high density development requiring on-site wastewater systems where soils are not adequate to treat septic system waste.	Review existing ordinances, policies, and land use plans and revise as needed, with respect to existing subdivision and zoning regulations.	Elkhart County EC Planning Dept.	1-Year
	Encourage development to occur in areas where public sewer systems are available.	EC Planning Dept.	Ongoing
Goal #5: Use the Yellow Creek (lower) Management Plan as a template to address E. coli in other Elkhart County watersheds (for example, Yellow Creek Headwaters, Turkey Creek – Swoveland Ditch or Heaton Lake-Putterbaugh Creek).	Continued sampling by ECHD to identify areas of water quality impairment.	ECHD	Ongoing
	Develop watershed management plan(s) for other areas.	ECC/SWCD	5-Years
	Continue a program of sanitary surveys in areas of identified high E. coli concentrations to identify specific sources. This item can be coordinated with IDEM Rule 13.	ECHD	3-Years
Goal #6: Continue to educate resident of on-site wastewater systems.	Distribute educational information at appropriate locations and events.	ECHD, ECC, SWCD	Ongoing
	Continue to educate public through the investigation of failing septic systems.	ECHD	Ongoing
	Develop a web-page addressing non-point source pollution and wet weather issues.	ECHD/SWCD	Ongoing
	Educate public through local media (newspaper, television and radio).	ECHD, SWCD	Ongoing
Goal #7: Continue an education program on the effects of agricultural practices on water quality and management practices to reduce contaminants to surface waters.	Encourage a science program through the local school systems to address local water quality and watershed issues.	SWCD	3-Years
	Recruit an individual or group (could be a school classroom) to participate in the Hoosier River Watch Program collecting water samples from Yellow Creek.	SWCD, Public	3-Years
	Include agricultural water quality issues on web-page.	ECHD/SWCD	3-Years
	Publish articles in the SWCD/NRCS newsletter that is incorporated monthly into local issues of the Farmer's Exchange Newspaper.	SWCD/NRCS EC Extension	Ongoing
	Educate through local media (newspaper, television and radio).	ECHD, SWCD	Ongoing
Goal #8: Develop and Implement BMP's to reduce agricultural, commercial and residential sources of contaminants.	BMPs to address agricultural sources of pollution include filter strips, exclusion fencing and manure management plans. There are cost sharing programs available to agricultural producers administered through the NRCS. Grant funding is also available through the IDEM 319 program. Additional funding may also be available through the LARE program administered by the IDNR.	ECHD, SWCD, NRCS	Ongoing
	Review County Subdivision and Roadway Standards. Incorporate (if necessary) BMPs to address erosion control for both construction and post construction conditions.	EC Planning Dept. EC Highway Dept.	2-Years
	Include BMPs on web-page.	ECHD/SWCD	3-Years
	Encourage conservation practices to address erosion associated with crops. There are cost sharing programs to assist agricultural producers.	NRCS/SWCD	Ongoing
	Stabilize the banks of Yellow Creek in the vicinity of Concord Mall and US 33.	EC Drainage Board	4-5 Years
Goal #9: Identify a Watershed Coordinator	Identify coordinator.	ECC/SWCD	1-Year
Goal #10: Continue to work cooperatively with other watershed groups within the Elkhart River/St. Joseph River Basin.	Attend Joint Steering Committee Meetings.	ECC/ECHD, SWCD	Ongoing

Table 15
Calendar of Events and Project Milestones

Event or Project Milestone	*Date/Timeframe*	*Activity*
Milestone	July 16, 2001	ECC 319 Grant Project Begins
Event	April 8, 2002	Turkey Creek – Swoveland Ditch Watershed, 1st Public Meeting
Event	April 15, 2002	Yellow Creek (lower) Watershed, 1st Public Meeting
Event	April 22, 2002	Yellow Creek – Headwaters Watershed, 1st Public Meeting
Event	September 9, 2003	Yellow Creek Watershed Management Plan Public Meeting
Event	September 17, 2002	Joint Steering Committee Meeting
Event	October 20, 2002	Communities at the Crossroads V – Indiana Land Use Consortium Seminar
Event	December 15, 2002	Joint Steering Committee Meeting
Event	March 26, 2003	Joint Steering Committee Meeting
Event	May 14, 2003	Yellow Creek (lower) Watershed, 2nd Public Meeting
Event	May 18, 2003	Yellow Creek – Headwaters Watershed, 2nd Public Meeting
Event	May 28, 2003	Turkey Creek – Swoveland Ditch Watershed, 2nd Public Meeting
Event	June 11, 2003	Joint Steering Committee Meeting
Event	July 16, 2003	ECC 319 Grant Project Ends
Event	July 18-26, 2003	Elkhart County 4H Fair (Goals 6 and 7)
Event	August 27, 2003	Joint Steering Committee Meeting (Goal 10)
Event	November 19, 2003	Joint Steering Committee Meeting (Goal 10)
Event	February 18, 2004	Joint Steering Committee Meeting (Goal 10)
Event	April 14, 2004	Joint Steering Committee Meeting (Goal 10)
Milestone	July 2003 – July 2004	Identify Watershed Coordinator (Goal 9)
Milestone	July 2003 – July 2004	Identify Source(s) of CR 126 Contamination (Goal 1)
Milestone	July 2003 – July 2004	Review existing ordinances, policies and land use plans (Goal 4).
Milestone	July 2003 – July 2005	Evaluate means to plan, finance, construct, operate and maintain public wastewater systems. (Goal 2)
Milestone	July 2003 – July 2005	Review County Subdivision and Roadway Standards. Incorporate (if necessary) appropriate BMPs for construction and post construction conditions.
Milestone	July 2003 – July 2006	Encourage science program through local school system (Goal 6).
Milestone	July 2003 – July 2006	Recruit an individual or group to participate in Hoosier River Watch Program (Goal 7)
Milestone	July 2004 - July 2006	Eliminate source(s) of CR 126 Contamination (Goal 1)
Milestone	July 2003 – July 2008	Complete sanitary survey of Yellow Creek (Goal 3).
Milestone	July 2003 – July 2008	Use Yellow Creek (lower) Watershed Management Plan as a template for other watersheds (Goal 5).
Milestone	July 2003 – July 2008	Stabilize Yellow Creek Bank in vicinity of Concord Mall (Goal 8)
Milestone	July 2003 – July 2008	Increase conservation tillage practices by 5% within the watershed. (Goal 8)
Milestone	July 2003 – July 2008	Construct 5 acres of filter strips within the watershed. (Goal 8)

VII. Evaluating and Adapting the Plan

The Watershed Management Plan will be evaluated by assessing the progress made on each Goal identified in the previous sections. The evaluation of the Plan will be the responsibility of Elkhart County and should be conducted by the Watershed Coordinator. In the interim, prior to identification of a Watershed Coordinator, evaluating and adapting the Plan will be the responsibility of the Elkhart County Administrator.

The plan should be evaluated every two years to assess the progress made as well as to revise the plan if appropriate based on the progress achieved as well as additional information gathered. The Plan is meant to be a flexible tool to achieve water quality improvements within the Yellow Creek (lower) Watershed.

References:

1. Hydrogeologic Atlas of Aquifers in Indiana,
   USGS Water Resources Investigations Report 92-4142, 1994

2. Elkhart County, Indiana Handbook and Relocation Guide, 2002

3. History of Elkhart County, Indiana, 1881

4. Soil Survey of Elkhart County, USDA and NRCS, 1997