

Section IV: Water Quality Investigation

Designated Uses and Water Quality Standards

The State of Indiana specifies appropriate water uses to be achieved and protected for each water body, as required by the US EPA. Appropriate uses are identified by taking into consideration the use and value of the water body for public water supply; protection of fish, shellfish, and wildlife; and for recreational, agricultural, industrial, and navigational purposes.

According to Indiana Rule 327 IAC 2-1.5, the Little Calumet River is designated for full-body contact recreation and shall be capable of supporting a well-balanced, warm water aquatic community. The West Branch of the Little Calumet River is **not** designated as a Limited Use water or as an Outstanding State Resource Water.

The overall water quality goal for these watersheds, which includes the Little Calumet River, is that all water bodies meet the applicable water quality standards for their designated uses as determined by the State of Indiana, under the provisions of the Clean Water Act.

The following quantitative standards have been set for the Little Calumet River:

1. *E. coli* bacteria, using membrane filter (MF) count, shall not exceed:
 - a) One hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period.
 - b) Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period.
2. No pH values below six (6.0) or above nine (9.0) except daily fluctuations that exceed pH nine (9.0) and are correlated with photosynthetic activity, shall be permitted.
3. Concentrations of dissolved oxygen shall average at least five (5.0) milligrams per liter per calendar day and shall not be less than four (4.0) milligrams per liter at any time.
4. Total Cyanide is limited to 48,000 micrograms per liter for the protection of human health in non-drinking waters.
5. Temperatures in the river and its tributaries are limited to the following temperatures in degrees Fahrenheit (degrees Celsius):

a) January	50	(10)
b) February	50	(10)
c) March	60	(15.6)
d) April	70	(21.1)
e) May	80	(26.7)
f) June	90	(32.2)

g) July	90	(32.2)
h) August	90	(32.2)
i) September	90	(32.2)
j) October	78	(25.5)
k) November	70	(21.1)
l) December	57	(14.0)

Additional requirements for dissolved oxygen and temperature are in place for the East Branch of the Little Calumet River but are outside the boundaries of this watershed management plan.

Currently, there are no quantitative standards in place for nitrogen and phosphorus levels in this particular category of water body. Existing standards require only that concentrations of nitrogen and phosphorus, either separately or in combination together, cannot be such that they contribute to aquatic plant or algae growth to the extent that they become a nuisance, unsightly, or otherwise impair the designated uses of the water body.

Water Quality Impairments and TMDLs

The West Branch of the Little Calumet River is currently listed for *E.coli* and Cyanide on the Indiana Department of Environmental Management (IDEM) Section 303(d) List of Impaired Water Bodies. A Fish Consumption Advisory is also in effect for the West Branch of the Little Calumet River for PCB's and Mercury. This river has also appeared on the United States Environmental Protection Agency's Indiana List of Impaired Waters for 1998 for Cyanide, *E.coli*, Mercury, PCB's, Pesticides, and Impaired Biotic Communities.

Aquatic ecosystems have suffered from the chronic effects of contaminated sediments and air deposition. In the early and mid-1960s, most streams in northwestern Lake County were affected by pollution. Water quality currently is characterized within the basin by low dissolved oxygen, high biochemical oxygen demand (BOD), pollutant tolerant aquatic biota that has replaced native species in the northern reaches of the basin, and fish consumption advisories. Oil, grease, floating debris and offensive odors have made most portions of the Grand Calumet and Little Calumet rivers unappealing to recreational boaters and fishermen. High bacteria counts also have made them unfit for full body contact. Causes of such pollution include a history of unregulated and poorly regulated discharges from industries and sewage treatment plants, combined sewer overflows, urban runoff carrying pesticides, nutrients and heavy metals, and sedimentation (IDNR 1994).

A Total Maximum Daily Load (TMDL) standard for *E.coli* bacteria has been developed for this watershed. This plan has been crafted to achieve the required

pollutant reduction in the TMDL. Based on the 2004 TMDL report, a reduction of approximately 90% in the non-point source loads will be required.

Major causes of water quality impairment in the Little Calumet River watershed include:

- ◆ *E.coli* Bacteria.
- ◆ Cyanide
- ◆ PCBs
- ◆ Metals
- ◆ Pesticides

***E.coli* Pollution**

E.coli is a significant source of pollution in the Little Calumet River. The federal standard set forth to ensure safe use of waters for water supplies and recreation (327 IAC 2-1-6 Section 6(d)) states that *E.coli* bacteria, shall not exceed 125 per 100 milliliters as a geometric mean based on not less than five samples equally spaced over a 30 day period or 235 per 100 milliliters in any one sample in a 30 day period. The bacteria are associated with the intestinal tract of warm blooded animals. The presence of *E.coli* in water is a strong indication of the presence of sewage or animal waste contamination. It may enter the water through combined sewer outlets during rainfalls or other types of precipitation, or it may come from poorly functioning septic systems or spills from lagoons containing animal wastes. *E.coli* is widely used as an indicator of the potential presence of waterborne disease causing (pathogenic) bacteria and viruses because they are easier to detect than these pathogenic organisms. The presence of waterborne disease-causing organisms can lead to outbreaks of such diseases as typhoid fever, dysentery, and cholera.

Cyanide

Hydrogen Cyanide is mainly used to make the compounds needed to make nylon and other synthetic fibers and resins. Other cyanides are used as fertilizers. Cyanide enters the water through the release of discharges from metal finishing industries, iron, and steel mills and organic chemical industries. Cyanide ties up the hemoglobin sites that bind oxygen to red blood cells, resulting in oxygen deprivation. This condition is known as cyanosis and is characterized by blue skin color. Cyanide also causes chronic effects on the thyroid and central nervous system.

PCBs

PCBs are organic chemicals that were once used in capacitors and transformers. PCBs enter water from runoff from landfills and from the discharge of waste chemicals. In 1977, production of PCBs in North America was halted. PCB contamination today is a result of historical waste disposal practices. All water bodies in Indiana are under a fish consumption advisory for PCBs.

Metals

Municipal and industrial discharges and urban runoff are the main sources of metal contamination in surface water. Indiana has stream standards for many heavy metals, but the most common ones in municipal permits are cadmium, chromium, copper, nickel, lead, mercury, and zinc. Point source discharges of metals are controlled through the National Pollution Discharge Elimination System (NPDES) permit process. Non-point sources of metals are controlled through best management practices (BMPs).

Pesticides

Pesticides are used in agricultural and urban/residential settings to kill unwanted plants and animals. Pesticides enter surface waters primarily through non-point source runoff from agricultural lands and urban areas. Pesticide contamination is also due to legacy pesticides that are no longer being used but are still impairing the environment. Pesticides are a significant source of pollution in the Little Calumet-Galien watershed.

Existing Water Quality Data

Water quality data that had been previously gathered and analyzed by governmental agencies and local communities was collected for review. Information that had been generated by the Department of Natural Resources (DNR), United States Geological Survey (USGS), and Indiana Department of Environmental Management (IDEM) for the three 14-digit HUC watersheds was requested and received. The information is limited from these sources due to the fact that most of the water quality data collected in Northwest Indiana is along the Grand Calumet River.

Data that local communities had collected concerning the water quality of the Little Calumet River was also requested and reports were received from the Sanitary District of Hammond and from the Gary Sanitary District (GSD).

Fixed Station Data

Fixed station monitoring by the Indiana Department of Environmental Management (IDEM) in Portage, IN at the Portage Boat Yard Dock was reviewed from 1990 to 2006. Samples were analyzed for Alkalinity, Chlorides, COD, Cyanide, *E.coli*, Hardness, Ammonia, Nitrates, Nitrites, pH, Total Phosphorus

(TP), Total Kjeldahl Nitrogen (TKN), and Total Suspended Solids (TSS). The fixed station data from IDEM that is referenced here can be found in Appendix 6: IDEM Fixed Station Data.

Three additional sampling locations were added along the Little Calumet River/Portage Burns Waterway for sampling in July and August of 2000. These additional locations were at Cline Avenue, Broadway Street, and Ripley Street. The *E. coli* results of the five samples recorded can also be found in Appendix 6: IDEM Fixed Station Data.

***E. coli* Bacteria:** Figure 4.1 shows the *E. coli* sampling results from 1996 through 2001, the most recent reading recorded. The highest reading in this time frame was 5,200 cfu/100mL on August 8, 2000. In this time frame, 28 of the 52 readings exceeded the 235 cfu/100mL standard set forth.

Earlier data shows much higher readings in 1990 and 1991. Higher readings also occurred from mid 1997 to mid 1999. The highest recorded reading for *E. coli* was 11,000 cfu/100mL and occurred on January 16, 1991.

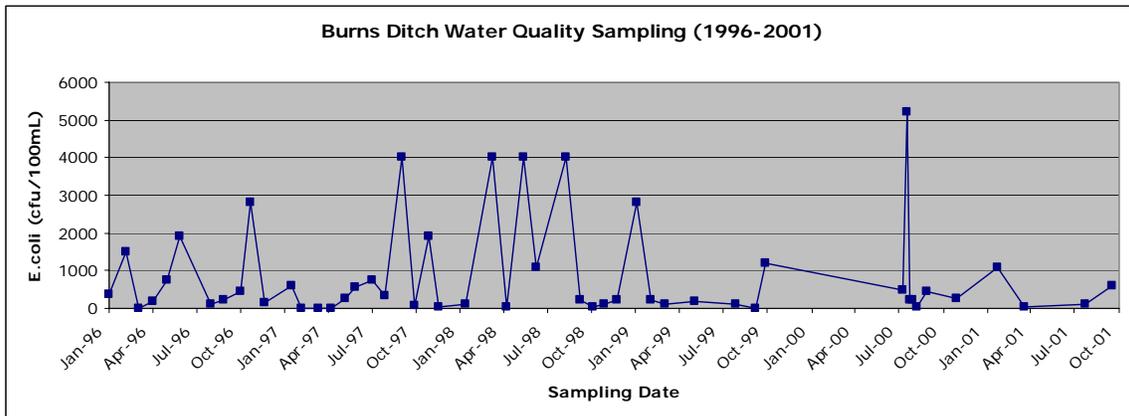


Figure 4.1: Portage Boat Yard fixed station *E. coli* data as recorded by IDEM.

Ammonia (NH₃): The level of Ammonia was determined at the Portage Boat Yard Dock on a monthly basis beginning in January of 1990. Figure 4.2 shows the sampling results from 2000 to 2006. The ammonia levels of the water were consistently around 0.1 mg/L with an average reading of 0.15 mg/L and the high level being found in February 2004 at 0.8 mg/L. This reading was also the high level for the 17 year sampling period. The ammonia levels have been consistent since 1990 with the 17 year average at 0.18 mg/L.

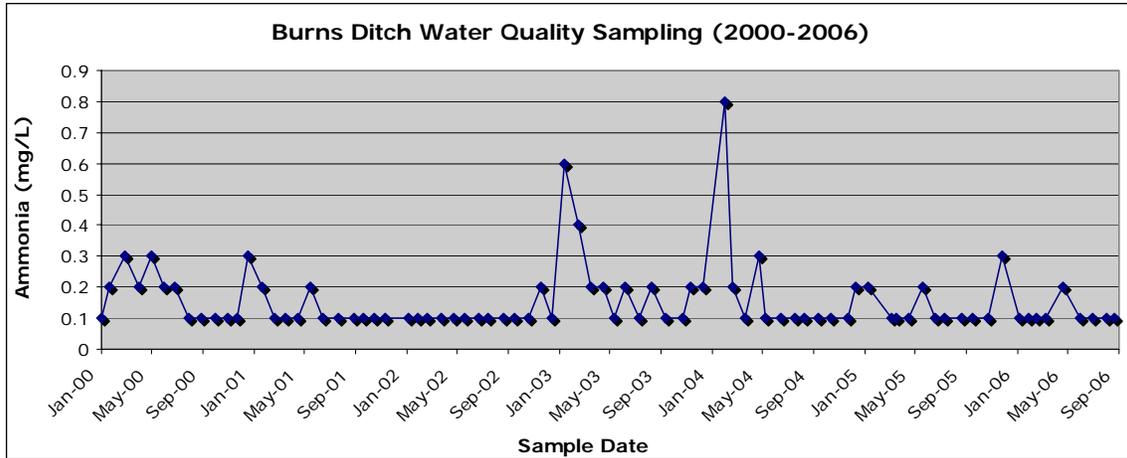


Figure 4.2: Portage Boat Yard fixed station ammonia (NH₃) data as recorded by IDEM.

Nitrogen: The nitrogen sampling results are comprised of the total nitrates and nitrites found each month over the 17 year period. Figure 4.3 shows the sampling data from 2000 to 2006. The high reading was found to be 4.6 mg/L in July 2005.

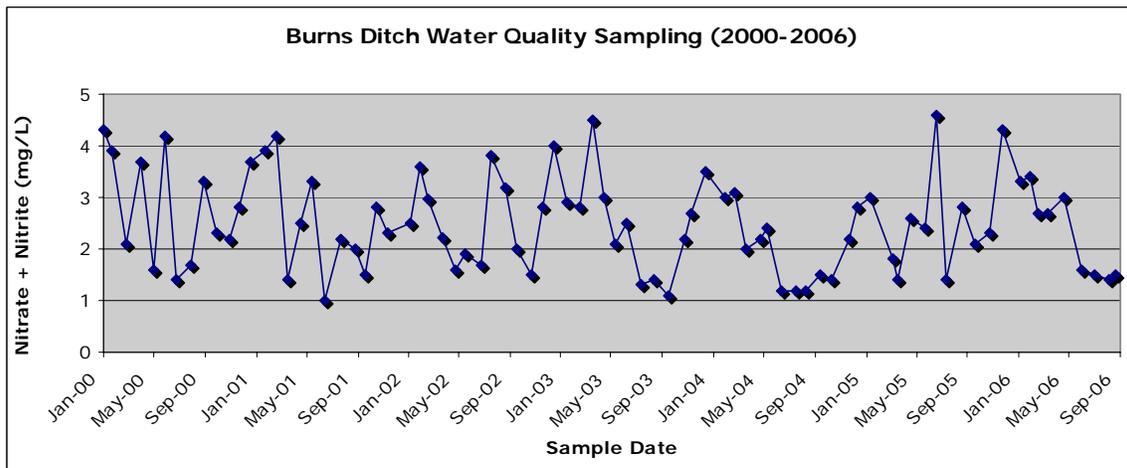


Figure 4.3: Portage Boat Yard fixed station nitrate and nitrite data as recorded by IDEM.

Total Phosphorous: The phosphorous levels can be found in Figure 4.4 for the Portage-Burns Waterway from 2000 to 2006. The levels vary from 0.05 to 0.38 mg/L for the seven (7) year sampling period. This period accurately reflects the overall 17 year trend where the levels vary from 0.05 to 0.45 mg/L. The high reading of 0.45 mg/L was found in November 1990 with the next highest reading being 0.38 mg/L in July 1999 and then again in July 2005, which is reflected in the chart shown.

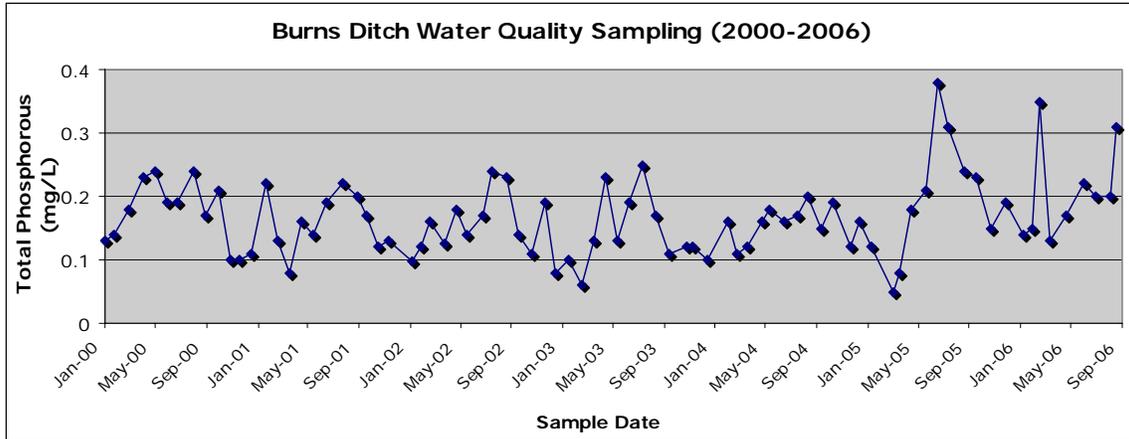


Figure 4.4: Portage Boat Yard fixed station total phosphorus data as recorded by IDEM.

Total Kjeldahl Nitrogen: The results of the water quality sampling conducted for the TKN levels showed a variance of 1.9 mg/L, with the low being 0.4 mg/L. There seems to be no consistent pattern in the TKN levels found. Figure 4.5 shows the results from 2000 through 2006 which accurately reflect the 17 year testing period in the variance shown and that there is no consistent pattern that can be found.

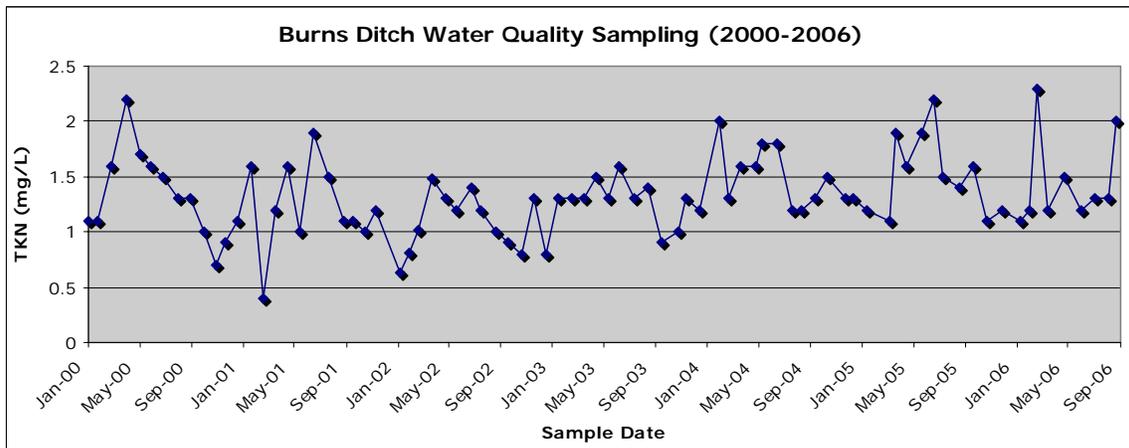


Figure 4.5: Portage Boat Yard fixed station total kjeldahl nitrogen data as recorded by IDEM.

Total Suspended Solids: The water quality sampling results for TSS showed levels that were consistently below 50 mg/L. While majority of the samples were found to be under 50 mg/L there were five samples over the 17 year sampling period that were above 150 mg/L. The first of these was the largest with a value of 240 mg/L. In the seven (7) year sampling period shown in Figure 4.6 there is only one of these spikes. It occurred on March 13, 2006 and was found to be 186 mg/L. The other three spikes all occurred before July 1997.

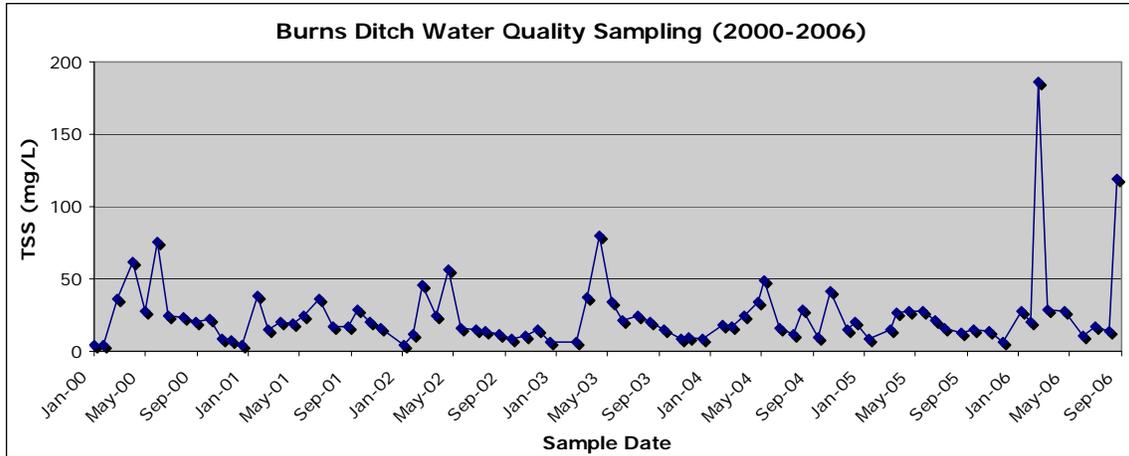


Figure 4.6: Portage Boat Yard fixed station total suspended solids data as recorded by IDEM.