Combined Sewer Overflow Master Plan Phase II – Little Calumet River Sampling Program for the Hammond Sanitary District – November 1995

This study was intended to characterize and model water quality in the Little Calumet River and the impact that Combined Sewer Overflows (CSO’s) have on the river for the Hammond Sanitary District. The study was bounded by Cline Avenue on the east and Hohman Avenue on the west. The samples were analyzed for ammonia, *E.coli*, metals, phosphorus, cyanide, nitrates, and other pollutants of concern. Some baseline biological sampling was also conducted. The data collected as part of this study is included in Appendix 8: CSO Master Plan Phase II for the Hammond Sanitary District. Sampling was conducted at seven locations, shown in Figure 4.7, on August 11, 1994, October 8, 1994, and October 31, 1994.

Three of the seven sampling points were within the boundaries of the watershed being studied as part of this planning effort. A fourth point was located just outside of the watershed boundary along Hart Ditch, which flows north from the Munster area.

*E.coli* Bacteria: The *E.coli* concentrations found during this study far exceeded the state standard of 235 cfu/100mL. The lowest concentration recorded in this report was 3,000 cfu/100mL at the Kennedy Avenue sampling site on October 4, 1994. Figure 4.8 shows the *E.coli* concentrations recorded at Hart Ditch and the three sampling locations within the boundaries of our study area. The highest concentration levels were found west of these sites at the Hohman and Calumet sampling locations on October 31 and were recorded as being 260,000 and 400,000 cfu/100mL, respectively. While the highest concentration levels were found west of our watershed it can be seen that Hart Ditch also contributes high concentration levels. The east-west split of the river is just west of Hart Ditch; therefore, these high concentrations have a significant impact on our watershed study area. At the same time the high readings west of Hart Ditch should not affect our study area.
Figure 4.7: HNTB sampling locations for the 1995 Phase II Combined Sewer Overflow Master
Ammonia: The concentrations of ammonia (NH$_3$) found during the sampling events ranged from 0.4 to 1.82 mg/L. The high and low value resulted from samples taken at Kennedy Avenue on the October 4$^{th}$ and 31$^{st}$ sampling dates, respectively. Figure 4.9 shows ammonia concentrations for the four sampling locations inside the study area watershed and along Hart Ditch.

Total Phosphorus: The concentration level of total phosphorus found during the three sampling events was as high as 2.5 mg/L. This is significantly higher than the sampling results recorded by Greeley & Hansen for GSD, the fixed station data recorded by IDEM, and those recorded from the sampling data collected for this study. Figure 4.10 shows the concentration levels recorded by HNTB at the four sampling locations located inside the study area and along Hart Ditch.
Figure 4.10: Hammond water quality data as recorded in Phase II Combined Sewer Overflow Master by HNTB completed in November 1995 for the Sanitary District of Hammond.

Nitrate: The concentrations of nitrate for the four sampling locations being used for comparison ranged from 0.35 to 9.44 mg/L. The three HNTB sampling locations not shown in Figure 4.11 also fall in this range.

Figure 4.11: Hammond water quality data as recorded in Phase II Combined Sewer Overflow Master by HNTB completed in November 1995 for the Sanitary District of Hammond.
Little Calumet River Stream Reach Characterization and Evaluation Report – October 2002

This study attempted to identify the concentrations of pollutants in the West Branch of the Little Calumet River and in Combined Sewer Overflows (CSO’s) during both dry and wet weather for the Gary Sanitary District (GSD). The dry weather samples were taken on April 27, 2001, June 25, 2001, December 11, 2001, and July 2, 2002. There were two wet weather sample taken, the first from September 18-21, 2001 and the second spanning April 27-30, 2002. Each sampling event tested 11 different sites throughout the City of Gary, these locations are shown in Figure 4.12. The samples were analyzed for a number of parameters, including: *E.coli*, Ammonia, Nitrogen, Total Phosphorus (TP), Total Suspended Solids (TSS), and Dissolved Oxygen (DO). Data for the four dry weather sampling events and two wet weather sampling events is included in Appendix 11: GSD Stream Reach Characterization and Evaluation Report.

*E. coli* Bacteria: The dry weather *E.coli* results collected in this study covered a large range of values. Two of the sample dates showed that all 11 sites met the state standard of 235 cfu/100mL. These two samples took place on April 27, 2001 and December 11, 2001. When comparing this to the dry weather sample taken on June 25, 2001, in which all sites exceeded the state standard, you can see a range in values from 30 to 2,000 cfu/100mL at the Martin Luther King Street Bridge. The fourth dry weather sampling date met the state standard at three (3) of the 11 sites. Figure 4.13 shows the dry weather sampling results.

The wet weather sampling results for *E.coli* bacteria in the Little Calumet River followed the unpredictability of the dry weather results. The first storm event in September 2001 showed large peeks in the *E.coli* concentrations at the Broadway and Martin Luther King Street bridges. These peeks were not found to occur again during the second storm event in April 2002. In order to better understand what may have caused these peeks the CSO data collected during these storm events was looked at, this information is included in Appendix 11: GSD Stream Reach Characterization and Evaluation Report. The CSO events did not account for the spikes in the *E.coli* concentrations during the first storm event. The CSO located directly upstream of the Broadway Street Bridge overflowed during both storm events; however, during the first storm event the high *E.coli* concentrations were recorded starting four (4) hours before the storm while the overflow did not occur until five (5) hours after the start of the storm event. The CSO located before the Martin Luther King Street Bridge did not overflow during either storm event and therefore can not be the cause of the increased concentrations. The wet weather sampling results found at four (4), eight (8), and 12 hours after the start of each storm event are shown in Figure 4.14.
Figure 4.12: Greeley & Hansen sampling locations for the Little Calumet River Stream Reach Characterization and Evaluation Report.
Ammonia (NH₃): The ammonia concentrations were found at each sampling site for the four (4) dry weather events and the two (2) wet weather events. When looking at the dry weather events shown in Figure 4.15 it can be seen that the average ammonia concentration is highest from the Broadway Street Bridge to the Railroad Tracks. The first wet weather event shows higher concentration levels at the Broadway Street and Martin Luther King Street bridges, the same locations and storm event as the high E.coli readings. The second wet weather sampling event does not repeat these higher concentration levels as can be seen in Figure 4.16.
Total Kjeldahl Nitrogen:  Concentrations of TKN found during dry and wet weather sampling events were similar in numbers. Both set of events have an average concentration around two (2) mg/L. Figure 4.17 and 4.18 show the dry and wet weather sampling events concentrations, respectively.
Total Phosphorus: The concentrations of phosphorus found in both the dry and wet weather samples appeared to be higher in the summer months when compared to the winter samplings. The dry weather samples taken in June 2001 and July 2002 were higher at every location than the concentrations found in April and December 2001, as can be seen in Figure 4.19. The wet weather concentrations followed the same pattern with the September concentrations being higher than the April concentrations for the same time period. This can be seen in Figure 4.20 with the only exception being the first sample taken at Cline Avenue. The concentrations found for the wet weather events are also lower in value than the dry weather events.
Total Suspended Solids: The concentration levels of suspended solids for the wet weather sampling events are consistently less than those found for the dry weather sampling events. The dry weather events can be seen in Figure 4.21 with the average value for each sampling site shown by the gray line. Figure 4.22 shows the wet weather sampling events with the orange column representing the average values for each site.
Figure 4.21: Dry weather TSS concentrations as reported in Greeley & Hansen’s Little Calumet River Stream Reach Characterization and Evaluation Report completed October 2002 for GSD.

Figure 4.22: Wet weather TSS concentrations as reported in Greeley & Hansen’s Little Calumet River Stream Reach Characterization and Evaluation Report completed October 2002 for GSD.

**pH Units:** The pH levels found during both the dry and wet weather sampling events met the state standard range. Figures 4.23 and 4.24 show the dry and wet weather sampling results, respectively, with the state standard range of a minimum six (6) and a maximum nine (9) being identified on the charts.
GSD 2002 Dry Weather Stream Reach Characterization

![GSD 2002 Dry Weather Stream Reach Characterization](image)

Figure 4.23: Dry weather pH units as recorded in Greeley & Hansen’s Little Calumet River Stream Reach Characterization and Evaluation Report completed in October 2002 for GSD.

GSD 2002 Wet Weather Stream Characterization

![GSD 2002 Wet Weather Stream Characterization](image)

Figure 4.24: Wet weather pH units as recorded in Greeley & Hansen’s Little Calumet River Stream Reach Characterization and Evaluation Report completed in October 2002 for GSD.

CDM Study for the Gary Sanitary District – 2003

In 2003 CDM completed a study for the City of Gary in which they conducted sampling at four hour intervals after three separate rain events. There were a total of eight (8) sampling locations; seven (7) along the Little Calumet River and one (1) on Deep River. Sampling locations and how they fit into our watershed study area can been seen in Figure 4.25. The four (4) locations located on the western end were tested at +4 and +8 hours after the storm event while the four on the eastern half were sampled at +8 and +12 hours. The wet weather sampling took place on May 20, June 18 and July 15, 2003. The eight sampling locations were also sampled on May 19, June 10 and June 25, 2003 for dry weather samples. Appendix 12: CDM Study for the Gary Sanitary District contains all of the sampling results.
Figure 4.25: CDM sampling locations for the 2003 study completed for the Gary Sanitary District.
**E.coli Bacteria:** The wet weather sampling results found at the +8 hour storm interval is shown in Figure 4.26; the sampling locations at the far west and east ends met the state standard of 235 cfu per 100 mL. These two locations met the standard for the +8 hour interval; however, neither one met the standards on the other interval sample. The sampling locations at Colorado Street and Ripley Street show elevated levels when compared to the other sampling locations at this sampling interval. This is an accurate reflection of the other sampling intervals results. The large peak shown at the Colorado Street sampling location is similar to the peak found in the sampling results recorded for this study. The Colorado Street peak is also close to the interchange of I-65 and I-80.

The dry weather *E.coli* sampling shows an elevated level along Deep River. Figure 4.27 shows the sampling results for the dry weather sampling events. The Deep River sample is the highest for the May 19th and June 25th sampling dates; however, for the June 10th sampling date it was found to be one of the lowest *E.coli* concentration levels.

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**Figure 4.26:** Wet weather *E.coli* sampling results recorded by CDM for the City of Gary.

**Figure 4.27:** Dry weather *E.coli* sampling results recorded by CDM for the City of Gary.
Total Suspended Solids: Figures 4.28 and 4.29 show the total suspended solids sampling data results for the wet weather and dry weather sampling events, respectively. It can be seen from both sets of data that the western portion of the sampling area covered has higher TSS concentrations than the east. The sampling data recorded for this watershed management plan found the highest TSS concentrations to be around Grant Street which is between the Cline and Colorado Street sampling locations used here by CDM.

![Figure 4.28: Wet weather TSS concentrations recorded by CDM for the City of Gary.](image)

![Figure 4.29: Dry weather TSS concentrations recorded by CDM for the City of Gary.](image)

pH: The measured pH values met the state standards on all levels. They were all found to be within the minimum of six and the maximum of nine. Figure 4.30 and 4.31 show the pH values for the wet and dry weather sampling events, respectively. The blue lines represent the state standards for maximum and minimum.
Figure 4.30: Wet weather pH values as recorded by CDM for the Gary Sanitary District.

Figure 4.31: Dry weather pH values as recorded by CDM for the Gary Sanitary District.
**Sampling Plan**

Three sampling alternatives were presented to the Steering Committee on March 14, 2007. They were:

**Alternative A**

1.) 7 sites w/ grab samples for a full suite of water chemistry and physical parameters:
   - pH, temperature, dissolved oxygen,
   - nitrate+nitrite, organic nitrogen (TKN), ammonia nitrogen,
   - total and dissolved phosphorus,
   - turbidity, conductivity, and discharge (flow).
   - Fecal coliform as *E.coli*
   - Stormflow and baseflow samples collected once at each site.

2.) 40 long-term *E. coli* samplers
   - Samplers stay in via stakes for one month
   - Media removed and rinsed
   - Sub-sample of wash water cultured on Petri dish and enumerated

3.) Water Quality & *E.coli* Public Workshop
   - Focus on interpretation in lay persons terms
   - Public can view samples of bugs and bacteria samples
   - Approve understanding of *E.coli* threat and its status as an indicator organism
   - **NOTE:** may need approval from IDEM for workshop element to be part of sampling budget

**Alternative B**

1.) 7 sites w/ grab samples for a full suite of water chemistry and physical parameters:
   - pH, temperature, dissolved oxygen,
   - nitrate+nitrite, organic nitrogen (TKN), ammonia nitrogen,
   - total and dissolved phosphorus,
   - turbidity, conductivity, and discharge (flow).
   - Fecal coliform as *E.coli*
   - Stormflow and baseflow samples collected once at each site.

2.) 90 long-term *E.coli* samplers
   - Samplers stay in via stakes for one month
   - Media removed and rinsed
   - Sub-sample of wash water cultured on Petri dish and enumerated