Macroinvertebrate Sampling Required by Ohio EPA Permit Number 3PA00002*FD

December 17, 2007

1. Name of the facility:

   Combined sewer overflows (CSOs) of the Northeast Ohio Regional Sewer District (NEORSD).

2. Receiving water of the discharge and subsequent stream network:

   NEORSD CSOs discharge to several water bodies. This report pertains to macroinvertebrate sampling required under Ohio EPA Permit No. 3PA00002*FD. Sampling was conducted on Big Creek, Doan Brook, Euclid Creek, and Mill Creek. Doan Brook and Euclid Creek are tributary to Lake Erie. Big Creek and Mill Creek are tributary to the Cuyahoga River and ultimately to Lake Erie.

3. Description of the facility:

   Several different types of CSO structures are present within the NEORSD system. The location of each NEORSD CSO is listed in Ohio EPA Permit No. 3PA00002*FD. Diagrams and any other descriptive information pertaining to each CSO are on file at the NEORSD Planning Department.

4. Characterization of the effluent from the facility:

   NEORSD CSO effluent data were reported to Ohio EPA in monthly Combined Sewer Overflow Reports from November 1988 through March 1997.

5. Descriptions of all sampling sites in the study area:

   Ohio EPA Permit No. 3PA00002*FD states that macroinvertebrate sampling shall be conducted at the mouths of Mill Creek, Big Creek, Doan Brook, and Euclid Creek. For practical purposes, however, sampling was not necessarily conducted at the mouths of these water bodies. This slight alteration of the sites specified in the permit was discussed with and approved by Ohio EPA in 1997. Documentation of this and other minor changes in sampling and reporting procedures are included in Appendix A.

   <u>Big Creek</u>
   Hester-Dendy artificial substrate samplers were installed downstream of the furthest CSO discharging to Big Creek, at NEORSD stream monitoring Site #25 (N41.4460°/W81.6865°). This site is located approximately 500 feet downstream of Jennings Road. The creek at this location has riffles, a run, and a deep pool. The samplers were located approximately 100 feet downstream of the Treadway Creek outfall, downstream of the last riffle in the area and upstream of a sharp bend in the

creek and a deep pool. The creek is approximately 10 feet wide at this location with riffle depths generally greater than three inches. The Hester-Dendy samplers were placed in approximately 15 inches of water at this location. The stream gradient at Site #25 is estimated to be approximately 18 feet per mile and the creek has a drainage area of approximately 38.6 square miles. The riparian zone in the area is very narrow, and land use is primarily urban and industrial.

Doan Brook

The Doan Brook NEORSD macroinvertebrate sampling site #16.1 (N41.5330°/W81.6296°) is located approximately 150 feet downstream of the furthest downstream CSO discharging to Doan Brook. This site is located within Rockefeller Park, approximately 100 feet downstream of St. Clair Avenue in the channelized section of the brook. Stone walls eight to ten feet in height are present on both sides of the brook from the University Circle area to Interstate 90. Stream width at this location is approximately 10 feet and Hester-Dendy samplers were placed in approximately two feet of water, just downstream of a riffle, at the beginning of a run. Land use in the area and throughout the Doan Brook watershed is predominantly residential and recreational. The stream gradient at this site was estimated at approximately 14 feet per mile and the stream has a drainage area of approximately 9.5 square miles.

Euclid Creek

The Euclid Creek macroinvertebrate sampling site is located at NEORSD stream monitoring Site #0.5 (N41.5833°/W81.5594°), within the Wildwood Park area of the Cleveland Lakefront State Park. The stream gradient at this site is estimated to be approximately six feet per mile, creating a dry weather velocity that is lower than desired for the colonization of Hester-Dendy artificial substrate samplers. Despite this low flow, the Hester-Dendy artificial substrate samplers were set downstream of all the Euclid Creek CSOs, approximately 500 feet downstream of Lake Shore Boulevard, in a glide area, which was approximately 18 inches deep. The creek is approximately 15 feet wide at this location with a narrow riparian zone and a drainage area of approximately 24.2 square miles. Upstream of Lake Shore Boulevard, the creek has been channelized by the U.S. Army Corps of Engineers. Land use within the Euclid Creek watershed is primarily residential and recreational.

Mill Creek

Hester-Dendy artificial substrate samplers were installed downstream of the furthest CSO discharging to Mill Creek, at NEORSD stream monitoring Site #31 (N41.4178°/W81.6385°). This site is located approximately 500 feet upstream of the confluence with the Cuyahoga River. Hester-Dendy artificial substrate samplers were installed downstream of a riffle approximately 50 feet upstream from the Canal Road Bridge. The samplers were installed in approximately 15 inches of water, just

downstream of a riffle, at the beginning of a run. This site is downstream from all CSO outfalls and tributaries to Mill Creek. At this location the stream gradient is calculated to be approximately 12 feet per mile, and the creek has a drainage area of approximately 18.1 miles. Land use within the Mill Creek watershed is primarily industrial and residential.

6. Listing of name and model number of all sampling equipment used:

   Hester-Dendy artificial substrate samplers per Ohio EPA specifications; two sizes of cinder blocks (12”x 4”x 2” and 16”x 8” x 8”); assorted lengths of half inch diameter steel rebar; plastic tie wraps; 1000-milliliter cylindrical plastic screw-top containers; 500-micron D-frame aquatic dip net, Turtox Design 73-440, Wildco Catalog number 425-A46; one square foot Surber sampler; serrated fine-point forceps; 50-milliliter snap-cap vials; Hedwin 4-liter Cubitainers #10M4M3; Wildco Model #190-E20 wash bucket (583-micron mesh bottom); YSI 556 MPS multi-meter (dissolved oxygen, specific conductance, pH and temperature).

7. Description of all electrofishing configurations used:

   Not Applicable.

8. Types of boats used:

   Not Applicable.

9. Description of exact methods for demarcation of the sampling zone:

   Investigators identified the Hester-Dendy artificial substrate sampler locations by pacing off the distance from known landmarks and the sample location. The Big Creek site was located midstream, approximately ninety feet downstream of the Treadway Creek outfall; the Doan Brook site was located river left, approximately 100 feet downstream of the St. Clair Avenue Bridge; the Euclid Creek site was located river right, approximately 600 feet downstream of the Lake Shore Boulevard bridge; and the Mill Creek site was located river right, approximately 50 feet upstream of Canal Road. All sample sites were marked with a length of rebar.

10. Diagram of the course followed as each sampling zone was traversed:

    Not Applicable.

11. Description of sample preservation methods:

A five-gallon Wildco wash bucket was placed under water, just downstream of the cluster of Hester-Dendy artificial substrate samplers, with the opening of the bucket facing upstream. The Hester-Dendy artificial substrate samplers were detached from the cinder block and placed into the five-gallon wash bucket while still under water. The wash bucket was removed from the water. The individual samplers were disassembled in this wash bucket. The Hester-Dendy plates were left in the wash bucket while all of the associated hardware was washed into the bucket with water from the stream being sampled and carefully examined before discarding. The remaining contents of the wash bucket, including the Hester-Dendy plates, were then placed into a 1000-milliliter cylindrical, plastic screw-top container and approximately 10 milliliters of 10 percent formalin was added. Qualitative samples were obtained and placed directly into a 50-milliliter snap-cap vial containing approximately 5 milliliters of 10 percent formalin. It should be noted that the formalin solution used to preserve the first round of samplers at all of the permit-required sites in 2007 was found to be defective in that all of the samples had signs of being under-preserved (septic odor and off-gassing when the container was opened). This resulted in the decomposition of the majority of the macroinvertebrates collected, with the remaining organisms not a true representation of the original sample collected. However, individual organism identifications indicate genus/species that were present in the macroinvertebrate communities. The cause of the under-preservation has been attributed to using a 5-gallon carboy of 10% formalin solution, previously opened in 2006, whereby the integrity of the container may have been compromised. This would have facilitated evaporation/degradation of the formalin, resulting in a weakened strength of solution. As a result, to prevent under-preservation in the future, all macroinvertebrate samples will be preserved using a 100% formalin solution (37% formaldehyde) from a container appropriately sized to be completely used during one field season. The solution in the sample container will then be diluted to the approximate 10% formalin solution using water from the sample site. *Any scores derived from the first sampling period, July/August 2007, are suspect due to under-preservation. Therefore, these data should not be used to assess the macroinvertebrate communities at these sites*.

12. Listing of all taxonomic keys utilized for specimen identification:

The following taxonomic literature sources were used by EA Engineering, Science and Technology to identify the benthos in the NEORSD's samples from Big Creek, Doan Brook, Euclid Creek and Mill Creek.

Bednarik, A.F. and W.P. McCafferty. 1979. Biosystematic revision of the genus Stenonema (Ephemeroptera: Heptageniidae). Canadian Bulletins of Fisheries and Aquatic Sciences 201:1-73.

Bode, R.W. 1983. Larvae of North American Eukiefferiella and Tvetenia (Diptera: Chironomidae). New York State Museum Bulletin 452:1-40.

Bolton, M.J. 2007. Ohio EPA supplemental keys to the larval Chironominae (Diptera) of Ohio and Ohio Chironomidae checklist. Ohio EPA, Division of Surface Water, Ecological Assessment Section, Columbus, Ohio.

Brown, H.P. 1976. Aquatic dryopoid beetles (Coleoptera) of the United States. Water Pollution Control Series 18050 ELDO4/72. 2nd edition. U.S. Environmental Protection Agency, Cincinnati, OH.

Burch, J.B. 1982. Freshwater snails (Mollusca: Gastropoda) of North America. EPA-600/3-82-026. U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, OH.

Epler, J.H. 1987. Revision of the Nearctic Dicrotendipes Kieffer, 1913 (Diptera: Chironomidae). Evolutionary Monographs No. 9:1-102.

_____. 1995. Identification manual for the larval Chironomidae (Diptera) of Florida. Florida DEP, Division of Water Facilities, Tallahassee, FL.

_____ . 2001. Identification manual for the larval Chironomidae (Diptera) of North and South Carolina. North Carolina DENR, Division of Water Quality, Raleigh, NC.

Grodhaus, G. 1987. Endochironomus Kieffer, Tribelos Townes, Synendotendipes new genus, and Endotribelos new genus (Diptera: Chironomidae) of the Nearctic region. Journal of the Kansas Entomological Society 60(2):167-247.

Jezerinac, R.F., G.W. Stocker, and D.C. Tarter. 1995. The crayfishes (Decapoda: Cambaridae) of West Virginia. Bulletin of the Ohio Biological Survey 10(1):1-193.

Klemm, D.J. 1985. Guide to the freshwater Annelida (Polychaeta, naidid, and tubificid Oligochaeta, and Hirudinea) of North America. Kendall/Hunt Publishing Co., Dubuque, IA.

Maschwitz, D.E. and E.F. Cook. 2000. Revision of the Nearctic species of the genus *Polypedilum* Kiefer (Diptera:Chironomidae) in the subgenera *P. (Polypedilum)* Kieffer and *P. (Uresipedilum)* Oyewo and Saether. Bulletin of the Ohio Biological Survey. New Series 12(3): 1-135.

McCafferty, W.P. and R.D. Waltz. 1990. Revisionary synopsis of the Baetidae (Ephemeroptera) of North and Middle America. Transactions of the American Entomological Society 116(4):769-799.

Merritt, R.W., K.W. Cummins, and M.B. Berg, eds. 2007. An introduction to the aquatic insects of North America. 4th edition. Kendall/Hunt Publishing Co., Dubuque, IA.

Morihara, D.K. and W.P. McCafferty. 1979. The Baetis larvae of North America (Ephemeroptera: Baetidae). Transactions of the American Entomological Society 105:139-221.

Needham, J.G., M.J. Westfall, Jr., and M.L. May. 2000. Dragonflies of North America (Revised Edition). Scientific Publishers, Gainesville, Florida.

Roback, S.S. 1985. The immature chironomids of the eastern United States VI. Pentaneurini-genus Ablabesmyia. Proceedings of The Academy of Natural Sciences of Philadelphia 137(2):153-212.

Saether, O.A. 1977. Taxonomic studies on Chironomidae: Nanocladius, Pseudochironomus, and the Harnischia complex. Bulletin of the Fisheries Research Board of Canada 196:1-143.

Simpson, K.W. and R.W. Bode. 1980. Common larvae of the Chironomidae (Diptera) from New York State streams and rivers with particular reference to the fauna of artificial substrates. New York State Museum Bulletin 439:1-105.

Smith, D.G. 2001. Pennak's Freshwater Invertebrates of the United States: Porifera to Crustacea, Fourth Edition. John Wiley & Sons, New York, NY.

Westfall, M.J., Jr. and M.L. May. 1996. Damselflies of North America. Scientific Publishers, Gainesville, Florida.

Wiederholm, T., ed. 1983. Chironomidae of the Holarctic region. Keys and diagnoses. Part 1. Larvae. Entomologica Scandinavica Supplement 19:1-457.

Wiggins, G.B. 1996. Larvae of the North American caddisfly genera (Trichoptera). 2nd edition. University of Toronto Press, Toronto, Canada.

13. Location of the reference collection and other sources used to verify identifications:

A reference collection was not necessary for identification of these specimens. However, if a reference collection had been needed to verify any specimens, EA Engineering, Science and Technology maintains a sizable macroinvertebrate voucher collection with over 1800 specimens representing over 700 taxa. If this taxonomic library proved to be insufficient, every reasonable attempt would be made to have the specimen(s) identified or verified by a noted authority.

14. Exact methods used to construct Hester-Dendy samplers or source of purchase:

Hester-Dendy artificial substrate samplers were constructed by ARC Industries, Inc., using eight, three-inch squares of one-eighth inch thick hardboard, twelve one-inch diameter round, one-eighth inch thick plastic washers (spacers), a one-quarter inch eyebolt, and a one-quarter inch nut. A one-quarter inch diameter hole was drilled through the center of each hardboard square. The plates and spacers were arranged on the eyebolt to provide three single spaces, three double spaces, and one triple space. ARC Industries, Inc. is located at 2879 Johnstown Road in Columbus, Ohio.

15. Methods for anchoring Hester-Dendy samplers:

There are two methods used by NEORSD staff to anchor Hester-Dendy samplers. First, five Hester-Dendy artificial substrate samplers are clustered together with plastic tie-wraps. Another plastic tie-wrap is used to secure the cluster of samplers to the top end of the 12” x 4” side of a 12” x 4” x 2” cinder block or to the top end of the 12” x 2” side. If a 16” x 8” x 8” cinder block is used, then the cluster of samplers is secured to the 16” x 8” side or to the top end of the 16” x 8” side. If the cluster of Hester-Dendy samplers is attached to the 12” x 4”, or the 16” x 8”, side of the block, a plastic tie-wrap is passed through the hole in the other end of the concrete block and around a length of steel rebar that has been driven into the substrate, as shown in Figure A. If the cluster of Hester-Dendy samplers is attached to the 12” x 2”, or the 16” x 8”, top end of the concrete block, a length of steel rebar is driven into the substrate through the hole in the concrete block, as shown in Figure B. The latter method is used at sampling sites that are prone to heavy silt deposition to aid in preventing the Hester-Dendy samplers from being buried in the silt.

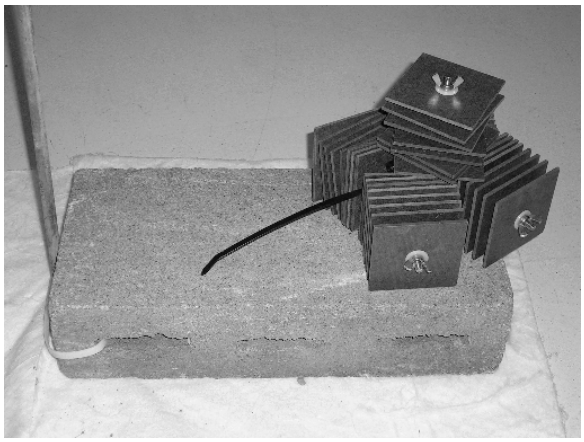


Figure A

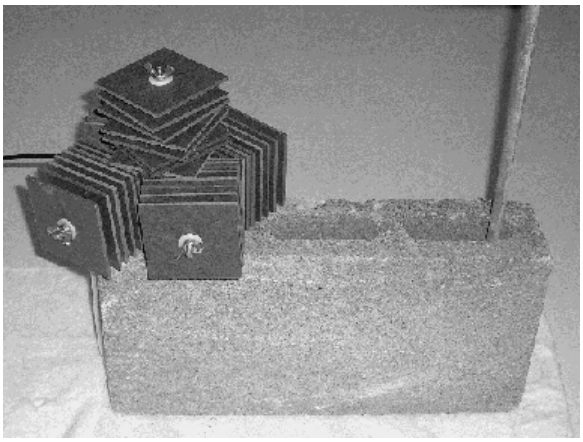


Figure B

16. Descriptions of the methods used to identify dipterans of the family Chironomidae:

    Chironomidae larvae were cleared in warm 10% potassium hydroxide and mounted in CMC-10 prior to identification. Generally, 100 chironomids from any single sample are mounted for identification. Species-level identifications generally follow those suggested by Ohio EPA.

17. Copies of all raw data sheets:

    Raw data sheets are located in the Appendices at the end of this report as follows:

Appendix B	Chemical Sample Analysis Sheets
Appendix C	Macroinvertebrate Data Sheets

18. Description of the methods used to calculate the QHEI, the IBI, the MIwb, and the ICI for each site:

    The QHEI, IBI and the MIwb were not required by Ohio EPA Permit No. 3PA00002*FD.

    The Invertebrate Community Index (ICI) was used as the principal measure of overall macroinvertebrate community condition. Developed by the Ohio EPA, the ICI is a modification of the Index of Biotic Integrity for fish (Ohio EPA 1987). The ICI consists of ten individually scored structural community metrics:

    1. Total number of taxa
    2. Total number of mayfly taxa
    3. Total number of caddisfly taxa
    4. Total number of dipteran taxa
    5. Percent mayflies
    6. Percent caddisflies
    7. Percent Tanytarsini midges
    8. Percent other dipterans and non-insects
    9. Percent tolerant organisms
    10. Total number of qualitative EPT taxa

Scoring criteria for all ten metrics is dependent upon drainage area. The scoring of an individual sample is based on the relevant attributes of that sample compared to equivalent data from 232 reference sites throughout Ohio. Metric scores range from six points for values comparable to exceptional community structure to zero points for values that deviate strongly from the expected range of values based on scoring criteria established by Ohio EPA (1989a). The sum of the individual metric scores resulted in the ICI score for that particular location. *As it is not appropriate to apply an ICI score to a Surber sample or any other sample that is not quantitative, for comparison purposes only, an ICI score was calculated for each Surber sample. These ICI scores, based on Surber samples, are not presented graphically or used to determine average ICI scores for individual sites. Surber samples were only used from 2002-2006, when Hester-Dendy samplers were unrecoverable.*

Calculation of the ICI was conducted using a computer program written for the software SAS® by EA in 1994. This program is continuously tested and updated to ensure its accuracy.

As noted in line item 11, *any scores derived from the first sampling period, July/August 2007, are suspect due to under-preservation. Therefore, these data should not be used to assess the macroinvertebrate communities at these sites.*

19. Description of qualitative macroinvertebrate sampling techniques:

Qualitative macroinvertebrate sampling was conducted using a 500-micron D-frame aquatic dip net and curved, serrated fine-point forceps. The net was placed in the water with the open end facing upstream. The substrate of all available habitat types (i.e., riffles, runs, deep pools, margins, undercut banks, etc.) was disturbed using kicks with the foot or by hand. Kick sampling and hand picking were conducted until all available habitat types were sampled. The contents of the net were placed into a white enamel pan and sorted for 35 to 45 minutes, until no new or different organisms were found. The organisms were preserved with formalin in sealed containers for future identification.

20. Complete description of any statistical analysis performed on the data:

The only statistical comparison used was the relative abundance (or percent composition) of individual taxa per site and sample type. Relative abundance was calculated as:

$$\text{Relative Abundance} = \frac{\text{\# Individuals of a Taxa}}{\text{Total \# of Individuals in a Sample}}$$

21. Dates and Times of Sampling:

Hester-Dendy artificial substrate samplers were installed at all four sites twice during the sampling season. Two macroinvertebrate samplings were conducted at each site in 2007 to evaluate seasonality as a variable. The following table lists the stream sampled, date installed and date removed.

FIRST SAMPLING PERIOD			
STREAM	DATE		
	INSTALLED	ADDITIONAL INSTALLATIONS*	REMOVED
EUCLID CREEK	JUNE 18, 2007	-	JULY 31, 2007
DOAN BROOK			JULY 31, 2007
BIG CREEK			AUGUST 3, 2007
MILL CREEK		JULY 3, 2007	-

SECOND SAMPLING PERIOD			
STREAM	DATE		
	INSTALLED	ADDITIONAL INSTALLATIONS*	REMOVED
EUCLID CREEK	AUGUST 13, 2007	-	SEPTEMBER 24, 2007
DOAN BROOK			
BIG CREEK			SEPTEMBER 25, 2007
MILL CREEK	-	AUGUST 16, 2007	SEPTEMBER 25, 2007
*Additional installations due to samplers being lost/buried.			

22. Results of the stream surveys, in terms of species presence, absence, and relative numbers for each study site.

A list of taxa collected at each site is included in Appendix C.

23. Discussion of historic data pertaining to the locality of the study sites or that stream segment:

ICI SCORES				
DATE	BIG CREEK	DOAN BROOK	EUCLID CREEK	MILL CREEK
1995	22	--	--	18
1996	20	--	--	--
1997	8	4	8	--
1998	--	16	4	--
1999	16	40	22	32
2000	12	30	10	28
2001	22	8	4	12
July 2002	34[1]	30	24	28
September 2002	26	22	26	32
August 2003	10[1]	0[1]	10[1]	0[2]
September 2003	16[1]	22	26	18
July 2004	20[1]	16	10	16
September 2004	10	12	18	4[2]
July 2005	4[2]	10[1]	22	28
September/October 2005	20[1]	6[2]	10	4[1]
July/August 2006	18	26	4[1,2]	12
September 2006	34	30	24	28

[1]ICI score obtained using Surber sampler.
[2]Low-end scoring applied per Volume II Update (November 8, 2006)

Big Creek

NEORSD has conducted quantitative macroinvertebrate sampling near the mouth of Big Creek since 1995. Although there were difficulties with the Hester-Dendy samplers being lost or buried in 1995 and high flows that prevented their timely removal in 1996, the site received an ICI score of 22 in 1995 and of 20 in 1996. In 1997, the site received a *Poor* score of 8. It is important to note that, during the 1997 sampling period, a large construction project was taking place approximately one quarter of a mile upstream of the sampling location. This construction site had extensive erosion and runoff, which entered Big Creek through nearby storm sewers. By 1999, the ICI score had improved to 16. In 2000, the ICI score decreased to 12, but it should be noted that the creek again experienced heavy sediment loadings attributable to a nearby construction project. By 2001, the score had improved to 22, which may reflect the benthic community's recovery from the previous high sediment load. In 2002, Hester-Dendy samplers were installed twice, once in July and once in September. During the July 2002 sampling period, the

Hester-Dendy samplers were either lost or buried, so a Surber sample was obtained and an ICI score of 34 was calculated. In September 2002, the site obtained an ICI score of 26. In 2003, Hester-Dendy samplers were also installed twice, one six-week period ending in August and one six-week period ending in September. It is hypothesized that heavy rains during the first sampling period led to the samplers being buried or washed away, and in general, led to the lower scores, at all sites, in 2003. In 2004, the Hester-Dendy samplers were installed twice. As the Hester-Dendy sampler was not recovered for the first period, a Surber sample was collected, resulting in an ICI score of 20. The second 2004 period of Hester-Dendy sampling received a score of 10. Hester-Dendy samplers were installed for two periods during July and September, each for a six-week period, during 2005. The first period of sampling received an ICI score of 4, while a Surber sample was taken for the second period of sampling, due to the Hester-Dendy being lost or buried, resulting in an ICI score of 20. Hester-Dendy samplers were installed in 2006 for two 6-week colonization periods. An ICI score of 18 was obtained for the first period, while a dramatic increase occurred in September, as the ICI score for the second period was 34. According to the Ohio EPA, a score of 34 meets the warmwater habitat attainment criterion of 34 for the Erie/Ontario Drift and Lake Plain ecoregion and also falls within the narrative range of *Good*. This improvement is noteworthy as it indicates attainment at this location for the first time since NEORSD began sampling. In general, the ICI scores for Big Creek have increased since September 2004, indicating a recovering benthic community.

Doan Brook

NEORSD has conducted quantitative sampling near the mouth of Doan Brook since 1997. The ICI score calculated in 1997 was 4. The ICI score at this location improved to 16 by 1998. The 1999 ICI score of 40 demonstrated improvement from the previous years. Flow velocities had increased and some upstream discharges had been remediated. In 2000, the ICI score near the mouth of Doan Brook was 30. In 2001, the scores had decreased to 8, but, by 2002, the ICI score had improved. In 2002, Hester-Dendy samplers were installed twice, and they were removed in July and September. The scores had improved to 30 and 22, respectively. In 2003, the average score for the two periods that were sampled decreased to 11. The scores from the two 2004 sample periods improved to an average of 14. In 2005, Hester-Dendy samplers were installed twice, once in July and once in September. The July ICI score was 10, based on a Surber sample, while the ICI score for the Hester-Dendy collected in September was 6. Overall, ICI scores from 2005 resulted in narrative ratings of *Poor* and *Very Poor*, decreases from the *Fair* rating of 2004. In 2006, Hester-Dendy samplers were installed twice, with ICI scores of 26 and 30, both improvements from 2005, and resulting in an average narrative rating of *Fair*.

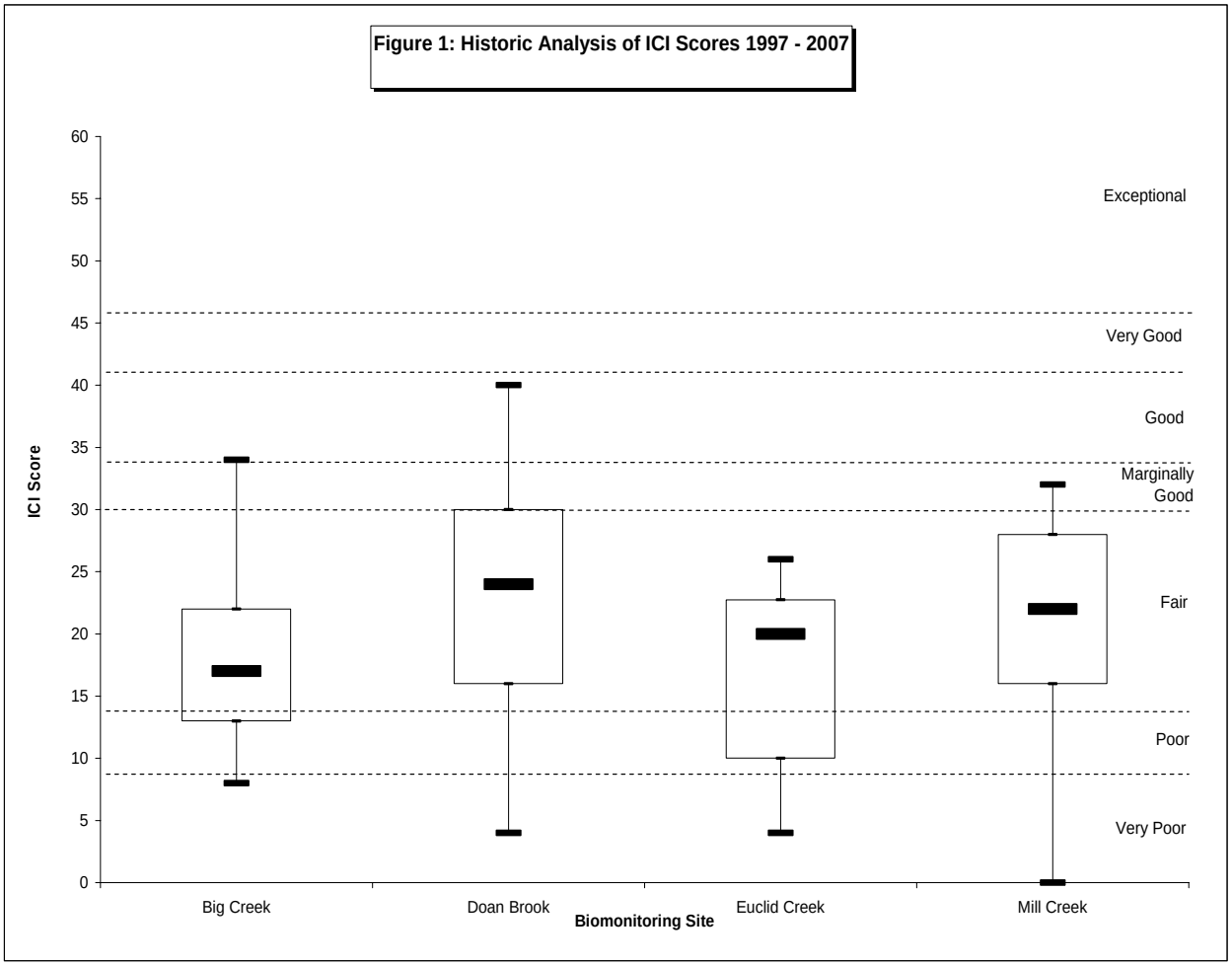
Euclid Creek

NEORSD conducted quantitative macroinvertebrate sampling near the mouth of Euclid Creek as early as 1991, when a score of 18 was obtained. In 1997, the site was relocated approximately 450 feet downstream of the previous location. At the new location (closer to the mouth), ICI scores of 8 and 4 were obtained in 1997 and 1998, respectively. Low flow observed at the site may have contributed to the poor habitat conditions and low ICI scores. By 1999, the ICI score near the mouth of Euclid Creek had improved to 22. However, in 2000 the score decreased to 10. In 2001, the score had further decreased to 4. By 2002, the Euclid Creek ICI scores had shown an improvement. The Hester-Dendy samplers were installed twice in 2002 and removed in July and September with scores of 24 and 26, respectively. In 2003, the Hester-Dendy samplers were also installed twice. The first sampler was lost or buried and a Surber sample was obtained. This sample received an ICI score of 10. The second sampling period received a score of 26. The first sampling in 2004 received a score of 10. The second Hester-Dendy sampling of 2004 improved to a score of 18. In 2005, Hester Dendy samplers were retrieved in July and September. An ICI score of 22 was obtained in July and in September a score of 10 was obtained. Compared to the average ICI score of 14 in 2004, the average ICI score in 2005 increased to 16. Hester-Dendy samplers were installed twice in 2006. As the first sampler was found buried, a Surber sample was obtained, resulting in a score of 4. The second sampling in 2006 received an ICI score of 24.

Mill Creek

NEORSD conducted quantitative macroinvertebrate sampling on Mill Creek, upstream of Canal Road in 1995 and obtained an ICI score of 18. In 1999, an ICI score of 32 at Mill Creek indicated marked improvement since 1995. The ICI score decreased to 28 in 2000. It should be noted that a break in an interceptor sewer had occurred in the spring of 2000, allowing untreated sewage to enter Mill Creek. In 2001, the ICI score had further decreased to 12, suggesting a possible lag time between the break in the interceptor sewer and the effects on the biota of the creek. By 2002, the ICI scores near the mouth of Mill Creek had improved. The Hester-Dendy samplers were installed twice in 2002 and 2003, with average scores of 30 and 9, respectively. In 2004, the average scores increased to 10. Again in 2005, the Hester-Dendy samplers were installed twice, resulting in ICI scores of 28 in July and 4 in October. The ICI score in October was based on a Surber sample, as the Hester-Dendy had been buried in sediment. In 2006, Hester-Dendy samplers were installed twice resulting in scores of 12 and 28, with an average narrative rating of *Fair*.

All Sites

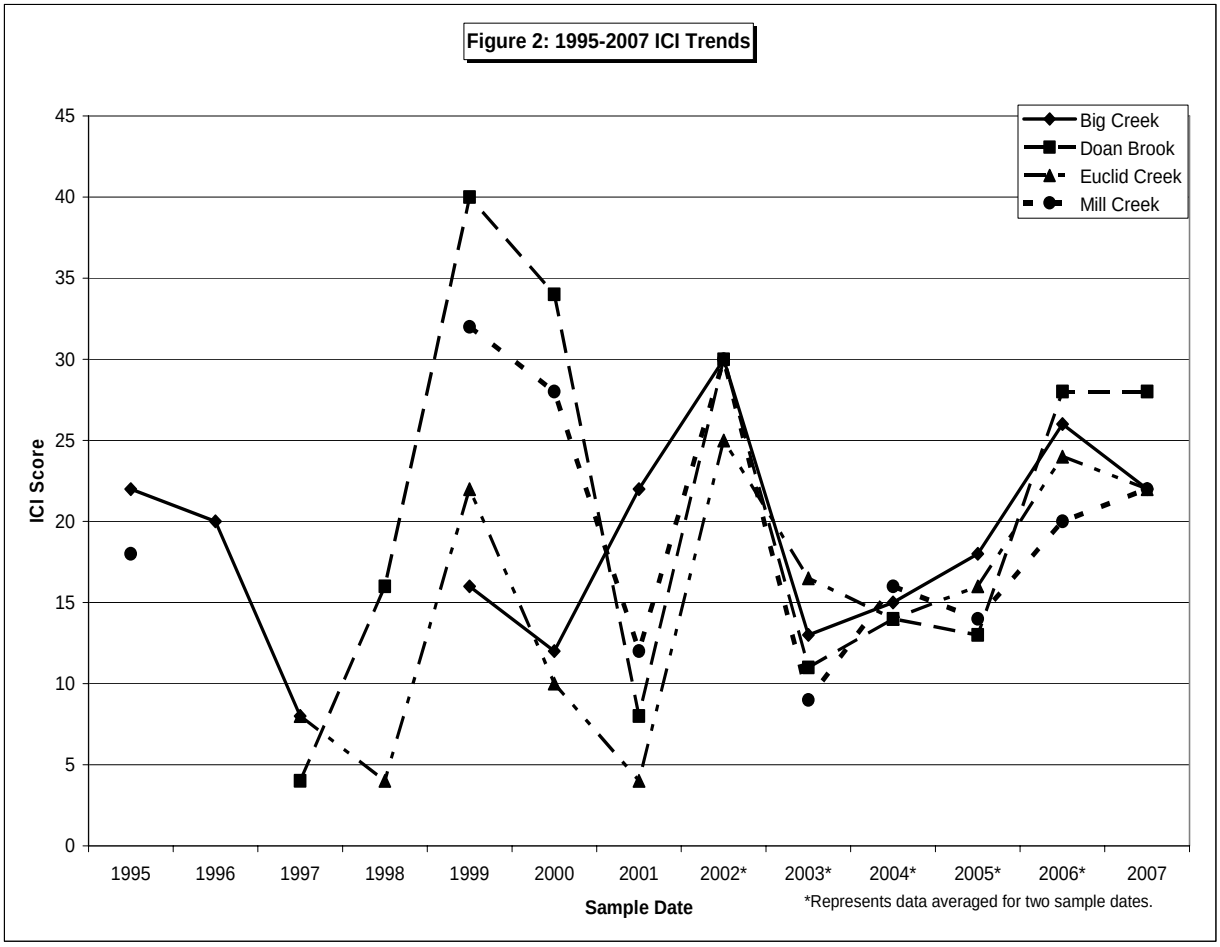


ICI scores based on Surber samples have been excluded.

The box-and-whisker plot in Figure 1 provides a comprehensive view of ICI scores for each body of water from 1997 to 2007. This reveals that Doan Brook has experienced the greatest amount of variability in ICI scores since 1997, with the interquartile range falling between 16 and 30. The amount of variability in the individual ICI scores for Big Creek, Euclid Creek and Mill Creek since 1997 is similar. The interquartile ranges, as well as the maximum and minimum scores, indicate that there has been a great deal of variability at each site over the past ten years.

Analyses of 1995-2007 ICI scores, as shown in Figure 2, reveal considerable fluctuation from year to year for each creek. Please note that in 2002 through 2006, ICI scores from both sampling periods were averaged to produce a single score. Based on suspect data from under-preservation in the first sampling period of 2007, only the second sampling period score is represented in Figure 2 for 2007. Figure 2 also suggests that the

fluctuation in ICI scores may not be dependent on site-specific changes in water quality, as the scores for each site appear to increase and decrease in unison. The fluctuation of ICI scores may be at least partially dependant on an external factor, such as rainfall, that has a similar effect on each watershed.



ICI scores based on Surber samples have been excluded.

24. The calculated index scores used for comparison with the biological water quality criteria:

Sample Location	July/August 2007 Score	Narrative Rating	September 2007 Score	Narrative Rating
Big Creek	20	Fair	22	Fair
Doan Brook	8	Poor	28	Fair
Euclid Creek	2	Very Poor	22	Fair
Mill Creek	-	-	22	Fair

As noted in line item 11, *any scores derived from the first sampling period, July/August 2007, are suspect due to under-preservation. Therefore, these data should not be used to assess the macroinvertebrate communities at these sites.*

25. Raw data submitted in computer format:

    The raw data are contained on the enclosed compact disk.

26. The biological criteria used for comparison with the stream sampling data, and the rationale behind the selection of the criteria:

    The stream segments that are required to be sampled for macroinvertebrates per Ohio EPA Permit No. 3PA00002*FD have all been designated Warmwater Habitat for aquatic life use by the Ohio EPA. According to Table 7-15 (Biological Criteria for Warmwater, Exceptional Warmwater and Modified Warmwater Habitats) in OAC 3745-1-07, the ICI criterion for sites that have been designated Warmwater Habitat within the Erie/Ontario Lake Plain ecoregion is 34. The table, however, also indicates that the criteria do not apply to Lake Erie river mouths.

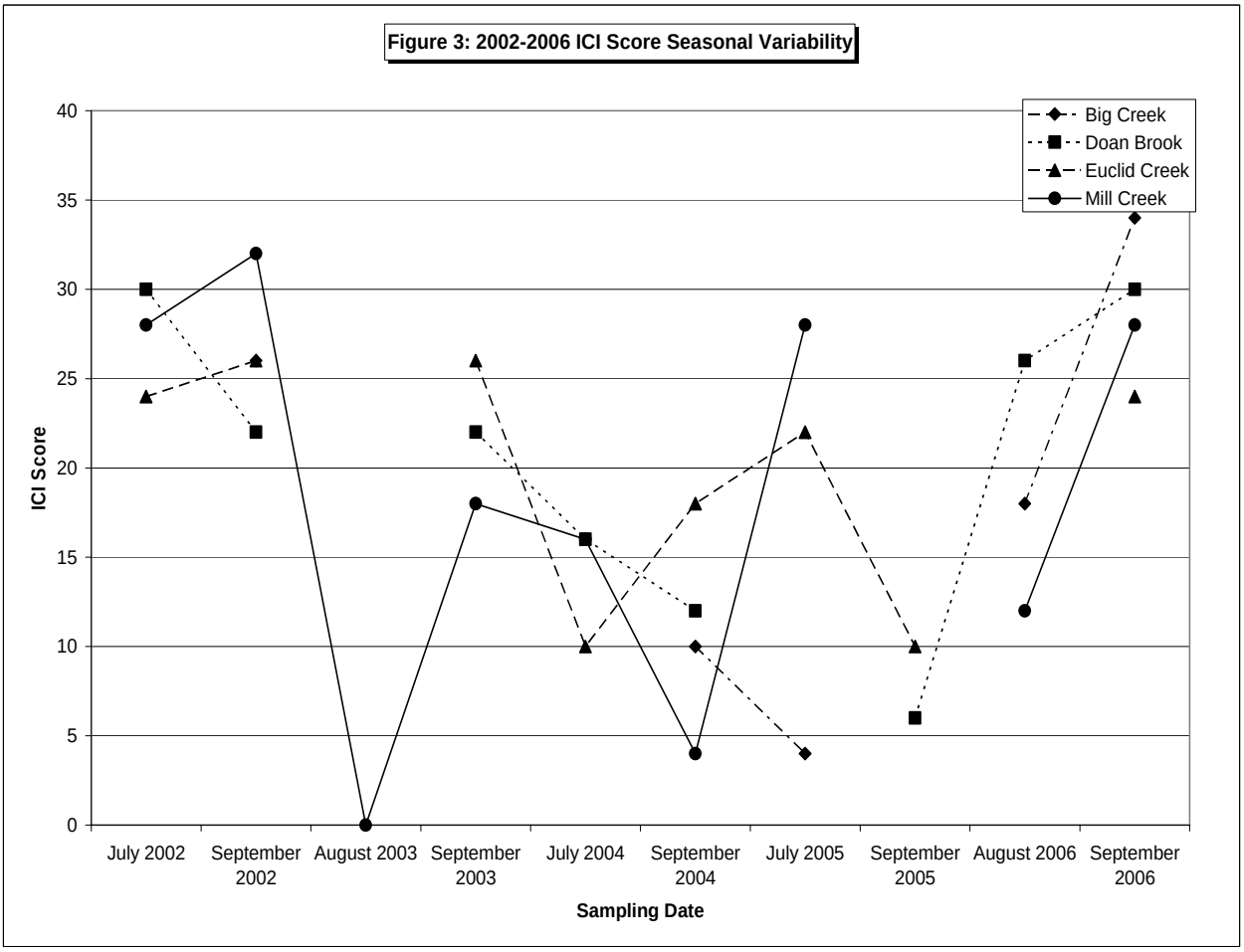
27. The calculated QHEI values:

    Not required by Ohio EPA Permit No. 3PA00002*FD.

28. Discussion of the study results in terms of impact from the facility in question and other facilities that may have been studied:

    Since 2002, NEORSD staff has installed Hester-Dendy samplers for two 6-week periods, in an effort to account for seasonal variability. The individual scores for 2007 are provided in the table in item 24 above. It was previously noted in item 11, above, that the formalin solution used to preserve the first round of samplers for 2007 was found to be defective, in that all of the samples, both quantitative and qualitative, exhibited signs of being under-preserved (septic odor and off-gassing/bubbles when the container was opened). This resulted in decomposition of the majority of the macroinvertebrates in these samples, with the remaining organisms identified not being a true representation of the samples.

    Figure 3 indicates the amount of variability present between the two sampling periods, from 2002 to 2006. There is clearly a great amount of seasonal variability between the two sampling periods for each year at all of the sites. Results from 2007 have not been included as the first round of sampling has been invalidated and should be used for informational purposes only.



For each sampling year, rainfall may be a factor that affected the ICI scores. In 2007, a total of 3.10 and 7.44 inches of rainfall was measured at Cleveland Hopkins International Airport by the National Weather Service during the first and second sampling periods, respectively. Over half (56%) of the total rainfall during the first sampling period occurred from July 24, 2007 to July 27, 2007, approximately one week prior to the Hester-Dendy sampler retrievals. Half of the total rainfall during the second sampling period occurred from August 19, 2007 to August 21, 2007. Either of these sets of concentrated storm events may have caused scouring and insufficient colonization of the Hester-Dendy samplers and/or a change in the streambed morphology due to the elevated stream flows.

Additional problems plagued the weekly status of the Hester-Dendy sampler at Mill Creek Site #31 during the sampling season. This sampler was reset twice due to burial from sand deposition, and twice it was resituated: once due to partial burial and once as the Hester-Dendy was found not submerged. The Hester-Dendy sampler was found to be out of the flow on September 13, 2007, for an unknown period of time.

As the sampler was still wet, the Hester-Dendy was repositioned on September 13, 2007 under the flow and was retrieved for collection twelve days later. The condition of this sampler may be suspect, as the sampler could have been out of the flow for up to seven days, resulting in the loss of organisms and/or insufficient remaining time for colonization.

There was one documented dry-weather overflow during the two sampling periods. A dry-weather overflow from CSO 053 was discovered on August 13, 2007, three days after the Hester-Dendy sampler was installed for the second sampling period at Big Creek Site #25. This dry-weather overflow was due to a sewer blockage, the result of accumulated grit and brick in a sewer on West 56th Street, and was remediated on August 13, 2007 by jetting the blockage.

For the purposes of this project, wet weather events occur when the average amount of rainfall reported by the National Weather Service at http://www.afws.net/ is:

- greater than 0.10 inches and rain events began, in general, before 12:00 noon (samples collected that day are considered wet weather samples);
- greater than 0.10 inches but less than 0.25 inches (samples collected the following day are considered wet weather samples);
- greater than 0.25 inches (samples collected the following two days are considered wet weather samples).

During the first sampling period, one zinc excursion from applicable outside mixing zone maximum (OMZM) water quality criteria for the protection of aquatic life occurred on Euclid Creek, and two (zinc and pH) occurred on Mill Creek. There were no water quality excursions during the second colonization period.

Neither zinc excursion that occurred on Euclid and Mill Creeks on June 18, 2007 was the result of a wet weather event as no precipitation had occurred in the previous nine days; however, the field pH excursion that was recorded on Mill Creek on August 8, 2007 did occur during a wet weather event. An investigation was not conducted on the zinc excursions, as elevated zinc concentrations were not detected during subsequent sampling. An investigation was conducted on the low field pH value on August 8, 2007. Investigators checked the field pH at two upstream locations, where pH values were found to be within the acceptable range of 6.5-9.0 standard units (s.u.) for applicable outside mixing zone water quality criteria for the protection of aquatic life. The Investigators again checked the field pH at Mill Creek Site #31, where the pH was then found to be 7.1 s.u., an increase from the original 5.8 s.u. In conclusion, while a cause was not determined, the low pH had ceased.

Site	Period	Sample Date	Parameter	Value (µg/L)	OMZM Aquatic Life Criterion (µg/L)
Euclid Creek #0.5	1st	June 18, 2007	Zinc	358	224
Mill Creek #31	1st	June 18, 2007	Zinc	371	366
		August 8, 2007	Field pH	5.8 s.u.	6.5-9.0 s.u.

There were no exceedances of 30-day outside mixing zone average water quality criteria for the protection of aquatic life during either of the sampling periods.

29. Other relevant information:

All information believed to be relevant has been included.

Appendix A

Correspondence Concerning Minor Changes in Sampling and Reporting Procedures

Northeast Ohio Regional Sewer District

Environmental & Maintenance Services Center • 4747 E. 49th St. • Cuyahoga Heights, OH 44125-1011
(216) 641-6000 • FAX: (216) 641-8118

May 8, 1997

Ms. Sandy Cappotto
Ohio Environmental Protection Agency
Northeast District Office
2110 East Aurora Road
Twinsburg, OH 44087

Dear Ms. Cappotto:

I am writing to confirm our telephone conversation of April 28, 1997 concerning the Northeast Ohio Regional Sewer District's (NEORSD) CSO NPDES Permit No. 3PA00002*FD, effective April 1, 1997.

Part II, Item I of the permit states in part, "The macroinvertebrate sampling required at F.1(d) and G.2 shall be established and conducted in accordance with procedures outlined in 'Reporting and Testing Guidance for Biomonitoring Required by the Ohio Environmental Protection Agency'(October 1991, or latest revision; Division of Surface Water)...." The October 1991 version of "Reporting and Testing Guidance..." is the latest revision.

Section 1, Part B of "Reporting and Testing Guidance..." requires the submission of a Standard Operating Procedure (SOP) which details the techniques used to conduct tests required by NPDES permits. NEORSD will not be required, for the purposes of macroinvertebrate sampling required by NPDES Permit No. 3PA00002*FD, to submit an SOP.

Section 4, Part F of "Reporting and Testing Guidance..." requires the submission of a study plan prior to the initiation of an instream biomonitoring program. NEORSD will not be required, for the purposes of macroinvertebrate sampling required by NPDES Permit No. 3PA00002*FD, to submit a study plan.

Section 4, Part G of "Reporting and Testing Guidance..." requires chemical analysis of ambient waters in conjunction with an instream biological survey. Part G states,

Ms. Sandy Cappotto
Ohio Environmental Protection Agency
May 8, 1997
Page 2

"Parameters analyzed at each site should be relevant to the NPDES permit monitoring requirements and any interactive impacts, including nonpoint sources, that occur in the study area." Ohio EPA will not specify which chemical parameters must be analyzed. NEORSD staff may exercise its discretion in the selection of appropriate chemical parameters.

If I have misinterpreted or misstated our telephone conversation of April 28, 1997, please contact me at the letterhead address or by telephone at (216) 641-6000.

Sincerely,

Frank Foley, Supervisor
Water Quality and Industrial Surveillance

cc J. Weber
R. Connelly
F. Greenland
K. Linn
W. Mack

OhioEPA
State of Ohio Environmental Protection Agency
Northeast District Office
2110 E. Aurora Road
Twinsburg, Ohio 44087-1969
(216) 425-9171
FAX (216) 487-0769

George V. Voinovich
Governor

June 9, 1997

NEORSD
CSO Permit
3PA00002 (OH0043991)

Mr. Frank Greenland
NEO Regional Sewer District
3826 Euclid Ave.
Cleveland, OH 44115

Dear Mr. Greenland:

This letter is to document conversations between Frank Foley, NEORSD and Steve Tuckerman of this office concerning the macroinvertebrate sampling requirement per Part II., I., of the NEORSD CSO permit. The permit as written has conflicting information concerning the dates of deployment of the Hester Dendy artificial substrates (HDs). The dates specified in the permit are in error and all macroinvertebrate sampling should be performed in accordance with "Biological Criteria for the Protection of Aquatic Life: Volume III" which lists June 15 through September 30 as the proper sampling times.

Concern was also expressed about the possible loss of HDs due to natural stream conditions or vandalism. The Ohio EPA recognizes that such situations may occur. All reasonable efforts must be made to collect samples from HDs. If loss of substrates should occur, the District would send a written explanation of why the HDs could not be collected. In any case, qualitative kick net sampling should be performed and the results reported.

The site locations mentioned in the permit are intended as a general location of the sampling area. Final selection of the HD location may be made at the discretion of the NEORSD field staff.

If you have any questions please contact this office at (216) 963-1124 or Steve Tuckerman (216) 963-1105.

Sincerely,
Sandra M. Cappotto
Sandra M. Cappotto
Environmental Scientist
Division of Surface Water

SMC:bp

cc: Frank Foley, NEORSD

file:misc:neorsd:mac

RECEIVED
WATER QUALITY ... INDUSTRIAL
SURVEILLANCE
JUN 11 1997
NORTHEAST OHIO REGIONAL
SEWER DISTRICT

Printed on recycled paper

2007 ICI Scores

	Big Creek Site #25		Doan Brook Site #16.1		Euclid Creek Site #0.5		Mill Creek Site #31	
	Aug 2007	Sept 2007	July 2007	Sept 2007	July 2007	Sept 2007	Sept 2007	-
Drainage Area	38.0	38.0	10.0	10.0	23.0	23.0	18.1	
ICI Score	**20**	**22**	**8**	**28**	**2**	**22**	**22**	
Total Number of Organisms	53	403	22	429	15	169	189	
Number of Taxa	10	29	15	28	7	25	18	
Taxa Score	0	4	2	4	0	4	2	
Number of Mayflies	0	1	0	1	0	0	2	
Mayfly Score	0	0	0	0	0	0	0	
Number of Caddisflies	5	4	2	3	1	2	4	
Caddisfly Score	6	6	4	6	2	4	6	
Number of Dipterans	2	19	8	19	5	17	8	
Dipteran Score	0	4	2	4	0	4	2	
Percent Mayflies	0.0	0.2	0	12.4	0	0	10.1	
% Mayfly Score	0	2	0	4	0	0	2	
Percent Caddisflies	52.8	2.0	9.1	0.9	26.7	1.2	9.0	
% Caddisfly Score	6	2	0	4	0	2	6	
Percent Tanytarsini	0.0	7.9	0	13.1	0	25.4	0.5	
% Tanytarsini Score	0	2	0	4	0	6	2	
Percent Other Dipterans	47.2	89.8	90.9	73.7	73.3	71.0	79.9	
% Other Dipterans Score	2	0	0	0	0	0	0	
Percent Tolerant	0.0	43.9	22.7	40.1	26.7	33.7	60.8	
% Tolerant Score	6	0	0	0	0	0	0	
Qualitative EPT	3	5	3	5	2	5	4	
EPT Score	0	2	0	2	0	2	2	
Low-end Scoring	No	No	Yes	No	Yes	No	No	

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH HESTER-DENDY AND QUALITATIVE SAMPLE AT LOCATION BIG CREEK (BC25), AUGUST AND SEPTEMBER 2007.

TAXA	AUGUST				SEPTEMBER			
	HESTER		QUAL		HESTER		QUAL	
	#	%	#	%	#	%	#	%
Turbellaria	--	--	2	5.13	1	0.25	3	5.45
Plumatella	1	1.89	--	--	1	0.25	--	--
Oligochaeta	--	--	6	15.38	3	0.74	--	--
Mooreobdella microstoma	3	5.66	2	5.13	4	0.99	2	3.64
Caecidotea	--	--	--	--	--	--	1	1.82
Baetis intercalaris	--	--	2	5.13	--	--	3	5.45
Baetis flavistriga	--	--	2	5.13	1	0.25	3	5.45
Calopteryx	--	--	--	--	--	--	1	1.82
Hetaerina	--	--	--	--	--	--	1	1.82
Enallagma	--	--	5	12.82	--	--	--	--
Aeshna	--	--	1	2.56	--	--	--	--
Cheumatopsyche	18	33.96	4	10.26	5	1.24	13	23.64
Hydropsyche depravata grp.	1	1.89	--	--	--	--	1	1.82
Hydropsyche dicantha	--	--	--	--	1	0.25	--	--
Ceratopsyche morosa	3	5.66	--	--	1	0.25	2	3.64
Ceratopsyche sparna	1	1.89	--	--	--	--	--	--
Hydroptila	5	9.43	--	--	1	0.25	--	--
Ablabesmyia mallochi	--	--	3	7.69	8	1.99	--	--
Thienemannimyia grp.	--	--	1	2.56	88	21.84	7	12.73
Cricotopus tremulus grp.	--	--	--	--	42	10.42	4	7.27
Cricotopus bicinctus grp.	--	--	1	2.56	38	9.43	2	3.64
Cricotopus sylvestris grp.	--	--	--	--	14	3.47	--	--
Nanocladius distinctus	--	--	1	2.56	18	4.47	--	--
Nanocladius crassicornus/rectinervis	--	--	--	--	2	0.50	--	--
Chironomus	--	--	--	--	2	0.50	2	3.64
Cryptochironomus	--	--	1	2.56	--	--	--	--
Dicrotendipes neomodestus	--	--	--	--	2	0.50	--	--
Dicrotendipes fumidus	--	--	--	--	2	0.50	--	--
Phaenopsectra flavipes	--	--	--	--	2	0.50	--	--
Phaenopsectra obediens	--	--	1	2.56	--	--	--	--
Polypedilum fallax grp.	--	--	--	--	6	1.49	--	--
Polypedilum flavum	--	--	--	--	2	0.50	--	--
Polypedilum illinoense	--	--	--	--	96	23.82	8	14.55
Polypedilum scalaenum grp.	--	--	1	2.56	2	0.50	--	--
Paratanytarsus	--	--	--	--	18	4.47	--	--
Tanytarsus glabrescens grp.	--	--	--	--	6	1.49	--	--
Tanytarsus guerlus grp.	--	--	--	--	8	1.99	--	--
Simulium	13	24.53	3	7.69	--	--	2	3.64
Hemerodromia	2	3.77	1	2.56	28	6.95	--	--
Physa	6	11.32	2	5.13	1	0.25	--	--
TOTAL	53	100.00	39	100.00	403	100.00	55	100.00
TOTAL TAXA	10		18		29		16	

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH HESTER-DENDY AND QUALITATIVE SAMPLE AT LOCATION DOAN BROOK (DB16.1), JULY AND SEPTEMBER 2007.

TAXA	JULY				SEPTEMBER			
	HESTER		QUAL		HESTER		QUAL	
	#	%	#	%	#	%	#	%
Turbellaria	--	--	1	3.57	7	1.63	9	9.38
Plumatella	1	4.55	--	--	--	--	1	1.04
Oligochaeta	1	4.55	--	--	6	1.40	2	2.08
Helobdella stagnalis	--	--	--	--	--	--	1	1.04
Erpobdella punctata punctata	1	4.55	--	--	--	--	--	--
Mooreobdella microstoma	3	13.64	1	3.57	2	0.47	3	3.13
Crangonyx	--	--	1	3.57	--	--	--	--
Hydracarina	--	--	1	3.57	4	0.93	--	--
Baetis intercalaris	--	--	1	3.57	--	--	1	1.04
Baetis flavistriga	--	--	2	7.14	53	12.35	29	30.21
Cheumatopsyche	1	4.55	--	--	2	0.47	8	8.33
Hydropsyche depravata grp.	1	4.55	3	10.71	1	0.23	5	5.21
Hydroptila	--	--	--	--	1	0.23	17	17.71
Ablabesmyia mallochi	--	--	--	--	10	2.33	1	1.04
Thienemannimyia grp.	1	4.55	3	10.71	26	6.06	5	5.21
Cricotopus tremulus grp.	--	--	1	3.57	6	1.40	--	--
Cricotopus bicinctus grp.	1	4.55	1	3.57	10	2.33	2	2.08
Cricotopus sylvestris grp.	1	4.55	--	--	6	1.40	--	--
Nanocladius distinctus	--	--	--	--	2	0.47	--	--
Synorthocladius	--	--	--	--	28	6.53	1	1.04
Chironomus	--	--	--	--	6	1.40	--	--
Dicrotendipes simpsoni	--	--	--	--	6	1.40	--	--
Phaenopsectra flavipes	1	4.55	--	--	2	0.47	--	--
Phaenopsectra obediens	--	--	1	3.57	--	--	--	--
Polypedilum fallax grp.	--	--	--	--	2	0.47	--	--
Polypedilum flavum	5	22.73	--	--	2	0.47	--	--
Polypedilum illinoense	2	9.09	4	14.29	134	31.24	5	5.21
Polypedilum scalaenum grp.	--	--	--	--	--	--	1	1.04
Paratanytarsus	--	--	--	--	10	2.33	--	--
Rheotanytarsus	--	--	--	--	2	0.47	--	--
Tanytarsus glabrescens grp.	--	--	--	--	8	1.86	--	--
Tanytarsus guerlus grp.	--	--	1	3.57	36	8.39	--	--
Simulium	1	4.55	3	10.71	1	0.23	3	3.13
Tipula	--	--	--	--	--	--	1	1.04
Hemerodromia	1	4.55	3	10.71	55	12.82	1	1.04
Bithynia tentaculata	--	--	1	3.57	1	0.23	--	--
Physa	1	4.55	--	--	--	--	--	--
TOTAL	22	100.00	28	100.00	429	100.00	96	100.00
TOTAL TAXA	15		16		28		19	

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH SURBER, HESTER-DENDY, AND QUALITATIVE AT LOCATION EUCLID CREEK (EC0.5), JULY AND SEPTEMBER 2007.

TAXA	JULY				SEPTEMBER			
	HESTER		QUAL		HESTER		QUAL	
	#	%	#	%	#	%	#	%
Turbellaria	--	--	4	16.67	1	0.59	4	3.60
Oligochaeta	--	--	1	4.17	12	7.10	3	2.70
Mooreobdella microstoma	2	13.33	--	--	--	--	2	1.80
Caecidotea	--	--	1	4.17	2	1.18	8	7.21
Crangonyx	--	--	--	--	--	--	5	4.50
Baetis flavistriga	--	--	8	33.33	--	--	10	9.01
Stenonema femoratum	--	--	--	--	--	--	20	18.02
Calopteryx	--	--	--	--	--	--	2	1.80
Hetaerina	--	--	1	4.17	--	--	--	--
Argia	--	--	--	--	--	--	1	0.90
Boyeria	--	--	--	--	1	0.59	--	--
Cheumatopsyche	--	--	--	--	1	0.59	11	9.91
Hydropsyche depravata grp.	--	--	--	--	--	--	2	1.80
Ceratopsyche morosa	--	--	--	--	--	--	1	0.90
Hydroptila	4	26.67	1	4.17	1	0.59	--	--
Stenelmis	--	--	1	4.17	3	1.78	5	4.50
Ablabesmyia mallochi	--	--	--	--	3	1.78	4	3.60
Thienemannimyia grp.	--	--	4	16.67	1	0.59	--	--
Cricotopus tremulus grp.	--	--	--	--	31	18.34	5	4.50
Cricotopus bicinctus grp.	--	--	--	--	31	18.34	5	4.50
Cricotopus sylvestris grp.	--	--	--	--	1	0.59	--	--
Nanocladius distinctus	--	--	--	--	1	0.59	--	--
Chironomus	--	--	--	--	3	1.78	1	0.90
Dicrotendipes neomodestus	--	--	--	--	5	2.96	--	--
Dicrotendipes fumidus	2	13.33	--	--	9	5.33	3	2.70
Dicrotendipes simpsoni	--	--	--	--	--	--	1	0.90
Paratendipes	--	--	1	4.17	--	--	--	--
Phaenopsectra flavipes	--	--	--	--	1	0.59	--	--
Phaenopsectra obediens	1	6.67	--	--	4	2.37	--	--
Polypedilum fallax grp.	--	--	--	--	1	0.59	--	--
Polypedilum illinoense	4	26.67	--	--	8	4.73	2	1.80
Polypedilum scalaenum grp.	1	6.67	1	4.17	1	0.59	4	3.60
Pseudochironomus	1	6.67	--	--	--	--	--	--
Paratanytarsus	--	--	--	--	34	20.12	--	--
Rheotanytarsus	--	--	--	--	--	--	1	0.90
Tanytarsus glabrescens grp.	--	--	--	--	9	5.33	5	4.50
Tanytarsus guerlus grp.	--	--	--	--	--	--	2	1.80
Simulium	--	--	--	--	--	--	3	2.70
Hemerodromia	--	--	1	4.17	4	2.37	1	0.90
Helisoma	--	--	--	--	1	0.59	--	--
TOTAL	15	100.00	24	100.00	169	100.00	111	100.00
TOTAL TAXA	7		11		25		26	

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH HESTER-DENDY AND QUALITATIVE SAMPLE AT LOCATION MILL CREEK (MC31), SEPTEMBER 2007.

	SEPTEMBER			
	HESTER		QUAL	
TAXA	#	%	#	%
Turbellaria	--	--	1	5.56
Plumatella	1	0.53	--	--
Oligochaeta	9	4.76	1	5.56
Gammarus	5	2.65	--	--
Baetis intercalaris	2	1.06	1	5.56
Baetis flavistriga	17	8.99	2	11.11
Calopteryx	--	--	2	11.11
Aeshna	1	0.53	--	--
Cheumatopsyche	7	3.70	--	--
Hydropsyche depravata grp.	--	--	1	5.56
Hydropsyche dicantha	3	1.59	--	--
Ceratopsyche morosa	6	3.17	2	11.11
Hydroptila	1	0.53	--	--
Ablabesmyia mallochi	--	--	1	5.56
Thienemannimyia grp.	22	11.64	2	11.11
Cricotopus bicinctus grp.	33	17.46	1	5.56
Cricotopus sylvestris grp.	2	1.06	--	--
Parametriocnemus	1	0.53	--	--
Polypedilum fallax grp.	2	1.06	--	--
Polypedilum illinoense	69	36.51	2	11.11
Paratanytarsus	1	0.53	--	--
Hemerodromia	7	3.70	2	11.11
TOTAL	189	100.00	18	100.00
TOTAL TAXA	18		12	