Northeast Ohio Regional Sewer District

Northeast Ohio Regional SEWER DISTRICT

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

December 30, 2002

"Protecting Your Clean Water Investment"

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.

   Big Creek

   Hester-Dendy artificial substrate samplers were installed downstream of all CSOs tributary to Big Creek at NEORSD stream monitoring Site #25, which is downstream of Jennings Road. At this site, the creek has riffles, a run, and a deep pool. The samplers were located downstream of the last riffle and just upstream of a sharp bend with a deep pool, approximately 90 feet downstream of the Treadway Creek outfall. The riffle depth is generally greater than 10 centimeters, the Hester-Dendy samplers were placed in approximately 36 centimeters of water, and the creek is approximately 3 meters wide at this location. The stream gradient at Site #25 was estimated at approximately 18 feet per mile, and the creek had a drainage area of approximately 38.6 square miles. The riparian zone in the area is very narrow, and land use would be classified primarily as urban/industrial. A construction project began in May of 2000 on the river left bank, adjacent to the Hester-

Dendy samplers. The construction site for the commercial building and parking lot was completely denuded of vegetation right up to the stream. No erosion control was observed during the 2000 sample period, and evidence of sediment-laden storm runoff and erosion was observed. This section of Big Creek was dramatically impacted by the construction with the riffle areas being filled in with sediment. Due to the heavy sediment load from the construction site, the Hester-Dendy samplers needed to be reset on two occasions when the samplers were buried in approximately 36 centimeters of sediment and rock. Reduction of fine sediments in the creek and recovery of the riparian vegetation were observed in 2001. In 2002, the riparian vegetation along Big Creek had fully recovered.

Doan Brook

The Doan Brook NEORSD macroinvertebrate sampling site #16.1 is located approximately 100 feet downstream of St. Clair Avenue in the channelized section of the brook, which flows through Rockefeller Park. The site is approximately 150 feet downstream of the furthest downstream CSO discharging to Doan Brook. Stone walls approximately 8 to 10 feet in height are present on both sides of the brook from University Circle to I-90. Stream width at this location is approximately 3 meters, and Hester-Dendy samplers were placed in approximately 36 centimeters of water. 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 had a drainage area of approximately 9.5 square miles.

Euclid Creek

The Euclid Creek macroinvertebrate sampling site is located downstream of NEORSD stream monitoring Site #0.5, within the Wildwood Park area of the Cleveland Lakefront State Park. Hester-Dendy artificial substrate samplers were installed approximately 600 feet downstream of Lake Shore Boulevard and downstream of all Euclid Creek CSOs. The slow flow velocity during dry weather, which is below that required for Hester-Dendy sampling, is attributable to the low stream gradient at this location. The stream gradient at this site was estimated at approximately 6 feet per mile, and the creek had a drainage area of approximately 24.2 square miles. The depth of the creek at this location is approximately 36 centimeters midstream and approximately 10 centimeters along the margins. Hester-Dendy artificial substrate samplers were set in a glide area, which was approximately 36 centimeters deep. The creek is approximately 20 meters wide at this location with a narrow riparian zone. 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

The Mill Creek benthic macroinvertebrate sample site is located upstream of the Canal Road Bridge. This site is also used as the NEORSD routine water quality and benthic macroinvertebrate sample Site #31. 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 36 centimeters of water. This site is downstream from all CSO outfalls and tributaries to Mill Creek. At this location, the stream gradient was

calculated to be approximately 12 feet per mile, and the creek has a drainage area of approximately 18.1 square miles.

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

   Hester-Dendy artificial substrate samplers per Ohio EPA specifications; 12" x 8" x 4" cinder blocks; assorted lengths of ½-inch steel rebar; 3/8-inch eye bolts; plastic tie wraps; 1/8-inch 300-pound test nylon rope; five-gallon bucket; soft-bristled brush; U.S. number 35 standard sieve (500-micron openings); 500-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; YSI Model 57 dissolved oxygen meter; Wildco Model #190-E20 wash bucket (583-micron mesh bottom); Orion Model 260 pH meter; Orion Model 128 conductivity meter.

7. Descriptions 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:

   Hester-Dendy artificial substrate samplers were installed at midstream at all sample sites. Investigators identified sample locations by pacing off the distance between known landmarks and the sample location. The Big Creek site was located approximately 90 feet downstream of the Treadway Creek outfall, the Doan Brook site was located approximately 100 feet downstream of the St. Clair Avenue Bridge, the Euclid Creek site was located approximately 600 feet downstream of the Lake Shore Boulevard bridge, and the Mill Creek site was located approximately 50 feet upstream of Canal Road. All sample sites were marked with a length of rebar, the top end of which had been painted fluorescent orange.

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

    Not Applicable.

11. Description of sample preservation methods:

    Hester-Dendy artificial substrate samplers were removed from the water and placed in a five-gallon bucket. The individual samplers were disassembled and all invertebrates and debris were washed into the five-gallon wash bucket using water from the stream being sampled. The contents of the wash bucket were then placed into 500-millileter cylindrical plastic screw-top containers. The contents of the five-gallon bucket were passed through a standard U.S. number 35 sieve. The sieved material was placed into 500-milliliter cylindrical plastic

screw-top containers. A mixture of 85% ethanol, 10% glycerin, and 5% water (AGW), which completely covered the sieved material, was added to the container. Qualitative samples were obtained and placed directly into a 50-milliliter snap-cap vial containing AGW.

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, Mill Creek, and Euclid 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. 1998. Guide to the identification of larval Chironomidae (Diptera) in the temperate eastern Nearctic north of Florida. 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.

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. 1976. Revision of the Nearctic species of the subgenus *Polypedilum* (Chironomidae: Diptera). Doctoral Dissertation, University of Minnesota.

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. and K.W. Cummins, eds. 1996. An introduction to the aquatic insects of North America. 3rd 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. and M.J. Westfall, Jr. 1955. A manual of the dragonflies of North America (Anisoptera) including the Greater Antilles and the provinces of the Mexican border. University of California Press, Berkeley, California.

Pennak, R.W. 1989. Fresh-water invertebrates of the United States. 2nd edition. John Wiley & Sons, New York, NY.

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.

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 1600 specimens representing over 500 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 3-inch squares of 1/8-inch thick hardboard, twelve one-inch squares of 1/8-inch thick hardboard (spacers), a ¼-inch eyebolt, and ¼-inch nut. A ¼-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 used for anchoring Hester-Dendy samplers:

Five Hester-Dendy artificial substrate samplers were clustered together at each location with plastic tie-wraps. Another plastic tie-wrap was used to secure the cluster of samplers to a 3/8-inch eyebolt that was anchored to the top of a 12" x 8" x 4" cinder block. The cinder blocks were anchored in place by driving a length of steel rebar into the substrate through a second 3/8-inch eyebolt, which was attached to the end of the block. A diagram that shows how the Hester-Dendy samplers were anchored is included in Appendix 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 usually 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 C	QHEI Field Sheets
Appendix D	Chemical Sample Analysis Sheets
Appendix E	Macroinvertebrate Data Sheets

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

QHEI scores, while not required by Ohio EPA Permit No. 3PA00002*FD, were calculated according to procedures outlined in *The Qualitative Habitat Evaluation Index [QHEI] Rationale, Methods, and Application* (Rankin, 1989) and in training provided to NEORSD personnel by the Ohio Environmental Protection Agency.

The IBI and the MIwb were not required by Ohio EPA Permit Number 3PA00002*FD.

The methods used for calculation of the ICI are as follows (detailed methodology can be found in *Biological Criteria for the Protection of Aquatic Life*, OEPA. 1988):

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 are dependent upon drainage area. The scoring of an individual sample was 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 each location.

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

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. Large objects, such as logs, boulders, and slabs, were first handpicked for large invertebrates using forceps and then were washed off into the kicknet. 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.

A Surber sample was utilized when Hester-Dendy samplers were lost or buried. A quadrat (one square foot) is attached to the frame of the collecting net in such a way that it can be placed on the substrate. The substrate within the quadrat is disturbed and benthic organisms are washed by current into the net. The contents retained within the Surber sample were preserved 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 for both sample

types as:

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

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 2002 to evaluate seasonality as a variable. The following table lists the streams, date installed and date removed.

FIRST SAMPLING EVENT		
Stream	Date	
	Installed	Removed
Euclid Creek	June 17, 2002	July 29, 2002
Doan Brook		
Mill Creek	June 18, 2002	July 30, 2002
Big Creek		July 30, 2002 (Surber Sample)

SECOND SAMPLING EVENT		
Stream	Date	
	Installed	Removed
Euclid Creek	August 5, 2002	September 17, 2002
Doan Brook		
Mill Creek	August 6, 2002	
Big Creek		

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 E.

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

The following table summarizes the results of macroinvertebrate sampling at all four sites since 1995:

Dates Sampled	**ICI Scores**			
	Big Creek	***Doan Brook***	***Euclid Creek***	***Mill Creek***
1995	22 (Fair)	-	-	18 (Fair)
1996	20 (Fair)	-	-	-
1997	8 (Poor)	4 (Poor)	8 (Poor)	
1998	-	16 Fair	4 (Poor)	-
1999	16 (Fair)	40 (Good)	22 (Fair)	32 (Marg. Good)
2000	12 (Poor)	34 (Good)	10 (Poor)	28 (Fair)
2001	22 (Fair)	8 (Poor)	4 (Poor)	12 (Fair)

Dates Sampled	ICI Scores			
	Big Creek	*Doan Brook*	*Euclid Creek*	*Mill Creek*
July 2002	34 (Good) (Surber sample)	30 (Marg. Good)	24 (Fair)	28 (Fair)
September 2002	26 (Fair)	22 (Fair)	26 (Fair)	32 (Marg. Good)

Big Creek

NEORSD conducted quantitative macroinvertebrate sampling near the mouth of Big Creek and obtained ICI scores of 22 (Fair) in 1995, 20 (Fair) in 1996, 8 (Poor) in 1997, 16 (Fair) in 1999, 12 (Poor) in 2000, 22 (Fair) in 2001, and scores of 34 and 26 (Good and Fair) in July and September 2002, respectively. The Hester-Dendy samplers were either lost or buried during the July 2002 sampling period. Therefore, a Surber sample was obtained to calculate the ICI score (34). These scores are graphically displayed in Figure 1 with the exception of the Surber sample score, which, for method consistency, has not been included in Figure 1.

Doan Brook

NEORSD collected macroinvertebrates on Doan Brook downstream of St. Clair Avenue and obtained ICI scores of 4 (Poor) in 1997, 16 (Fair) in 1998, 40 (Good) in 1999, 30 (Marginally Good) in 2000, 8 (Poor) in 2001, and scores of 30 and 22 (Marginally Good and Fair) in July and September of 2002, respectively. These scores are graphically displayed in Figure 2.

Euclid Creek

NEORSD conducted quantitative macroinvertebrate sampling at Euclid Creek and obtained ICI scores of 8 (poor) in 1997, 4 (Poor) in 1998, 22 (Fair) in 1999, 10 (Poor) in 2000, 4 (Poor) in 2001, and scores of 24 and 26 (Fair) in July and September of 2002, respectively. These scores are graphically displayed in Figure 3.

Mill Creek

NEORSD collected macroinvertebrates on Mill Creek upstream of Canal Road in 1995, 1999, 2000, 2001, and July and September of 2002. ICI scores of 18 (Fair), 32 (Marginally Good), 28 (Fair), 12 (Poor), 28 (Fair) and 32 (Marginally Good) were obtained, respectively. These scores are graphically displayed in Figure 4.

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

Sample Location	July 2002 Score	Narrative Rating	September 2002 Score	Narrative Rating	Avg. 2002 Scores	Narrative Rating
Big Creek	34 (Surber sample)	Good	26	Fair	-	-
Doan Brook	30	Marginally Good	22	Fair	26	Fair
Euclid Creek	24	Fair	26	Fair	25	Fair
Mill Creek	28	Fair	32	Marginally Good	30	Marginally Good

25. Raw data submitted in computer format:

    The raw data are contained on the enclosed diskette.

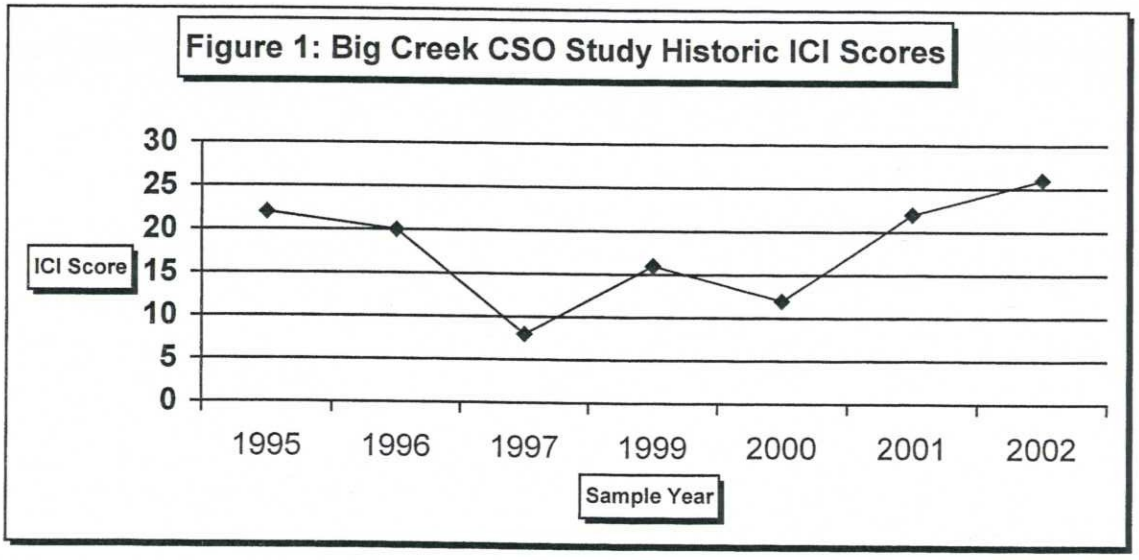
26. The biological criteria used for comparison with the stream sampling data, and the rationale behind the selection of the criteria:

    The stream segments which 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 7-16 (Biological Criteria for Warmwater, Exceptional Warmwater and Modified Warmwater Habitats) in OAC 3745-1-07, the ICI criterion for sites, which have been designated warmwater habitat within the Erie/Ontario Lake Plain (EOLP) ecoregion is 34. The table, however, also indicates that the criteria do not apply to Lake Erie river mouths.

27. The calculated QHEI values:

Sample Location	QHEI Score
Big Creek	69.25
Doan Brook	50
Euclid Creek	54
Mill Creek	61. 5

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

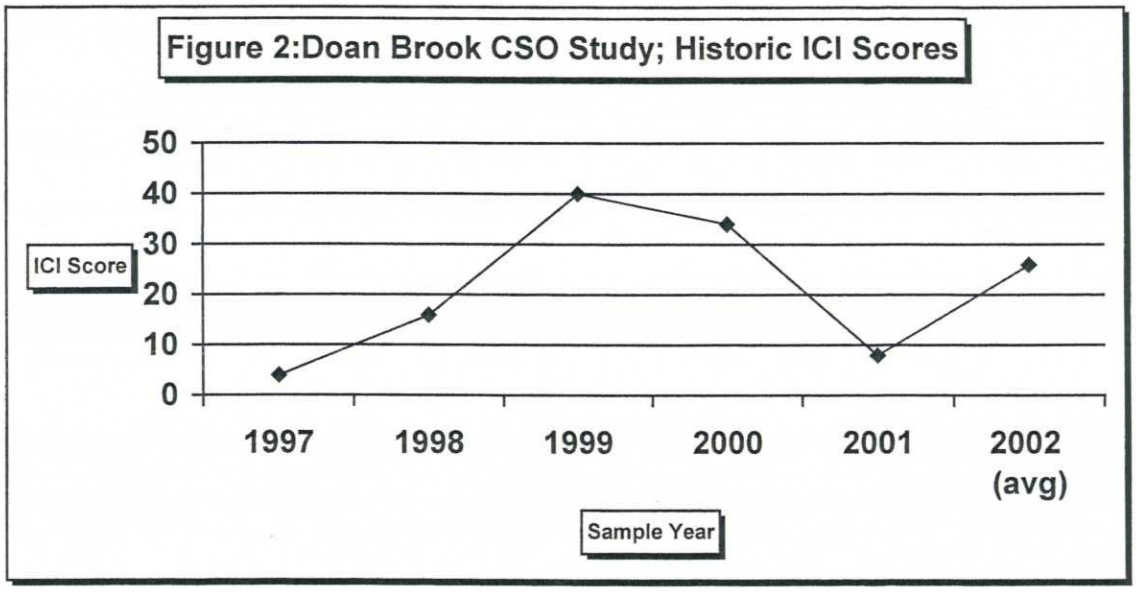


Analysis of historic ICI data for Big Creek (1995-2002) reveals an improvement in ICI scores since 2000. (See Figure 1.) There had been declines in the scores in both 1997 and 2000, which may be attributable in part to extreme fluctuations in hydrological conditions and land use activities upstream of and at the sample location during those years. (See item 5 above.)

The high score in July 2002 (34) was calculated from a Surber sample and, for sampling method consistency, was not included in Figure 1. A Surber sample was obtained to calculate the ICI score because the Hester-Dendy samplers were either lost or buried prior to retrieval.

Water quality monitoring data revealed no excursions from chemical-specific criteria for the warmwater habitat aquatic life use designation.

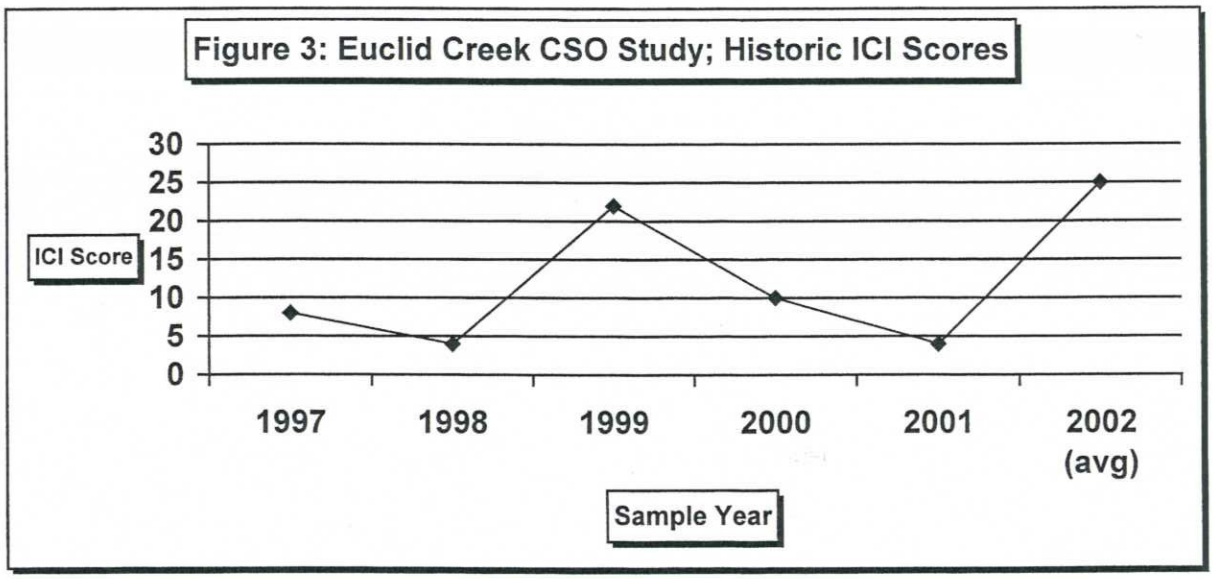
The NEORSD reported four dry weather sewer overflow events from April 2002 to September 2002 on Big Creek.



Analysis of historic Doan Brook ICI scores (1997-2002) reveals an improvement since 2001, partially reversing the decline from 1999. (See Figure 2.) The decline in the benthic macroinvertebrate community in Doan Brook in 2001 may be attributed to elevated copper concentrations discovered by investigators during water quality sampling. Subsequent investigations revealed that a laundry discharge from the Cleveland Museum of Art to a storm sewer tributary to Doan Brook may have contributed to the elevated copper concentrations. Additionally, the aquatic vegetation in a pond on the Museum's property is managed with Cutrine-Plus (copper sulfate). This pond overflows to Doan Brook, thereby contributing to increased copper loadings. On February 21, 2002, the laundry discharge was rerouted from the storm sewer to the sanitary sewer. Furthermore, representatives of the Cleveland Museum of Art stated that they would decrease the amount of copper sulfate added to the pond. Possibly due to this proactive response by the Cleveland Museum of Art, the Doan Brook water quality sampling results revealed no elevated concentrations of copper in 2002. Additionally, water quality monitoring data revealed no excursions from chemical-specific criteria for the warmwater habitat aquatic life use designation. This may have been a factor in the observed improvement in the benthic macroinvertebrate community.

The disparity between the July 2002 and September 2002 scores may reflect some natural seasonal variability in the benthic macroinvertebrate community.

The NEORSD reported three dry weather sewer overflow events from April 2002 to August 2002 on Doan Brook.

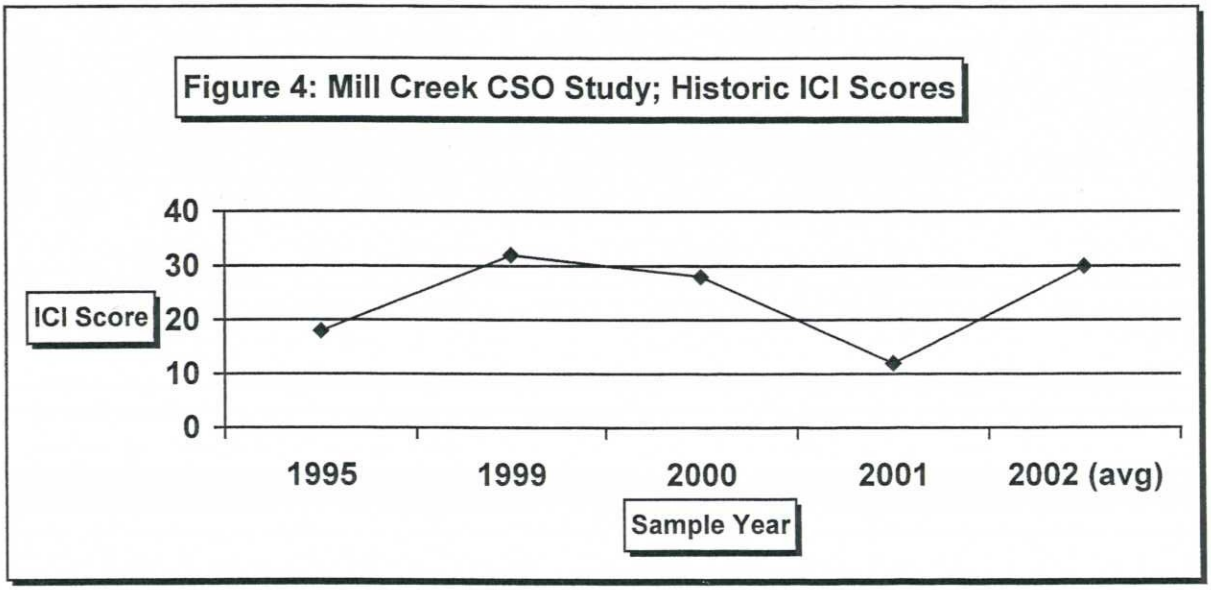


Analysis of historic ICI scores (1997-2002) calculated for Euclid Creek downstream of Lake Shore Blvd. indicates an unstable benthic macroinvertebrate community. (See Figure 3.) Such instability may be attributable to changes in the habitat at this location, which is influenced by water levels in Lake Erie, as well as the hydrological (spates, drought, etc.) and

anthropogenic (CSO, SSO, etc.) influences that may impact the structure and composition of the benthic macroinvertebrate community at any of the sites.

Water quality monitoring data revealed a daily maximum copper excursion and a thirty-day average lead excursion from chemical-specific criteria for the warmwater habitat aquatic life use designation. The copper excursion was due to a single value of 60 µg/L measured for September 17, 2002. The lead excursion was primarily due to a value of 111 µg/L measured for July 29, 2002.

The NEORSD reported one dry weather sewer overflow event on Euclid Creek in 2002, but it occurred in December, well after the sampling period.



Analysis of historic ICI scores for Mill Creek (1995-2002) reveal an improvement in ICI scores since 2001. (See Figure 4.) Possible differences in the technique of various investigators installing samplers and collecting the qualitative samples could be a factor in some of the variability of results noted at this as well as other sites.

Water quality monitoring data revealed a thirty-day average selenium excursion from the chemical-specific criterion for the warmwater habitat aquatic life use designation. The selenium excursion was due to a single value of 11 µg/L measured for June 19, 2002. However, due to its proximity to the method detection level of 10 µg/L, there exists some uncertainty regarding the actual selenium concentration. All other selenium concentrations were below detection.

The NEORSD reported fourteen dry weather sewer overflow events in 2002 on Mill Creek, but four of the events occurred in November and December, well after the sampling period.

29. Other relevant information:

All information believed to be relevant has been included above.

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,

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

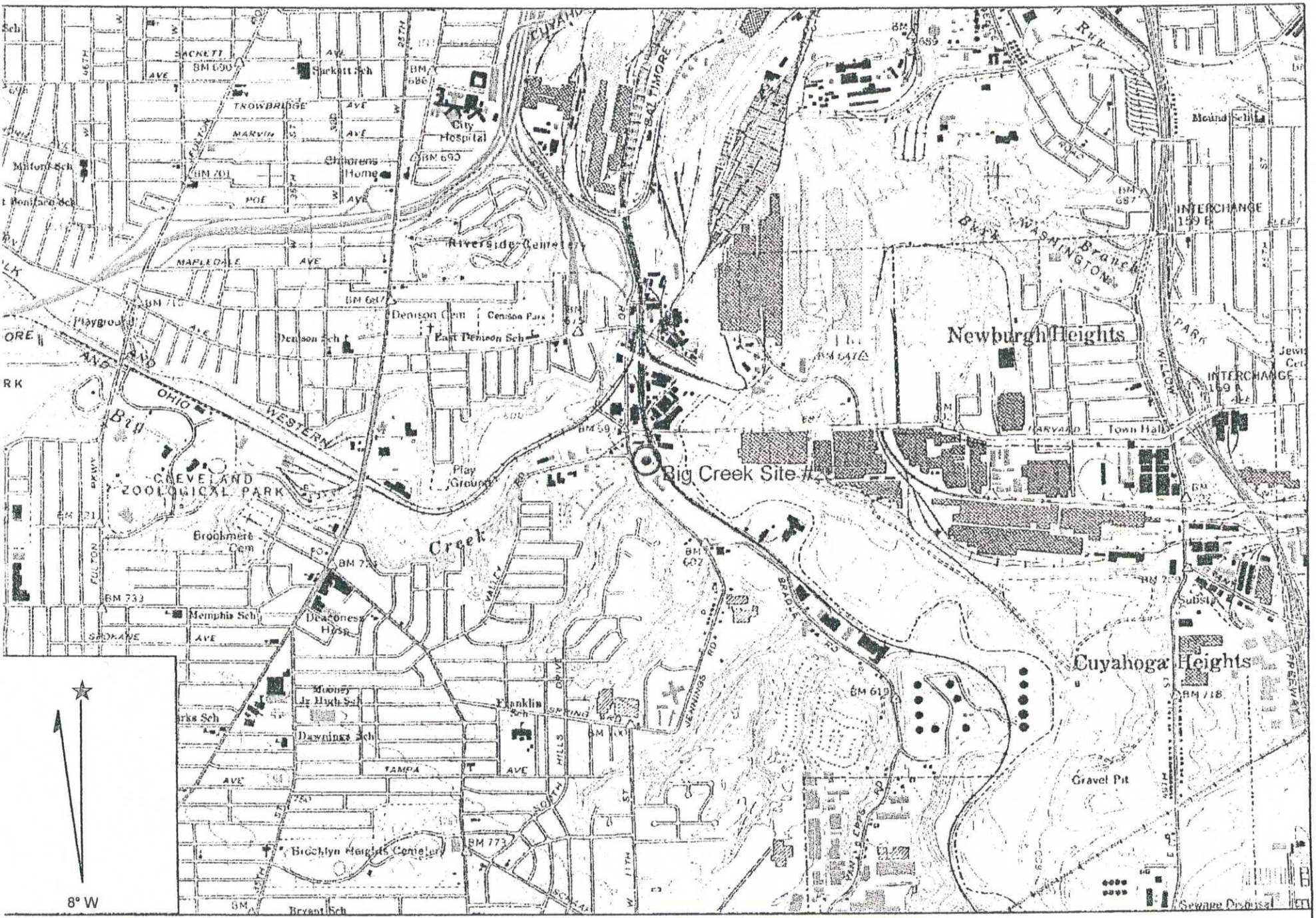
Sandra M. Cappotto
Environmental Scientist
Division of Surface Water

SMC:bp

cc: Frank Foley, NEORSD

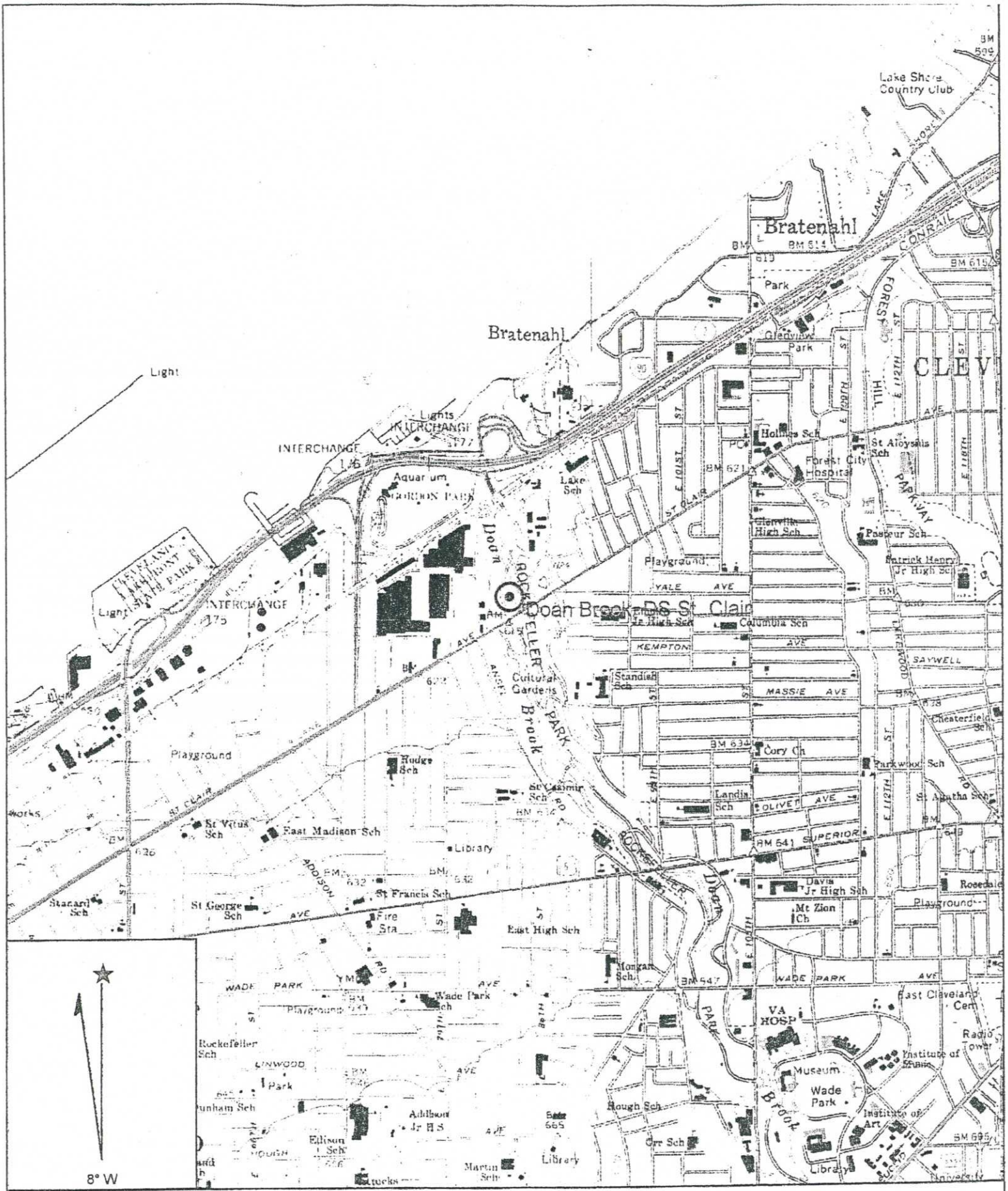
file:misc:neorsd:mac

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



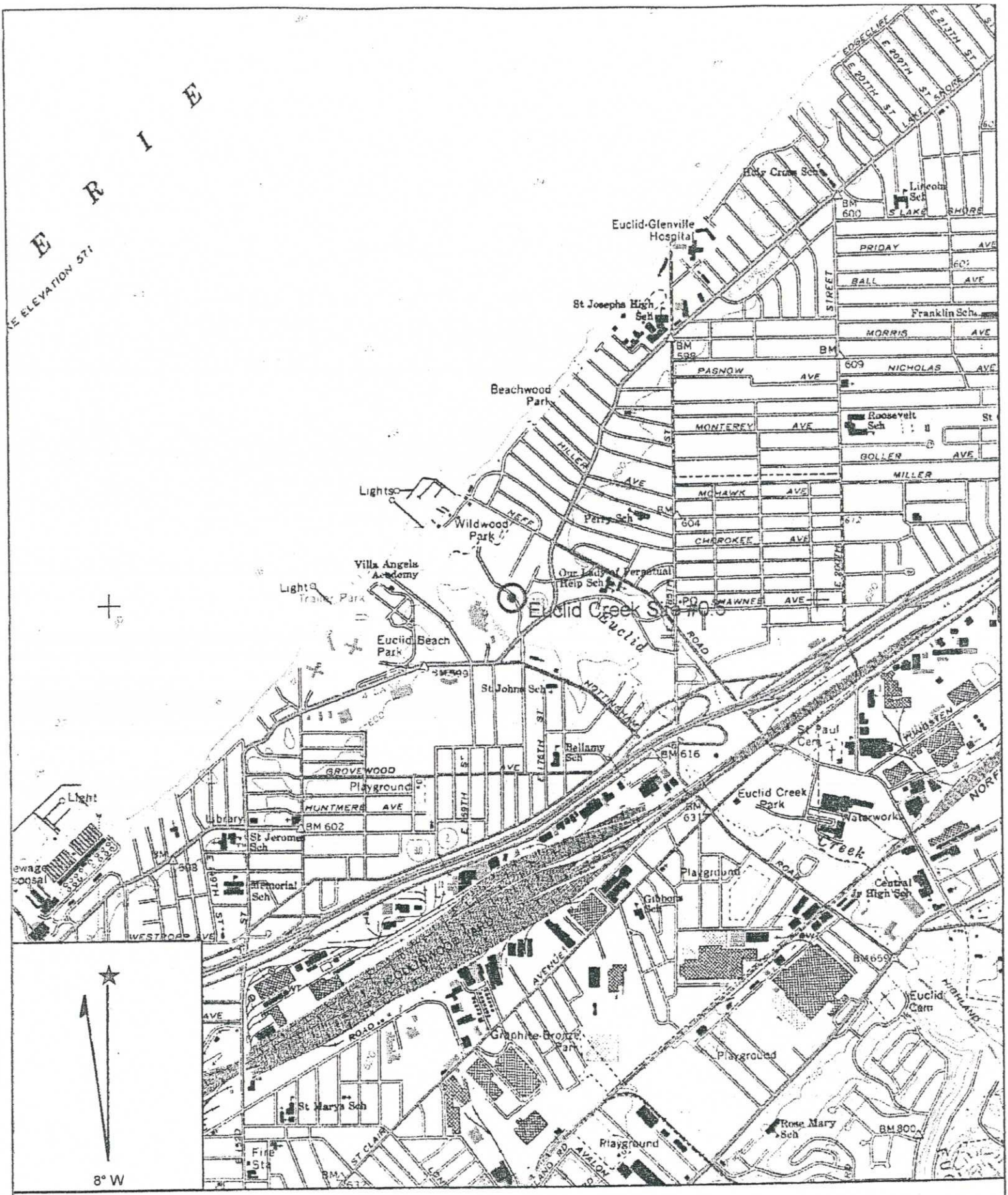
Name: CLEVELAND SOUTH
Date: 8/3/2001
Scale: 1 inch equals 2000 feet

Location: 17 442624 E 4588506 N
Caption: NEORSD CSO Permit-Required Macroinvertebrate Sampling Site, Big Creek



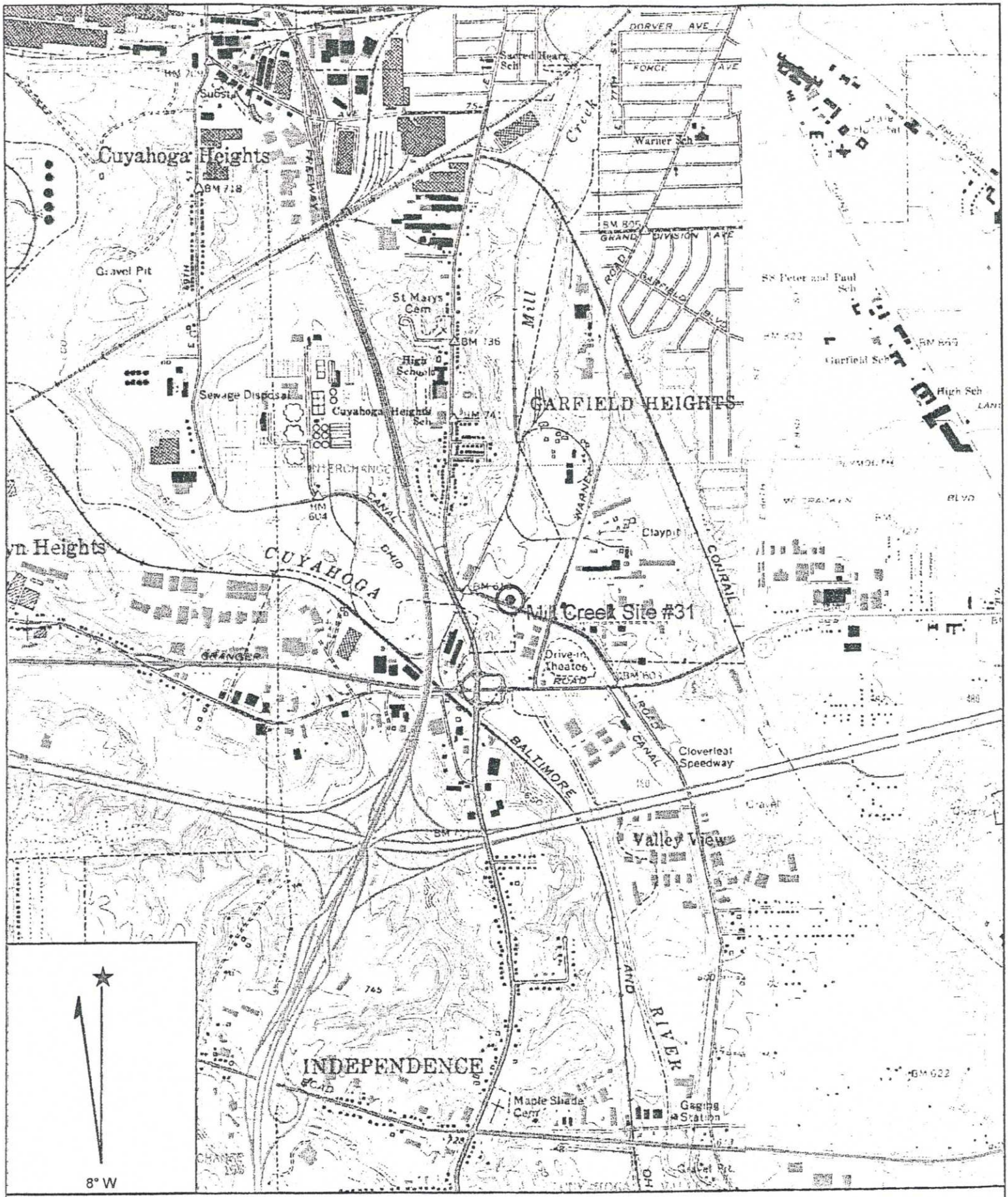
Name: CLEVELAND NORTH
Date: 8/3/2001
Scale: 1 inch equals 2000 feet

Location: 17 447451 E 4598140 N
Caption: NEORSD CSO Permit-Required Macronvertebrate Sampling Site, Doan Brook



Name: EAST CLEVELAND
Date: 8/3/2001
Scale: 1 inch equals 2000 feet

Location: 17 453333 E 4603683 N
Caption: NEORSD CSO Permit-Required Macroinvertebrate Sampling Site, Euclid Creek

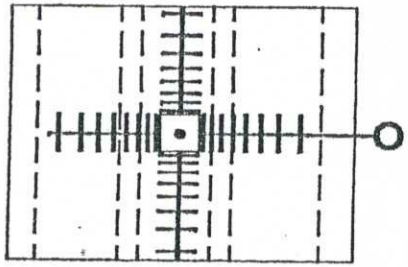


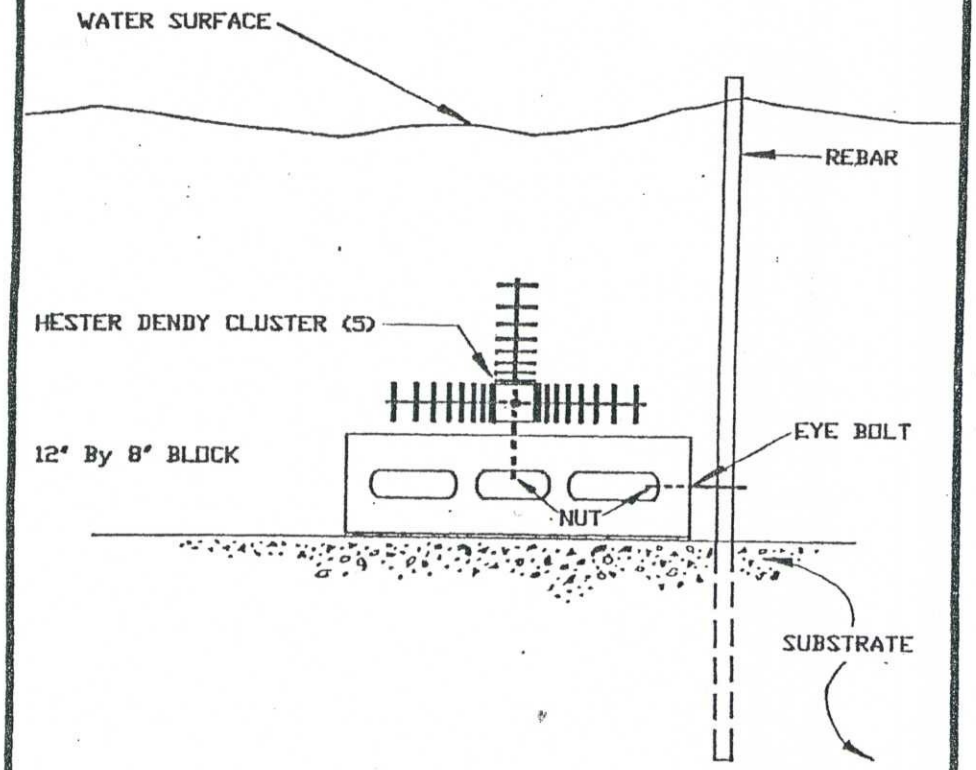
Name: CLEVELAND SOUTH
Date: 8/3/2001
Scale: 1 inch equals 2000 feet

Location: 17 446623 E 4585336 N
Caption: NEORSD CSO Permit-Required Macroinvertebrate Sampling Site, Mill Creek

Appendix B
Diagram of Hester-Dendy Anchoring Methods

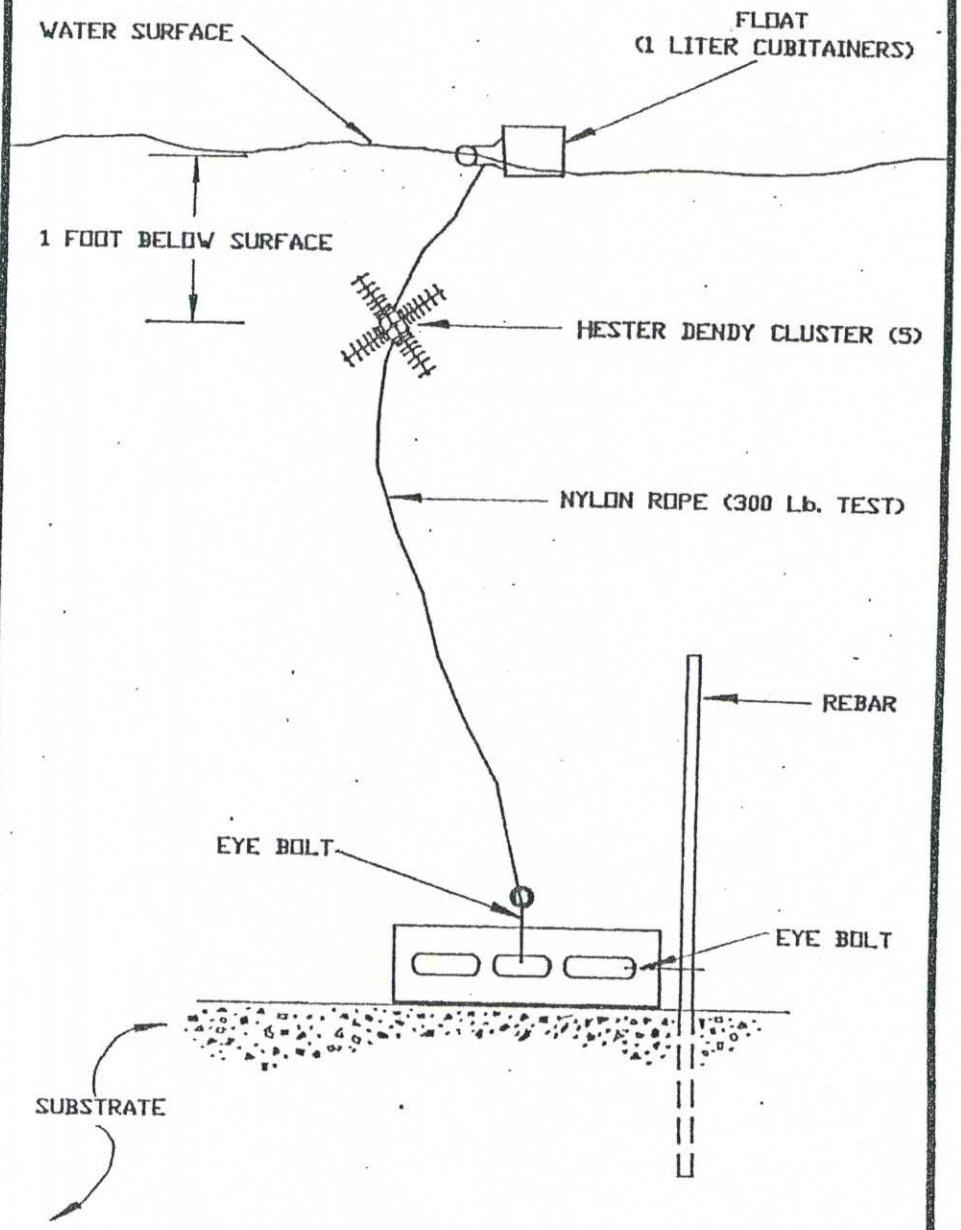
TOP VIEW





STANDARD SHALLOW WATER METHOD

NOT TO SCALE



DEEP WATER METHOD

NOT TO SCALE

Appendix C
QHEI Field Sheets

Ohio EPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 69.25

River Code: _____ RM: _____ Stream BIG CREEK

Date 6/27/02 Location SITE #25 (DOWNSTREAM OF JENNINGS ROAD)

Scorers Initials: CZ Comments _____

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);

TYPE	POOL	RIFFLE
☐ ☐-BLDR/SLBS[10]	___	___
☐ ☐-BOULDER [9]	5	15
☐ ☐-COBBLE [8]	5	25
☐ ☐-HARDPAN [4]	5	0
☐ ☐-MUCK [2]	___	___
☐ ☐-SILT [2]	___	___
■ ☐-GRAVEL [7]	25	45
■ ☐-SAND [6]	60	10
☐ ☐-BEDROCK[5]	___	___
☐ ☐-DETRITUS[3]	___	___
☐ ☐-ARTIFICIAL[0]	0	5

NOTE: *(Ignore sludge originating from point-sources; score on natural substrates)*

NUMBER OF SUBSTRATE TYPES: ■-5 or More [2] ☐-4 or Less [0]

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1] ■ -TILLS [1] ☐ -WETLANDS[0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP/RAP [0] ☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐-COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))

SILT: ☐ -SILT HEAVY [-2] ☐ -SILT MODERATE [-1] ■ -SILT NORMAL [0] ☐ -SILT FREE [1]

EMBEDDEDNESS: ☐ -EXTENSIVE [-2] ■ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

Substrate: 15 Max 20

COMMENTS: _____

2] INSTREAM COVER (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)

■ 1 UNDERCUT BANKS [1] ■ 2 POOLS> 70 cm [2] ☐ ___OXBOWS, BACKWATERS [1]

☐ ___OVERHANGING VEGETATION [1] ☐ ___ROOTWADS [1] ☐ ___AQUATIC MACROPHYTES [1]

■ 1 SHALLOWS (IN SLOW WATER) [1] ■ 1 BOULDERS [1] ■ 1 LOGS OR WOODY DEBRIS [1]

☐ ___ROOTMATS [1] COMMENTS: _____

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)

☐ - EXTENSIVE > 75% [11] ■ - MODERATE 25-75% [7] ■ - SPARSE 5-25% [3] ☐ - NEARLY ABSENT < 5%[1]

Cover: 11 Max 20

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)

SINUOSITY: ☐ - HIGH[4] ■ - MODERATE [3] ■ - LOW [2] ☐ - NONE [1]

DEVELOPMENT: ☐ - EXCELLENT [7] ■ - GOOD [5] ■ - FAIR [3] ☐ - POOR [1]

CHANNELIZATION: ■ - NONE [6] ☐ - RECOVERED [4] ☐ - RECOVERING [3] ☐ - RECENT OR NO RECOVERY [1]

STABILITY: ☐ - HIGH [3] ■ - MODERATE [2] ☐ - LOW [1]

MODIFICATIONS/OTHER: ☐ - SNAGGING ☐ - IMPOUND. ☐ - RELOCATION ☐ - ISLANDS ■ - CANOPY REMOVAL ☐ - LEVEED ☐ - DREDGING ☐ - BANK SHAPING ☐ - ONE SIDE CHANNEL MODIFICATIONS

Channel: 14.5 Max 20

COMMENTS: _____

4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

RIPARIAN WIDTH (L R (Per Bank)):
☐ ☐ú-WIDE > 50m [4]
☐ ☐ - MODERATE 10-50m [3]
☐ ☐ú-NARROW 5-10m [2]
☐ ■ú- VERY NARROW <5 m[1]
■ ■ú-NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank)):
☐ ☐-FOREST, SWAMP [3]
☐ ☐-SHRUB OR OLD FIELD [2]
☐ ☐-RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐-FENCED PASTURE [1]
☐ ☐-CONSERVATION TILLAGE [1]
■ ■-URBAN OR INDUSTRIAL [0]
☐ ☐-OPEN PASTURE, ROWCROP [0]
☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION (L R (Per Bank)):
■ ■-NONE/LITTLE [3]
☐ ☐-MODERATE [2]
☐ ■-HEAVY/SEVERE [1]

Riparian: 2.75 Max 10

COMMENTS: _____

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!):
■ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☐ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE):
☐ú-POOL WIDTH > RIFFLE WIDTH [2]
■ -POOL WIDTH = RIFFLE WIDTH [1]
☐ú-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply):
☐ú-EDDIES [1] ☐ú-TORRENTIAL [-1]
■ú-FAST [1] ☐ú-INTERSTITIAL [-1]
■ú-MODERATE [1] ☐ú-INTERMITTENT [-2]
■ú-SLOW [1]

Pool/Current: 10 Max 12

COMMENTS: _____

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH:
■ - *Best Areas >10 cm [2]
☐ - Best Areas 5-10 cm [1]
☐ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH:
■ - MAX > 50 [2]
☐ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE:
■-STABLE (e.g., Cobble, Boulder) [2]
■-MOD. STABLE (e.g., Large Gravel) [1]
☐-UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS:
☐ - NONE [2]
■ - LOW [1]
■ - MODERATE [0]
☐ - EXTENSIVE [-1]

☐ - NO RIFFLE [Metric=0]

Riffle/Run: 6 Max 8

Gradient: 10 Max 10

COMMENTS: _____

6] GRADIENT (ft/mi): 17.6 **DRAINAGE AREA (sq.mi.):** 38.6

%POOL: 10 %GLIDE: 5 %RIFFLE: 40 %RUN: 45

*Best areas must be large enough to support a population of riffle-obligate fish species.

Ohio EPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 50

River Code:_____ RM: _____ Stream DOAN BROOK
Date 6/21/02 Location SITE #16.1 (DOWNSTREAM OF ST. CLAIR AVENUE)
Scorers Initials: CZ Comments_____

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);

TYPE	POOL	RIFFLE
☐ ☐-BLDR/SLBS[10]	5	0
☐ ☐-BOULDER [9]	5	10
☐ ☐-COBBLE [8]	5	20
☐ ☐-HARDPAN [4]		
☐ ☐-MUCK [2]		
☐ ☐-SILT [2]		
■ ☐-GRAVEL [7]	35	40
■ ☐-SAND [6]	25	30
☐ ☐-BEDROCK[5]	15	0
☐ ☐-DETRITUS[3]		
☐ ☐-ARTIFICIAL[0]	10	0

NOTE: *(Ignore sludge originating from point-sources; score on natural substrates)*
NUMBER OF SUBSTRATE TYPES: ■-5 or More [2] ☐-4 or Less [0]

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1] ■ -TILLS [1] ☐ -WETLANDS[0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP/RAP [0] ☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐-COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
SILT: ☐ -SILT HEAVY [-2] ■ -SILT MODERATE [-1] ■ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ■ -EXTENSIVE [-2] ■ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

COMMENTS_____

Substrate: 14 Max 20

2] INSTREAM COVER (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ ___UNDERCUT BANKS [1] ☐ ___OVERHANGING VEGETATION [1] ■ 1 SHALLOWS (IN SLOW WATER) [1] ☐ ___ROOTMATS [1] ☐ ___POOLS> 70 cm [2] ☐ ___ROOTWADS [1] ■ 1 BOULDERS [1] ☐ ___OXBOWS, BACKWATERS [1] ■ 1 AQUATIC MACROPHYTES [1] ☐ ___LOGS OR WOODY DEBRIS [1]
COMMENTS:_____

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11] ☐ - MODERATE 25-75% [7] ■ - SPARSE 5-25% [3] ☐ - NEARLY ABSENT < 5%[1]

Cover: 6 Max 20

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)

SINUOSITY: ☐ -HIGH[4] ☐ -MODERATE[3] ■ -LOW[2] ■ -NONE[1]
DEVELOPMENT: ☐ - EXCELLENT [7] ☐ - GOOD [5] ☐ - FAIR [3] ■ - POOR [1]
CHANNELIZATION: ☐ - NONE [6] ☐ - RECOVERED [4] ☐ - RECOVERING [3] ■ - RECENT OR NO RECOVERY [1]
STABILITY: ■ -HIGH[3] ☐ -MODERATE[2] ☐ -LOW[1]
MODIFICATIONS/OTHER: ☐ - SNAGGING ☐ - IMPOUND. ☐ - RELOCATION ☐ - ISLANDS ☐ - CANOPY REMOVAL ☐ - LEVEED ☐ - DREDGING ■ - BANK SHAPING ☐ - ONE SIDE CHANNEL MODIFICATIONS

Channel: 6.5 Max 20

COMMENTS:_____

4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

RIPARIAN WIDTH L R (Per Bank)	FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAM*) L R (Most Predominant Per Bank)		BANK EROSION L R (Per Bank)
☐ ☐ú-WIDE > 50m [4]	☐ ☐-FOREST, SWAMP [3]	☐ ☐-CONSERVATION TILLAGE [1]	■ ■-NONE/LITTLE [3]
☐ ☐ - MODERATE 10-50m [3]	☐ ☐-SHRUB OR OLD FIELD [2]	■ ■-URBAN OR INDUSTRIAL [0]	☐ ☐-MODERATE [2]
☐ ☐ú-NARROW 5-10m [2]	■ ■-RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐-OPEN PASTURE, ROWCROP [0]	☐ ☐-HEAVY/SEVERE [1]
☐ ☐ú- VERY NARROW <5m [1]	☐ ☐-FENCED PASTURE [1]	☐ ☐-MINING/CONSTRUCTION [0]	
■ ■ú-NONE [0]			

Riparian: 3.5 Max 10

COMMENTS:_____

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!): ☐ - >1m [6] ☐ - 0.7-1m [4] ■ - 0.4-0.7m [2] ☐ - 0.2-0.4m [1] ☐ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE): ☐ú-POOL WIDTH > RIFFLE WIDTH [2] ■ -POOL WIDTH = RIFFLE WIDTH [1] ☐ú-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply): ☐ú-EDDIES[1] ■ú-FAST[1] ■ú-MODERATE[1] ■ú-SLOW[1] ☐ú-TORRENTIAL[-1] ☐ú-INTERSTITIAL[-1] ☐ú-INTERMITTENT[-2]

Pool/Current: 6 Max 12

COMMENTS:_____

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH: ☐ - *Best Areas >10 cm [2] ■ - Best Areas 5-10 cm[1] ☐ - Best Areas < 5 cm [RIFFLE=0]
RUN DEPTH: ■ - MAX > 50 [2] ☐ - MAX < 50[1]
RIFFLE/RUN SUBSTRATE: ☐-STABLE (e.g., Cobble, Boulder) [2] ■-MOD. STABLE (e.g., Large Gravel) [1] ☐-UNSTABLE (Fine Gravel, Sand) [0]
RIFFLE/RUN EMBEDDEDNESS: ☐ - NONE [2] ☐ - LOW [1] ■ - MODERATE [0] ☐ - EXTENSIVE [-1]
☐ - NO RIFFLE [Metric=0]

Riffle/Run: 4 Max 8

Gradient: 10 Max 10

COMMENTS:_____

6] GRADIENT (ft/mi): 13.9 **DRAINAGE AREA (sq.mi.):** 9.5

%POOL: 5 %GLIDE: 5 %RIFFLE: 5 %RUN: 85

*Best areas must be large enough to support a population of riffle-obligate fish species.

Ohio EPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 54

River Code:_____ RM: ____ Stream EUCLID CREEK
Date 6/20/02 Location SITE #0.5 (DOWNSTREAM OF LAKE SHORE BLVD)
Scorers Initials: CZ Comments_____

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);

TYPE	POOL	RIFFLE
☐ ☐-BLDR/SLBS[10]	____	____
☐ ☐-BOULDER [9]	5	—
☐ ☐-COBBLE [8]	5	—
☐ ☐-HARDPAN [4]	5	—
☐ ☐-MUCK [2]	____	____
☐ ☐-SILT [2]	____	____
■ ☐-GRAVEL [7]	35	—
■ ☐-SAND [6]	50	—
☐ ☐-BEDROCK[5]	____	____
☐ ☐-DETRITUS[3]	____	____
☐ ☐-ARTIFICIAL[0]	____	____

NOTE: *(Ignore sludge originating from point-sources; score on natural substrates)*
NUMBER OF SUBSTRATE TYPES: ■-5 or More [2] ☐-4 or Less [0]

SUBSTRATE ORIGIN (Check ONE (OR 2 & AVERAGE)): ☐ -LIMESTONE [1] ■ -TILLS [1] ☐ -WETLANDS[0] ☐ -HARDPAN [0] ☐ -SANDSTONE [0] ☐ -RIP/RAP [0] ☐ -LACUSTRINE [0] ☐ -SHALE [-1] ☐-COAL FINES [-2]

SUBSTRATE QUALITY (Check ONE (OR 2 & AVERAGE))
SILT: ☐ -SILT HEAVY [-2] ■ -SILT MODERATE [-1] ☐ -SILT NORMAL [0] ☐ -SILT FREE [1]
EMBEDDEDNESS: ■ -EXTENSIVE [-2] ■ -MODERATE [-1] ☐ -NORMAL [0] ☐ -NONE [1]

COMMENTS_____

Substrate: 14 Max 20

2] INSTREAM COVER (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
■ 1 UNDERCUT BANKS [1] ■ 1 OVERHANGING VEGETATION [1] ■ 2 SHALLOWS (IN SLOW WATER) [1] ■ 1 ROOTMATS [1]
■ 2 POOLS> 70 cm [2] ☐ ROOTWADS [1] ■ 1 BOULDERS [1]
☐ OXBOWS, BACKWATERS [1] ☐ AQUATIC MACROPHYTES [1] ☐ LOGS OR WOODY DEBRIS [1]
COMMENTS:_____

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11] ☐ - MODERATE 25-75% [7] ■ - SPARSE 5-25% [3] ■ - NEARLY ABSENT < 5%[1]

Cover: 9 Max 20

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)

SINUOSITY: ☐ - HIGH [4] ☐ - MODERATE [3] ■ - LOW [2] ☐ - NONE [1]
DEVELOPMENT: ☐ - EXCELLENT [7] ☐ - GOOD [5] ■ - FAIR [3] ■ - POOR [1]
CHANNELIZATION: ■ - NONE [6] ☐ - RECOVERED [4] ☐ - RECOVERING [3] ☐ - RECENT OR NO RECOVERY [1]
STABILITY: ☐ - HIGH [3] ■ - MODERATE [2] ■ - LOW [1]
MODIFICATIONS/OTHER: ☐ - SNAGGING ☐ - RELOCATION ■ - CANOPY REMOVAL ☐ - DREDGING ☐ - IMPOUND. ☐ - ISLANDS ☐ - LEVEED ☐ - BANK SHAPING ☐ - ONE SIDE CHANNEL MODIFICATIONS

COMMENTS:_____

Channel: 11.5 Max 20

4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

RIPARIAN WIDTH (L R (Per Bank))
☐ ☐ú-WIDE > 50m [4] ☐ ☐ - MODERATE 10-50m [3] ■ ☐ú-NARROW 5-10m [2] ☐ ☐ú- VERY NARROW <5m [1] ■ ■ú- NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAM*) (L R (Most Predominant Per Bank))
☐ ☐-FOREST, SWAMP [3] ☐ ☐-SHRUB OR OLD FIELD [2] ■ ■-RESIDENTIAL, PARK, NEW FIELD [1] ☐ ☐-FENCED PASTURE [1]
☐ ☐-CONSERVATION TILLAGE [1] ☐ ☐-URBAN OR INDUSTRIAL [0] ☐ ☐-OPEN PASTURE, ROWCROP [0] ☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION (L R (Per Bank))
■ ■-NONE/LITTLE [3] ☐ ☐-MODERATE [2] ☐ ☐-HEAVY/SEVERE [1]

COMMENTS:_____

Riparian: 4.5 Max 10

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
■ - >1m [6] ☐ - 0.7-1m [4] ☐ - 0.4-0.7m [2] ☐ - 0.2-0.4m [1] ☐ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
■ú-POOL WIDTH > RIFFLE WIDTH [2] ☐-POOL WIDTH = RIFFLE WIDTH [1] ☐ú-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)
☐ú-EDDIES [1] ☐ú-FAST [1] ☐ú-MODERATE [1] ■ú-SLOW [1] ☐ú-TORRENTIAL [-1] ☐ú-INTERSTITIAL [-1] ☐ú-INTERMITTENT [-2]

COMMENTS:_____

Pool/Current: 9 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH
☐ - *Best Areas >10 cm [2] ☐ - Best Areas 5-10 cm [1] ☐ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ - MAX > 50 [2] ☐ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐-STABLE (e.g., Cobble, Boulder) [2] ☐-MOD. STABLE (e.g., Large Gravel) [1] ☐-UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐ - NONE [2] ☐ - LOW [1] ☐ - MODERATE [0] ☐ - EXTENSIVE [-1]

COMMENTS:_____ ■ - NO RIFFLE [Metric=0]

Riffle/Run: 0 Max 8

Gradient: 6 Max 10

6] GRADIENT (ft/mi): 5.9 **DRAINAGE AREA (sq.mi.):** 24.2

%POOL: 20 %GLIDE: 30 %RIFFLE: 0 %RUN: 50

*Best areas must be large enough to support a population of riffle-obligate fish species.

OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 61.5

River Code:_____ RM: _____ Stream Mill CREEK
Date 6/25/02 Location SITE #31 (UPSTREAM OF CANAL ROAD)
Scorers Initials: CZ Comments

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);

TYPE	POOL	RIFFLE
☐ ☐-BLDR/SLBS[10]		
☐ ☐-BOULDER [9]	5	5
☐ ☐-COBBLE [8]	5	35
☐ ☐-HARDPAN [4]		
☐ ☐-MUCK [2]		
☐ ☐-SILT [2]	15	5
☒ ☐-GRAVEL [7]	30	45
☒ ☐-SAND [6]	40	5
☐ ☐-BEDROCK[5]		
☐ ☐-DETRITUS[3]		
☐ ☐-ARTIFICIAL[0]	5	5

NOTE: *(Ignore sludge originating from point-sources; score on natural substrates)*

NUMBER OF SUBSTRATE TYPES: ☒-5 or More [2] ☐-4 or Less [0]

SUBSTRATE ORIGIN Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☒ -TILLS [1]
☐ -WETLANDS[0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP/RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐-COAL FINES [-2]

SILT:
☒ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]

EMBEDDEDNESS:
☐ -EXTENSIVE [-2]
☒ -MODERATE [-1]
☐ -NORMAL [0]
☐ -NONE [1]

SUBSTRATE QUALITY Check ONE (OR 2 & AVERAGE)

Substrate: 13 Max 20

COMMENTS:

2] INSTREAM COVER (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☒ 1 UNDERCUT BANKS [1]
☐ ___ OVERHANGING VEGETATION [1]
☒ 2 SHALLOWS (IN SLOW WATER) [1]
☒ 1 ROOTMATS [1]
☒ 1 POOLS> 70 cm [2]
☐ ___ ROOTWADS [1]
☒ 1 BOULDERS [1]
☐ ___ OXBOWS, BACKWATERS [1]
☐ ___ AQUATIC MACROPHYTES [1]
☒ 1 LOGS OR WOODY DEBRIS [1]

COMMENTS:

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☒ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5%[1]

Cover: 10 Max 20

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)

SINUOSITY
☐ - HIGH [4]
☒ - MODERATE [3]
☒ - LOW [2]
☐ - NONE [1]

DEVELOPMENT
☐ - EXCELLENT [7]
☐ - GOOD [5]
☒ - FAIR [3]
☐ - POOR [1]

CHANNELIZATION
☒ - NONE [6]
☐ - RECOVERED [4]
☐ - RECOVERING [3]
☒ - RECENT OR NO RECOVERY [1]

STABILITY
☐ - HIGH [3]
☒ - MODERATE [2]
☐ - LOW [1]

MODIFICATIONS/OTHER
☐ - SNAGGING ☐ - IMPOUND.
☐ - RELOCATION ☐ - ISLANDS
☐ - CANOPY REMOVAL ☐ - LEVEED
☐ - DREDGING ☐ - BANK SHAPING
☒ - ONE SIDE CHANNEL MODIFICATIONS

Channel: 11 Max 20

COMMENTS: NO RECOVERY = SECTION OF CHANNEL MODIFIED WHERE LANDFILL BORDERS CREEK (RL)

4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

RIPARIAN WIDTH
L R (Per Bank)
☐ ☐ú-WIDE > 50m [4]
☐ ☐ - MODERATE 10-50m [3]
☐ ☐ú-NARROW 5-10m [2]
☒ ☒ú- VERY NARROW <5m [1]
☒ ☒ú-NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*)
L R (Most Predominant Per Bank)
☐ ☐-FOREST, SWAMP [3]
☐ ☐-SHRUB OR OLD FIELD [2]
☐ ☒-RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐-FENCED PASTURE [1]

L R
☐ ☐-CONSERVATION TILLAGE [1]
☒ ☐-URBAN OR INDUSTRIAL [0]
☐ ☐-OPEN PASTURE, ROWCROP [0]
☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION
L R (Per Bank)
☒ ☒-NONE/LITTLE [3]
☐ ☐-MODERATE [2]
☐ ☐-HEAVY/SEVERE [1]

Riparian: 4 Max 10

COMMENTS:

5.]POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1 ONLY!)
☒ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☐ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ú-POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☒ú-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)
☐ú-EDDIES [1] ☐ú-TORRENTIAL [-1]
☒ú-FAST [1] ☐ú-INTERSTITIAL [-1]
☒ú-MODERATE [1] ☐ú-INTERMITTENT [-2]
☒ú-SLOW [1]

Pool/Current: 9 Max 12

COMMENTS:

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH
☒ - *Best Areas >10 cm [2]
☒ - Best Areas 5-10 cm [1]
☐ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ - MAX > 50 [2]
☒ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☒-STABLE (e.g., Cobble, Boulder) [2]
☒-MOD. STABLE (e.g., Large Gravel) [1]
☐-UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐ - NONE [2]
☒ - LOW [1]
☒ - MODERATE [0]
☐ - EXTENSIVE [-1]

☐ - NO RIFFLE [Metric=0]

Riffle/Run: 4.5 Max 8

Gradient: 10 Max 10

6] GRADIENT (ft/mi): 11.9 **DRAINAGE AREA (sq.mi.):** 18.1

%POOL: 5 %GLIDE: 5
%RIFFLE: 15 %RUN: 75

*Best areas must be large enough to support a population of riffle-obligate fish species.

Appendix E
Macroinvertebrate Data Sheets

NEORSD - 2002 MACROINVERTEBRATE STUDY
ICI METRICS AND SCORES

LOCATION	MONTH	DRNAREA	ICITOTAL	TOTNUM	NUMTAXA	TAXSCORE	NUMMAY	MAYSCORE	NUMCAD	CADSCORE	NUMDIPT	DIPSCORE	PERMAY	PMAYSCR	PERCAD	PCADSCR	PERTANY	PTANSCR	PEROTHER	POTHSCR	PERTOLN	PTOLSCR	QUALEPT	EPTSCORE
DB16.1	JUL	10.0	30	430	27	4	1	0	3	6	17	4	9.8	2	18.8	6	6.5	2	64.9	0	14.9	4	4	2
DB16.1	SEP	10.0	22	1321	24	2	1	0	2	4	15	4	0.5	2	11.4	6	3.6	2	84.5	0	42.6	0	4	2
EC0.5	JUL	23.0	24	555	37	4	3	2	2	4	22	6	4.7	2	1.1	2	7.6	2	83.6	0	18.2	2	2	0
EC0.5	SEP	23.0	26	832	20	2	0	0	2	4	14	4	0.0	0	6.5	4	35.6	6	56.5	2	13.5	4	2	0
MC31	JUL	18.1	28	770	26	4	3	2	5	6	11	2	4.3	2	19.2	6	0.0	0	75.8	0	10.4	4	6	2
MC31	SEP	18.1	32	997	26	4	1	0	5	6	15	4	1.9	2	18.9	6	1.6	2	77.5	0	4.5	6	7	2
BC25	AUG	38.0	34	436	18	2	2	0	3	4	10	2	34.9	6	43.8	6	0.5	2	20.9	6	7.3	4	7	2
BC25	SEP	38.0	26	1272	27	4	2	0	4	6	16	4	9.4	2	10.9	6	1.3	2	78.2	0	39.6	0	7	2

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH SURBER, HESTER-DENDY, AND QUALITATIVE SAMPLE AT LOCATION BIG CREEK (BC25), AUGUST AND SEPTEMBER 2002.

TAXA	AUGUST				SEPTEMBER			
	SURBER		QUAL		HESTER		QUAL	
	#	%	#	%	#	%	#	%
Turbellaria	--	--	3	3.37	--	--	4	1.73
Plumatella	--	--	--	--	--	--	1	0.43
Oligochaeta	6	1.38	5	5.62	48	3.77	5	2.16
Helobdella stagnalis	--	--	--	--	2	0.16	--	--
Erpobdella punctata punctata	--	--	--	--	5	0.39	1	0.43
Mooreobdella microstoma	5	1.15	2	2.25	--	--	5	2.16
Caecidotea	3	0.69	2	2.25	2	0.16	6	2.60
Crangonyx	--	--	--	--	--	--	2	0.87
Hydracarina	--	--	3	3.37	--	--	--	--
Baetis intercalaris	52	11.93	22	24.72	31	2.44	22	9.52
Baetis flavistriga	100	22.94	19	21.35	89	7.00	64	27.71
Calopteryx	--	--	--	--	--	--	1	0.43
Cheumatopsyche	4	0.92	2	2.25	70	5.50	9	3.90
Hydropsyche depravata grp.	16	3.67	6	6.74	19	1.49	26	11.26
Hydropsyche dicantha	--	--	1	1.12	--	--	2	0.87
Ceratopsyche morosa	--	--	2	2.25	10	0.79	2	0.87
Hydroptila	171	39.22	12	13.48	40	3.14	9	3.90
Stenelmis	--	--	--	--	2	0.16	1	0.43
Ablabesmyia mallochi	2	0.46	--	--	16	1.26	6	2.60
Thienemannimyia grp.	2	0.46	2	2.25	200	15.72	9	3.90
Brillia	2	0.46	--	--	--	--	--	--
Cardiocladius	--	--	--	--	--	--	1	0.43
Cricotopus tremulus grp.	24	5.50	--	--	144	11.32	13	5.63
Cricotopus bicinctus grp.	24	5.50	1	1.12	408	32.08	9	3.90
Cricotopus trifascia grp.	2	0.46	--	--	8	0.63	--	--
Nanocladius distinctus	--	--	--	--	8	0.63	--	--
Nanocladius crassicornus/rectinervis	--	--	--	--	40	3.14	1	0.43
Chironomus	--	--	--	--	--	--	2	0.87
Cryptochironomus	--	--	--	--	--	--	1	0.43
Dicrotendipes neomodestus	--	--	--	--	8	0.63	4	1.73
Dicrotendipes simpsoni	--	--	--	--	8	0.63	--	--
Polypedilum flavum	2	0.46	1	1.12	16	1.26	2	0.87
Polypedilum illinoense	2	0.46	--	--	32	2.52	1	0.43
Polypedilum scalaenum grp.	--	--	1	1.12	32	2.52	--	--
Tribelos jucundum	--	--	--	--	8	0.63	1	0.43
Paratanytarsus	--	--	--	--	--	--	1	0.43
Tanytarsus glabrescens grp.	2	0.46	--	--	16	1.26	1	0.43
Tanytarsus guerlus grp.	--	--	--	--	--	--	1	0.43
Simulium	--	--	4	4.49	--	--	15	6.49
Tipula	--	--	--	--	1	0.08	--	--
Hemerodromia	17	3.90	1	1.12	9	0.71	3	1.30
TOTAL	436	100.0	89	100.0	1272	100.0	231	100.0
TOTAL TAXA	18		18		27		33	

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH HESTER-DENDY AND QUALITATIVE SAMPLE AT LOCATION DOAN BROOK (DB16.1), JULY AND SEPTEMBER 2002.

TAXA	JULY				SEPTEMBER			
	HESTER		QUAL		HESTER		QUAL	
	#	%	#	%	#	%	#	%
Turbellaria	--	--	3	4.05	1	0.08	3	2.00
Plumatella	1	0.23	1	1.35	1	0.08	1	0.67
Oligochaeta	22	5.12	2	2.70	328	24.83	13	8.67
Helobdella stagnalis	1	0.23	--	--	3	0.23	2	1.33
Placobdella	--	--	--	--	--	--	1	0.67
Erpobdella punctata punctata	3	0.70	--	--	17	1.29	5	3.33
Mooreobdella microstoma	4	0.93	4	5.41	--	--	--	--
Crangonyx	2	0.47	--	--	--	--	--	--
Hydracarina	--	--	1	1.35	--	--	--	--
Baetis flavistriga	42	9.77	29	39.19	6	0.45	37	24.67
Argia	--	--	--	--	--	--	1	0.67
Cheumatopsyche	66	15.35	1	1.35	138	10.45	13	8.67
Hydropsyche depravata grp.	13	3.02	10	13.51	13	0.98	4	2.67
Hydroptila	2	0.47	7	9.46	--	--	1	0.67
Natarsia sp. A	--	--	1	1.35	--	--	--	--
Ablabesmyia mallochi	--	--	--	--	8	0.61	--	--
Thienemannimyia grp.	116	26.98	5	6.76	112	8.48	13	8.67
Thienemanniella xena	8	1.86	--	--	--	--	--	--
Cardiocladius	--	--	--	--	--	--	1	0.67
Cricotopus tremulus grp.	--	--	--	--	--	--	1	0.67
Cricotopus bicinctus grp.	8	1.86	--	--	--	--	12	8.00
Cricotopus trifascia grp.	--	--	--	--	--	--	1	0.67
Nanocladius crassicornus/rectinervis	2	0.47	--	--	8	0.61	4	2.67
Chironomus	2	0.47	1	1.35	32	2.42	2	1.33
Dicrotendipes neomodestus	--	--	--	--	--	--	1	0.67
Dicrotendipes fumidus	2	0.47	--	--	--	--	--	--
Phaenopsectra punctipes	8	1.86	--	--	8	0.61	1	0.67
Polypedilum fallax grp.	2	0.47	--	--	--	--	--	--
Polypedilum flavum	54	12.56	4	5.41	296	22.41	1	0.67
Polypedilum illinoense	30	6.98	--	--	200	15.14	6	4.00
Polypedilum scalaenum grp.	8	1.86	--	--	72	5.45	3	2.00
Stenochironomus	2	0.47	--	--	--	--	--	--
Tribelos jucundum	--	--	--	--	8	0.61	1	0.67
Paratanytarsus	2	0.47	--	--	16	1.21	2	1.33
Rheotanytarsus	--	--	--	--	--	--	1	0.67
Tanytarsus glabrescens grp.	6	1.40	--	--	--	--	1	0.67
Tanytarsus guerlus grp.	20	4.65	--	--	32	2.42	5	3.33
Pericoma	--	--	--	--	8	0.61	--	--
Simulium	3	0.70	1	1.35	5	0.38	12	8.00
Tipula	--	--	1	1.35	3	0.23	1	0.67
Hemerodromia	1	0.23	--	--	3	0.23	--	--
Amnicola	--	--	1	1.35	--	--	--	--
Physella	--	--	2	2.70	3	0.23	--	--
TOTAL	430	100.0	74	100.0	1321	100.0	150	100.0
TOTAL TAXA	27		17		24		30	

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH HESTER-DENDY AND QUALITATIVE SAMPLE AT LOCATION EUCLID CREEK (EC0.5), JULY AND SEPTEMBER 2002.

TAXA	JULY				SEPTEMBER			
	HESTER		QUAL		HESTER		QUAL	
	#	%	#	%	#	%	#	%
Turbellaria	10	1.80	2	2.15	--	--	4	5.63
Oligochaeta	32	5.77	13	13.98	32	3.85	10	14.08
Helobdella stagnalis	3	0.54	1	1.08	--	--	--	--
Mooreobdella microstoma	6	1.08	3	3.23	--	--	3	4.23
Caecidotea	19	3.42	7	7.53	4	0.48	2	2.82
Crangonyx	4	0.72	2	2.15	1	0.12	--	--
Hydracarina	--	--	1	1.08	--	--	--	--
Baetis flavistriga	24	4.32	6	6.45	--	--	1	1.41
Stenonema femoratum	1	0.18	--	--	--	--	3	4.23
Caenis	1	0.18	--	--	--	--	--	--
Calopteryx	--	--	2	2.15	--	--	2	2.82
Argia	--	--	--	--	--	--	3	4.23
Enallagma	--	--	12	12.90	--	--	3	4.23
Stylurus	1	0.18	--	--	--	--	--	--
Trichocorixa	--	--	1	1.08	--	--	--	--
Polycentropus	--	--	1	1.08	--	--	--	--
Cheumatopsyche	3	0.54	--	--	46	5.53	--	--
Hydropsyche depravata grp.	3	0.54	--	--	8	0.96	--	--
Peltodytes	--	--	1	1.08	--	--	--	--
Stenelmis	16	2.88	1	1.08	12	1.44	--	--
Ablabesmyia mallochi	18	3.24	4	4.30	--	--	--	--
Thienemannimyia grp.	106	19.10	11	11.83	108	12.98	--	--
Corynoneura	--	--	--	--	8	0.96	--	--
Thienemanniella xena	--	--	--	--	16	1.92	--	--
Cardiocladius	--	--	--	--	--	--	1	1.41
Cricotopus tremulus grp.	48	8.65	1	1.08	8	0.96	12	16.90
Cricotopus bicinctus grp.	48	8.65	2	2.15	56	6.73	17	23.94
Cricotopus sylvestris grp.	--	--	1	1.08	--	--	5	7.04
Parametriocnemus	4	0.72	--	--	--	--	--	--
Chironomus	8	1.44	2	2.15	--	--	4	5.63
Cryptochironomus	4	0.72	--	--	--	--	--	--
Dicrotendipes modestus	30	5.41	2	2.15	24	2.88	1	1.41
Dicrotendipes neomodestus	16	2.88	--	--	16	1.92	--	--
Glyptotendipes	4	0.72	--	--	--	--	--	--
Paratendipes	18	3.24	1	1.08	40	4.81	--	--
Phaenopsectra punctipes	12	2.16	1	1.08	--	--	--	--
Polypedilum flavum	12	2.16	--	--	24	2.88	--	--
Polypedilum illinoense	8	1.44	4	4.30	24	2.88	--	--
Polypedilum scalaenum grp.	--	--	--	--	108	12.98	--	--
Tribelos jucundum	26	4.68	3	3.23	--	--	--	--
Paratanytarsus	30	5.41	1	1.08	--	--	--	--
Rheotanytarsus	--	--	--	--	8	0.96	--	--
Tanytarsus glabrescens grp.	8	1.44	1	1.08	288	34.62	--	--
Tanytarsus guerlus grp.	4	0.72	--	--	--	--	--	--
Culex	--	--	1	1.08	--	--	--	--
Pericoma	12	2.16	--	--	--	--	--	--
Psychoda	--	--	1	1.08	--	--	--	--
Tipula	6	1.08	--	--	--	--	--	--
Antocha	--	--	--	--	1	0.12	--	--
Hemerodromia	4	0.72	--	--	--	--	--	--
Euparyphus	1	0.18	1	1.08	--	--	--	--
Fossaria	--	--	1	1.08	--	--	--	--

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH HESTER-DENDY AND QUALITATIVE SAMPLE AT LOCATION EUCLID CREEK (EC0.5), JULY AND SEPTEMBER 2002 (CONTINUED).

	JULY		SEPTEMBER	
	HESTER	QUAL	HESTER	QUAL

TAXA								
	#	%	#	%	#	%	#	%
Physella	4	0.72	2	2.15	--	--	--	--
Ferrissia	1	0.18	--	--	--	--	--	--
TOTAL	555	100.0	93	100.0	832	100.0	71	100.0
TOTAL TAXA	37		32		20		15	

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH HESTER-DENDY AND QUALITATIVE SAMPLE AT LOCATION MILL CREEK (MC31), JULY AND SEPTEMBER 2002.

TAXA	JULY				SEPTEMBER			
	HESTER		QUAL		HESTER		QUAL	
	#	%	#	%	#	%	#	%
Turbellaria	--	--	2	1.47	--	--	2	0.79
Prostoma	--	--	--	--	--	--	1	0.39
Plumatella	--	--	--	--	--	--	1	0.39
Oligochaeta	48	6.23	28	20.59	--	--	10	3.94
Helobdella stagnalis	4	0.52	--	--	--	--	--	--
Erpobdella punctata punctata	--	--	--	--	1	0.10	1	0.39
Mooreobdella microstoma	27	3.51	3	2.21	9	0.90	4	1.57
Caecidotea	--	--	1	0.74	--	--	--	--
Gammarus	--	--	--	--	5	0.50	--	--
Crangonyx	--	--	4	2.94	--	--	--	--
Baetis intercalaris	2	0.26	--	--	--	--	2	0.79
Baetis flavistriga	30	3.90	23	16.91	19	1.91	41	16.14
Caenis	1	0.13	--	--	--	--	--	--
Calopteryx	--	--	--	--	--	--	4	1.57
Hetaerina	3	0.39	3	2.21	1	0.10	--	--
Argia	--	--	--	--	--	--	1	0.39
Enallagma	--	--	3	2.21	--	--	1	0.39
Anax	--	--	1	0.74	--	--	--	--
Cheumatopsyche	33	4.29	5	3.68	60	6.02	29	11.42
Hydropsyche depravata grp.	28	3.64	16	11.76	64	6.42	119	46.85
Hydropsyche dicantha	34	4.42	6	4.41	44	4.41	14	5.51
Ceratopsyche morosa	38	4.94	11	8.09	19	1.91	4	1.57
Hydroptila	15	1.95	2	1.47	1	0.10	2	0.79
Peltodytes	--	--	--	--	--	--	2	0.79
Tropisternus	--	--	2	1.47	--	--	--	--
Berosus	2	0.26	2	1.47	--	--	--	--
Psephenus herricki	--	--	--	--	--	--	1	0.39
Bezzia/Palpomyia	4	0.52	--	--	--	--	--	--
Ablabesmyia mallochi	--	--	3	2.21	28	2.81	--	--
Thienemannimyia grp.	356	46.23	12	8.82	304	30.49	4	1.57
Thienemanniella xena	4	0.52	--	--	--	--	--	--
Cricotopus tremulus grp.	4	0.52	--	--	8	0.80	--	--
Cricotopus bicinctus grp.	--	--	--	--	16	1.60	--	--
Nanocladius crassicornus/rectinervis	--	--	--	--	28	2.81	--	--
Chironomus	--	--	--	--	--	--	1	0.39
Dicrotendipes neomodestus	--	--	--	--	24	2.41	--	--
Dicrotendipes simpsoni	--	--	--	--	8	0.80	--	--
Microtendipes	--	--	--	--	8	0.80	--	--
Phaenopsectra punctipes	4	0.52	--	--	--	--	--	--
Polypedilum flavum	44	5.71	--	--	--	--	--	--
Polypedilum illinoense	8	1.04	--	--	16	1.60	1	0.39
Polypedilum scalaenum grp.	48	6.23	4	2.94	256	25.68	2	0.79
Paratanytarsus	--	--	--	--	8	0.80	--	--
Tanytarsus glabrescens grp.	--	--	--	--	8	0.80	--	--
Pericoma	--	--	--	--	4	0.40	--	--
Simulium	--	--	2	1.47	44	4.41	3	1.18
Tipula	1	0.13	--	--	--	--	--	--
Hemerodromia	7	0.91	--	--	9	0.90	3	1.18
Euparyphus	1	0.13	1	0.74	--	--	--	--
Physella	18	2.34	2	1.47	5	0.50	1	0.39
Ferrissia	6	0.78	--	--	--	--	--	--

TAXA COMPOSITION, NUMBER, AND PERCENT OF ORGANISMS COLLECTED IN EACH HESTER-DENDY AND QUALITATIVE SAMPLE AT LOCATION MILL CREEK (MC31), JULY AND SEPTEMBER 2002 (CONTINUED).

	JULY		SEPTEMBER	
	HESTER	QUAL	HESTER	QUAL