Greater Cleveland Area Environmental Water Quality Assessment 1991 - 1992

GREATER CLEVELAND AREA

ENVIRONMENTAL WATER QUALITY ASSESSMENT

1991-1992 REPORT

NORTHEAST OHIO REGIONAL SEWER DISTRICT

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June 1994

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EXECUTIVE SUMMARY

Since the inception of the Northeast Ohio Regional Sewer District (NEORSD) in 1972, governmental entities, industry, and the general public have invested heavily in clean water. Much progress in improving our waterways has been clearly evident in the Greater Cleveland Area's enhanced use of the Cuyahoga River and the lakefront. Memories of a "burning" river and a "dying" Lake Erie are fading.

To provide a more scientific characterization of the current condition of Greater Cleveland Area waterways and to identify remaining water quality problems, the NEORSD initiated a stream monitoring program in 1986. The program produced reports for 1987, 1988, and 1989-1990. While these reports presented data confirming the dramatic improvement in the area's surface water quality, a significant success of the program was its discovery and resulting elimination of numerous unaddressed sources of pollution.

This report cites 50 specific environmental disruptions identified and/or responded to by NEORSD investigators in 1991 and 1992. These disruptions included sewerage leaks and cross connections, dry weather combined/sanitary sewer overflows, industrial/commercial oil and chemical spills, and landfill leachate. 35 of the investigations concluded with effective remedial action being taken.

In addition to the information on specific, identifiable point sources of pollution presented in this report, information on more problematic, diffuse sources has been collected. This report's appendices include anecdotal information collected on two examples of such sources: atmospheric deposition and slag leachate. Since point sources have become increasingly and effectively controlled in recent years, such diffuse sources constitute much higher relative contributions to surface water pollution. Consequently, nonpoint sources warrant much more attention in the future than they have received in the past.

To monitor water quality conditions in surface waters throughout the NEORSD jurisdictional area, the routine sampling begun in 1986 has been continued and expanded. In 1991, 188 routine water samples from 77 sites on 18 area streams were analyzed for up to 34 chemical and bacteriological parameters. 148 of the samples were collected at stream sites designated as surface waters by the Ohio EPA.

Excluding 6 concentrations measured below practical quantification levels[1], 53 excursions failing State of Ohio water quality standards were detected. Of these, 47 were conventional parameters typically associated with domestic sanitary sewage: elevated fecal coliform bacteria and ammonia-nitrogen concentrations, and dissolved oxygen deficiencies. Only two of the water quality standard excursions were due to metal concentrations in unculverted streams (copper in Doan Brook on 5/16/91 and cadmium in Tinkers Creek on 5/23/91). The culverted Kingsbury Run exhibited the remaining three metals excursions (copper, zinc, and hexavalent chromium).

38 of the 53 excursions were due to concentrations of fecal coliform bacteria. As noted in previous NEORSD Environmental Assessment reports, elevated fecal coliform levels have been the most valuable indicators in the identification of sources of stream pollution. Fecal coliform bacteria are found in the intestinal tracts of warm-blooded animals including humans. Elevation of their concentration by as much as several orders of magnitude in urban or suburban waterways provides an unambiguous indication of contamination by sanitary sewage. These bacteria are not harmful to aquatic life or humans, but the sanitary sewage in which they are carried are likely to also carry heavy loads of decomposing organic waste, which are harmful to aquatic ecosystems, and pathogens, which can pose a threat of disease through human contact.

Another valuable indicator of environmental disruptions in streams is the benthic macroinvertebrate community. Benthic macroinvertebrates are aquatic organisms which inhabit the bottom regions of water bodies and include insect larvae, crustaceans, snails, clams, worms, etc. A high diversity of benthic macroinvertebrates is typically indicative of a healthy ecosystem, while a low diversity is usually indicative of an ecosystem under environmental stress, such as from pollution. Furthermore, various taxa of benthic macroinvertebrates exhibit various sensitivities to pollution, and through identification of the taxa and knowledge of their tolerance of pollution, the quality of a water body over time may be characterized. In this respect, benthic macroinvertebrate data can provide more information than chemical or bacteriological data, because the benthic community reflects all recent stream events and is not just a "snapshot" from the time at which sampling occurs.

Study of the benthic community is particularly useful in monitoring the gradual recovery of an ecosystem following remediation of severe environmental disruptions. One Greater

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[1]A practical quantification level is defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions and is set at five times the method detection limit.

Cleveland Area example is the west branch of Big Creek. A sewer system malfunction resulting in the dry weather discharge of nearly a half million gallons of raw sanitary sewage to this stream per day was discovered by NEORSD investigators and repaired by the City of Cleveland in 1988. Prior to the remediation, instream fecal coliform concentrations were measured as high as 1,800,000 organisms per 100 ml. Further remediation occurred in 1990 when NEORSD contractors repaired another section of the sewer system tributary to Big Creek's west branch.[2] In 1991, instream fecal coliform concentrations at the previously sampled downstream location were measured no higher than 1,100 and as low as 180 organisms per 100 ml. While the improvement revealed by bacteriological analyses is dramatic, more ecologically significant is the benthic community's recovery. The increase in benthic macroinvertebrate diversity is presented in Tables i, ii, and iii.

Although previous NEORSD reports have presented benthic data primarily as anecdotal, qualitative information, this report includes for the first time use of several numerical indices of the benthic macroinvertebrate community - most notably, the Hilsenhoff Biotic Index. This index was calculated for 56 stream sites, producing water quality ratings of "excellent" at 1 site, "very good" at 8 sites, "good" at 18 sites, "fair" at 14 sites, "fairly poor" at 7 sites, "poor" at 2 sites, and "very poor" at 1 site. (5 additional sites did not meet the minimum habitat characteristics required for rating.) It is hoped that the use of numerical indices will result in more meaningful site-to-site comparisons and provide an improved baseline for future studies assessing water quality in the streams.

Fish community data can also provide useful water quality information despite the greater mobility in fish populations than in benthic macroinvertebrate populations. As in previous years, the NEORSD has monitored the fish community in the Cuyahoga River upstream and downstream of the Southerly Wastewater Treatment Plant effluent using its electrofishing boat. Although the river's fish community continues to fail to attain standards set forth by the Ohio EPA, the NEORSD's sampling does not indicate that the failure is related to the quality of the plant effluent. It may yet, in fact, be attributable to factors other than water quality (i.e., heavy to severe bank erosion, heavy silt loads, low stream gradient, lack of channel sinuosity, etc.). Some of these factors have been determined by the geologic history of the area, which is outlined in this report's final appendix.

In addition to the electrofishing on the Cuyahoga River, the NEORSD in 1992 also electrofished the Rocky River and one of its tributary streams, Abram Creek, using long-line generator

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[2]Details of the investigations and resulting remediation are presented in previous NEORSD reports for 1988 and 1989-1990.

Table i. Benthos Collected at Site #27 (Big Creek West Branch) in 1989:

Physella sp. (pouch snails)

Table ii. Benthos Collected at Site #27 (Big Creek West Branch) in 1990:

Oligochaeta (sludgeworms)
Helobdella stagnalis (leeches)
Hydropsyche betteni (caddisfly larvae)
Thienemannimyia sp. gr. (midgefly larvae)
Cricotopus sp. (midgefly larvae)
Cricotopus trifascia (midgefly larvae)
Physella sp. (pouch snails)

Table iii. Benthos Collected at Site #27 (Big Creek West Branch) in 1991:

Dugesia tigrina (flatworms)
Dina (Moorebdella) microstoma (leeches)
Erpobdella punctata (leeches)
Helobdella stagnalis (leeches)
Asellus sp. (pillbugs)
Crangonyx gracilis complex (scuds)
Enallagma sp. (damselfly larvae)
Coenagrion sp./*Enallagma* sp. complex (damselfly larvae)
Ischnura sp. (damselfly larvae)
Plathemis sp. (dragonfly larvae)
Tipula sp. (cranefly larvae)
Thienemannimyia sp. gr. (midgefly larvae)
Cricotopus bicinctus (midgefly larvae)
Physella sp. (pouch snails)
Helisoma sp. (planorbid snails)

electrofishing equipment. This sampling, along with chemical, bacteriological, and benthic macroinvertebrate sampling, was performed to evaluate stream conditions before decommissioning of the Brook Park and Middleburg Heights wastewater treatment plants. Sewage influent to these plants, which had been discharged to Abram Creek following treatment, was diverted at the end of 1992 to the NEORSD's Southwest Interceptor for conveyance to the Southerly Wastewater Treatment Plant. Comparison of the sampling data collected before the decommissioning with future sampling data should characterize the resulting impact on the water quality and biota of the Rocky River and Abram Creek. The results of this comparison will appear in future NEORSD reports.

Since aquatic biota are at least as dependent on habitat quality as on water quality, this report includes site-specific aquatic habitat evaluations. The NEORSD employed the Ohio EPA's Qualitative Habitat Evaluation Index (QHEI) at 55 stream locations. The QHEI scores varied site-to-site from ratings of "poor" to ratings of "excellent." The scores provide insight into the extent to which differences in biota can be attributed to water quality versus habitat limitations.

The NEORSD 1992 environmental assessment efforts also included sampling of Lake Erie waters at 12 sites along the Greater Cleveland shoreline and at 3 sites offshore near the City of Cleveland public water supply intakes. 47 lake water samples were collected for analyses of up to 45 chemical and bacteriological parameters. Excluding one cadmium concentration below the practical quantification level, six excursions failing State of Ohio water quality standards were detected in the samples collected at Lake Erie's surface.

Four of these excursions were due to bacteria levels at sites along the Greater Cleveland shoreline. At least one of these elevated bacteria levels is probably associated with tributary creeks known to have contamination by sanitary sewage. The only two other excursions detected at Lake Erie's surface were due to a dissolved oxygen deficiency at the mouth of the Cuyahoga River and a single, slightly elevated cadmium concentration northeast of the mouth of Euclid Creek. Failure to attain dissolved oxygen standards in the lower Cuyahoga River is likely due to channel modification, and this attainability issue has been explored by the Ohio EPA in conjunction with the Cuyahoga River Remedial Action Plan. The cadmium concentration remains unexplained, although it could represent sampling contamination or an analytical anomaly.

Previous NEORSD reports included latitude and longitude coordinates for Lake Erie sampling sites. For this report, a Loran-C (low-frequency radio navigation system) was used to obtain precise latitude and longitude coordinates at all sampling sites - both on the lake and on the streams. It is hoped that this will facilitate reliable location of the sites during future sampling efforts.

Future environmental assessment efforts by the NEORSD will focus on collecting water quality trends data for the Greater Cleveland Area. As current projects, such as construction of the NEORSD's Southwest and Heights-Hilltop Interceptors, continue toward completion and new projects, such as enhanced combined sewer overflow control, are commenced, further water quality improvements are anticipated. NEORSD monitoring will also focus on previously identified problem areas, where aging, deteriorating sewer systems or recurring system malfunctions are likely to result in further environmental disruptions. Responsiveness to the community will continue to be a priority, as will interagency water quality information sharing, such as through the Cuyahoga River Remedial Action Plan and the Cleveland Metroparks stream sampling program. Better knowledge and understanding of our valuable water resources are essential for continuation of the progress that has been seen in the past two decades.

Over 100 copies of each of the past NEORSD environmental assessment reports have been distributed to researchers, academia, governmental agencies, and the general public. Likewise, this report will also receive such a distribution. Peer review and comment are invited.

ACKNOWLEDGEMENTS

This report was authored by Cathy Zamborsky, Tom Zablotny, John Rhoades, Bill Mack, Keith Linn, and Tim Dobriansky. The information contained herein was provided by numerous members of NEORSD Water Quality & Industrial Surveillance and Sewer Maintenance & Control. The chemical and bacteriological analyses were performed by NEORSD Analytical Services. Benthic macroinvertebrate identification was conducted by Bill Mack. Fish identification was conducted by Tom Zablotny. Computer programming was performed by Scott Horvath. Typing was performed by Judy Himes. The report was edited by Cathy Zamborsky and Keith Linn.

CUYAHOGA RIVER

In 1969, oil and debris at the Cuyahoga River's head of navigation caught fire, and the "river that burns" received international notoriety. The fire drew attention to the heavily polluted condition of the Cuyahoga River, which flowed orange with industrial and municipal waste under slicks of oil, providing an impetus for a worldwide environmental movement.

In the two decades that followed, massive efforts to improve environmental water quality were undertaken by industry and government. Among these efforts was the creation in 1972 of the Cleveland Regional Sewer District, eventually to become known as the Northeast Ohio Regional Sewer District (NEORSD).

At the top of the NEORSD agenda was the clean-up of the Cuyahoga River basin's largest municipal discharge, the Southerly Wastewater Treatment Plant (WWTP). Following years of reconstruction and expansion at the plant, accompanied by intercepting sewer construction, industrial pretreatment installation, and initiation of combined sewer overflow control, dramatic improvements in the water quality of the Cuyahoga River became evident. As the loadings of raw, untreated sanitary sewage to the river dropped between the 1970's and 1980's, so did the levels of fecal coliform bacteria in the water. When the NEORSD installed nitrification as an advanced wastewater treatment stage at the Southerly WWTP in the mid-1980's, levels of ammonia, which is oxygen-demanding and toxic to aquatic life, also dropped. (For quantification of the fecal coliform and ammonia decreases, see NEORSD Greater Cleveland Area Environmental Water Quality Assessment 1989-1990 Report.)

Aquatic organisms returned to the now increasingly habitable river, and between 1988 and 1991, 49 species of fish were found living in the river within the boundaries of Cuyahoga County. The public's appreciation of the Cuyahoga River as a resource also returned as recreational boating on the river and commercial development in the Cleveland Flats along the river banks boomed in popularity.

Nevertheless, the Cuyahoga River's recovery was not yet complete and concerns about the river's water quality remained. Dissolved oxygen deficiencies were being measured periodically in the river's navigation channel. The river was failing to achieve Ohio EPA biological criteria for balanced, reproducing fish and invertebrate populations. Tumors were being found in bottom-dwelling catfish. Analyses of dredged river sediments were revealing levels of contaminants unacceptable for open-lake disposal. Following storms, muddy discoloration and floating debris continued to be eyesores, and elevated wet weather bacterial concentrations continued to raise public health concerns.

Because of the continuing water quality concerns, the International Joint Commission's Great Lakes Water Quality Board identified the Cuyahoga River as one of 43 Areas of Concern in the Great Lakes basin. To restore uses which have been impaired, the eight Great Lakes states and the Province of Ontario have committed to developing a Remedial Action Plan (RAP) for each Area of Concern.

The Cuyahoga River RAP is a joint effort involving state and federal agencies, industrial, commercial, and private interests, community interest groups, and local public jurisdictions. The NEORSD has participated heavily in the Cuyahoga River RAP. The involvement of NEORSD Water Quality & Industrial Surveillance has constituted providing data for the RAP Stage One efforts to describe the environmental condition of the Cuyahoga River watershed. From 1989 to 1992, this involvement included a major study on the levels of contaminants found in the fish of Cuyahoga River and Lake Erie fish.

A paucity of data had existed on the concentrations in Cuyahoga River fish tissue of chemical substances that could pose a threat to human health through consumption. To fill this data gap, the RAP Technical Committee established a RAP Fish Tissue Group, co-chaired by the Ohio EPA and the NEORSD. Sampling was commenced in 1989 and was completed in 1992. NEORSD investigators assisted throughout the fish collection efforts, which were aided by the employment of the NEORSD electrofishing vessel. Some fish tissue analyses were performed by NEORSD Analytical Services, and the NEORSD contributed to the funding of the analyses, which were performed by the Ohio EPA Laboratory.

Fish collected include bottom-dwellers representing the worst-case risk through human consumption and "sport" fish representing the most likely consumption. 370 fish were collected and tested for 130 pollutants. Of the 130 pollutants, 27 were detected including trace levels of some metals, pesticides, and PCBs (polychlorinated biphenyls), most of which are attributable to the Cuyahoga River's polluted past. For example, the PCB concentrations, are slightly elevated when lipid-normalized and compared to non-urban reference sites. PCBs had been used extensively in capacitors, transformers, hydraulic fluids, sealants, and elsewhere. However, the manufacture and utilization of PCBs have been banned since the 1970's, and the concentrations in fish at urban locations are relatively uniform irrespective of the proximity of major point sources, suggesting diffuse sources of PCBs, such as from historical sediment contamination. Although not detected in Cuyahoga River sediments, PCBs present in sediments below levels of detectability may yet be responsible for the fish tissue levels due to their high bioaccumulation potential.

The data were evaluated by the Ohio Department of Health, the agency responsible for issuing fish consumption advisories, and based on the levels of PCB's in fish, the Department is issuing an advisory for the Cuyahoga River. Results of analysis on Cuyahoga RAP samples were also compared to a recent national study on levels of fish contamination. This comparison revealed that, generally, concentrations of contaminants detected in fish collected from the Cuyahoga River AOC were similar to levels in fish collected at over 100 urban, agricultural, and industrial areas across the nation. Refer to Appendix XIV for a brief discussion on the fish tissue research. The results in detail and a more comprehensive discussion are presented in the Cuyahoga River RAP Stage One Report.

The Cuyahoga River and its tributaries drain approximately 813 square miles of land in northeastern Ohio (SAIC, 1986). The headwaters of the river originate in Geauga County and drop from approximately 1,300 feet above sea level at an average rate of three to four feet per mile. Flowing south/southwest, the river moves through Lake Rockwell in Portage County and then continues west/southwest through Kent. Entering Summit County, the river flows through Cuyahoga Falls and Akron. As the river moves through the Cuyahoga gorge above Akron, it falls at a rate of about 25 feet per mile. At Akron, the river moves north/northwest and continues down through Cuyahoga County and Cleveland, descending at a rate of about five feet per mile. Compared to its upstream stretches, the river is influenced less by dam structures and diversions as it moves from Akron to Lake Erie.

As the Cuyahoga River flows through northeastern Ohio and finally empties into Lake Erie through Cleveland Harbor, it passes through and around urban, suburban, and rural land. Each of the residential, commercial, industrial, agricultural, and recreational uses exert their influences on the river, either directly or indirectly.

The hydrologic characteristics of the Cuyahoga River vary widely depending on regional precipitation, predominant soil types and their water-holding capacities, and the proportion of the drainage basin covered by impermeable surfaces. The latter is especially influential as the river moves through the highly developed Cleveland area. Low flow levels have been altered upward due to this condition. The soils in the basin range from slightly erodible to highly erodible. For a discussion of the succession of the geomorphological features of the Cuyahoga River basin, refer to Appendix XV.

Flow data for the Cuyahoga River is measured by a United States Geological Survey (USGS) station at Old Rockside Road in Independence (RM 13.2). The average flow recorded at this station was 1,143 cubic feet per second (CFS) for water year 1991 and 1,206 CFS for water year 1992. The average discharge recorded during the 54-year period of record, up to 1984 was 823 CFS (SAIC, 1986). The measured flow at Old Rockside Road does not include most of the flow diverted to the Ohio Canal at State Route 82 upstream of the gauge.

The flow in the Cuyahoga River in its navigable section, downstream of River Mile (RM) 5.6, is strongly influenced by Lake Erie. The dynamics of river and lake mixing near the confluence are primarily a function of the prevailing nearshore currents as well as the physical characteristics of the lower channel and the Lake Erie shoreline. The area where the mixing is most predominant can be considered a freshwater estuary. The effect of Lake Erie on the flow of the Cuyahoga River can be observed as far as six to seven miles upstream. Additionally, the slow moving current in the lower channel has led to the deposition of large amounts of sediment. A high rate of solids settling requires that the lower navigation channel be dredged routinely to maintain a depth of 25 to 30 feet. This sediment has been carried downstream from the river's upper and middle reaches and originates primarily from upland areas in the basin (U.S. Army Corps of Engineers, 1981). River transport of 211,000 and 530,000 tons of sediment per year have been estimated by the USGS and the Army Corps of Engineers, respectively (SAIC, 1986).

In 1990, the Ohio Supreme Court upheld an Ohio EPA decision to designate the Cuyahoga River segment from RM 10.8 (Southerly's WWTP effluent channel) to RM 5.6 (head of the river's navigation channel) Warmwater Habitat for aquatic life use. Since the designation in 1986, the NEORSD has challenged the Ohio EPA assessment of the Cuyahoga River's ability to sustain, in this segment, balanced, reproducing populations of warmwater fish, vertebrate and invertebrate organisms, and plants on an annual basis. The NEORSD contends that factors such as lack of physical habitat, silt and sediment load, and nonpoint sources of pollutants (e.g., seasonally elevated concentrations of chlorides from roadsalt runoff) are negatively influencing the river's potential for aquatic life habitation in this segment. It is the Ohio EPA's contention that stricter controls on point source discharges from municipalities and industry will allow the river to attain Warmwater Habitat status. The NEORSD plans no further appeals on this decision and fully intends to comply with any effluent discharge limits applied as a result of the habitat designation. However, whether the river habitat is equally obliging in meeting its use designation remains to be seen.

As of the end of 1992, the Ohio EPA had a default use designation of Limited Resource Water for the Cuyahoga River Navigation Channel (from RM 5.6 to the mouth). The Ohio EPA has recognized the habitat restrictions in this river segment resulting from physical factors such as continual dredging, steel shoring of banks, and the total lack of riparian buffer and shallow water habitat. Consequently, the default designation for the Cuyahoga River navigation channel applied pending a formal determination of the appropriate use designation for this unique water body.

Water quality modeling studies performed by the Ohio EPA in conjunction with the Cuyahoga River RAP have demonstrated that depressed dissolved oxygen levels in the navigation channel are attributable to the channel's modification for navigation maintenance. The studies showed that natural levels of oxygen-demanding materials would result in periodic failure to attain Warmwater Habitat standards as long as the channel remains at its current depth. However, sufficient decrease in the depth to ensure Warmwater Habitat Standards attainment would preclude navigation. Therefore, the modeling results were being used by Ohio EPA as the basis for site-specific water quality standards to be proposed in 1993 for the Cuyahoga River Navigation Channel.

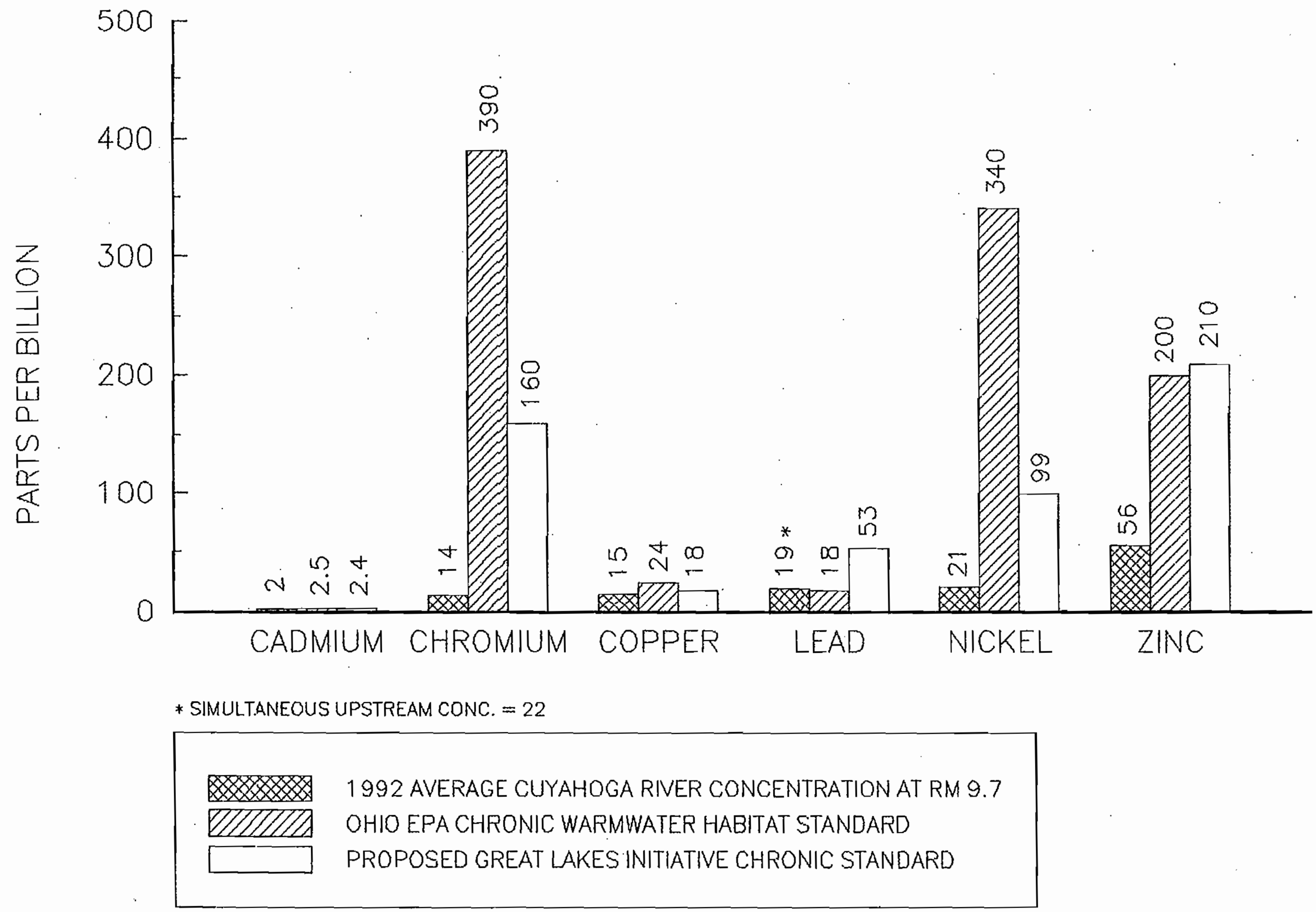
Upstream of the navigation channel, the Cuyahoga River has been designated by the Ohio EPA State Resource Water, Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply, and Primary Contact Recreational Use.

The National Pollutant Discharge Elimination System (NPDES) Permit for NEORSD's Southerly Wastewater Treatment Plant (WWTP) effluent requires water analysis of the Cuyahoga River upstream (RM 11.3) and downstream (RM 9.7) of the effluent outfall (RM 10.8). These sites are sampled once per week and analyzed for chemical parameters by NEORSD Analytical Services. These sites are also sampled and analyzed daily for bacteriological parameters during the recreational season.

NEORSD 1992 monitoring data revealed average metal concentrations below the Ohio EPA chronic Warmwater Habitat criteria downstream of Southerly's effluent, with the exception of lead (Figure 1). However, lead was also found at an average concentration above the chronic criterion at the site upstream of the effluent discharge and, in fact, was at a higher average concentration upstream than downstream. The maximum concentrations of metals measured in 1992 on the Cuyahoga River downstream of the effluent discharge were below the Ohio EPA maximum Warmwater Habitat criteria with the exceptions of copper and zinc (Figure 2). However, these metals were also found with maximum concentrations above the criteria on the same days at the upstream location, and since rain events were associated with these days, the elevated copper and zinc concentrations both upstream and downstream may be attributed to wet weather sources. The 1992 Cuyahoga River data downstream of the Southerly WWTP were also compared in Figures 1 and 2, with similar results, to the generally more stringent criteria proposed by the Great Lakes Water Quality Initiative (at 58 Federal Register 20802-21047).

In 1991, routine sampling for chemical and bacteriological analysis was performed at twelve sites on the Cuyahoga River between the river mouth at RM 0.3 and Bolanz Road in Cuyahoga Valley National Recreation Area at RM 33.2. Chemical and bacteriological data from the Cuyahoga River are presented in Appendix II.

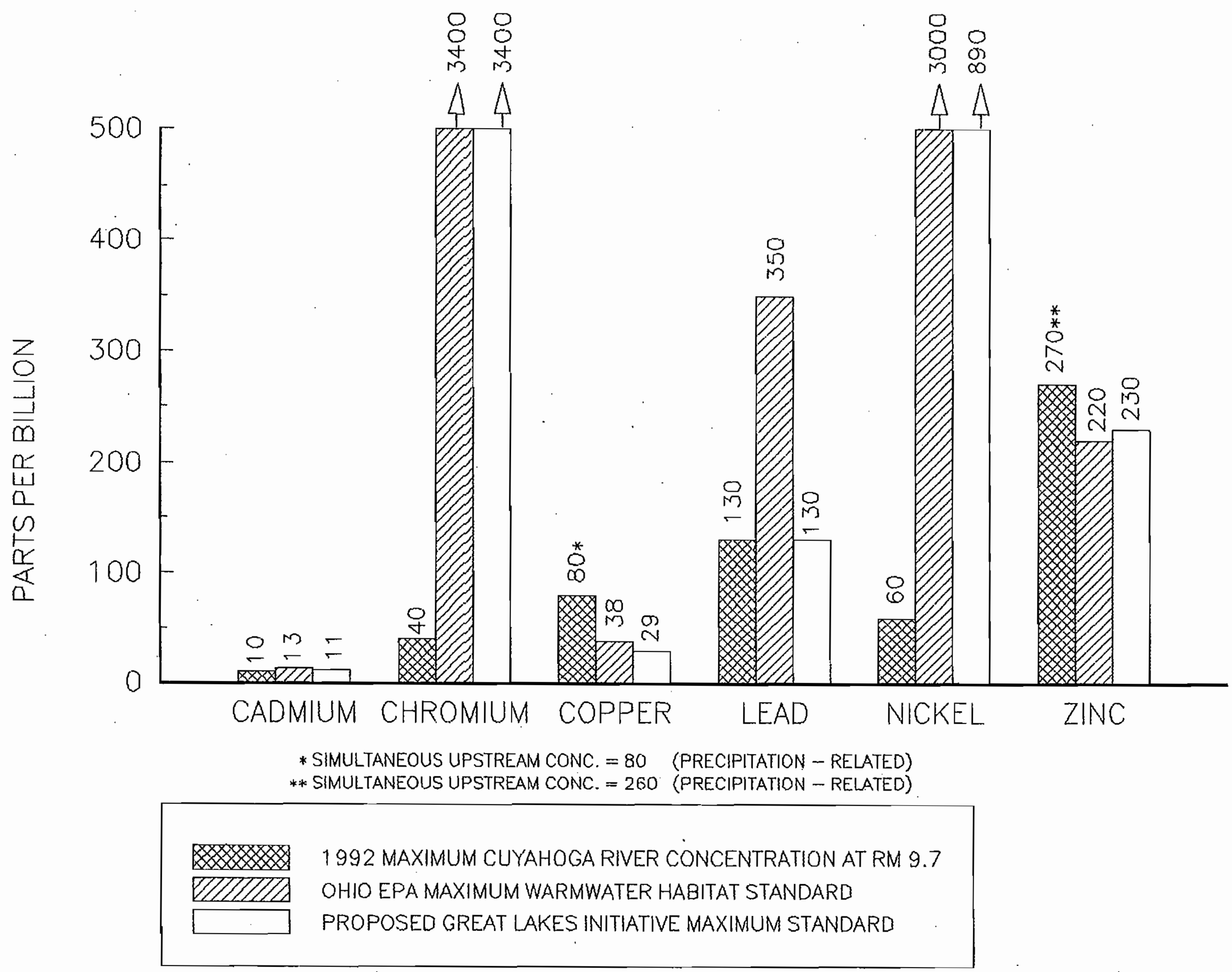
Site #20 (41° 29.93' N, 81° 42.50' W) is off the east bank of the Cuyahoga River at RM 0.3 behind Fagan's Restaurant, located at the intersection of Old River Road and Front Street. The river at this



* SIMULTANEOUS UPSTREAM CONC. = 22

DOWNSTREAM OF SOUTHERLY TREATMENT PLANT

Figure 1
MTLSDSS/2/18/94



DOWNSTREAM OF SOUTHERLY TREATMENT PLANT

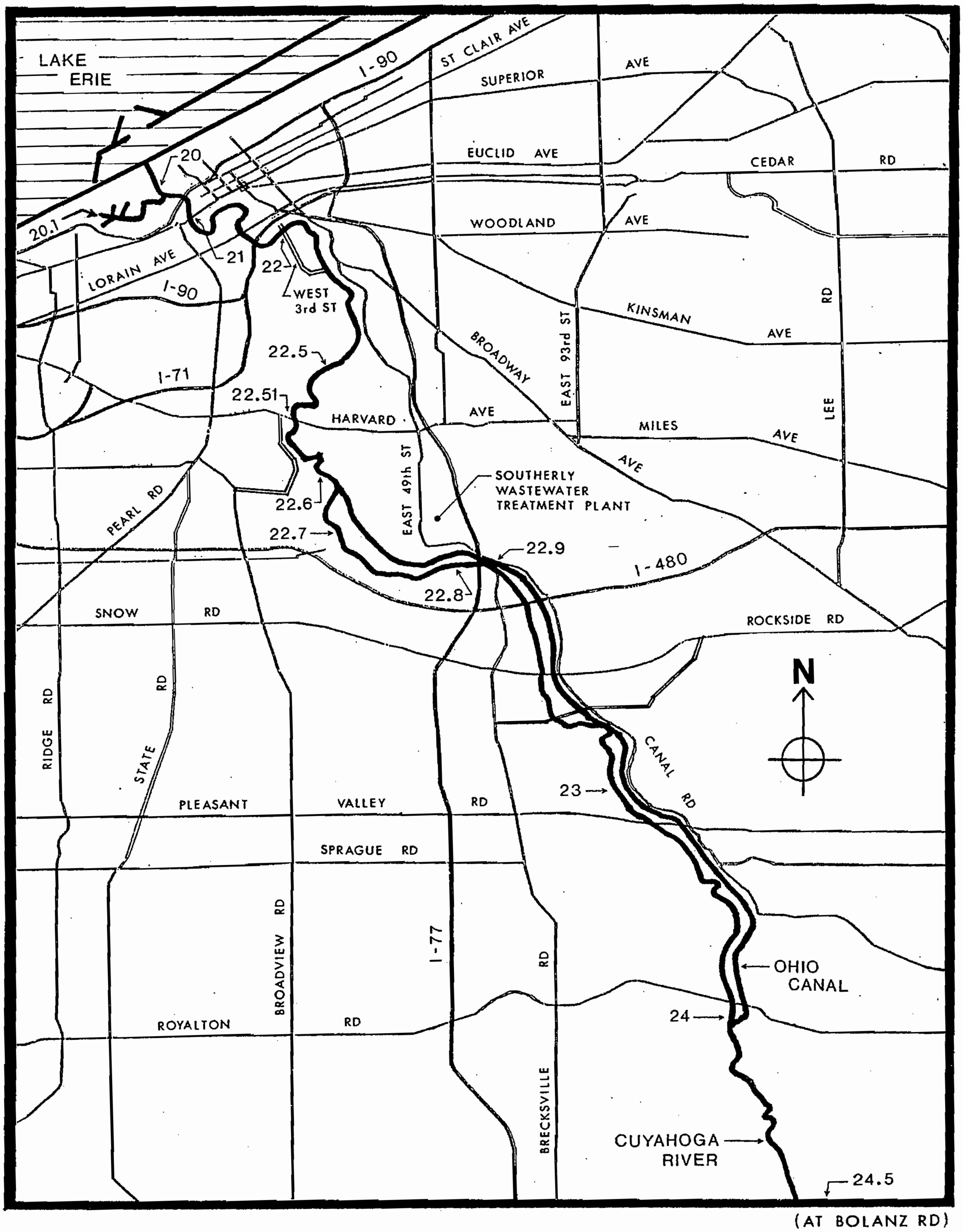
Figure 2
MTLSDSS/2/3/94

location is approximately 300 feet wide and 30 feet deep. Undirectional flow in the river is barely evident on most occasions during dry weather conditions. A cessation in flow or backflow, which are occasionally observed, are a result of the interfacing of the river with Lake Erie's waters. At this site and at all of the other sites where the depth is at least three feet, the river generally appears turbid or light brown in color. Small amounts of natural and/or manmade debris have been often observed near the river edge at Site #20. A substrate of fine sediment and muck is typical in the lower navigation channel, and the habitat type can be considered either a very slow run or large pool. It is not a natural, riverine habitat due to the extensive shoreline development, the existence of steel-lined banks with virtually no vegetative cover, and the fact that the channel is routinely dredged to maintain its depth. No QHEI score was determined at this location.

Site #21 (41° 29.62' N, 81° 42.26' W) is at the north downstream side of the Center Street bridge (RM 1.0). The river at this location is approximately 150 feet wide and 30 feet deep. Like Site #20, this segment of the river is within the navigation channel. Both banks consist of steel seawall with developed shorelines. The water color is light brown and the substrate is silt. Lake-effect backflow has been observed at this site. Samples are collected from the bridge at midstream. No QHEI score was determined at this site.

Site #22 (41° 29.43' N, 81° 41.27' W) is at the West 3rd Street bridge in the Cleveland Flats (RM 3.3). The river at this location is approximately 200 feet wide and 28 feet deep. Again, the velocity of flow in the river is very slow and barely evident on most occasions under dry weather conditions. The physical characteristics of the river are very similar to those of Sites #20 and #21, with the exception of a 0.1- to 0.2-mile stretch of exposed earthen bank along the west side of the river at this location. Substrate type and quality are also similar to those of Sites #20 and #21. Samples are collected from the bridge at midstream. No QHEI score was determined at this site.

Site #22.5 (41° 27.81' N, 81° 40.65' W) is at the Newburg and South Shore Railroad bridge on the property of the LTV Steel Company and can be accessed by following the river onto the steel mill property from either Independence Road or Campbell Road (RM 5.6). There are two parallel railroad bridges located approximately 30 feet apart at the site. The Newburg and South Shore Railroad bridge is located on the upstream side and is the downstream boundary of the Ohio EPA Warmwater Habitat designation. The bridge on the downstream side is at the head of the navigation channel. The river at this location is approximately 150 feet wide and the depth ranges from four feet nearshore to about ten feet midstream. On the upstream side of the twin bridges, the bottom contour is more riverine. On the downstream side, the depth is greater and more uniform due to maintenance dredging. On most occasions while sampling at this site,



Cuyahoga River

Figure 3

the accumulation of natural and/or manmade debris at the bridge supports, especially near the east bank, has been noted. In this run-type habitat, the substrate is primarily composed of sand and fine gravel midstream and silt and muck along the margins. An industrial setting predominates in the upland area. Separating the river and the industry is a very narrow vegetative buffer upstream of the sampling site. The vegetative buffer begins at Site #22.5 and is more extensive along the east bank than the west bank. As one approaches Site #22.51, which is 1.6 miles upstream at the Lower Harvard bridge, the buffer is intermittent and is interspersed with small sections of open or "raw" land. Also, immediately upstream of Site #22.5, the lower west bank is concrete-lined. Several industrial discharges are evident both upstream and downstream of this site. No QHEI score was determined at this location.

Site #22.51 (41° 26.77' N, 81° 41.07' W) is at the Lower Harvard Avenue bridge (RM 7.1). It is located less than 0.2 miles downstream of the Cuyahoga River/Big Creek confluence. Downstream of the bridge, the river begins to slow as it moves through the "LTV stretch" from RM 7.1 to RM 4.3. Lake Erie has the potential to exert an effect on the river's velocity as far upstream as this site. In 1992, Site #22.51 obtained a QHEI score of 62 (Appendix VI).

Site #22.6 (41° 26.43' N, 81° 40.71' W) is at the west bank of the river adjacent to the River Smelting & Refining Company, 4195 Bradley Road (RM 7.9). The site can be accessed from Bradley Road, at the southeast end of the company's dirt-and-gravel front lot. Site #22.6 is about one-half mile upstream of the Cuyahoga River/Big Creek confluence. In 1992, Site #22.6 obtained a QHEI score of 45.5 (Appendix VI).

Site #22.7 (41° 25.36' N, 81° 40.01' W) is at the east bank of the river underneath the crossing of the NEORSD Southwest Interceptor (RM 9.7). This site is located one mile downstream of the effluent discharge from the NEORSD Southerly Wastewater Treatment Plant. The site can be accessed from the tow path which runs between the river and the Ohio Canal. Access can be made to the tow path at the Southerly ash lagoons off Canal Road. Located upstream between RM 10.0 and RM 10.5 are three demolition material disposal sites. Two disposal sites are situated on the west bank and one site is located on the east bank. Site #22.7 obtained a QHEI score of 54 in 1992 (Appendix VI).

Site #22.8 (41° 26.56' N, 81° 39.61' W) is at the chlorine-access railroad bridge to the Southerly WWTP and is located near the southwest end of the plant's ash lagoons (RM 11.3). This site is about one-half mile upstream of the effluent discharge from the NEORSD Southerly WWTP and 0.1 miles downstream of the West Creek confluence. The site can be accessed from Canal Road across from the NEORSD's Southerly Treatment Plant's main entrance gate. In 1992, Site #22.8 obtained a QHEI score of 61 (Appendix VI).

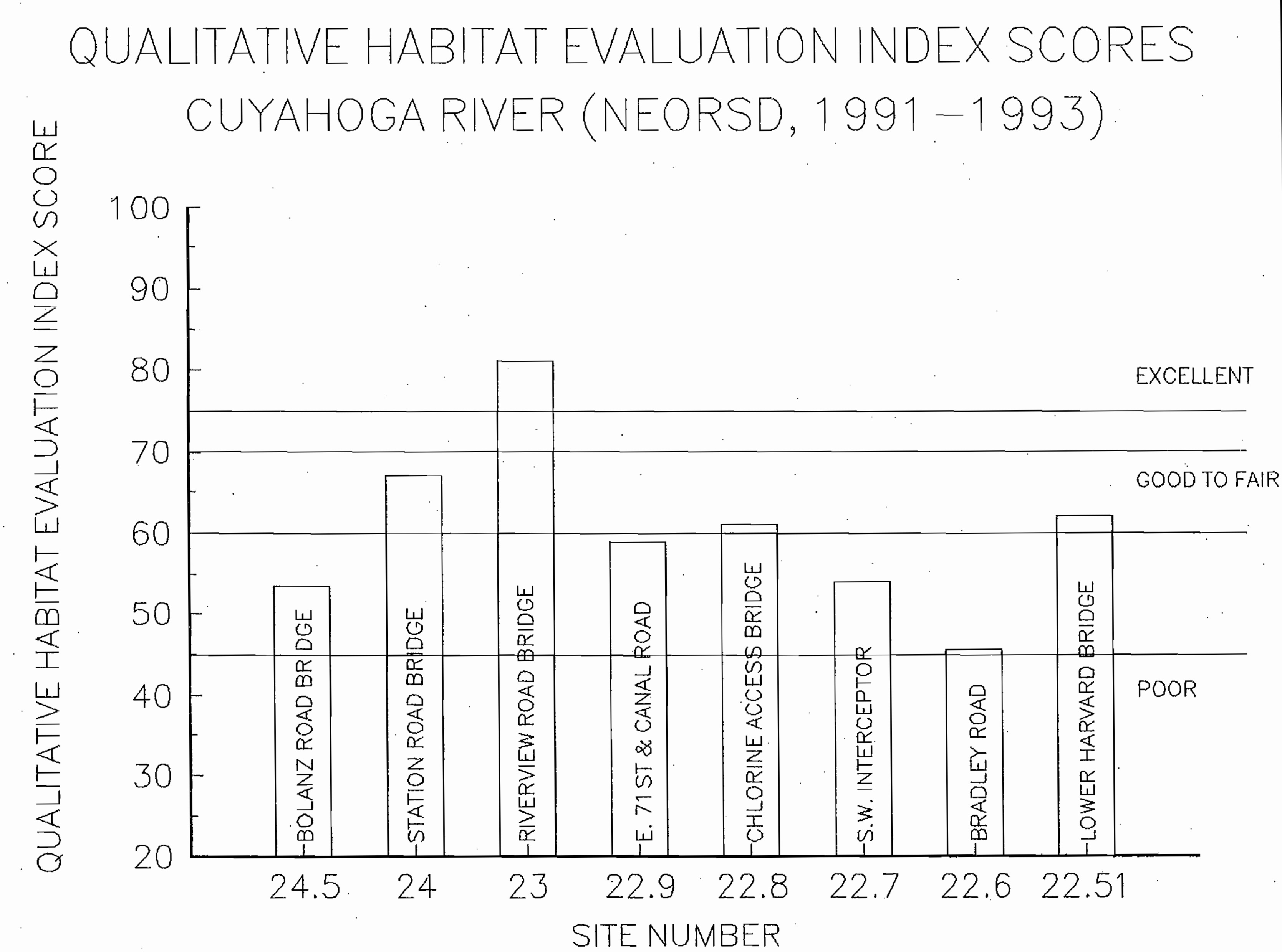

QUALITATIVE HABITAT EVALUATION INDEX SCORES
CUYAHOGA RIVER (NEORSD, 1991–1993)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
BOLANZ ROAD BR DGE
STATION ROAD BRIDGE
RIVERVIEW ROAD BRIDGE
E. 71ST & CANAL ROAD
CHLORINE ACCESS BRIDGE
S.W. INTERCEPTOR
BRADLEY ROAD
LOWER HARVARD BRIDGE
EXCELLENT
GOOD TO FAIR
POOR
24.5
24
23
22.9
22.8
22.7
22.6
22.51
SITE NUMBER

Figure 4

Site #22.9 (41° 26.51' N, 81° 39.18' W) is at the railroad bridge crossing southeast of the intersection of East 71st Street and Canal Road (RM 11.7). This site is located 0.2 miles downstream of the Mill Creek confluence. Site #22.9 obtained a QHEI score of 59 in 1992 (Appendix VI).

Site #23 (41° 21.86' N, 81° 36.69' W) is located at the Old Riverview Road bridge (RM 16.8). This site is in the Cuyahoga Valley National Recreation Area (CVNRA) and is located 0.2 miles downstream of the Cuyahoga River/Tinkers Creek confluence. The site can be accessed from Canal Road at the intersection with Tinkers Creek Road. In 1992, Site #23 obtained a QHEI score of 81 (Appendix VI).

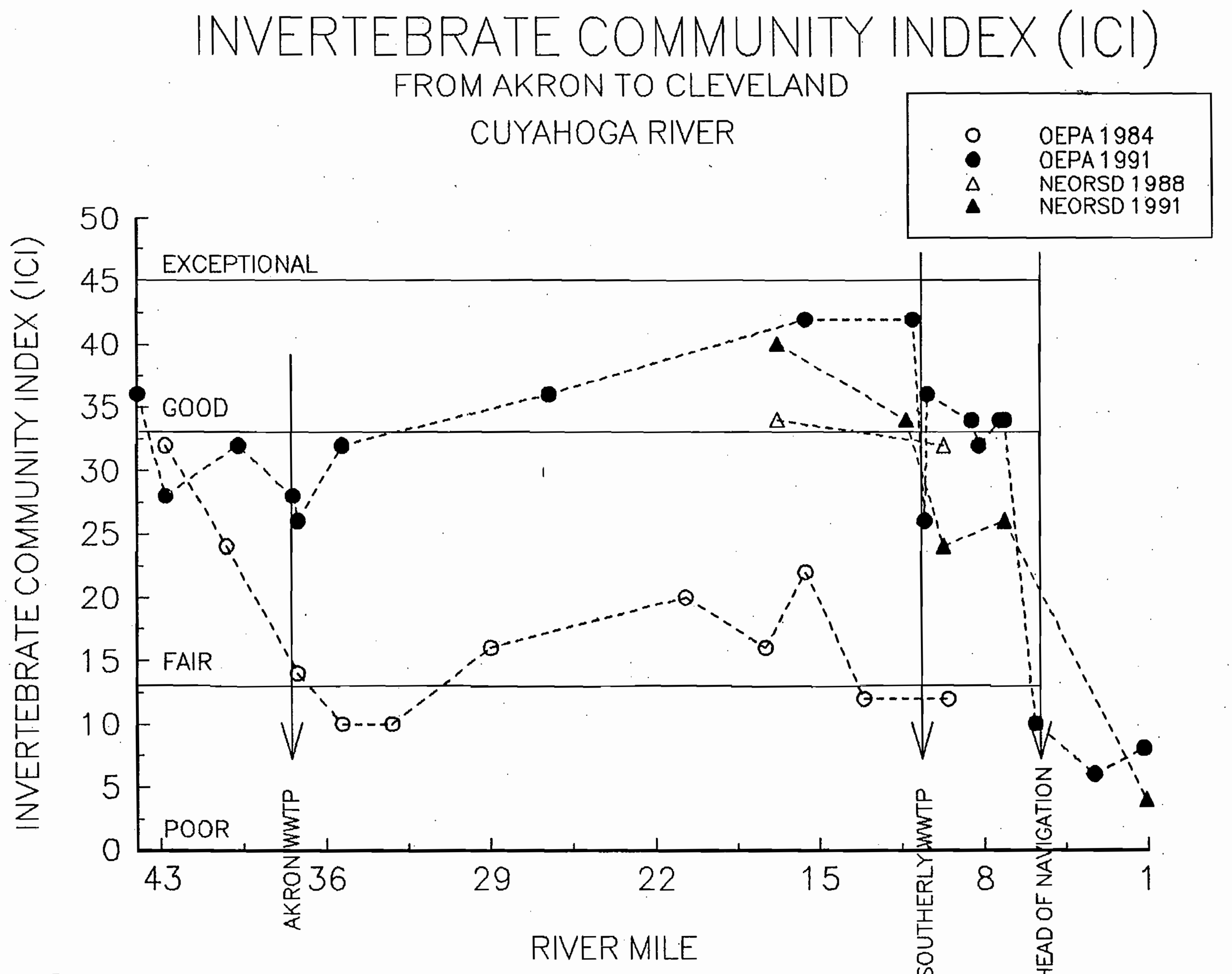
Site #24 (41° 19.29' N, 81° 35.21' W) is located downstream of the State Route 82 bridge (RM 20.8). This site is also in the CVNRA and is located downstream of the Cuyahoga River/Chippewa Creek confluence. This site can be accessed from Riverview Road south of its intersection with State Route 82. In 1992, Site #24 obtained a QHEI score of 67 (Appendix VI).

Site #24.5 (41° 11.95' N, 81° 34.14' W) is located east of the intersection of Bolanz Road and Riverview Road in Summit County at RM 33.2. This site is approximately four miles downstream of the City of Akron Wastewater Treatment Plant effluent discharge and less than 0.2 miles upstream of the Cuyahoga River/Furnace Run confluence. Site #24.5 was selected to evaluate Cuyahoga River water quality upstream and outside of the NEORSD jurisdictional area for comparison with downstream water quality. In 1992, Site #24.5 obtained a QHEI score of 53.5 (Appendix VI).

BENTHIC MACROINVERTEBRATE SAMPLING ON THE CUYAHOGA RIVER

In 1991, benthic macroinvertebrates were collected from Sites #24.5, #24, #23, #22.9, #22.8, #22.7, #22.51, #21 and #20.1. The samples were used to calculate Hilsenhoff Biotic Index (HBI), Shannon Diversity Index ($\bar{d}$), total taxa, Ephemeroptera + Plecoptera + Trichoptera taxa (EPT), and percent EPT composition (Appendix IV-B). With exceptions for Sites #21.1 and #20.1, all HBI scores were either in the "Very Good" or "Good" narrative ratings (Figure 6). These ratings suggest possible slight organic pollution to some organic pollution exists at these locations.

The HBI scores presented in Figure 6 exhibit a gradual increase as you move downstream from Site #24 to Site #22.7. The gradual increase in HBI scores may reflect the impact that the tributary streams upstream of each location may be having on the Cuyahoga River (see Figure 6). Many of the tributary streams upstream of the Southerly WWTP contribute increased sediment load and drainage from residential septic systems and other sources of sewage (i.e. leaking sanitary sewers, overflowing sewers, small wastewater treatment plants, etc.),



INVERTEBRATE COMMUNITY INDEX (ICI)
FROM AKRON TO CLEVELAND
CUYAHOGA RIVER
OEPA 1984
OEPA 1991
NEORSD 1988
NEORSD 1991
INVERTEBRATE COMMUNITY INDEX (ICI)
50
45
40
35
30
25
20
15
10
5
0
EXCEPTIONAL
GOOD
FAIR
POOR
AKRON WWTP
SOUTHERLY WWTP
HEAD OF NAVIGATION
43
36
29
22
15
8
1
RIVER MILE

Figure 5

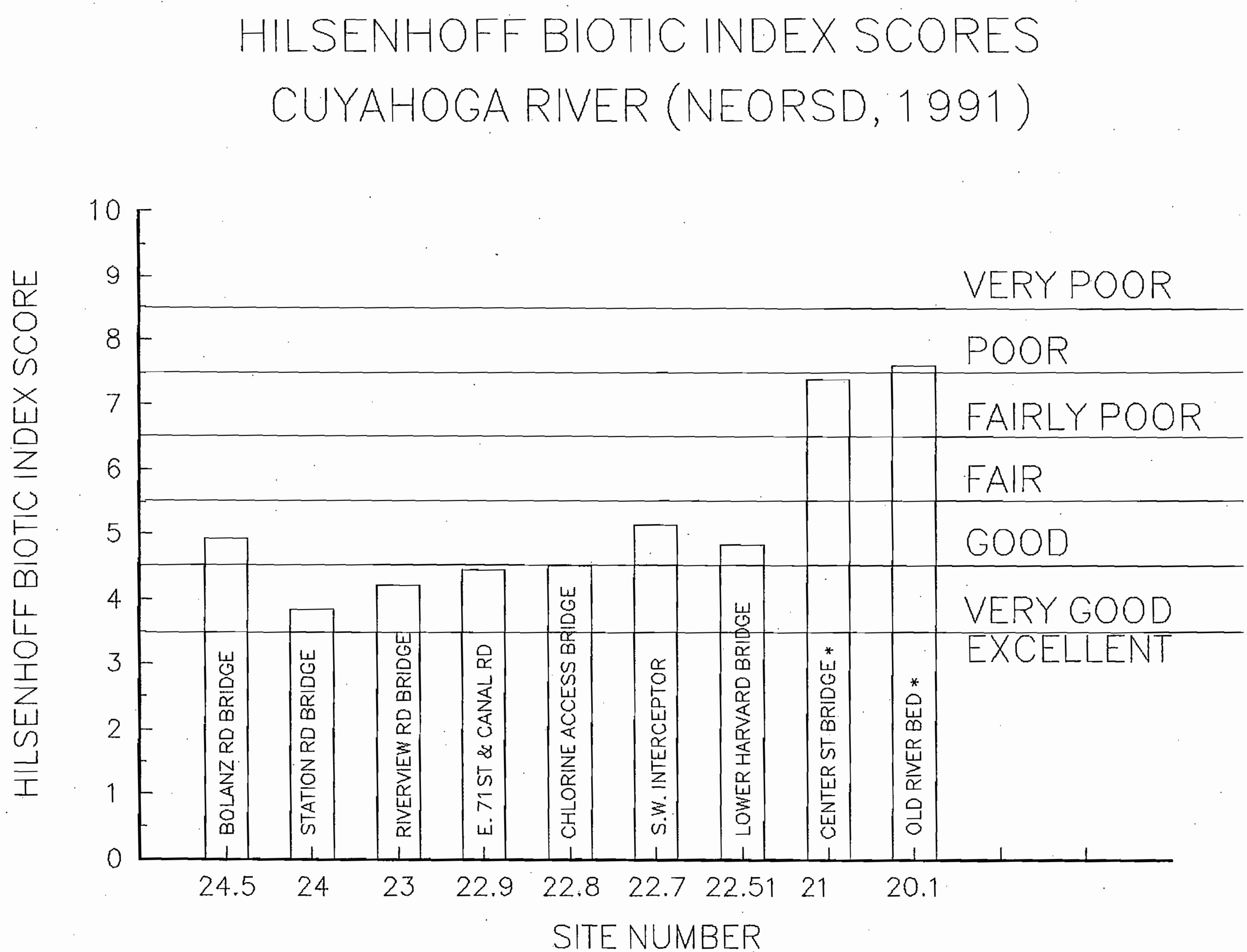


Figure 6 * Habitat at this location does not fully meet criteria for HBI calculation; supplemental score only.

which can negatively effect the benthic community of the Cuyahoga River. The biota of the river begins to recover downstream of the NEORSD's Southerly WWTP until the Head of Navigation where scores begin another increase to the mouth of the Cuyahoga River. The significantly higher HBI scores in the Navigation Channel are attributed to its depth, box shape, slow rate of flow and long retention time which result in very low dissolved oxygen concentrations, especially during hot summer months. The higher HBI scores can also be attributed to contaminated sediments, increased siltation, and dredging of the Navigation Channel which make it not conducive to habitation by benthic macroinvertebrates. The Navigation Channel is a depositional area which is more sensitive to silt and suspended solids than riffle/run habitats. Further sampling is required to verify this longitudinal trend.

In 1991, Hester-Dendy Artificial Substrate samplers were placed by the NEORSD at six locations on the Cuyahoga River for use in Invertebrate Community Index (ICI) calculations. Four locations were upstream of the Navigation Channel at Sites #23, #22.8, #22.7 and #22.51, with one in the Navigation Channel at Site #21 and the last one in the old river bed near the Channel Park Marina, Site #20.1 (Figure 3).

The two upstream locations, Sites #23 and #22.8 had ICI scores with "Good" narrative rating (Figure 5). The 1991 ICI score at Site #23 (40) indicates that the water quality at this location has improved since 1988 when an ICI score of 34 was calculated.

The two locations downstream of the Southerly WWTP, Sites #22.7 and #22.51 had ICI scores with "Fair" narrative ratings (Figure 5).

In 1991, a decrease in the Invertebrate Community Index (ICI) compared to 1988 was noted. In 1988 an ICI score of 32 was calculated for Site #22.7, while in 1991 the ICI score was 24; both values are within the "Fair" narrative rating (Appendix IV-I). The most significant difference in the benthic macroinvertebrate community at Site #22.7 between 1988 and 1991 can be found in the percent caddisfly composition (43.9% in 1988, 1.08% in 1991). The total number of caddisfly taxa decreased from 3 in 1988 to 1 in 1991. Also, a decrease in mayfly taxa from 6 in 1988 to 4 in 1991 occurred. The total taxa did show an increase from 39 in 1988 to 56 in 1991. However, the increase in total taxa can be attributed to improved taxonomic skill, especially in midge taxonomy.

The habitat at Site #22.7 has a slow current and no riffles, making it a depositional area. Depositional areas with slow current and pools are more sensitive and quicker to respond to increased sediment loads than riffle areas (Cline et.al. 1982; Logan and Brooker 1983). The deposited inorganic material can smother organic food particles, resulting in reduced food supply and eventually decreases in population densities. Land-use activities that introduce sediment to aquatic systems are among the most serious and widespread human impacts on the quality of running water (Cordone and Kelley 1961; Hynes 1970).

The lower ICI score at Site #22.7 may not be attributable to changes in water quality but changes in habitat and land-use. Chemical and bacteriological parameters analyzed in 1991 were similar to concentrations in 1988. However, the habitat around Site #22.7 did change since 1988. In 1988, there was one disposal facility located on the west bank of the river upstream of Site #22.7. In 1990, two additional facilities began operating, with one on the east bank and an additional one on the west bank. The new operations involved clearing the land completely of its vegetation, right up to the river's edge. The process of land clearing leaves large areas of barren earth more susceptible to erosion during rain events. Fine inorganic sediment from the cleared areas can be washed into the river. Clouds of dust generated by machinery which is used in the daily operation of the disposal facilities can be deposited in the river. The associated silt deposition can adversely impact downstream benthic macroinvertebrate communities. The significant reduction in the percent caddisfly composition may be attributed to this change in habitat, because net spinning caddisflies are especially sensitive to increased turbidity (Roback, 1962).

The differences between the 1991 benthic data for Sites #22.7 and #22.8 (which is upstream of Site #22.7) also indicate the possible negative impact of the three disposal facilities located between these locations. The chemical water quality data at Site #22.7 and Site #22.8 are similar, but the 1991 ICI scores differ: 24 at Site #22.7 and 34 at Site #22.8. The difference in the ICI scores can be attributed to decreases in caddisfly and mayfly taxa. There were 6 mayfly taxa and 4 caddisfly taxa at Site #22.8 in 1991, compared to 4 and 1 respectively at Site #22.7 in 1991. The percent caddisfly composition and percent mayfly composition are also lower at Site #22.7 (1.08% and 2% respectively, compared to 13.3% and 23.6% respectively for Site #22.8). Two of the caddisfly taxa (Ceraclea sp. and Hydroptila sp.) absent from the Site #22.7 sample are sensitive to silt and elevated suspended solids concentrations (Doeg and Milledge, 1991; Hogg and Norris, 1991; and Roback, 1962). Mayfly and caddisfly taxa richness declines as impacts from agriculture and sedimentation increase (Lenat et al., 1981; Lenat, 1984). This reduction in caddisfly and mayfly taxa and population densities at Site #22.7 may indicate a negative impact from the three disposal facilities located along the river.

Another noted change in habitat is the reduction in cover provided by tree canopy and reduced riparian buffer zone. Many of the large cottonwood trees have been pushed into the river during land clearing at the disposal facilities. This decrease in canopy will result in increased water temperature during hot summer months which, in turn, will result in lower dissolved oxygen concentrations. The higher temperatures and lower dissolved oxygen will cause fish and macroinvertebrate species that are sensitive to elevated temperature and low dissolved oxygen to be absent or present in very low numbers.

The destruction of the riparian zone will result in greater amounts of sediment entering the river. The increase in sediment will interfere with respiratory processes of many fish and macroinvertebrate species. It is possible that the three disposal facilities near Site #22.7 may be attributable for the lower ICI score in 1991, because run-off from land clearing and development have a negative effect on benthic macroinvertebrate numbers and species richness (Hogg and Norris, 1991).

An ICI score of 4 was calculated for Site #21.1 and is within the "Poor" narrative rating. However, this narrative rating may not be applicable to this location because there was no aquatic life use designation assigned to the Navigation Channel. The Cuyahoga River Navigation Channel has a unique habitat when compared to other river systems. The Navigation Channel is approximately 5.6 miles long, over 20 feet deep and as wide as 300 feet in some locations. The Channel is box-shaped with straight sheet pile sides and a muck/silt substrate. This type of habitat is not conducive to habitation by many aquatic organisms. The predominant organisms are midges, sludgeworms and mollusks. Further sampling is required to accurately characterize the benthic community present in the 5.6 miles of the Navigation Channel.

Site #20.1, located in the Old Riverbed near the Channel Park Marina had a higher ICI score than Site #21: 18 at Site #20.1 compared to 4 at Site #21. This higher score may be attributable to a slightly better habitat. Site #20.1 is not as deep as #21.1 and has some natural instream cover and lacks much of the sheet pile on the sides which is predominant in the Navigation Channel. The ICI score of 18 is within the "Fair" narrative rating. However, this narrative rating may not be applicable to this habitat as the Old Riverbed has also not been designated for aquatic life use. Further sampling is required to better characterize the benthic macroinvertebrate community of the Old Riverbed.

A comparison of the 1991 OEPA ICI scores with the 1984 OEPA ICI scores for the Cuyahoga River from Akron to Cleveland (Figure 5), indicates a general improvement in water quality and in the benthic macroinvertebrate community. The majority of OEPA sample locations were within the "Good" narrative rating and were attaining the Warmwater Habitat Criteria for Aquatic Life. The OEPA ICI scores did decline downstream of the Southerly WWTP effluent, but recovered downstream of the mixing zone. In 1991, the OEPA also installed Hester-Dendy artificial substrates in the Navigation Channel at three locations. The ICI scores calculated for these Navigation Channel locations were similar to what was calculated at the one NEORSD location, receiving "Poor" narrative ratings. The 1991 OEPA ICI data indicate the continued improvement of water quality in the Cuyahoga River from Akron to Cleveland. Continued biological monitoring is required to verify the trend and to ensure the continued improvement of water quality in the Cuyahoga River.

In Figure 5 there are some apparent discrepancies between several 1991 OEPA ICI scores and 1991 NEORSD ICI scores. The differences may be attributable to differences in sample locations selected. Future sampling by the NEORSD will include OEPA sample locations upstream and downstream of the Southerly WWTP to determine if spatial variability is the only factor.

FISH SURVEYS

Since 1990, the NEORSD has monitored the fish communities of the Cuyahoga River in the vicinity of the Southerly Wastewater Treatment Plant (WWTP). A Coffelt electrofishing boat with a Model VVP-ZE electroshocker is employed for this monitoring. In 1991 and 1992, quantitative fish surveys of the river were conducted upstream and downstream of the plant effluent discharge and downstream of the lower Harvard Avenue bridge at RM 7.1.

The fish community data was compared to the biological criteria set by the Ohio EPA for Erie/Ontario Lake Plain Warmwater Habitat. The biological criteria are based on ecoregional reference site scores of the Index of Biotic Integrity (IBI) and the Modified Index of Well-Being (MIwb) developed by the Ohio EPA. The indices are used to evaluate overall fish community health in Ohio streams by gauging attributes against those at relatively unimpacted habitats.

In 1991 and 1992, the IBI and MIwb scores obtained upstream and downstream of Southerly WWTP effluent had narrative ratings of "Very Poor" to "Fair." The scores obtained at the site downstream of the lower Harvard Avenue bridge had narrative ratings of "Poor" to "Fair." These scores are consistent with scores obtained by the Ohio EPA at and near these locations on the Cuyahoga River in recent years.

Appendix V presents and discusses the 1991-1992 NEORSD Cuyahoga River fish community survey data. In Tables V-1, V-2, and V-3, IBI and MIwb scores obtained by various entities performing quantitative fish surveys in this segment of the Cuyahoga River are compared. Fish species collected from the Cuyahoga River by the NEORSD in 1991 and 1992 are presented in Appendices V-A to V-Q.

The fish community continues to be dominated by species more tolerant of chemical or physical disturbances, resulting in depressed quantitative index values. Although the fish community continues to fail to attain the biological criteria set by the Ohio EPA, the data suggest that there is no apparent adverse effect related to the quality of the Southerly WWTP effluent.

The continuing failure to achieve Ohio EPA's expectations may yet be attributable to factors other than water quality. Habitat limitations noted in this segment of the Cuyahoga River include heavy to severe bank erosion, heavy silt loads, low stream gradient, and lack of channel sinuosity (Appendix VI). The geologic history of the area has played an important role in limiting habitat in the Cuyahoga River (Appendix XV).

PROBLEMS AND REMEDIATION

-1-

On December 28, 1990, NEORSD investigators responded to a reported oil spill at LTV Steel Coke Plant #1, located on Independence Road. The LTV Steel management reported that a check valve on an untreated benzolized wash oil transfer line had failed and was leaking. Approximately 100 gallons of this used scrubber oil was released into the immediate area. An unknown portion of this oil had entered the storm sewer which is tributary to Morgana Run. Morgana Run discharges to the Cuyahoga River. Samsel Services was contracted and erected a floating boom to contain any residual oil in Morgana Run and remove it.

On March 12, 1991 NEORSD investigators again responded to an oil spill at LTV Steel Coke Plant #1. The Cleveland Fire Department and LTV Steel Management confirmed that approximately 100 gallons of wash oil leaked from a pressurized pipe at a pump seal. An unknown amount of oil entered a storm drain approximately 30 feet from the spill. This storm sewer feeds Morgana Run, which is tributary to the Cuyahoga River. An unknown quantity of oil was observed as a slick moving along the Cuyahoga River's edge downstream of the Morgana Run outfall to the river. The majority of spilled oil was contained behind a dike and covered with sand. The LTV Steel Corporation and the U.S. Coast Guard made the necessary arrangements to clean up the oil in the river.

-2-

On January 10, 1991, NEORSD investigators responded to gasoline entering the Cuyahoga River via a storm sewer outfall on Dry Dock Road, on the west bank of the river. Investigators joined with U.S. Coast Guard personnel in investigating the source of the gasoline. Inspections revealed that an oil separator system and ground water monitoring wells at Fleet Supplies, 250 Mahoning Avenue, were contaminated with gasoline. It was believed that the gasoline was entering the storm sewer by infiltration with ground water. Fleet Supplies accepted responsibility for the gasoline and any related clean-ups. Samsel Services was contracted and began clean-up by pumping out the ground water monitoring wells. Gasoline was also removed from the storm sewer.

-3-

NEORSD investigators responded on April 5, 1991, to a complaint of oil on the surface of the Cuyahoga River at Harvard Avenue. An inspection of the area revealed a discharge from an 8" PVC pipe at the rear of American Recovery Technologies (now American Waste Recovery), 4181 Bradley Road, on the west bank of the river. American Recovery Technologies recycles aluminum dross. Analysis of the discharge from the 8-inch pipe revealed elevated concentrations of copper (20.0 mg/L); zinc (11.0 mg/L); iron (19.0 mg/L); and lead (5.1 mg/L). A continuous rain occurred on the day of this inspection. Due to this rain it could not be concluded whether American Recovery Technologies was discharging directly to the pipe or stormwater runoff was indirectly discharging to the river.

NEORSD investigators returned to this area of the Cuyahoga River on September 26, 1991, and observed a dry weather discharge from the above described 8" PVC pipe. The pipe was discharging a dark oily substance with a fuel-oil odor into the Cuyahoga River. Analysis of the discharge from the PVC pipe revealed elevated concentrations of copper (3.4 mg/L); zinc (2.6 mg/L); iron (7.1 mg/L); and lead (1.7 mg/L). American Recovery officials confirmed knowledge of the discharge. According to company officials a dump truck transporting aluminum dross had overturned in the parking lot, leaking fuel from its tank. An unknown quantity of fuel had entered a storm drain tributary to the PVC pipe. Remediation of the spill had begun by constructing an earthen dike around the storm drain and applying an absorbent material to the fuel on the ground. The Ohio EPA was notified of the spill and remedial measures by NEORSD personnel.

-4-

On October 26, 1991, NEORSD personnel responded to a reported diesel fuel spill on the Cuyahoga River, near LTV Steel. Management from LTV Steel reported that a line of thirteen rail cars were being filled with coke when they broke free. After rolling down an incline the cars collided with two diesel locomotives. The force of the impact tore a hole in the bottom of one of the fuel tanks, causing the fuel to leak into the river. An estimated 300 to 500 gallons of "Number 2" diesel fuel entered the river. All of the appropriate authorities were contacted. Samsel Services was contracted and responded to perform the clean-up on the river.

-5-

On May 15, 1992, NEORSD investigators responded to a reported oil discharge to the Cuyahoga River from LTV Steel Corporation, 3430 Old Campbell Road. The NEORSD personnel joined with Cleveland Fire

Department and LTV personnel in investigating the source of the discharge. These investigations revealed that an unknown quantity of "Number 6" fuel oil was discharging from LTV's Outfall Number 005. This outfall is adjacent to the Burke Brook culvert outfall at Cuyahoga River Mile 5.3. The investigations further revealed that the "Number 6" fuel oil was entering LTV's storm sewer system from a blast furnace building. Personnel from LTV later estimated that approximately 300 to 500 gallons of the fuel oil had spilled in the blast furnace building and entered the storm sewer.

Northeasterly winds prevented the released oil from migrating from the area adjacent to Outfall Number 005. Containment booms were placed on the Cuyahoga River downstream of LTV's Outfall Number 005 by Samsel Services and U.S. Coast Guard personnel. Additionally, Samsel Services installed absorbent pillows in manholes on the storm sewer downstream of the source of the fuel oil. It is believed that most of the oil was recovered by the absorbent materials and vacuum recovery trucks. Personnel from LTV Steel tested the oil system at the blast furnace on May 16, 1992, and found no leaks or malfunctions. Management at LTV Steel believes that the spill was a deliberate act from one of its employees.

-6-

In July 1992, NEORSD investigators repeatedly responded to odor complaints in the Bradley and Jennings Roads area. A follow-up investigation on July 29, 1992, revealed a grayish flow in Spring Creek, which is tributary to the Cuyahoga River at River Mile 7.9. Spring Creek's flow is culverted through two active landfills, Bradley Road and Northcoast Disposal Landfills. A strong odor of hydrogen sulfide was also found in the areas the gray flow was found. The flow in Spring Creek was examined upstream of the culvert section, at West 14th Street and Tampa Avenue, to determine the extent of the contamination in the creek. No odors or gray flow was noted at this upstream location. Overflow structures to the creek were also checked and found operating properly.

On July 31, 1992, NEORSD personnel met with North Coast Disposal (NCD) officials regarding a leachate-like material found coming out of the ground at the border of NCD and ODOT (Ohio Department of Transportation) property. The ODOT property lies at the north boundary of the NCD Landfill. This property had previously been filled, graded and planted with grass for future construction of the Jennings Freeway. The leachate was collected at a low spot on the NCD property. The leachate was similar in appearance to that found in Spring Creek. It was decided that the culvert needed to be walked to isolate the source of the gray flow. The NEORSD notified the OEPA of the findings and of the intent to walk the culvert. The culvert walk was conducted on August 5, 1992, by NEORSD investigators.

Prior to the culvert walk, it was determined that a 30-inch storm sewer, flowing through the landfill, was the probable source of the gray contaminant. This was confirmed when the walk revealed the 30-inch storm sewer tie-in as the only source of the gray flow entering the culvert. These findings were reported to the OEPA and Cleveland Health Department on August 6, 1992. The NEORSD also informed both agencies of the hazardous conditions caused by hydrogen sulfide vapors.

The NEORSD continued to provide manpower and technical assistance in the study of this problem, although the problem exceeded the scope of NEORSD authority. During August and September, 1992, numerous samples were collected from upstream, downstream and at the 30" tie-in into the culverted Spring Creek. Samples were also collected from the low spot on NCD property where the leachate seepage flowed to the inlet basin. Samples collected during these investigations revealed sulfates at the 30-inch tie-in more than double those found at the inlet to the culvert. Sulfates at the NCD Landfill were found 5 times the concentrations at the outlet. The sampling at the culvert outlet also revealed a fecal coliform concentration of 310,000 organisms per 100 ml. Results of the sampling were reported to the City of Cleveland Councilman James Rokakis, Ward 15 office.

On August 26, 1992, temporary treatment began at NCD by placing calcium hypochlorite briquettes in a pit placed near the toe of the slop where the leachate water was seeping. On September 12, 1992, a second treatment system, consisting of calcium hypochlorite briquettes placed in two 1,500 gallon tanks connected in series, was installed at NCD. NCD next began test well borings so that a subsurface investigation of the ultimate source could be determined. NCD still contends that the leachate originates on ODOT property and flows to the surface on their land during wet weather events. The City of Cleveland requested a closure plan from NCD before renewing their annual permit to receive fill. This closure plan was delivered in December, 1992.

NCD also questioned that they could be the source of the fecal coliform contamination due to the fact that their landfill only accepts construction waste fill. To determine that the infiltration into the 30-inch storm sewer was not being compounded by exfiltration from the sanitary sewers on Spring Road and West 11th Street, an exfiltration test was planned. The NEORSD planned, in early 1993, to introduce fluorescent dye into the sanitary sewer on West 11th Street, which flows to Spring Road. After dye introduction samples were to be collected from test bores on NCD property and analyzed for fluorescence.

NOTE: In 1993 the fluorescence test was performed with no exfiltration from the sanitary sewers being found. Final treatment plans and discharge provisions were to be formulated in 1993.

-7-

A dark flow was observed in a drainage swale along Bradley Road by NEORSD investigators on September 18, 1992. The reddish-brown substance appeared to be flowing from the ground at the foot of a hill located north of Sky Lane Drive. Once in the Bradley Road swale the flow traveled both east and west along the road. The eastbound swale flowed into a storm culvert which travels between the B.P. Oil tank farm and the Wabash Foundry and into the Cuyahoga River. The westbound swale flowed to Spring Creek south of Bradley Road. This creek also discharges into the Cuyahoga River. A sample of the substance flowing from the foot of the hill was collected for analysis. Analysis of this sample revealed elevated levels of total cyanide (12.5 mg/L) and amenable cyanide (11.3 mg/L). Metals were also analyzed for but not found in elevated levels. Further investigation of this area is needed to determine if this was an isolated problem or a continuing intermittent discharge from an as yet unidentified source.

-8-

On December 1, 1992, NEORSD investigators responded to a fuel oil spill at LTV Steel Corporation's C-5 Blast Furnace Building. Officials from LTV Steel estimated that 50 gallons of fuel oil spilled into a floor drain in the building. The floor drain is tributary to Burke Brook via a storm pipe near the culvert outfall. Most of the oil that reached the Cuyahoga River was retained by a protruding landmass at the river bank. Samsel Services was contracted by LTV Steel to recover the lost fuel oil.

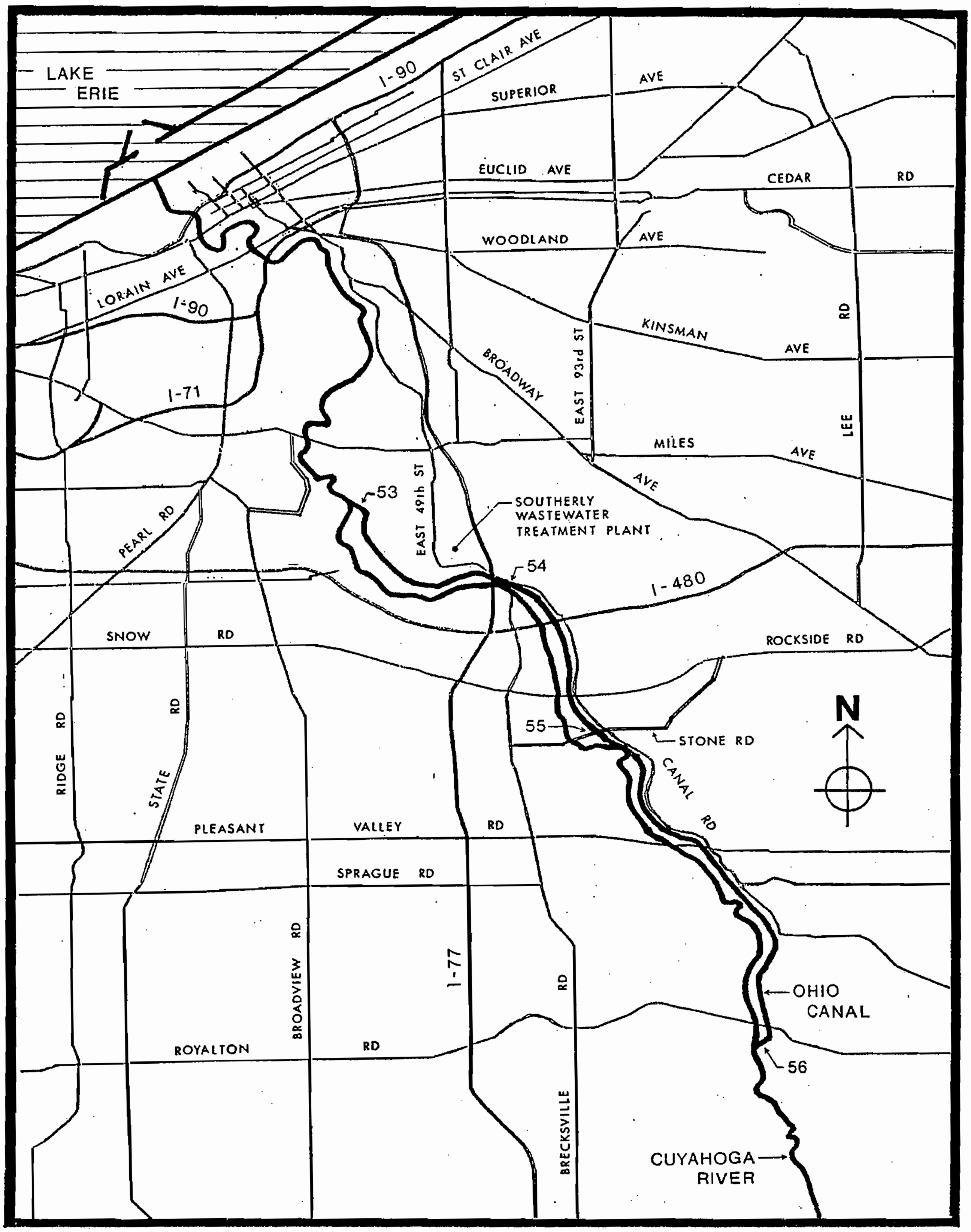
OHIO CANAL

The Ohio Canal, which was opened between Cleveland and Akron in 1827, had replaced the Cuyahoga River as the major transportation artery in this region. The canal system opened up Ohio and the Midwest to commerce and industrialization. 53 years later, however, it was replaced as a transportation route by the railroads and subsequently abandoned. What is presently left of the canal system is of not much more than historical significance. The only remaining wetted section stretches for eleven miles northward along the east bank of the Cuyahoga River from the State Route 82 bridge crossing between Brecksville and Sagamore Hills.

The NEORSD incorporated sampling of the Ohio Canal into its Stream Monitoring Program as a result of arguments raised in early 1988 concerning designation of the Cuyahoga River as Warmwater Habitat from River Mile (RM) 10.8 to RM 5.6. Because the lower eleven miles of the canal are fed by the river, the two systems are expected to be quite similar in water quality characteristics. The NEORSD hypothesized that because of this similarity, any major differences in biological condition between the river and the canal must be related to differences in other factors, perhaps the quality of physical habitat and/or erosion and sedimentation. Thus, for experimental and informational purposes, chemical, bacteriological, and benthic sampling has been performed on the canal by the NEORSD.

The exact drainage area tributary to the canal's wetted section is unknown. It is fed by partial flow from the Cuyahoga River, near Site #24, through an inlet structure located just upstream of the low-head dam under the State Route 82 bridge. The canal is receiving flow from the river to provide a source of cooling water for the American Steel and Wire Corporation, located at 4300 East 49th Street in Cuyahoga Heights. The company leases the canal for this purpose from the Ohio Department of Natural Resources, and its intake line is located 0.4 miles upstream of the canal's confluence with the river. Downstream of the diversion of river water into the canal, no other large drainages which would significantly affect its flow are known to enter the canal. The flow in the canal is regulated by the inlet structure and five return structures located along its west bank. The water surface gradient is nearly zero for most of its length, and elevation drops are facilitated by lock structures and weirs.

The Ohio EPA has no current use designation for the Ohio Canal. No QHEI's were determined for the canal since it is not a natural watercourse. The NEORSD has selected four locations on the Ohio Canal for routine chemical, bacteriological and benthic sampling and analysis (Figure 7). Chemical and bacteriological data from the Ohio Canal are presented in Appendix II.



Ohio Canal
(NOT TO SCALE)

Figure 7

Site #53 (41° 26.27' N, 81° 24.88' W) is approximately 30 feet upstream of the confluence with the Cuyahoga River (RM 8.5). The site can be accessed from a walking trail that travels to the north between the river and the canal for 0.4 miles from the end of the old tow path.

Site #54 (41° 26.58' N, 81° 39.16' W) is located at the railroad bridge crossing near the intersection of East 71st Street and Canal Road. Parallel to this location is Site #22.9 on the Cuyahoga River.

Site #55 (41° 23.04' N, 81° 37.19' W) is located at the Stone Road bridge and can be accessed from Canal Road. This site is located in the Cuyahoga Valley National Recreation Area.

Site #56 (41° 19.17' N, 81° 35.25' W) is located at the inlet structure through which Cuyahoga River flow is diverted into the canal. This site is located in the rural environment of the Cuyahoga Valley National Recreation Area.

PROBLEMS AND REMEDIATION

-1-

On June 2, 1992, NEORSD investigators responded to a report of dead fish in the Ohio Canal at the American Steel and Wire Corporation dam. Investigators inspected the canal and noted that most of the fish were decomposed. Investigators reported an estimated count of 100 dead fish. White sucker, gizzard shad, common carp, bluegill, brown bullhead, green sunfish and pumpkinseed comprised the fish species identified.

The water temperature was measured at 16° C and dissolved oxygen at 2 ppm. Investigators also noted that the water level of the canal was low and only a trickle of water was flowing over the dam. The flow condition was attributed to the diversion gates upstream near State Route 82 which were closed, thus preventing Cuyahoga River water from entering the canal. The diversion gates had been closed for the reconstruction of the lock structure at Hillside Road and the Granger Road bridge construction. A water sample was obtained for chemical analysis. However, the results did not indicate any significant chemical contamination. The lack of flow entering the canal may have caused it to become stagnant, resulting in a low dissolved oxygen concentration.

-2-

On September 30, 1992 NEORSD investigators responded to a report of an orange color in the Ohio Canal, downstream of the Granger Road bridge. During the summer of 1992, the Granger Road bridge over the canal was closed for structural repairs. Investigators observed that the canal was dammed around the bridge construction site to allow for excavation. An Ohio Department of Transportation inspector informed investigators that three discharges were entering the canal from dewatering wells which contained groundwater from the excavation site. The inspector explained that a sump pump drains the wells. However, when the pumps are idle, water in the steel discharge pipes cause the pipes to rust. This rust accumulates until the pumps are activated. The initial flush from the pipes contain rusty water which discolors the canal. A sample of the discharge to the Ohio Canal showed an iron concentration of 13.1 mg/L. A substantial amount of orange sediment was observed by NEORSD investigators along the margins of the canal. However, the orange color was not observed in the flow downstream at the Warner Road bridge.

BIG CREEK

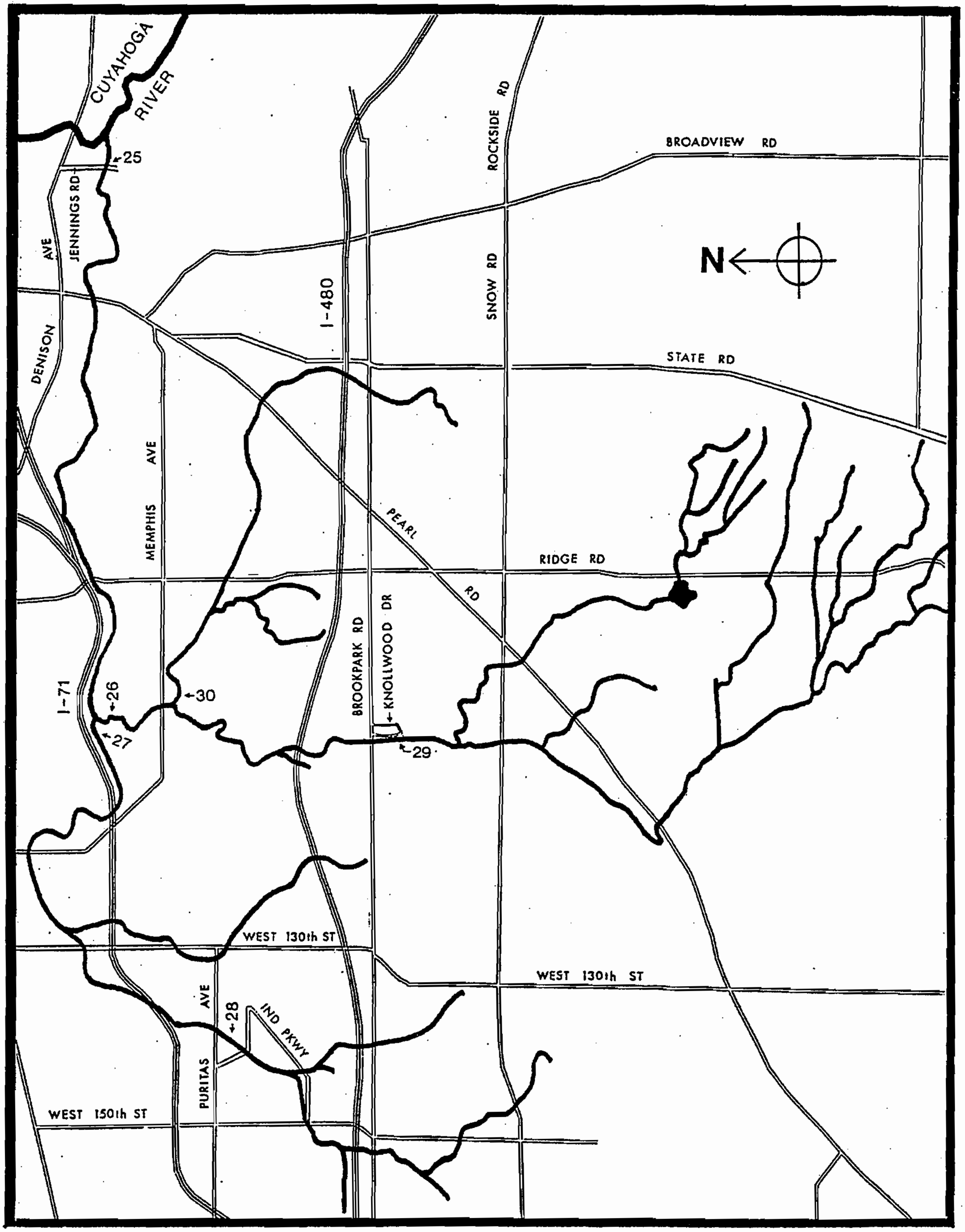
Big Creek drains southwestern Cleveland and the southwest suburbs. It has a total drainage area of 38.6 square miles and a total length of 12.0 miles. Big Creek has two main branches: the East Branch, which originates in North Royalton south of Pleasant Valley Road, and flows north through Parma and Parma Heights into Brooklyn; and the West Branch, which originates in Brook Park and flows northeast through the west side of Cleveland into Brooklyn, where it combines with the East Branch. From the confluence of the two main branches, Big Creek flows east through Brooklyn and Cleveland to the Cuyahoga River at River Mile 7.4. Additionally, each branch has a major tributary stream: Stickney Creek, which originates in Parma and flows northwest through a section of Cleveland into Brooklyn, where it combines with the East Branch; and the "Chevrolet" Branch, which originates in Parma south of Brookpark Road and flows northeast into Cleveland, where it combines with the West Branch.

Most of Big Creek is open, with only two major portions culverted: approximately 0.4 miles underneath the Cleveland Metroparks Zoo; and approximately 2.6 miles of the West Branch between West 117th Street and Puritas Avenue.

Along Interstate 71, from downstream of the East and West Branch confluence to Brookside Park, the creek has been relocated and channelized with concrete beds. Other than this 1.6 miles of channelization and the culverted portions, the creek's substrate is predominantly natural.

The creek's drainage area is largely residential and commercial but also includes significant portions of land used for industrial and recreational purposes. Big Creek's main stem and West Branch have been designated Limited Warmwater Habitat and Primary Contact Recreational Use by the Ohio EPA. The East Branch has been designated Warmwater Habitat and Primary Contact Recreational Use. Portions of Big Creek within the boundaries of the Cleveland Metroparks have been designated Warmwater Habitat, Primary Contact Recreational Use, and State Resource Waters. Big Creek has six locations that are routinely sampled by NEORSD investigators for chemical, bacteriological, and benthic analysis (Figure 8). Chemical and bacteriological data from Big Creek are presented in Appendix II.

Site #25 (41° 26.72' N, 81° 41.21' W) is located on the main stem downstream of Jennings Road and approximately 900 feet upstream of the confluence with the Cuyahoga River. In 1992, Site #25 obtained a QHEI score of 59.5 (Appendix VI).



Big Creek
(NOT TO SCALE)

Figure 8

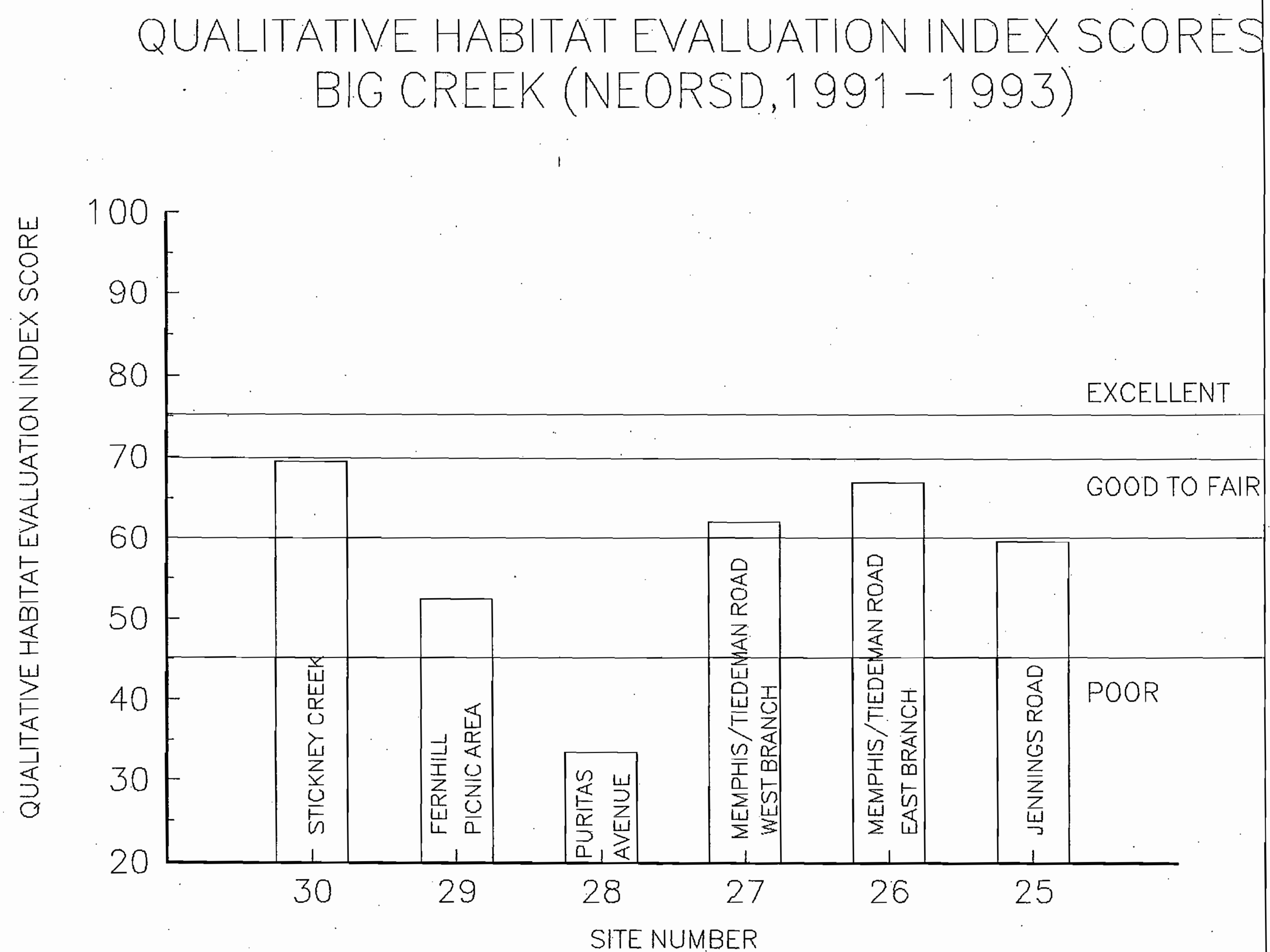

QUALITATIVE HABITAT EVALUATION INDEX SCORES
BIG CREEK (NEORSD,1991-1993)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
STICKNEY CREEK
FERNHILL PICNIC AREA
PURITAS AVENUE
MEMPHIS/TIEDEMAN ROAD WEST BRANCH
MEMPHIS/TIEDEMAN ROAD EAST BRANCH
JENNINGS ROAD
30
29
28
27
26
25
SITE NUMBER

Figure 9

Site #26 (41° 26.70' N, 81° 45.24' W) is located on the East Branch of Big Creek approximately 100 feet upstream of its confluence with the West Branch. As is the case with Site #27, this section of the creek passes through a portion of the Cleveland Metroparks Big Creek Reservation north of Memphis Avenue and Tiedeman Road. Site #26 obtained a QHEI score of 67 in 1992 (Appendix VI).

Site #27 (41° 26.73' N, 81° 45.33' W) is located on the West Branch of Big Creek approximately 100 feet upstream of the confluence with the East Branch. It is in a portion of the Cleveland Metroparks Big Creek Reservation north of Memphis Avenue and Tiedeman Road. In 1992, Site #27 obtained a QHEI score of 62 (Appendix VI).

Site #28 (41° 25.90' N, 81° 47.57' W) is located on the West Branch of Big Creek immediately upstream of the beginning of the double-barrel culvert south of Puritas Avenue. The stream at this point has passed through a flat marshland with high grass. Near the culvert, it has concrete beds which are covered with sand and a dense growth of green algae. Site #28 obtained a QHEI score of 33.5 in 1992 (Appendix VI).

Site #29 (41° 24.76' N, 81° 45.26' W) is located upstream on the East Branch of Big Creek at the Fernhill Picnic area in the Metroparks Big Creek Reservation, south of Brookpark Road. In 1992, Site #29 obtained a QHEI score of 52.5 (Appendix VI).

Site #30 (41° 26.33' N, 81° 45.13' W) is located on Stickney Creek about 100 feet upstream of its confluence with the East Branch of Big Creek south of Memphis Avenue. In 1992, Site #30 obtained a QHEI score of 69.5 (Appendix VI).

BENTHOS AT SITE #25

Noted increases in benthic diversity at Big Creek Site #25 in 1991 indicate improvements in water quality since 1990. Considerable increases in total taxa and EPT taxa (23 and 5, respectively, in 1991, compared to 6 and 0, respectively, in 1990) support the observation of improved water quality. The 1991 HBI score also indicates good water quality. The HBI score does however, indicate that some organic pollution exists. Further sampling is required to verify the trend.

BENTHOS AT SITE #27

The 1991 benthic macroinvertebrate data (Appendix IV-B) indicate a continued improvement of water quality at Site #27. Prior to December 1990, when remediation eliminated the contamination of the West Branch of Big Creek by sanitary sewage between Puritas Avenue and West 130th

Street, the creek had been obviously severely polluted (see NEORSD Greater Cleveland Area Environmental Quality Assessment 1989-1990). Though the 1991 HBI score (Appendix IV-B) indicates significant organic pollution existed, an improvement in the assemblage of benthic macroinvertebrates must be noted. Comparison of benthic macroinvertebrate data for Site #27 found in Tables 1-3 indicate an increase in benthic diversity from 1989 to 1991. North Carolina Biotic Index (NCBI) tolerance values are included in these tables for comparison of non-arthropods and organisms where no HBI tolerance value is available. In 1991, there were 15 total taxa compared to 1 in 1989 and 7 in 1990. Further sampling is required to verify this trend.

BENTHOS AT SITE BC-"C"

Site BC-"C" is located approximately 4,500 feet east of Ridge Road near Rose Field in Brookside Park. This site was chosen because it is less than one mile downstream from the October-November 1989 Big Creek Interceptor diversion at Ridge Road, and approximately two miles downstream of the Big Creek Interceptor diversion chamber outfall and the confluence of the East and West branches of Big Creek. The site has a long riffle/run habitat with a large pool under a pedestrian bridge. The substrate consists of cobble, concrete rubble, sand, and gravel. Many logs and other debris have accumulated on the upstream side of the pedestrian bridge. The creek at this site is approximately 30 feet wide with an average dry weather depth of 0.5 feet. Concrete walls for erosion prevention are located on both banks. This site was only sampled for benthic macroinvertebrates.

The 1991 benthic macroinvertebrate data indicate that the benthic fauna at this location have recovered from the 1989 diversions to pre-diversion status. Prior to the 1989 diversions, 14 total taxa and 3 EPT taxa were collected. Following the cessation of the October-November 1989 diversion there were 5 total taxa and 1 EPT taxa collected. In 1991, there were 14 total taxa and 4 EPT taxa collected. These data indicate that a recovery of the benthic macroinvertebrate community has occurred. All of the organisms collected were either facultative or tolerant to organic pollution, however, indicating that some organic pollution is present. The HBI score and narrative rating also indicates that organic pollution exists at this site (Appendix IV-B). Further sampling is required to verify this trend.

Table 1: Benthos at Big Creek Site #27 in 1989
Collected by D-frame Aquatic Net

Taxon	HBI Tolerance Value	NCBI Tolerance Value
Mollusca		
Physella sp.	-	9.1

Table 2: Benthos at Big Creek Site #27 in 1990
Collected by D-frame Aquatic Net

Taxon	HBI Tolerance Value	NCBI Tolerance Value
Annelida		
Oligochaeta	-	-
Helobdella stagnalis	-	6.7
Trichoptera		
Hydropsyche betteni	6	8.1
Diptera		
Chironomidae		
Thienemannimyia sp. gr.	6	8.7
Cricotopus sp.	7	-
Cricotopus trifascia	7	-
Mollusca		
Physella sp.	-	9.1

Table 3: Benthos at Big Creek Site #27 in 1991
Collected by D-frame Aquatic Net

Taxon	HBI Tolerance Value	NCBI Tolerance Value
Tricladida		
Planariidae		
Dugesia tigrina	-	9.1
Pharyngobdellida		
Erpobdellidae		
Dina (Moorebdella) microstoma	-	7.8
Erpobdella punctata	-	7.8
Rhynchobdellida		
Glossiphoniidae		
Helobdella stagnalis	-	6.7
Isopoda		
Asellidae		
Asellus sp.	8	9.4
Amphipoda		
Gammaridae		
Crangonyx gracilis complex	8	8.0
Odonata		
Zygoptera		
Coenagrionidae		
Enallagma sp.	8.8*	9.0
Coenagrion sp./*Enallagma* sp. complex	8.8*	9.0
Ischnura sp.	9	9.4
Anisoptera		
Libellulidae		
Plathemis sp.	8*	10.0
Diptera		
Tipulidae		
Tipula sp.	4	7.7
Chironomidae		
Thienemannimyia sp. group	6	8.7
Cricotopus bicinctus	7	8.7

(Continued on following page.)

Table 3: Benthos at Big Creek Site #27 in 1991
Collected by D-frame Aquatic Net (continued)

Taxon	HBI Tolerance Value	NCBI Tolerance Value
Gastropoda		
Physidae		
Physella sp.	-	9.1
Planorbidae		
Helisoma sp.	-	6.5

*Average Tolerance Value

HBI - Hilsenhoff Biotic Index (Wisconsin) - Hilsenhoff, 1987
NCBI - North Carolina Biotic Index - Lenat, 1993
Tolerance value scales 0 to 10 (intolerant to tolerant)

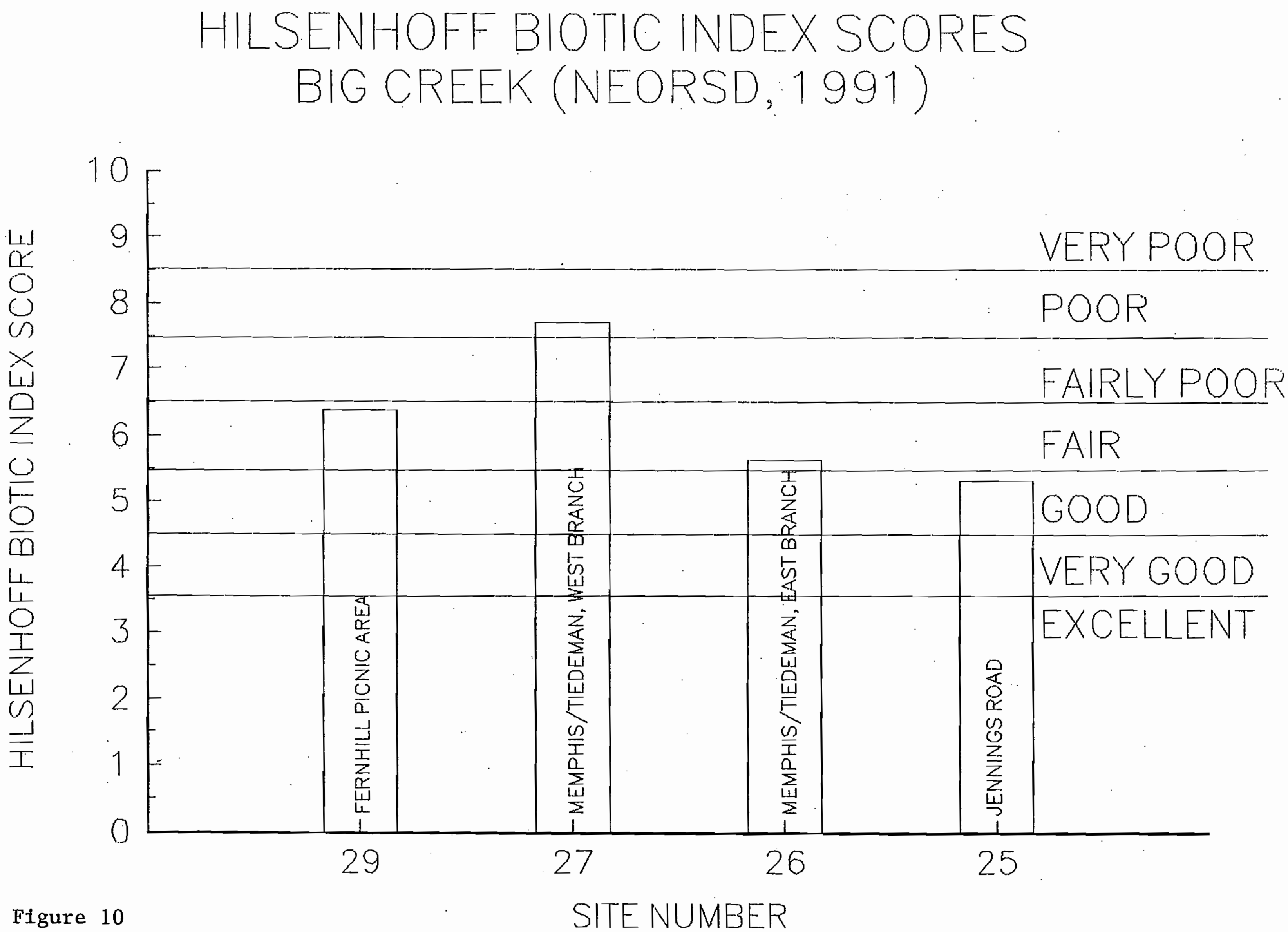

HILSENHOFF BIOTIC INDEX SCORES
BIG CREEK (NEORSD, 1991)
HILSENHOFF BIOTIC INDEX SCORE
0
1
2
3
4
5
6
7
8
9
10
VERY POOR
POOR
FAIRLY POOR
FAIR
GOOD
VERY GOOD
EXCELLENT
FERNHILL PICNIC AREA
MEMPHIS/TIEDEMAN, WEST BRANCH
MEMPHIS/TIEDEMAN, EAST BRANCH
JENNINGS ROAD
29
27
26
25
SITE NUMBER

Figure 10

PROBLEMS AND REMEDIATION

-1-

While performing routine sampling of Big Creek on May 3, 1991, NEORSD investigators observed a turbid, red-colored flow at Site #29. The turbid condition was attributed to structural repair work on the Snow Road bridge. The bridge had been closed beginning the summer of 1989. Construction activity in the creek and along the banks had disturbed the creek's substrate. Samples obtained for chemical and bacteriological analysis on May 3 from Site #29 showed elevated concentrations of suspended solids (1,000 mg/L) and iron (24 mg/L) which may be attributed to the bridge construction.

-2-

On two occasions, elevated fecal coliform concentrations (13,000 organisms per 100 ml on May 3 and June 21, 1991) were measured at Site #29. The other bacteriological sample Site #29 on September 6, 1991 had a fecal coliform concentration of 900 organisms per 100 ml. The results indicate some bacterial contamination in the creek, which may be attributed to a recurrence of a dry weather discharge of sanitary sewage located upstream of Site #29.

In April 1989, NEORSD investigators had discovered sanitary sewage entering Big Creek upstream of Site #29 through a storm sewer from the east which was traced to Fernhill Avenue. A blockage of the sanitary sewer at this location had been resulting in leakage of sewage into the storm sewer. The City of Parma Service Department subsequently removed the blockage, eliminating the influent to Big Creek.

On June 21, 1991, NEORSD investigators inspected the storm sewer outfall upstream of Site #29. No flow was observed from the pipe but residual septic sediments were noted in a pooled area of the creek at the outfall. This pooling may indicate that a periodic sanitary sewage discharge may be recurring at the storm sewer outfall.

-3-

On June 21 and September 6, 1991, elevated fecal coliform concentrations were measured at Site #30 (Appendix II). On July 17, 1991, NEORSD investigators discovered a dry weather flow containing sanitary sewage entering Stickney Creek from a storm sewer outfall at Outlook Drive. The flow was measured at approximately 3,000 gallons per day. Bacteriological analysis of this flow showed a fecal coliform concentration of greater than 30,000 organisms per 100 ml. The results indicate that it may be responsible for the bacterial contamination in the creek downstream at Site #30. Investigations of the storm sewer were performed by NEORSD personnel in an attempt to identify the source(s) of this pollution, but they were unsuccessful and further investigation is needed.

-4-

On April 12, 1991, NEORSD investigators discovered a red colored substance entering the "Chevrolet" Branch of Big Creek from an eastbound storm sewer under Brookpark Road. The pH of this substance was measured at approximately 10.0 standard units. The substance was traced back through a northbound storm sewer on West 130th Street to a manhole in front of Monarch Electric Service Company, 5325 West 130th Street.

An inspection of this facility revealed that wastewater from the company's steam cleaning operation was entering a catch basin tributary to the storm sewer on West 130th Street. Monarch Electric Service Company, which repairs electric motors and generators, uses a red colored caustic wash solution for steam cleaning. Company officials agreed to perform plumbing modifications to reroute the wastewater into the sanitary sewer system. On July 8, 1991, NEORSD investigators verified these plumbing modifications through a dye test.

-5-

During recent years, the NEORSD had received numerous reports of oil sheens and a white color in the "Chevrolet" Branch of Big Creek. This section of Big Creek flows along West 130 Street between Brookpark Road and Interstate 71 in Cleveland. Historically, NEORSD investigators had identified several sources of process wastewaters and oils discharged into the "Chevrolet" Branch. These sources included Monarch Electric Service, 5325 West 130 Street, in 1991 (a problem since remediated). Also, on May 14, 1991, officials from Modern Tool and Die Company, 5389 West 130 Street, informed NEORSD investigators that leaks to the storm sewer from their process wastewater line were found. Again, the necessary repairs were made to remediate the problem. Despite these remediations, reports of substances in this Branch of Big Creek persisted in 1991 and 1992. The intermittent nature of these occurrences has impeded identification of all remaining sources. Thus, further investigation is necessary.

-6-

On June 25, 1991, NEORSD investigators responded to a report of a brown color in Stickney Creek at Traymore Road. Upon arrival, the investigators observed a turbid, brown-colored flow in the creek. The investigators were unsuccessful in locating the source of the colored substance.

-7-

On October 16, 1991, NEORSD investigators responded to a report of green-colored flow in the "Chevrolet" Branch of Big Creek at Longmead Avenue. Investigators observed the discolored flow entering the creek from a northbound storm sewer under Brookpark Road. The substance was identified as green-colored dye after its source was determined to be United Survey Incorporated. United Survey Incorporated was contracted by the City of Parma to conduct dye tests to the sewers in the vicinity of Chevrolet Boulevard.

-8-

On October 18, 1991, NEORSD investigators responded to a report by the Ohio EPA of an oil sheen on the "Chevrolet" Branch of Big Creek. Investigators began inspecting the creek at Brookpark Road. Here they found containment booms positioned at three storm sewer outfalls located just north of the Chevrolet Parma Plant. A black oil had accumulated behind the boom at a northbound storm sewer outfall, which flows under the Chevrolet Parma Plant. Brown oil had accumulated behind the boom at an eastbound storm sewer outfall. No oil was observed from a northbound storm sewer outfall which flowed from Chevrolet Boulevard.

NEORSD investigators initiated an inspection of the Chevrolet Parma Plant, believed to be a possible source of the oil contamination. Company officials informed investigators that they had placed the containment booms at the storm sewer outfalls after problems occurred with their oil separator filters on October 27, 1991. The separator problem had been corrected on October 28 eliminating any additional contamination of the "Chevrolet" Branch of Big Creek from this source.

NEORSD investigators next traced the brown oil to a manhole on the storm sewer at the corner of Brookpark Road and West 130 Street. This manhole is located in front of Budget Truck and Van Rental, 12995 Brookpark Road. Investigators performed an inspection of the facility and were informed that this property was the former site of a gasoline service station. Employees of Budget Truck and Van Rental speculated that underground oil storage tanks may still be buried on the property. They also indicated that black oil seeps from the ground in the rear parking lot following heavy rain events.

It is probable that the oil found at the eastbound storm sewer outfall can be attributed to oil contaminated groundwater. Rain was reported on October 26 and October 27. These findings were reported to Ohio EPA and State Fire Marshal Bureau of Underground Storage Tank Regulations.

-9-

On December 17, 1991, NEORSD investigators responded to a report of oil on the East Branch of Big Creek at Memphis Avenue and Tiedeman Road. Upon arrival, investigators did not observe any oil on the creek. Investigators made an attempt to locate any remnants of oil contamination in the East Branch but none were found.

-10-

On March 4, 1992, NEORSD investigators responded to a complaint of diesel fuel in the East Branch of Big Creek at 6350 Stumph Road, near the Park Place Apartments. A tenant of the apartment complex informed investigators that the creek also had a strong fuel odor and heavy sheen on March 3. Investigators observed a light sheen on the creek but were unsuccessful in locating any sources of the problem.

-11-

On April 1, 1992, NEORSD investigators responded to a reported chemical spill at Ques Industries, Inc., 5420 West 140 Street. Company employees had been transferring an emulsion degreaser from an inside storage tank to a tanker truck outside when an overflow spilled to a nearby catch basin. According to company estimates, 10-50 gallons of the material had been lost.

NEORSD investigators inspected the first manhole downstream of the spill on the storm sewer system. Evidence of the substance was detected in this storm sewer. Upon this finding, company employees began pumping the emulsion degreaser from the storm sewer. An absorbant pillow was positioned at the storm sewer outlet. This storm sewer discharges to a swale which is tributary to Big Creek. No evidence of the substance was detected in the swale at that time. Ques Industries, Inc. officials also reported the spill to Ohio EPA, the Brook Park Fire Department and the Local Emergency Planning Committee.

On April 2, 1992, NEORSD investigators reinspected the swale and observed a white-colored discharge from the storm sewer outfall. A small quantity of the white substance had accumulated behind the absorbant pillow. Company officials were advised to resume pumping of the storm sewer and clean up the accumulated material in the swale. A follow-up inspection on April 3 verified completion of the clean-up.

-12-

On April 24, 1992, NEORSD investigators were requested to and provided assistance to the Brooklyn Fire Department and Ohio EPA in attempting to locate the source of oil in the East Branch of Big Creek at Brookpark Road. Investigators inspected the creek and observed a light sheen and turbid, brown-colored flow entering the creek from a westbound storm sewer outfall under Brookpark Road. Flow in the storm sewer is attributable to rain on April 24.

The discolored flow was traced back to a storm sewer on the property of the Minnotte Corporation, 9000 Brookpark Road. An inspection by investigators revealed that runoff, from a construction site on the property, was entering Big Creek through the storm sewer. Most of the runoff was muddy water. Additionally, the construction foreman explained that when water accumulates in a trench on the site it is pumped into the storm sewer. The Ohio EPA representatives indicated that they would investigate if the Minnotte Corporation had acquired the necessary NPDES Permit for the discharge from the site. No source of the oil was found.

-13-

An oil sheen on the East Branch of Big Creek at Brookpark Road was reported by the Brooklyn Fire Department on July 29, 1992. An inspection by NEORSD investigators found that the sheen on the creek was caused by contaminated stormwater runoff from Brookpark Road. Investigators traced the contaminated runoff to where a small amount of oil or fuel had been spilled onto the street. The rainwater washed the material to a catch basin which discharges to a storm sewer tributary to Big Creek. These findings were reported to the Brooklyn Fire Department and Ohio EPA on July 29.

-14-

On August 19, 1992, NEORSD investigators responded to a report by the Ohio EPA of a diesel fuel spill at Conrail's Rockport Yard. This rail yard is located at West 150 Street, just south of Interstate 480. An estimated 2,000 gallons of diesel fuel had been spilled onto the yard grounds. A small quantity of the fuel was also found in a swale on the Conrail property. This swale leads to a tributary of the West Branch of Big Creek. Containment booms and absorbant pads were positioned in the swale and downstream in Big Creek to prevent further migration of the spill. Clean-up measures were conducted by the OHM Environmental Company under contract with Conrail.

-15-

On September 10, 1992, NEORSD investigators responded to a report of a fuel odor in a tributary to Stickney Creek at Idlewood Drive. Investigators did not detect any fuel odors but did observe a sheen on the creek. The sheen was observed entering the creek from a ditch running parallel to Brookpark Road. Investigators traced the sheen to a storm sewer outfall located behind the Mr. Gasket Company, 8700 Brookpark Road.

Company officials informed investigators that equipment was temporarily placed out onto the parking lot the week of August 31. They explained that the machinery (which was to be auctioned), was sprayed with oil to prevent rust. Canopies had been erected over the equipment during this week but were removed following the auction on September 6. Rain on September 8 may have washed the oil off of the machinery and into the parking lot catch basin, which is tributary to the ditch. NEORSD investigators advised company officials that this runoff should be eliminated from entering the environment.

MILL CREEK

Mill Creek drains southeastern Cleveland and the suburbs along the southeastern border of Cleveland. It has a total drainage area of 18.1 square miles and a total length of 9.0 miles. Mill Creek originates in the vicinity of Warrensville Township, flows southwest through Warrensville Heights and a small section of Cleveland to near Broadway Avenue in Maple Heights, which it parallels northwest through Garfield Heights into Cleveland, and then flows south along the border of Cuyahoga Heights and Garfield Heights to the Cuyahoga River at River Mile 11.9.

Almost the entire creek is open - the only significant culverted sections being short segments of the creek upstream of Garfield Park, under Interstate 480, and downstream of the detention basin east of Kerruish Park. Except for the concrete beds in the culverts, the creek's substrate is predominantly natural.

Mill Creek's drainage area is primarily residential and industrial. The Ohio EPA has designated Mill Creek from its mouth to near Granger Road as Limited Warmwater Habitat and Secondary Contact Recreational Use; upstream of that point the designations are Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use.

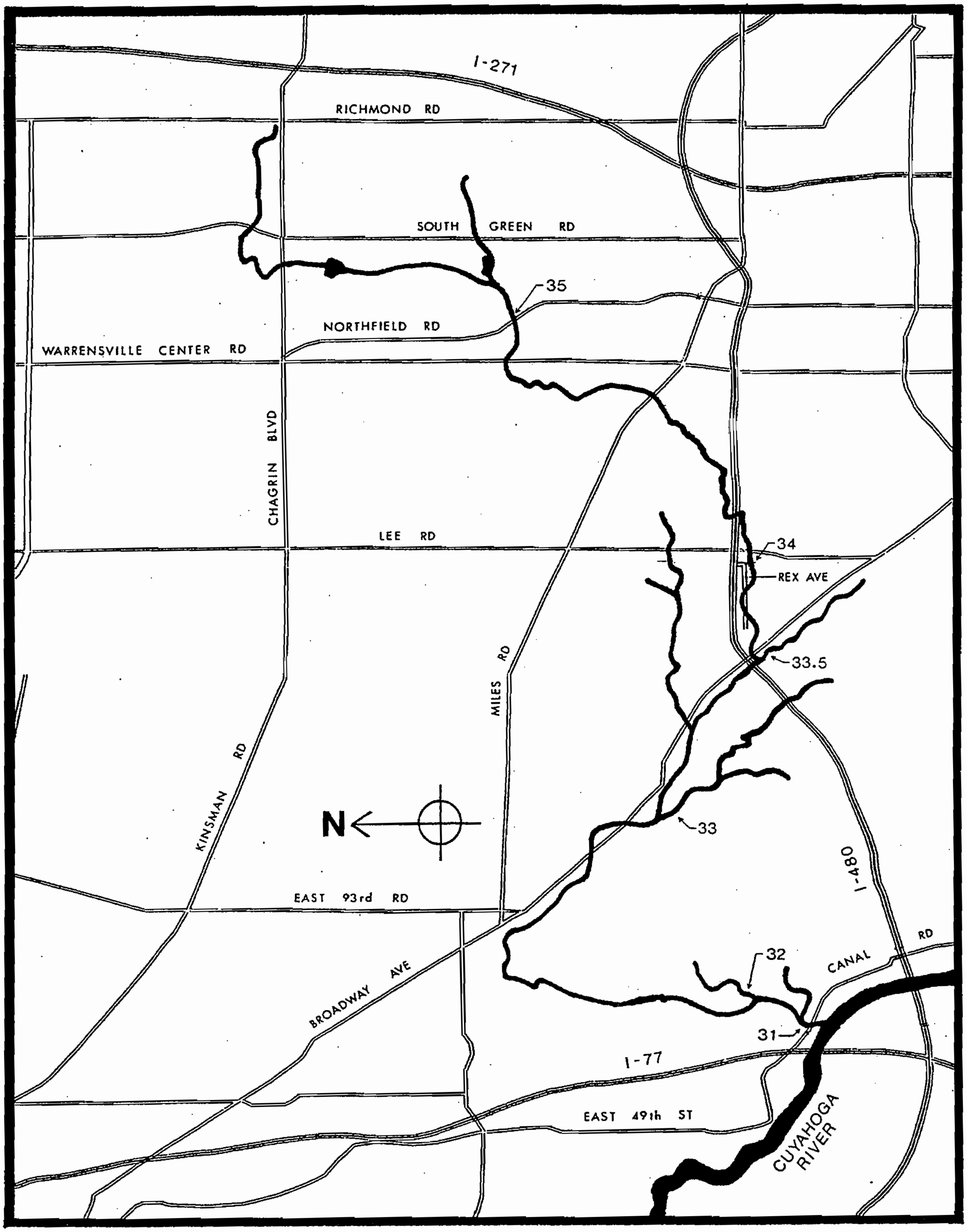
The water quality of Mill Creek is of particular concern to the NEORSD as it discharges into the Cuyahoga River approximately one mile upstream of the Southerly WWTP discharge to the river. Historically, Mill Creek has been one of the most heavily polluted streams in the Greater Cleveland Area.

Six locations were chosen on Mill Creek for routine chemical, bacteriological, and benthic sampling and analysis (Figure 11). Chemical and bacteriological data from Mill Creek are presented in Appendix II.

Site #31 (41° 24.99' N, 81° 38.33' W) is located on the main stem of Mill Creek, approximately 600 feet upstream of the confluence with the Cuyahoga River, under Canal Road. In 1992, Site #31 obtained a QHEI score of 61 (Appendix VI).

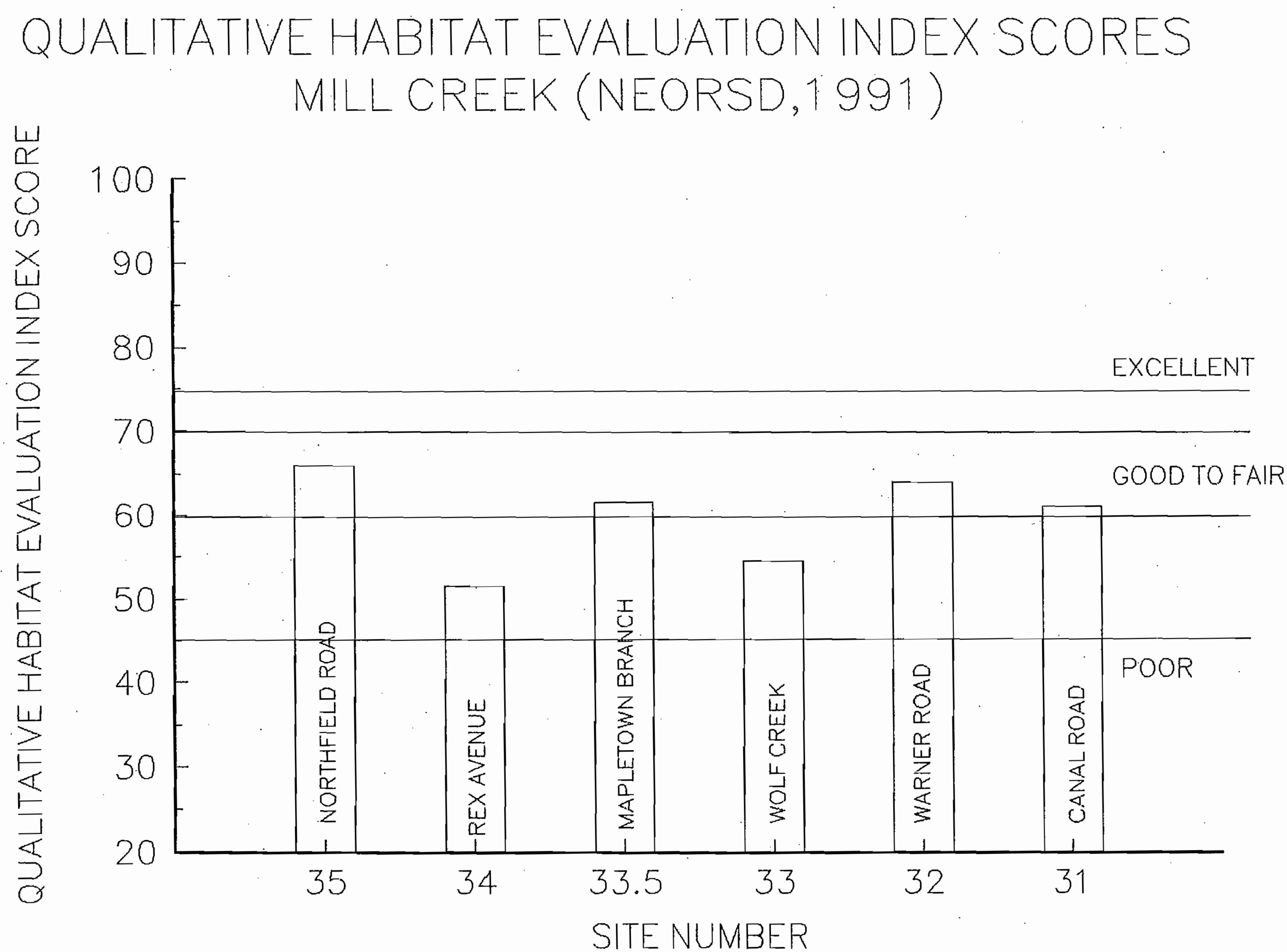
Site #32 (41° 25.27' N, 81° 38.11' W) is located on a small tributary to Mill Creek from the northeast which is culverted beneath Warner Road. The tributary enters the creek less than one half mile upstream of Mill Creek's confluence with the Cuyahoga River. Site #32 obtained a QHEI score of 64 in 1992 (Appendix VI).

Site #33 (41° 25.28' N, 81° 34.92' W) is located on "Wolf Creek" tributary to Mill Creek in the Cleveland Metroparks Garfield Park



Mill Creek
(NOT TO SCALE)

Figure 11



QUALITATIVE HABITAT EVALUATION INDEX SCORES
MILL CREEK (NEORSD,1991)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
NORTHFIELD ROAD
REX AVENUE
MAPLETOWN BRANCH
WOLF CREEK
WARNER ROAD
CANAL ROAD
35
34
33.5
33
32
31
SITE NUMBER

Figure 12

Reservation, approximately 100 feet upstream of its confluence with Mill Creek. In 1992, this site obtained a QHEI score of 54.5 (Appendix VI).

Site #33.5 (41° 25.85' N, 81° 36.31' W) is located on a tributary to Mill Creek known as the Mapletown Branch, which flows in a northeastern direction parallel to Broadway Avenue in Maple Heights. This site is approximately thirty feet upstream of this tributary's confluence with Mill Creek, south of Interstate 480 at Broadway Avenue. In 1992, this site obtained a QHEI score of 61.5 (Appendix VI).

Site #34 (41° 25.34' N, 81° 34.00' W) is located on Mill Creek at Rex Avenue and Glenburn Avenue in Maple Heights. Site #35 obtained a QHEI score of 51.5 in 1992 (Appendix VI).

Site #35 (41° 26.70' N, 81° 31.91' W) is located on Mill Creek 100 feet upstream of Northfield Road in Warrensville Township. In 1992, Site #35 obtained a QHEI score of 66 (Appendix VI).

BENTHOS AT SITE #31

The 1991 HBI score for Site 31 (3.57/very good) indicates "possible slight organic pollution." An increase in the EPT taxa (0 in 1989, 3 in 1991) and total taxa (7 in 1989, 11 in 1991) was noted for the 1991 assemblage of benthic macroinvertebrates. This suggests an improvement in water quality. Further sampling is required to verify the trend. An improvement of water quality may be attributable to remediation of upstream problems.

However, the 1989-1991 benthic macroinvertebrate samples and 1991 HBI score cannot be correlated with chemical and bacteriological analyses from Site #31. Water samples for chemical and bacteriological analysis are obtained downstream from the confluence of the main branch and Warner Road branch. The habitat in that area is not conducive for HBI evaluation. The location downstream from the confluence of the Warner Road branch lacks a suitable riffle for macroinvertebrate sampling used in HBI evaluations. The benthic samples collected from 1989 to 1991 were obtained upstream from the Warner Road branch confluence with the main branch. Future quantitative benthic macroinvertebrate sampling at Site #31 will include collection of samples for HBI evaluation from the same upstream area (as in 1989-1991) and Hester-Dendy artificial substrate samples at the assigned water quality sample location (downstream of the Warner Road Branch confluence). This sampling approach will provide a more comprehensive water quality evaluation. In the future, the Hester-Dendy sample analysis can then be correlated with chemical and bacteriological analyses.

BENTHOS AT SITE #33.5

The 1991 and 1992 benthic macroinvertebrate data indicate a continued improvement of water quality at Site #33.5. Prior to September 1988, when remediation eliminated the dry weather discharge of approximately 1.8 million gallons per day of sanitary sewage west of Mapletown Shopping Center, the tributary had been obviously severely polluted (see NEORSD Greater Cleveland Area Stream Monitoring Program 1988 Report). Though the 1991 and 1992 HBI scores (Appendix IV-B) indicate significant organic pollution existed, an improvement in the assemblage of benthic macroinvertebrates must be noted. The comparison of data from Tables 4-7 indicate an improvement in the assemblage of benthic macroinvertebrates from 1989 to 1992. North Carolina Biotic Index (NCBI) tolerance values are included in these tables for comparison of non-arthropods. In 1991, there were 16 total taxa and 2 EPT taxa collected, compared to 4 and 0, respectively in 1989, and 9 and 1, respectively in 1990. A slight decline from 1991 in the numbers of EPT taxa and total taxa was noted for 1992, indicating that some environmental disruption may have occurred in 1992. Further sampling is required to verify the trend.

Table 4: Benthos at Mill Creek Site #33.5 in 1989
Collected by D-frame Aquatic Net

Taxon	HBI Tolerance Value	NCBI Tolerance Value
Annelida		
Oligochaeta	-	-
Odonata		
Zygoptera		
Lestidae		
Lestes sp.	9	-
Lepidoptera		
Sphynigidae (larvae)	-	-
Gastropoda		
Physidae		
Physella sp.	-	9.1

Table 5: Benthos at Mill Creek Site #33.5 in 1990
Collected by D-frame Aquatic Net

Taxon	HBI Tolerance Value	NCBI Tolerance Value
Annelida		
Oligochaeta	–	–
Ephemeroptera		
Baetis flavistriga	4	7.2
Odonata		
Anisoptera		
Boyeria sp.	–	6.3
Diptera		
Stratiomyidae		
Stratiomys sp.	–	–
Simuliidae		
Simulium vittatum	7	8.7
Tipulidae		
Tipula furca	4	7.7
Chironomidae		
Natarsia sp.	8	10.0
Chironomus sp.	10	9.8
Gastropoda		
Physidae		
Physella sp.	–	9.1

Table 6: Benthos at Mill Creek Site #33.5 in 1991
Collected by D-frame Aquatic Net

Taxon	HBI Tolerance Value	NCBI Tolerance Value
Annelida		
Oligochaeta	-	-
Amphipoda		
Gammaridae		
Crangonyx pseudogracilis complex	8	8.0
Odonata		
Zygoptera		
Lestidae		
Archilestes sp.	9	-
Ephemeroptera		
Baetidae		
Baetis flavistriga	4	7.2
Cloeon sp.	4	7.4
Diptera		
Empididae		
Hemerodromia sp.	6	8.1
Simuliidae		
Simulium vittatum	7	8.7
Tipulidae		
Tipula prob. *abdominalis*	4	7.7
Chironomidae		
Ablabesmyia mallochi	8	7.6
Alotanypus sp.	-	-
Natarsia sp.	8	10
Helopelopia sp.	6	8.7
Zavrelimyia sp.	8	9.3
Polypedilum illinoense	6	9.2
Nanocladius sp.	3	7.2
Gastropoda		
Physidae		
Physella sp.	-	9.1

Table 7: Benthos at Mill Creek Site #33.5 in 1992
Collected by D-frame Aquatic Net

Taxon	HBI Tolerance Value	NCBI Tolerance Value
Tricladida		
Planariidae		
Dugesia tigrina	-	7.5
Amphipoda		
Gammaridae		
Cranrgonyx gracilis complex	8	8.0
Ephemeroptera		
Baetidae		
Baetis flavistriga	4	7.2
Coleoptera		
Tortricidae		
Bactra sp.	-	-
Diptera		
Chironomidae		
Helopelopia sp.	6	8.7
Polypedilum illinoense	6	9.2
Gastropoda		
Physidae		
Physella sp.	-	9.1

HBI - Hilsenhoff Biotic Index (Wisconsin) - Hilsenhoff, 1987
NCBI - North Carolina Biotic Index - Lenat, 1993
Tolerance value scales: 0 to 10 (intolerant to tolerant)

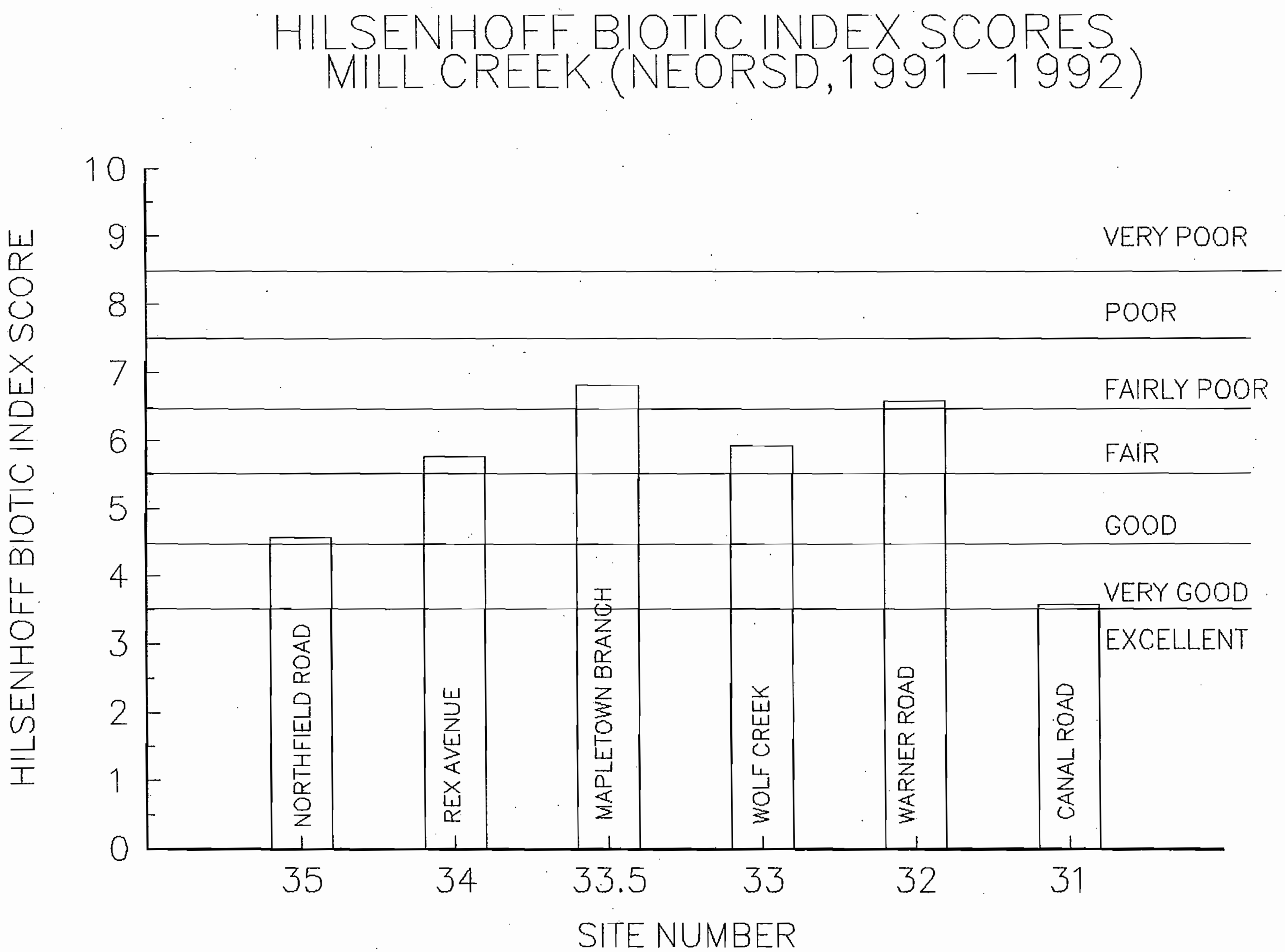

HILSENHOFF BIOTIC INDEX SCORES
MILL CREEK (NEORSD,1991–1992)
HILSENHOFF BIOTIC INDEX SCORE
0
1
2
3
4
5
6
7
8
9
10
VERY POOR
POOR
FAIRLY POOR
FAIR
GOOD
VERY GOOD
EXCELLENT
NORTHFIELD ROAD
REX AVENUE
MAPLETOWN BRANCH
WOLF CREEK
WARNER ROAD
CANAL ROAD
35
34
33.5
33
32
31
SITE NUMBER

Figure 13

PROBLEMS AND REMEDIATION

-1-

The elevated fecal coliform concentration (6,000 organisms per 100 ml) measured at Site #31 and elevated fecal coliform concentration (6,000 organisms per 100 ml) and ammonia (15.41 mg/L) and low dissolved oxygen (3.0 ppm) measured at Site #32 on September 9, 1991 can be attributed to a recurring problem upstream, at a combined sewer overflow structure, located at East 88th Street and Vista Avenue. Due to blockages in a downstream sanitary sewer, sewage overflowed to the Warner Road Branch of Mill Creek. This overflow began occurring between August 19, 1991 and September 24, 1991. NEORSD Sewer Maintenance and Control crews were able to remove the blockage on September 25, 1991. On November 5, 1991, the East 88th Street and Vista Avenue combined sewer overflow structure was inspected and found to be operating as designed, with no flow of water contaminated with sanitary sewage entering the creek.

Another combined sewer overflow structure was reported overflowing sewage on September 9, 1991, at 7620 New York Avenue. Overflows at this location are tributary to the main stem of Mill Creek upstream of Site #31. This overflow may have contributed to the elevated fecal coliform concentrations at Site #31. Blockages in the downstream sanitary sewer was responsible for the overflow. The blockages were removed on September 9, 1991 by the NEORSD.

-2-

Fecal coliform concentrations measured on April 26, 1991, (3,500 organisms/100 ml) and September 9, 1991, (4,100 organisms/100 ml) at Site #34, slightly exceeded the criteria for Primary Contact Recreational Use (2,000 organisms/100 ml). These slight exceedances can be attributed to recurring problems in the vicinity of Lee Road. It must be noted that homes in proximity to Site #34 use septic tanks. The effluents from some of these septic tanks are tributary to Mill Creek upstream of Site #34. All of these homes were scheduled to be tied-into the sanitary sewer system in 1992. With the decommissioning of the septic tanks, the water quality of Mill Creek at Site #34 should improve.

Under the Lee Road Bridge (upstream of Site #34) a storm sewer outfall located on the southside of the creek, has been found to be periodically contaminated with sanitary sewage during dry weather. Historically, blockages in the sanitary sewer on Raymond Street, between Theodore Street and Anthony Street, have resulted in the leakage of sanitary sewage into the storm sewer, which is tributary to the outfall under the Lee Road bridge. All blockages have been removed by the City of Maple Heights Service Department. Due to the recurring nature of the problem, continued monitoring of this location is warranted.

Another storm sewer on the north bank of Mill Creek east of Lee Road, at Myrtle Avenue, has also been found to be periodically contaminated with sanitary sewage. Further investigation of several possible sources of contamination is needed.

-3-

On May 16, 1991, NEORSD investigators discovered a large quantity of oil in a tributary of Mill Creek west of East 153rd Street and Johnston Parkway. The source of oil was found to be SPS Technologies Incorporated (4444 Lee Road). According to company officials, leakage of oil from a grinding sludge storage dumpster entered the storm sewer which is tributary to the stream. The company installed containment booms in the stream and storm sewer. Samsel Services Incorporated was contracted by SPS Technologies, Inc. for the clean-up of accumulated oil. The Ohio EPA was notified and apprised of the situation on May 16, 1991.

Oil in this tributary to Mill Creek is a chronic problem. The stream at Johnston Parkway is periodically contaminated with oil. SPS Technologies Incorporated was also responsible for a significant oil spill at this location in 1990.

NEORSD investigators responded to reported oil in the Johnston Parkway Branch of Mill Creek on July 17, 1991. Again, SPS Technologies Incorporated was found to be responsible for the oil present in the stream. On this date, a large volume of oil was found on the basement floor of the company. Similar to the 1990 oil spill, oil in the basement entered floor drains that are tributary to the storm sewer that is tributary to the Johnston Parkway Branch of Mill Creek. Company officials sealed all floor drains and installed containment booms in the stream and storm sewer. All of the accumulated oil in the storm sewer and stream was cleaned-up by SPS Technologies Incorporated.

On August 8, 1991, NEORSD investigators responded to another report of oil in the Johnston Parkway Branch of Mill Creek. The source of the oil was SPS Technologies Incorporated. A portion of this oil was residual oil from the previous spills, with the remaining being from stormwater run-off from outdoor storage areas on the company's property. On this date, clean-up was being conducted by C & K Industrial, who was contracted by SPS Technologies Incorporated. Due to the recurring nature of the problem, continued monitoring of this location is warranted.

-4-

On April 29, 1991, NEORSD investigators discovered a sanitary sewer break on the south side of Mill Creek, between East 131st Street and the Cranwood Pump Station. The sanitary sewer line crosses under the creek bed near the pump station. A joint on the pipe in the creek was found to be leaking sewage which was bubbling up into the creek. It was determined that approximately 3 million gallons per day of sewage was entering Mill Creek from this leak. Loadings calculations indicate that 100 lbs. per day of BOD and 73 lbs. per day of suspended solids were contributed to the flow of Mill Creek from this sewer break. The dissolved oxygen measured downstream of the sewer break dropped from 5 ppm to 3.7 ppm, indicating a possible deleterious impact of the sewer break on biota. The City of Garfield Heights was notified on April 29, 1991, to inform them of the sanitary sewer break.

On May 15, 1991, NEORSD investigators verified that repairs to the sewer were complete. The sanitary sewer line was capped with cement, preventing any further sewage from leaking into the creek.

-5-

On May 9, 1991, NEORSD investigators responded to a report of a white substance entering the Warner Road Branch of Mill Creek, at Warner Road and Canal Road. The substance was traced to a catch basin behind M & M Equipment (7900 Old Granger Road). A company official informed investigators that the white substance was liquid latex, which had leaked from two damaged 55 gallon drums located on the company's property. Only trace quantities of the liquid latex had accumulated in pooled areas of the stream. Because of the very small quantity present, no clean-up was conducted.

-6-

On July 16, 1991, NEORSD investigators observed a milky white discharge to Mill Creek from under the Miles Avenue bridge. The discharge was determined to be from the O'Brien Cut Stone Company (19100 Miles Avenue) which uses water in their stone cutting process. Previous samples of this discharge contained suspended solids as high as 17,600 mg/L. The impact on the stream habitat downstream of the discharge was visibly evident; a thick coating of fine silt could be found throughout the creek for several hundred feet. The Ohio EPA was notified of the situation. The NEORSD was informed by the OEPA that this discharge was to be eliminated by March 1, 1991, but an extension had been granted until September 1, 1991.

On August 29, 1991, a follow-up investigation by NEORSD found that the discharge of wastewater generated from the stone cutting operation had ceased. O'Brien Cut Stone had plugged the discharge pipe tributary to the storm sewer on Miles Avenue. The company has since started to recycle the water used in the stone cutting process.

-7-

On May 23, 1991 and again on April 16, 1992, NEORSD investigators found a dry weather discharge to Mill Creek from a storm sewer outfall under the Broadway Avenue bridge south of I-480 in Maple Heights.

Visible signs of contamination by sanitary sewage were observed in this discharge. The rate of discharge from the storm sewer outfall was determined to be approximately 32,000 gallons per day. This has been a continuous problem at this location since September 6, 1990. The source of the dry weather flow and contamination has not been determined and further monitoring and investigations are warranted.

-8-

On September 9, 1991, during routine sampling of the Warner Road Branch of Mill Creek at Site #32, NEORSD investigators discovered a large volume of water entering the stream from the ground on the south bank. This area is on the east side of Warner Road, next to an old Ziegler Tire Company building. A field test for residual chlorine was positive and indicated that potable city water was entering the creek at a measured rate of approximately 50,000 gallons per day. The City of Cleveland Water Department was notified on September 9, 1991 about the leak. Subsequent inspections revealed that the leak continued until May 8, 1992, when the City of Cleveland Water Department was able to locate and repair the problem. NEORSD investigators verified that repairs were complete on May 11, 1992. The repairs have eliminated the dilutive effect of potable water to Mill Creek at this location and any possible toxicity to biota related to residual chlorine.

-9-

An investigation of an illegal discharge to a storm sewer on South Miles Road was conducted by NEORSD investigators on March 3, 1992. Plumbers contracted by the Heinens Corporation were found to be pumping water from a concrete pit in the Heinens Corporation Warehouse (20101 South Miles Road) to the storm sewer in the street. An estimated volume of 50 to 100 gallons had been pumped from the pit in the warehouse to the storm sewer in the street. A sample of this discharge was obtained and found to contain elevated concentrations of BOD (920 mg/L), COD (4,280 mg/L), suspended solids (3,820 mg/L), chlorides (1,272 mg/L), nickel (0.32 mg/L), copper (2.3 mg/L), total chrome (0.48 mg/L), zinc (8.3 mg/L), iron (159 mg/L), cadmium (0.38 mg/L), and lead (2.1 mg/L). The Ohio EPA was contacted and informed about the activity, and results from the analysis of the discharge were also sent to the OEPA.

-10-

On April 10, 1992, a reported reddish brown color in Mill Creek at Canal Road was investigated by NEORSD personnel. A sample of Mill Creek was obtained and the analyses indicate elevated concentrations for iron (7.9 mg/L), total solids (1,114 mg/L), and total dissolved solids (1,005 mg/L). The source of this discoloration could not be determined on that date.

On May 21, 1992 NEORSD investigators responded to a second report that Mill Creek was brick red in appearance at Canal Road. Investigators walked upstream from Canal Road and discovered that the creek had been recently channelized. Approximately 300 yards upstream from Canal Road, a shovel excavator was observed removing soil from the creek and placing it on the north bank of the creek. This soil was being used to stabilize the bank. This location is adjacent to the City of Cuyahoga Heights Bacci Recreational Park ball diamond. It was apparent that this channelization and bank stabilization project had been underway for several weeks. This correlates with a previous investigation of a red color in Mill Creek on April 10, 1992. The brick red color can be attributed to the substrate of the creek and the soil in the vicinity, which is brick red in color. As the earth-moving equipment moved through the creek, the substrate was disturbed thus causing the turbid red-brown conditions downstream. The creek upstream of this channelization and bank stabilization project was clear, lacking the brick red color noted downstream.

-11-

On June 22, 1992, NEORSD investigators responded to a report by the Ohio EPA of a milky white substance with a "perfume-like" odor in Mill Creek at Warrensville Center Road. The substance was found to be entering the creek under the Warrensville Center Road bridge, from a 36-inch storm sewer outfall on the south side. The rate of discharge from the outfall was approximately 8 gallons per minute. Pooled and margin areas of the creek downstream of the outfall had some accumulated material. NEORSD investigators were able to trace the discharge back to the Warrensville Heights Junior High School (4285 Warrensville Center Road).

NEORSD investigators found a 55-gallon drum in the school parking lot, near a maintenance entrance. The drum was empty but contained residue which had an odor and appearance similar to that of the discharge to Mill Creek. A Material Safety Data Sheet (MSDS) attached to the drum, identified the material as State Chemical Formula 110, Acrylic Floor Seal with floral fragrance (tributoxyethyl phosphate). A school district official present at the time, informed the NEORSD investigators that a custodian had dumped the entire contents of the drum (55 gallons) into the parking lot catch basin, earlier that afternoon. Since most of the water soluble material had already dissipated and posed no serious health hazard, no clean-up was conducted. The head custodian of the school was informed on the following day that his method of disposal of chemicals was improper and illegal and can have a serious impact on the environment. He agreed to properly dispose of chemicals in the future and to not use the storm drain as a disposal method.

-12-

On November 6, 1992, a NEORSD investigator responded to a complaint of a dry weather discharge from a 12-inch corrugated pipe to

Mill Creek, 500 feet south of 4535 East 71st Street, on the west bank of Mill Creek in Cuyahoga Heights.

The dry weather discharge was tea colored and suds had accumulated in a small pool at the pipe's outfall. Two samples were obtained for chemical analysis from the discharge on November 6, 1992 and December 30, 1992. Results of the analyses indicate elevated concentrations for iron (as high as 163.5 mg/L), zinc (0.50 mg/L), lead (0.1 mg/L), ammonia (23.6 mg/L), phosphorus (11.7 mg/L), chlorides (710 mg/L), cadmium (0.03 mg/L), total dissolved solids (2,784 mg/L), and sulfates (465 mg/L). The discharge was entering Mill Creek at a rate of approximately 12,000 gallons per day.

The 12-inch corrugated pipe is located on the property of Harvard Refuse Incorporated, 7720 Harvard Avenue. The pipe is buried for approximately 75 feet upstream of the discharge outfall. At this point the pipe is exposed and open with a stream of liquid similar to the discharge, and it is tributary to the open end of the 12-inch corrugated pipe. The source of the stream is an area where the substance is bubbling out of the ground. The area from which the substance originates is a landfill and it is very probable that the liquid being discharged to Mill Creek is leachate from the Harvard Refuse Landfill. The leachate at the point where it bubbles out of the ground has a very strong sulfur odor, is black in color, and has a warm temperature. The leachate flows along the ground through a swale area before it enters the 12-inch corrugated pipe. As the leachate flows from its origin, exposed to the air, it becomes tea colored at the 12-inch corrugated pipe.

A sample of the bubbling leachate was obtained for chemical analysis from the point where it exits the ground. The results of the analyses indicate elevated concentrations for COD (1,412 mg/L), suspended solids (2,060 mg/L), ammonia (45.3 mg/L), phosphorus (5.62 mg/L), chlorides (1,380 mg/L), sulfates (2,828 mg/L), total dissolved solids (6,573 mg/L), turbidity (560 NTU), zinc (0.61 mg/L), iron (52.7 mg/L), lead (0.11 mg/L), and specific conductance (8,780 umhos). The analysis of a sample of the flow after it passes through the swale and pipe indicate that some solids settling is occurring. The chemical analysis of the discharge indicates a decrease in the following concentrations compared to the area where it bubbles from the ground: COD (1,116 mg/L), suspended solids (148 mg/L), ammonia (35.9 mg/L), phosphorus (1.15 mg/L), chlorides (1,118 mg/L), sulfates (1,666 mg/L), total dissolved solids (6,441 mg/L), turbidity (4.5 NTU), zinc (0.21 mg/L), iron (4.1 mg/L), lead (0.04 mg/L) and specific conductance (8,530 umhos/cm).

Some water quality problems on Mill Creek at Site #31 may be attributable to this discharge. The Ohio EPA has been informed about this probable leachate discharge. Results of analyses have also been sent to the Ohio EPA. This discharge may be contributing to the historically elevated iron concentrations measured at Site #31.

Further sampling of the area around the discharge to assess the impact it has on the water quality of Mill Creek may be warranted.

-13-

Blockages in the East 77th Street sanitary sewer can affect 12 combined sewer overflows in the area between Dorver Avenue and Grand Division Avenue, resulting in the dry weather overflow of sanitary sewage.

On July 22, 1992, a blockage in the East 77th Street sanitary sewer causing an overflow of sewage at Laumar Avenue was discovered by NEORSD personnel. The City of Cleveland Division of Water Pollution Control was notified on that date. On July 29, 1992, the overflow at Laumar Avenue was still occurring and was attributable for elevated fecal coliform concentrations (200,000 organisms per 100 ml) in Mill Creek downstream of the Laumar Avenue outfall. The City of Cleveland Division of Water Pollution Control was again notified about the blockage. Also on this date (July 29, 1992), a dry weather flow entering Mill Creek upstream of Laumar Avenue and west of Dorver Avenue was discovered. On August 10, 1992, the combined sewer overflow structures located west of Dorver Avenue and Laumar Avenue were found to be overflowing sanitary sewage. Samples for bacteriological analysis were obtained from the Dorver Avenue outfall (fecal coliform of 45,000 organisms/100 ml) and from Mill Creek downstream of Dorver Avenue (39,000 organisms/100 ml) on August 10, 1992. These elevated fecal coliform concentrations and overflows are attributable to the blockage in the East 77th Street sanitary sewer, first reported on July 22, 1992.

On August 25, 1992, the City of Cleveland Division of Water Pollution Control was able to remove the blockage on the East 77th Street sanitary sewer, thus eliminating this source of pollution to Mill Creek. Due to the recurring nature of the problem, which was discussed in the NEORSD Greater Cleveland Area Environmental Water Quality Assessment 1989-1990 report, continued monitoring is warranted.

-14-

During the months of October and November 1992, numerous complaints had been reported by residents on Greenhurst Road in Maple Heights concerning various colors in Mill Creek. NEORSD investigators traced these colors back to a structural problem in a sanitary sewer between East 174th Street and 17201 Miles Avenue. There is a 48-inch storm sewer on Miles Avenue that is tributary to a 10-foot storm sewer on Lee Road, and this 10-foot storm sewer then discharges to Mill Creek near Kollin Avenue, east of Lee Road. Exfiltration of sanitary sewage into the 48-inch storm sewer on Miles Avenue was attributable to a collapsed section of sanitary sewer between East 174 Street and 17201 Miles Avenue. The colors noted in the creek were various dyes typically discharged to the sanitary sewer from Sobel Corrugated

Containers Inc. (18612 Miles Avenue) located upstream of the collapse. The dry weather flow of water contaminated with sanitary sewage and industrial wastewater, discharged to Mill Creek was measured at a rate greater than 50,000 gallons per day.

The City of Cleveland Division of Water Pollution Control was notified of the findings on November 20, 1992. Repairs to the collapsed sewer between East 174th Street and 17201 Miles Avenue were planned for 1993, including the replacement of the 8-inch sanitary sewer. This remediation would eliminate this source of pollution in Mill Creek.

-15-

On December 16, 1992, NEORSD investigators discovered a source of sanitary sewage entering Mill Creek from the north bank east of Lee Road and north of I-480. Water contaminated with sanitary sewage was entering Mill Creek at a rate of approximately 300,000 gallons per day. A blockage in the Mill Creek Interceptor between East 173rd Street and Lee Road was attributable for the overflow of sewage entering Mill Creek. The sewage was found overflowing from a manhole in a wooded area east of Kollin Avenue. The blockage in the Mill Creek Interceptor was attributable for the elevated fecal coliform concentrations measured in Mill Creek east of Lee Road on December 2, 1992 (18,000 organisms/100 ml), December 9, 1992 (147,000 organisms/100 ml), December 15, 1992 (340,000 organisms/100 ml) and December 17, 1992 (130,000 organisms/100 ml).

The Cuyahoga County Sanitary Engineers were notified about the blockage on December 16, 1992. On December 18, 1992, a Cuyahoga County Sanitary Engineer field crew removed the blockage in the Mill Creek Interceptor, eliminating this contamination of Mill Creek with sanitary sewage east of Lee Road.

On December 18, 1992, NEORSD investigators verified that the blockage had been removed and that the overflow of sewage had ceased.

-16-

Historically, flow from a storm sewer outfall at East 117th Street and Edgepark Drive has been contaminated with sanitary sewage. The flow from this outfall has been approximately 20,000 gallons per day. The dry weather discharge from this outfall is tributary to Wolf Creek, which is a tributary of Mill Creek.

An effort to identify the sources of recurring dry weather contamination by sanitary sewage in Wolf Creek, at Edgepark Drive and East 117th Street and at the Old Andover Boulevard storm sewer outfall to Wolf Creek, was made from September to November 1992. Analyses of bacteriological sampling performed at these outfalls revealed fecal coliform concentrations as high as 860,000 organisms/100 ml at the

East 117th Street and Edgepark Drive storm sewer outfall and as high as 344,000 organisms/100 ml at the Old Andover Boulevard storm sewer outfall. Samples for bacteriological analysis were collected from storm sewers at various locations in the City of Garfield Heights that are tributary to either the Old Andover Boulevard outfall or the East 117th Street and Edgepark Drive storm sewer outfall. One storm sewer location had a fecal coliform concentration as high as 1,590,000 organisms/100 ml.

The results indicate that the contamination by sanitary sewage to Wolf Creek has numerous sources throughout the sewer system. The sources include improper connections of residential sanitary discharges to the storm sewers. Eliminating these possible sources of sanitary sewage to the storm sewer system in dry weather would reduce the bacteriological contamination in Wolf Creek. However, even if all of the sources of sanitary sewage contamination can be eliminated, contamination from properly operating separate sanitary sewer overflow outfalls will continue. There are seven of these structures with discharges tributary to Wolf Creek at various locations in Garfield Heights during wet-weather conditions.

WEST CREEK

West Creek drains the eastern section of Parma and portions of Seven Hills, Brooklyn Heights, and Independence. It has an approximate drainage area of 20 square miles and a total length of approximately 8 miles. West Creek has two branches: the main stem, which originates in Parma just south of the intersection of Broadview Road and Pleasant Valley Road and flows north through the eastern section of Parma, then east through Seven Hills, Brooklyn Heights, and Independence; and a smaller branch, originating in Independence north of the Chestnut Road and Oakwood Drive intersection, joining the main stem through a culvert under Interstate 480, west of the Interstate 77 interchange. From this confluence, West Creek flows north to the Cuyahoga River upstream of the Southerly WWTP chlorine-access railroad bridge (RM 11.3).

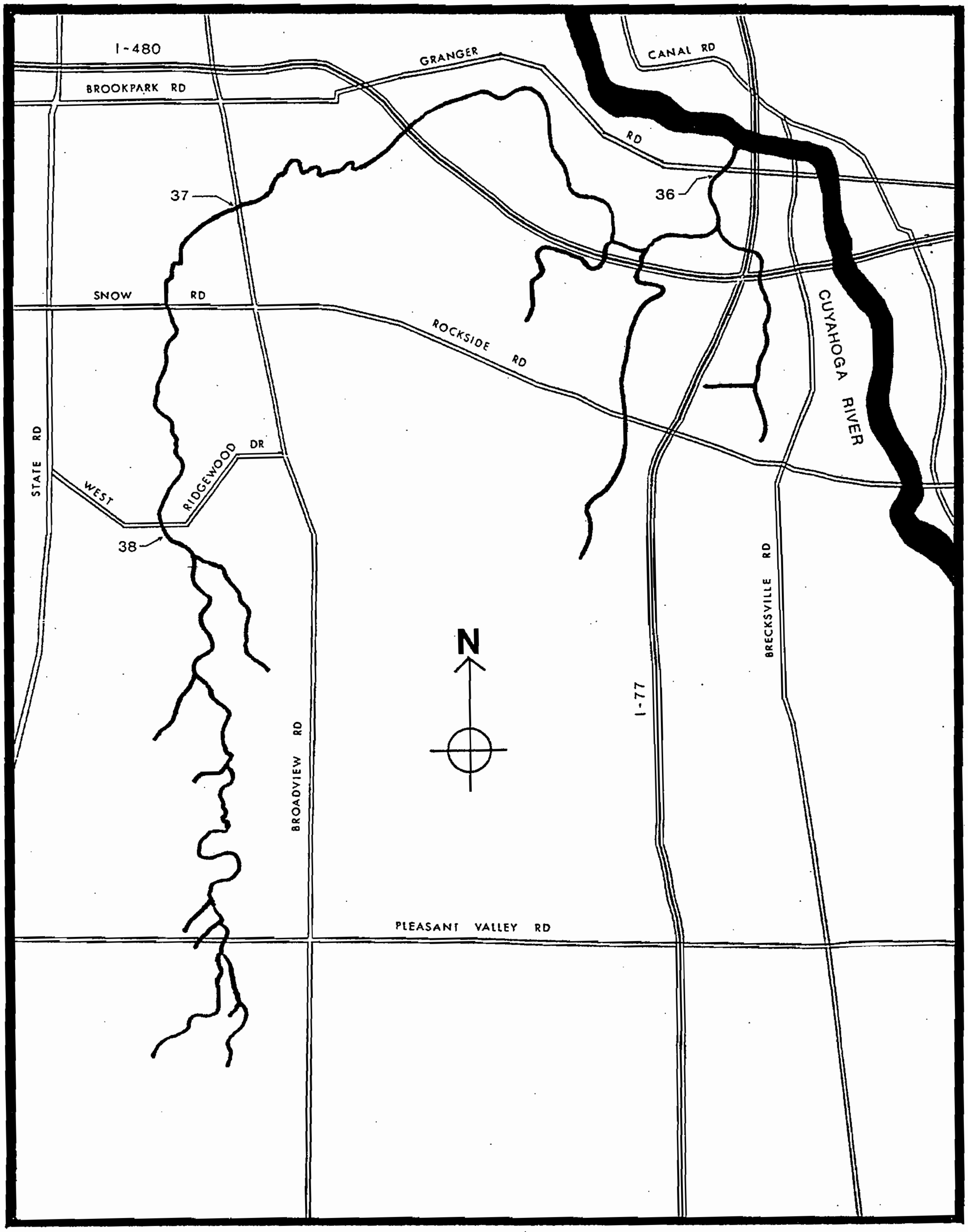
Most of West Creek is open and its substrate is predominantly natural. Along Interstate 480, the main stem has a short channelized section with concrete beds and sidewalks. Between Keynote Drive and Lancaster Drive in Brooklyn Heights, the stream has been re-routed to the northwest, with gabions installed on the banks to allow for construction of a new commercial/industrial park.

West Creek's drainage area is largely residential. The Ohio EPA has no current use designation for West Creek. The NEORSD has selected three locations on West Creek for routine chemical, bacteriological, and benthic sampling and analysis (Figure 14). Chemical and bacteriological data from West Creek are presented in Appendix II.

Site #36 (41° 24.81' N, 81° 38.86' W) is located on the main stem under the Granger Road bridge, between Interstate 77 and Valley Belt Road, approximately 1,000 feet upstream of the confluence with the Cuyahoga River. In 1992, Site #36 obtained a QHEI score of 51 (Appendix VI).

Site #37 (41° 24.64' N, 81° 41.68' W) is located on the main stem of West Creek under the Broadview Road bridge, between Brookdale Avenue and Sandpiper Drive in Parma. Approximately 50 feet upstream of the site is a city water leak (discovered during the 1987 NEORSD survey), which continues to discharge to the creek at a measured rate of 73 gallons per minute. In 1992, Site #37 obtained a QHEI score of 56.5 (Appendix VI).

Site #38 (41° 23.40' N, 81° 41.97' W) is located on the main stem of West Creek just upstream of the West Ridgewood Drive bridge, West of Post Road, in Parma. In 1992, Site #38 obtained a QHEI score of 59.5 (Appendix VI).



West Creek
(NOT TO SCALE)

Figure 14

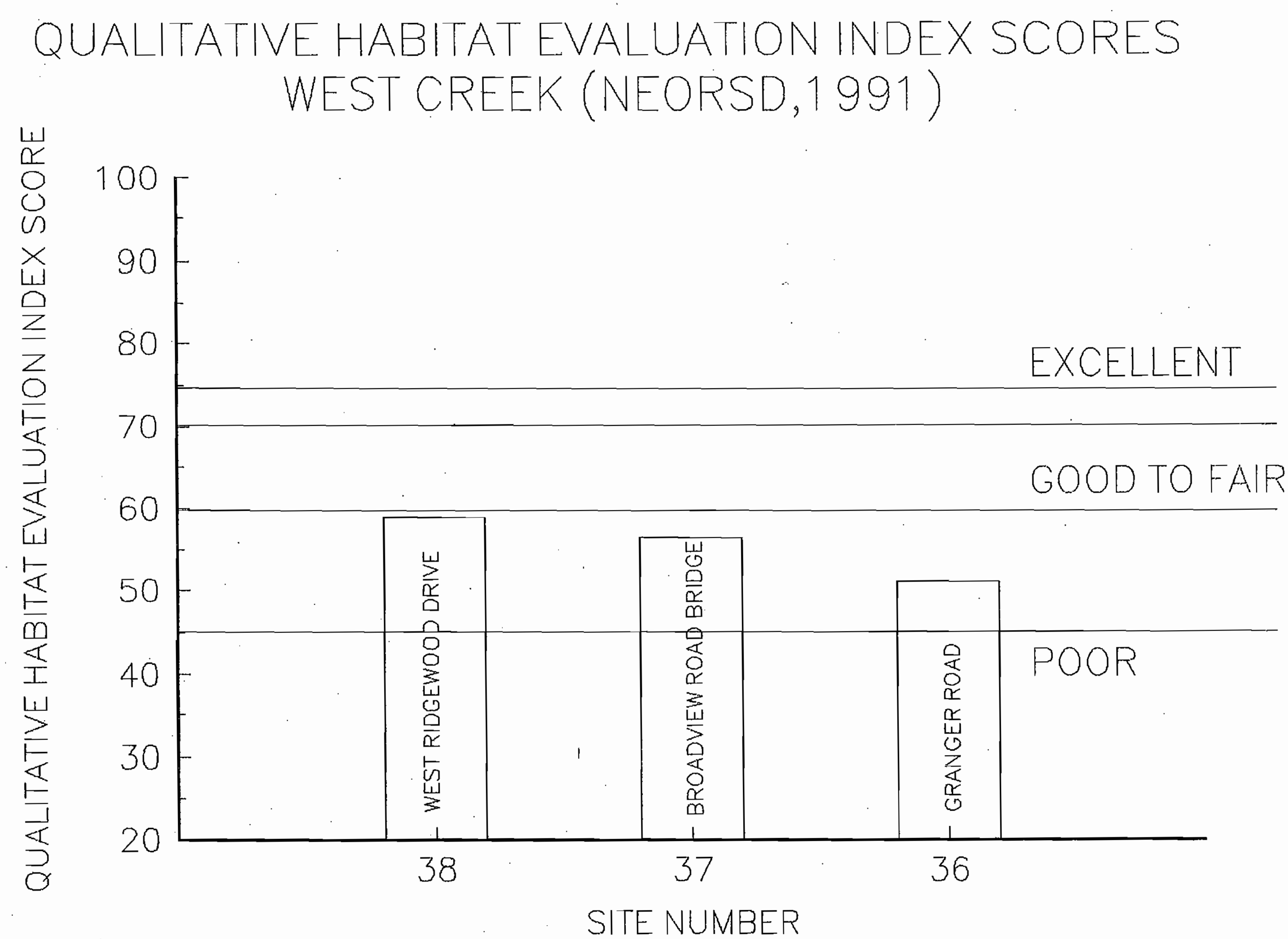

QUALITATIVE HABITAT EVALUATION INDEX SCORES
WEST CREEK (NEORSD,1991)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
WEST RIDGEWOOD DRIVE
BROADVIEW ROAD BRIDGE
GRANGER ROAD
38
37
36
SITE NUMBER

Figure 15

BENTHOS AT SITE #36

Benthic macroinvertebrate data (Appendix IV-B) from sampling performed at Site #36 in 1991 indicate an improvement in water quality. Comparing data from 1990 and 1991, there is a notable increase in the total taxa (4 in 1990, 20 in 1991) and total EPT taxa (0 in 1990, 5 in 1991). Although an improvement has been noted, the HBI score 4.38 indicates that slight organic pollution exists. This can be attributed to several problems discussed in the Problems and Remediation section. Further benthic macroinvertebrate sampling is required to verify this trend of improvement.

BENTHOS AT SITE #38

Site #38 had the highest HBI score (5.4) of all West Creek locations (Appendix IV-B). This score indicates that some organic pollution exists. The source of this pollution may be presence of septic tanks in the area, which are tributary to West Creek upstream of Site #38. Although organic pollution has been detected at Site #38, an improvement in water quality has occurred since 1989. Benthic macroinvertebrate data indicate an increase in the total taxa (18 in 1989, 28 in 1990) and EPT taxa (4 in 1989, 8 in 1991). Further sampling is required to verify this trend.

PROBLEMS AND REMEDIATION

-1-

On July 1, 1991, NEORSD investigators responded to a report of a white substance in West Creek behind the Broadview Nursing Home, Broadview Road. Past inspections of the creek revealed an area, approximately 100 feet upstream of Site #37, where the entire surface of the ground lacked vegetation and was covered with a white crusty material. This area, located on the flood plain on the north bank, also contained many small pools of brown water with pH's of 11 to 12 standard units. It was discovered that the hillside to the north, behind the Broadview Nursing Home, contains land-filled materials. Samples taken in 1990 and 1991 of the brown-colored water indicate relatively high concentrations of ammonia (47.8 mg/L), phosphorus (7.9 mg/L) and iron (4.1 mg/L). It appears that the white substance may be leached from the landfill following a rain event with the solids remaining from the evaporating water. Complaints of the white substance in West Creek have coincided with light rain events; however, further investigation will be required to confirm this hypothesis.

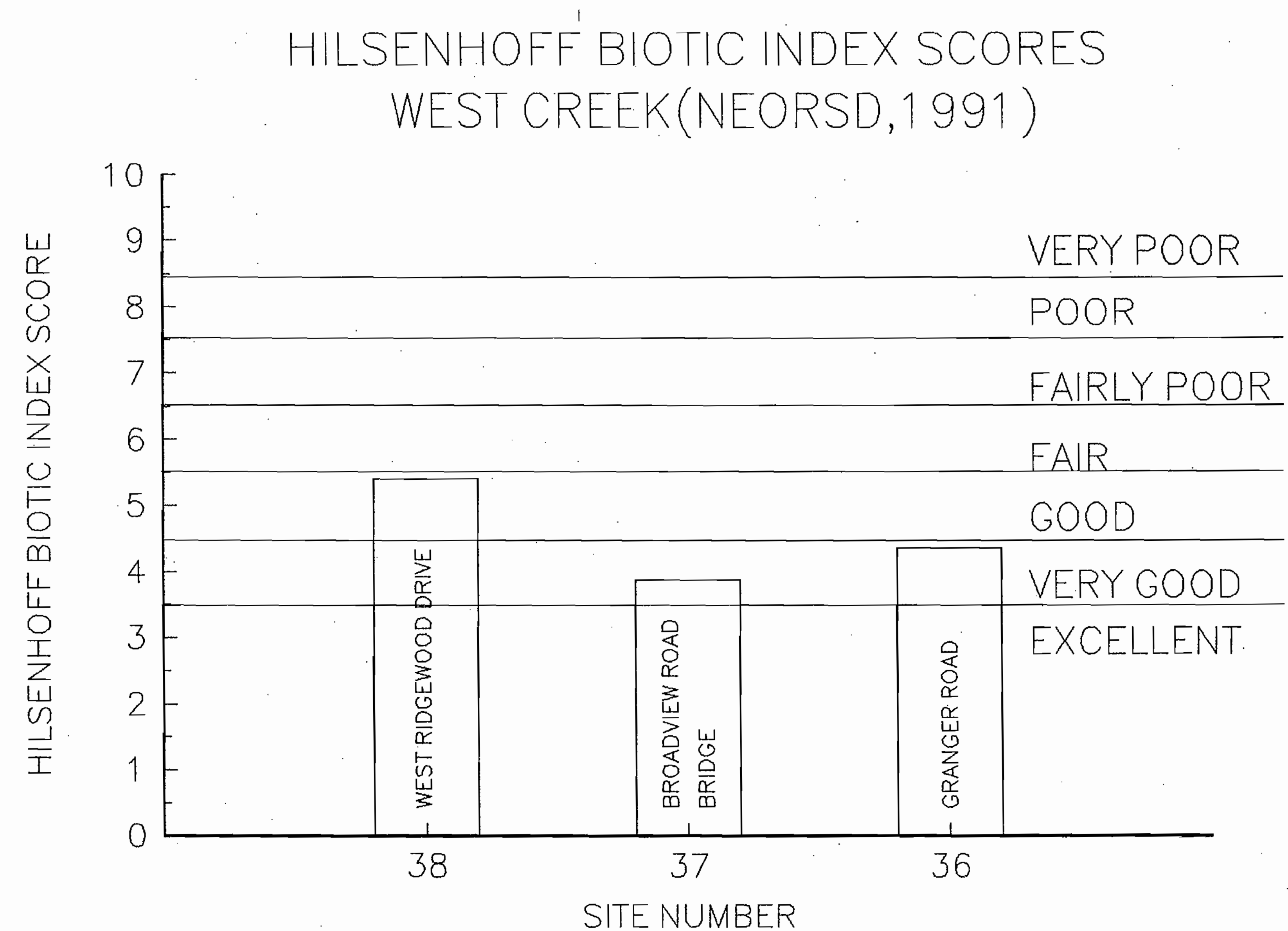

HILSENHOFF BIOTIC INDEX SCORES
WEST CREEK(NEORSD,1991)
HILSENHOFF BIOTIC INDEX SCORE
0
1
2
3
4
5
6
7
8
9
10
VERY POOR
POOR
FAIRLY POOR
FAIR
GOOD
VERY GOOD
EXCELLENT
WEST RIDGEWOOD DRIVE
BROADVIEW ROAD BRIDGE
GRANGER ROAD
38
37
36
SITE NUMBER

Figure 16

-2-

Over the past few years, NEORSD investigators have responded to complaints about sewage in a tributary to West Creek, east of 5245 West 10th Street. The problem was first reported in July 1988 by Ohio EPA. NEORSD investigators found sanitary sewage entering the tributary from a storm sewer outfall at this location.

Subsequent inspections by NEORSD investigators in 1989 and 1990 revealed that this discharge to the creek was continuing unabated. The problem had been reported to the City of Parma.

An inspection by investigators in June 1991 revealed that the sanitary flow was originating from several directions throughout the sewer system. On July 19, 1991, investigators found sanitary sewage entering the storm sewer on Brookpark Road at West 26th Street from the Ideal Mobile Home Park, 2700 Brookpark Road. Investigations of the trailer park revealed several mobile homes on 5th Avenue had improper connections of sanitary sewer discharges to the storm sewer on Brookpark Road. Further investigation is needed to identify the remaining source(s) of the dry weather flow.

-3-

Another environmental disturbance in this tributary to West Creek was discovered on June 22, 1991, east of 5245 West 10 Street. NEORSD investigators found oil entering the creek from a 54-inch storm sewer outfall at this location. An inspection by NEORSD investigators revealed oil in a drainage ditch which flows to the storm sewer tributary to West Creek, east of West 10th Street. The ditch is located north of Brookpark Road and runs parallel to the road. The oil was traced back to a pipe behind the Udelson Leasing Company, 1400 Brookpark Road. An inspection of the facility revealed that heavy construction equipment was being steam cleaned over a catch basin, resulting in a discharge of oil and grease into the drainage ditch. NEORSD investigators advised company officials that the discharge should be eliminated from entering the environment.

On October 25, 1991, NEORSD investigators responded to a report of oil in a tributary to West Creek, east of West 10th Street. The source of the oil was identified as the Udelson Leasing Company. The investigation revealed that construction equipment was still being steam cleaned over a catch basin. These findings were reported to Ohio EPA.

-4-

On October 1, 1991, NEORSD investigators responded to a report from Ohio EPA of a white substance in West Creek at the East Schaaf Road bridge. The investigators found the white substance entering the creek from a 12 inch storm sewer outfall under the bridge. The source of this contamination was identified as the Avery Engineering Company, 1455 East Schaaf Road. An inspection by investigators revealed that the employees had cleaned paint brushes and rollers, used to paint the exterior of the building, in a nearby catch basin. The paint used was a white, water soluble, latex paint. Company officials were informed that these clean-up procedures must cease and be changed to prevent further such discharges to West Creek. The Ohio EPA was notified of this situation.

-5-

On May 7, 1992, NEORSD investigators provided assistance to the Parma Fire Department and Ohio EPA attempting to locate the source of an unknown material in a tributary to West Creek, east of 5245 West 10th Street. The investigation revealed that the source of the material was Cleveland Systems Audio, 1723 Brookpark Road. Approximately two 55 gallon drums of an unidentified oil-based germicide, used for cleaning bathroom sinks and toilets, were dumped into a floor drain. A Cleveland Systems Audio employee was unaware that the floor drain led to the storm sewer system. The company was responsible for clean-up of the spill, which had entered the tributary to West Creek, east of West 10th Street. Earthen dikes, containment booms and absorbant pads were positioned in the creek to prevent further migration of the spill downstream. The clean-up was monitored by the Ohio EPA.

-6-

On May 8, 1992, NEORSD investigators discovered a white-colored discharge to West Creek, approximately 50 feet upstream of Granger Road. This discharge was emanating from a 24-inch storm sewer outfall located on the east bank. The flow was measured at approximately 8,600 gallons per day. This discharge was traced back to a storm sewer on the property of the Ohio Department of Transportation (ODOT) Independence Yard, 5469 Old Brecksville Road. An inspection by investigators revealed that run-off from the steam cleaning of engines and vehicle washing was entering West Creek through the storm sewer system. Recommendations were made to ODOT to eliminate further contamination of West Creek by run-off from the vehicle cleaning operations.

-7-

On June 29, 1992, NEORSD investigators discovered sanitary sewage entering West Creek at Mazepa Trail in Parma. The flow was measured at approximately 21,000 gallons per day. The sewage was traced back to a collapsed sanitary sewer on a hillside on Mazepa Trail, where sewage was emanating from the ground. The sanitary sewer may have collapsed from erosion of the hillside. Bacteriological analysis of this flow showed a fecal coliform concentration of greater than 60,000 organisms per 100 ml. The City of Parma was notified of the problem.

TINKERS CREEK

Tinkers Creek enters the Cuyahoga River at River Mile 17.0, south of Tinkers Creek Road in the Cuyahoga Valley National Recreation Area. Tinkers Creek is the largest tributary to the Cuyahoga River with a drainage area of 96 square miles.

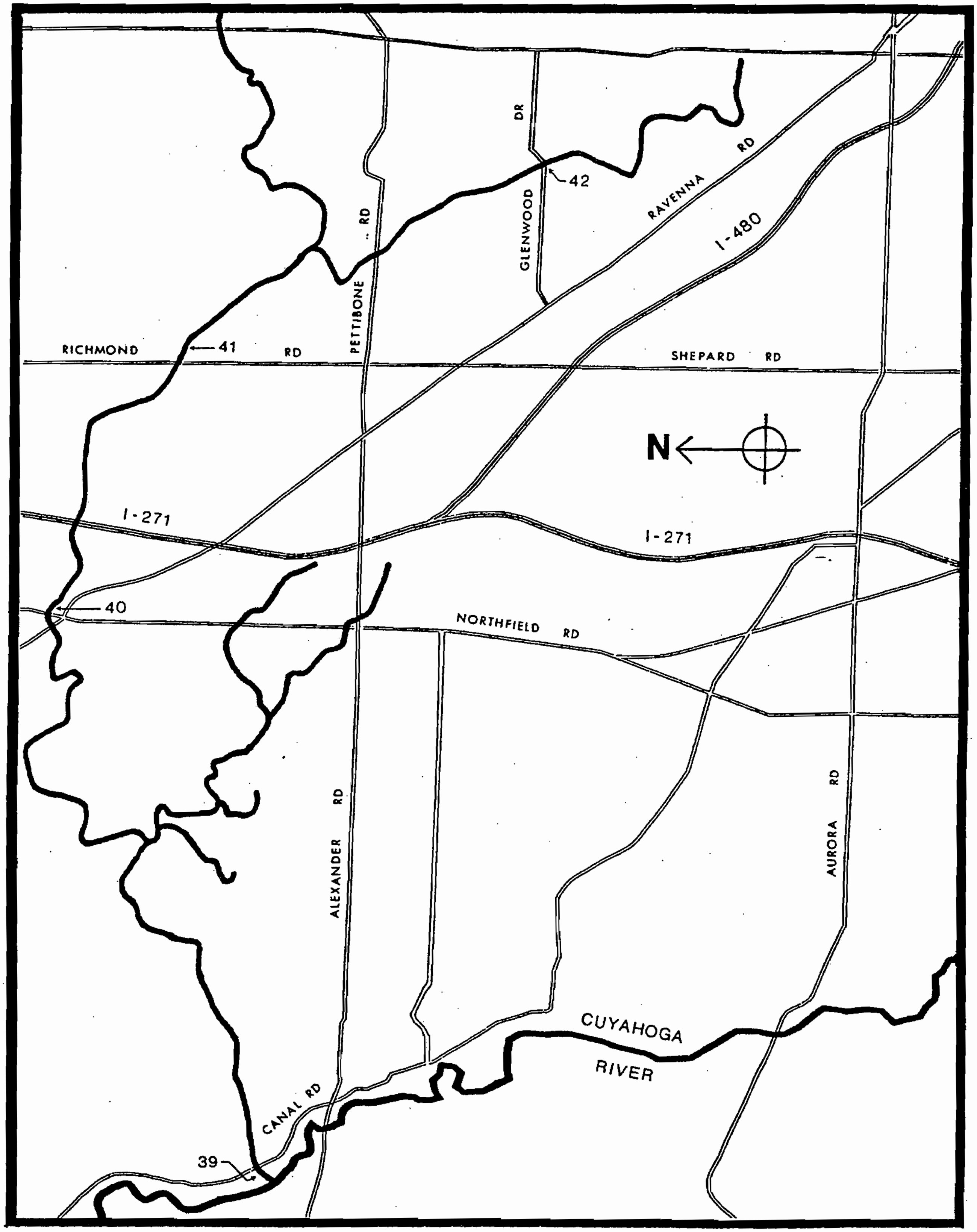
A northern run of Tinkers Creek originates in Warrensville Heights and flows south through Orange Township and into the City of Solon. In Solon, the run turns westward south of Solon Road and continues flowing west through Oakwood and into Bedford Heights. A southern run begins in Reminderville in Summit County. This run flows south into Twinsburg and then turns northwest and flows into Glenwillow. The run continues northwest through Oakwood and into Bedford Heights where it merges with the northern run. This confluence is in the Cleveland Metroparks Hawthorne Parkway, south of Solon Road.

The creek then flows northwest out of Bedford Heights and into Bedford. In the Cleveland Metroparks Bedford Reservation, a southern run, originating from tributaries in Oakwood and Walton Hills, merges with Tinkers Creek north of Gorge Parkway. From Bedford the creek turns west and flows through Walton Hills, finally entering the Cuyahoga River in Valley View.

The Tinkers Creek drainage area is primarily residential and recreational, with some industry and agriculture. The Ohio EPA has designated the creek State Resource Water, Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use. Tinkers Creek has been assigned four sites for routine chemical, bacteriological and benthic sampling by the NEORSD (Figure 17). Chemical and bacteriological data from Tinkers Creek are presented in Appendix II.

Site #39 (41° 21.79' N, 81° 36.55' W) is located on Tinkers Creek approximately 500 feet upstream from the confluence of Tinkers Creek with the Cuyahoga River. This sample site is south of the intersection of Canal Road and Tinkers Creek Road. Sampling is performed downstream of the west face of the Ohio Canal viaduct over the creek. In 1992, Site #39 obtained a QHEI score of 64 (Appendix VI).

Site #40 (41° 23.01' N, 81° 31.46' W) is located within the Cleveland Metroparks Bedford Chagrin Parkway. Specifically, the site is located off Bedford Chagrin Parkway, northeast of Broadway Avenue and underneath the Northfield Road bridge. In 1992, Site #40 obtained a QHEI score of 69.5 (Appendix VI).



Tinkers Creek
(NOT TO SCALE)

Figure 17

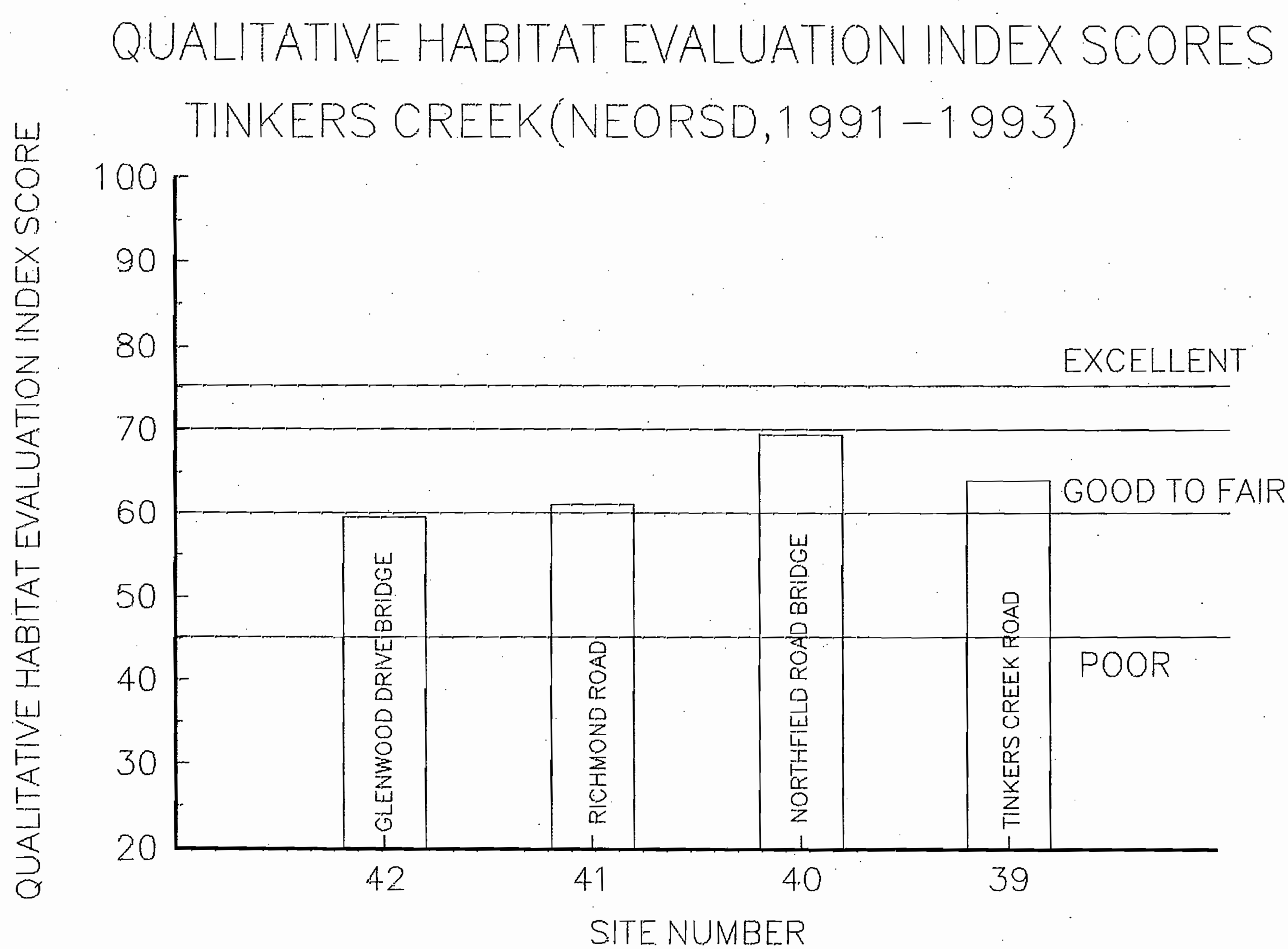

QUALITATIVE HABITAT EVALUATION INDEX SCORES
TINKERS CREEK(NEORSD,1991-1993)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
GLENWOOD DRIVE BRIDGE
RICHMOND ROAD
NORTHFIELD ROAD BRIDGE
TINKERS CREEK ROAD
42
41
40
39
SITE NUMBER

Figure 18

Site #41 (41° 22.48' N, 81° 29.37' W) is located east of Richmond Road, south of the Cleveland Metroparks Bedford Chagrin Parkway, and is opposite the service garage at Inland Refuse Transfer, Inc., 6705 Richmond Road. In 1992, Site #41 obtained a QHEI score of 61 (Appendix VI).

Site #42 (41° 21.79' N, 81° 27.97'W) is located upstream of the southeast face of the Glenwood Drive bridge crossing Tinkers Creek. The bridge lies between Idlewood Drive and Gary Drive in Twinsburg. In 1992, Site #42 obtained a QHEI score of 59.5 (Appendix VI).

PROBLEMS & REMEDIATION

-1-

In July 1990, NEORSD investigators responded to complaints of sewage in Wood Creek at Cresswell Avenue in Maple Heights. Wood Creek is a tributary of Tinkers Creek. Wood Creek flows in a southwest direction through Maple Heights and Bedford, entering Tinkers Creek southeast of the intersection of Button Road and Dunham Road in the Cleveland Metroparks Bedford Reservation.

Wood Creek is culverted from the Waterbury Reservoir, located in a wooded area west of Warrensville Center Road across from Southgate Boulevard, to Cresswell Avenue. The open end of the culvert on Cresswell Avenue is pooled in two areas as a result of concrete walls crossing perpendicular to the creek. The pools are approximately two feet deep each. Bacteriological analysis of the creek at this location on May 28, 1992, showed a fecal coliform concentration of 780,000 organisms per 100 ml. This concentration indicates relatively heavy contamination by sanitary sewage.

Previous inspections by NEORSD investigators had identified a dry weather flow entering Wood Creek from a southbound storm sewer at the Waterbury Reservoir. A bacteriological sample from this storm sewer was obtained for analysis in July 1990. The fecal coliform concentration of this sample was measured at 2,300 organisms per 100 ml. This concentration indicates some contamination by sanitary sewage during dry weather. The sewer flow was traced back to 20704 Kenyon Drive, where sanitary sewage was found leaking into the storm sewer. The leakage was due to a blockage in the sanitary sewer at this point. Bacteriological analysis of the dry weather flow in the Kenyon Drive storm sewer showed a fecal coliform concentration measured at greater than 1,000,000 organisms per 100 ml on May 28, 1992.

NEORSD investigators also discovered a significant dry weather flow entering the Wood Creek culvert from a southbound storm sewer on Watercrest Avenue. This flow was measured at approximately 10,000 gallons per day. Bacteriological analysis of this flow showed a fecal coliform concentration measured at greater than 60,000 organisms per 100 ml on May 28, 1992. The sewage in the storm sewer was traced back to a blocked sanitary sewer at 19431 Maple Heights Boulevard. This blockage of the sanitary sewer resulted in leakage of the sewage into the storm sewer.

The City of Maple Heights Service Department was notified of the above problems on June 4, 1992. Additional and subsequent inspections by NEORSD investigators revealed that the storm sewer on Maple Heights Boulevard had been unblocked and this source of pollution to Wood Creek had been eliminated. Bacteriological analysis revealed that the flow from the Kenyon Drive storm sewer continues to be contaminated with sanitary sewage. The fecal coliform concentration was measured at greater than 1,000,000 organisms per 100 ml on July 7, 1992. A sample obtained from Wood Creek at Cresswell Avenue showed a fecal coliform concentration of 6,500 organisms per 100 ml on July 7, 1992. This reduction in bacteriological contamination at Cresswell Avenue reflects the Maple Heights Boulevard remediation.

NEORSD investigators have also found an accumulation of sanitary sewage debris in a storm sewer tributary to Wood Creek at Hollywood Avenue and Waterbury Avenue. This debris indicates that the sanitary sewer may be overflowing into the storm sewer during wet weather. The pooled area of Wood Creek at Cresswell Avenue may retain the debris and water contaminated with sanitary sewage from previous rain events. The retained materials resulted in sewage odors and sanitary sewage sludge settled on the bottom of the pools.

Future sampling and investigations will be necessary to identify and eliminate all sources of sanitary sewage contamination in Wood Creek.

-2-

On July 2, 1992, NEORSD investigators discovered sanitary sewage entering Tinkers Creek upstream of Site #41. The sewage was traced back to the Glenwillow Mobile Home Park, 6835 Richmond Road. On July 6, investigators visited the facility and were informed that an electrical power failure on July 2 had shut the park's septic tank system's sump pump down, enabling sanitary sewage bypass the system and overflow into Tinkers Creek. The Glenwillow Mobile Home Park has a 10,000 gallon septic tank system with four sand filter beds which treat influents from 100 mobile homes. The park's manager estimated a time lapse of two hours prior to the pump restarting. The septic tank system was properly functioning during the July 6 investigation.

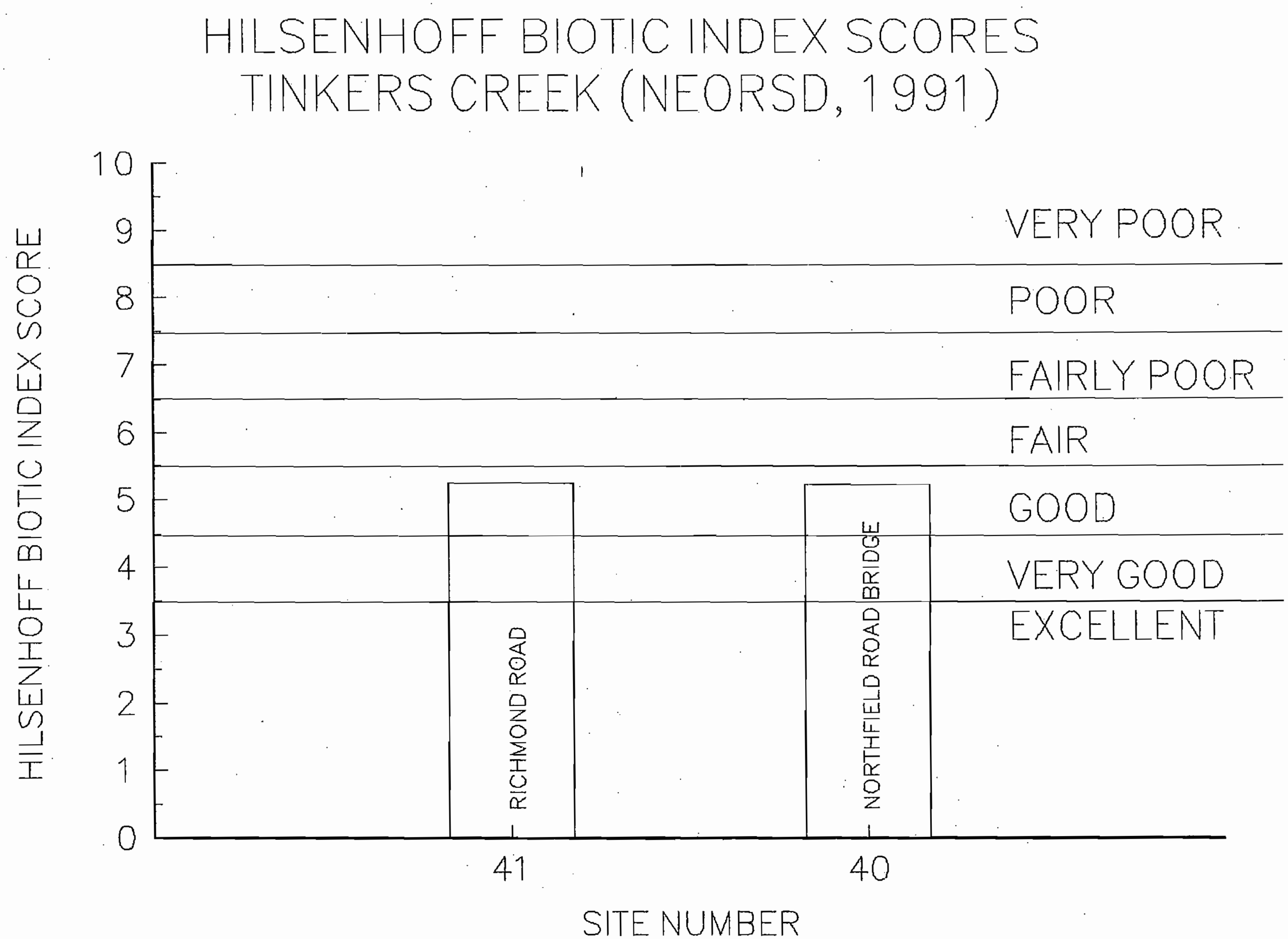

HILSENHOFF BIOTIC INDEX SCORES
TINKERS CREEK (NEORSD, 1991)
HILSENHOFF BIOTIC INDEX SCORE
0
1
2
3
4
5
6
7
8
9
10
VERY POOR
POOR
FAIRLY POOR
FAIR
GOOD
VERY GOOD
EXCELLENT
RICHMOND ROAD
NORTHFIELD ROAD BRIDGE
41
40
SITE NUMBER

Figure 19

CHIPPEWA CREEK

Chippewa Creek's drainage area includes the communities and parks in the southernmost part of Cuyahoga County west of the Cuyahoga River. From the creek's mouth upstream, these include: a portion of the Cuyahoga Valley National Recreational Area; the Metroparks Brecksville Reservation; the City of Brecksville; the City of Broadview Heights; the southern tip of the City of Seven Hills; the eastern portion of the City of North Royalton.

Chippewa Creek's drainage area is primarily residential and recreational. The Ohio EPA has designated Chippewa Creek State Resource Water, Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use. The NEORSD has selected three locations on Chippewa Creek which are routinely sampled for chemical, bacteriological, and benthic analysis (Figure 20). Chemical and bacteriological data from Chippewa Creek are presented in Appendix II.

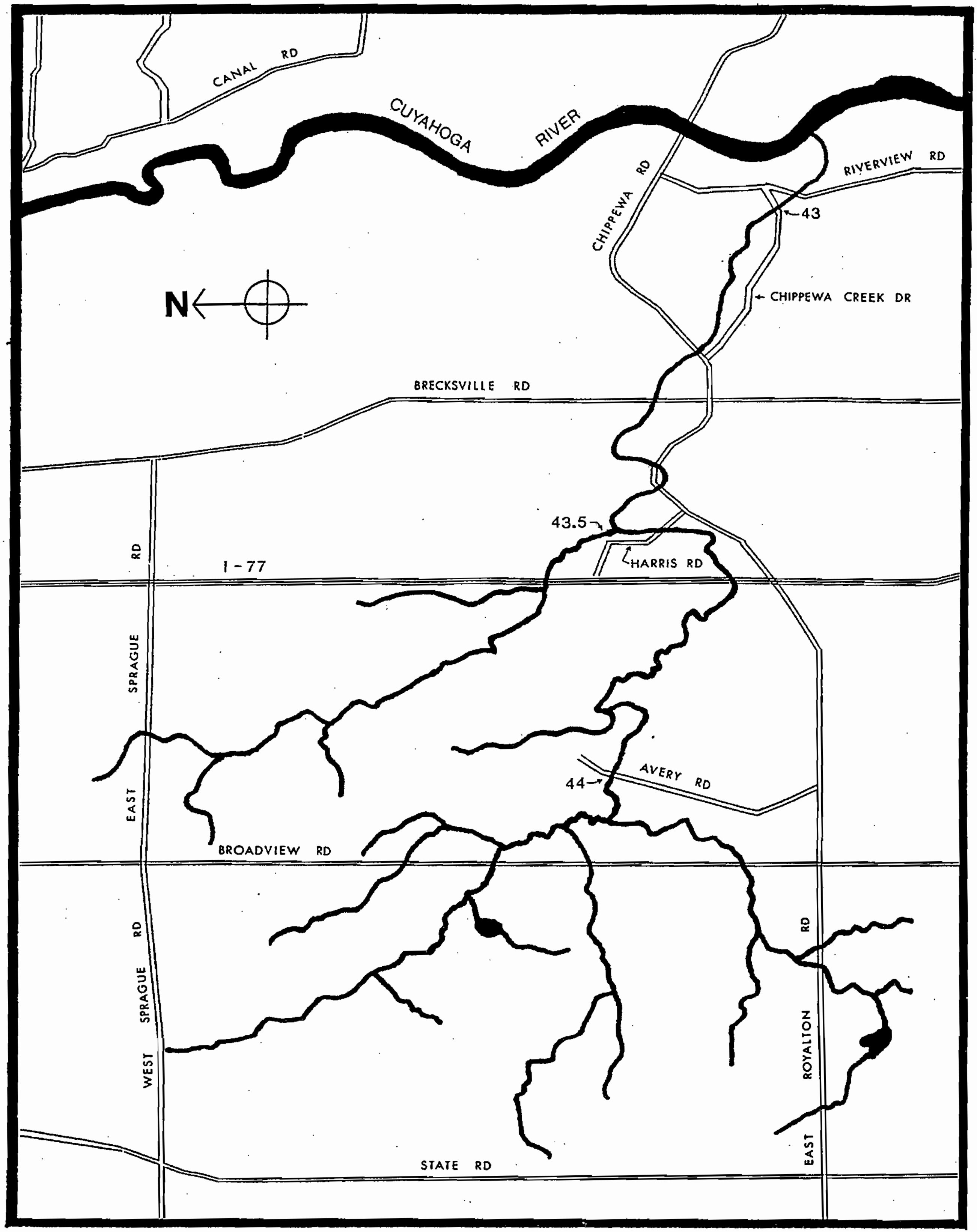
Site #43 (41^{o} 18.91' N, 81^{o} 35.88' W) is located at a concrete ford on which Chippewa Creek Drive crosses the creek east of Valley Parkway. This location is approximately 3,000 feet upstream of the confluence with the Cuyahoga River at about River Mile 22.0 and represents the total flow of Chippewa Creek. In 1992, Site #43 obtained a QHEI score of 80 (Appendix VI).

Site #43.5 (41^{o} 19.32' N, 81^{o} 38.69' W) is located on the Bramblewood Branch tributary to Chippewa Creek, just upstream of its confluence with the main stem of Chippewa Creek, east of Harris Road, north of Old Royalton Road. In 1992, Site #43.5 obtained a QHEI score of 62.5 (Appendix VI).

Site #44 (41^{o} 19.41' N, 81^{o} 40.37' W) is located on the main stem of Chippewa Creek at the Avery Road bridge between Harris Road and East Royalton Road. It is downstream of the confluence of the Seneca Branch, the Royalwood Branch, and the Briarwood Branch. In 1992, Site #44 obtained a QHEI score of 77 (Appendix VI).

BENTHOS AT SITE #44

In 1991, Site #44 was divided into two benthic macroinvertebrate sample sites, #44 up and #44 dst. Site #44 up is located upstream of the Avery Road Pump Station. Site #44 dst is located downstream of the Avery Road Pump Station. This division of Site #44 was conducted to determine if the pump station had an impact on Chippewa Creek benthos. The results of the benthic macroinvertebrate sampling



Chippewa Creek
(NOT TO SCALE)

Figure 20

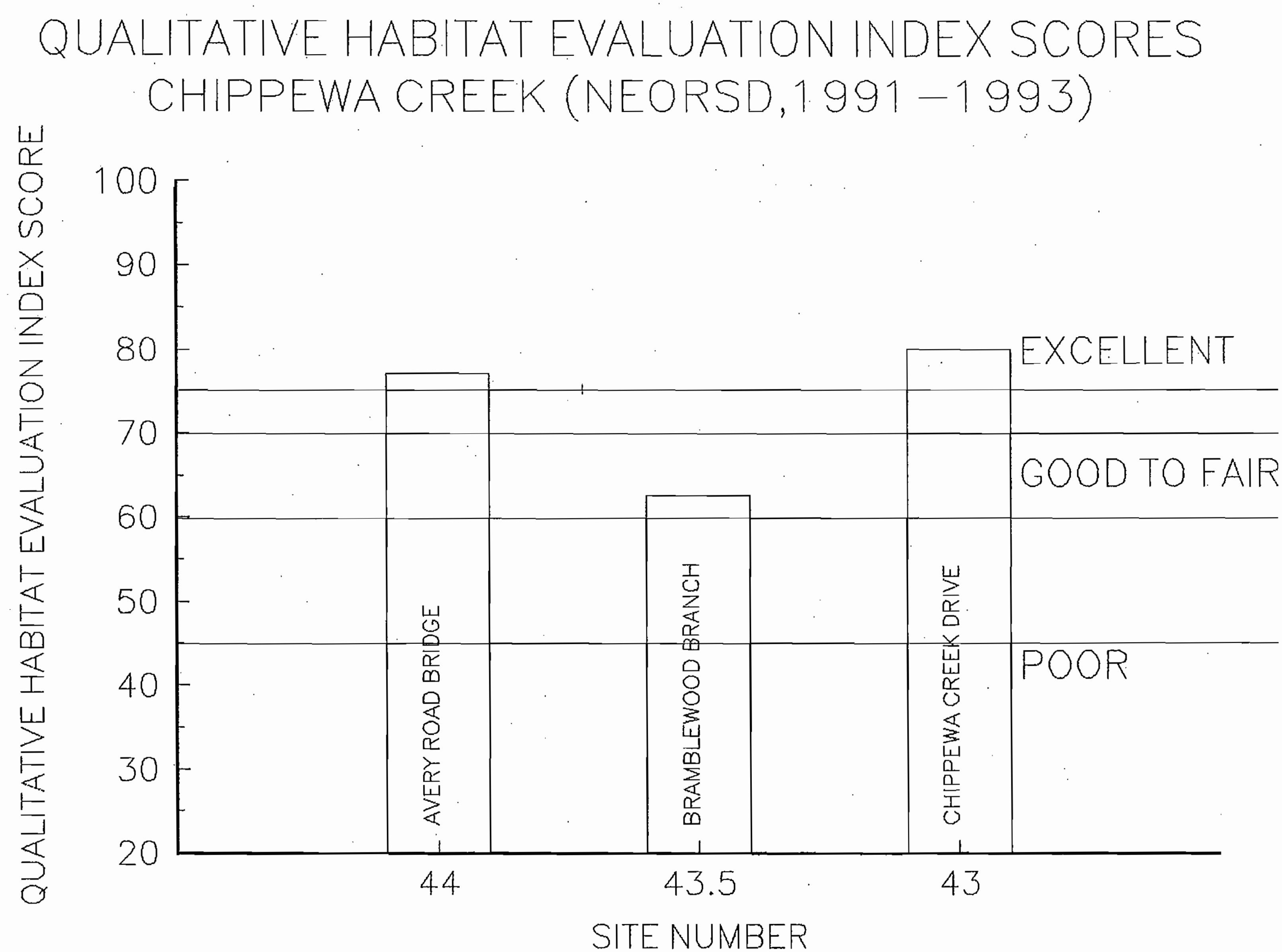

QUALITATIVE HABITAT EVALUATION INDEX SCORES
CHIPPEWA CREEK (NEORSD,1991 –1993)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
AVERY ROAD BRIDGE
BRAMBLEWOOD BRANCH
CHIPPEWA CREEK DRIVE
44
43.5
43
SITE NUMBER

Figure 21

performed on July 26, 1991 (Appendix IV-B) indicate no significant difference between the two special sample sites. Further sampling of these special sites may be performed in the future.

PROBLEMS AND REMEDIATION

Historically, eight municipal wastewater treatment plants, along with hundreds of residential and commercial septic systems in the Chippewa Creek drainage area, had discharged or infiltrated to the creek. The influents to these septic systems have since been diverted to the sanitary sewer system. This removal of wastewater formerly tributary to Chippewa Creek was made possible by the construction of the NEORSD Cuyahoga Valley Interceptor, through which the flows are now tributary to the Southerly WWTP. Improvements in Chippewa Creek's water quality have been demonstrated by the decreasing fecal coliform concentrations in 1987 through 1991 (i.e. the geometric mean for Site #44 was 3,800 organisms per 100 ml in 1987 and 390 organisms per 100 ml in 1991).

-1-

On July 25, 1990, NEORSD investigators responded to a report of a soapy discharge to Chippewa Creek from a 6-inch pipe at Eagle Valley Court and Harris Road. Investigators made an attempt to identify the source(s) of the discharge but they were unsuccessful.

On May 2, 1991, NEORSD investigators found the discharge recurring and traced its source to the Eagle Valley Health & Athletic Club, 1 Eagle Valley Court. Investigators discovered that backwash, from the club's outdoor pool, was being discharged to Chippewa Creek. Officials of the organization were advised to redirect this backwash to the sanitary sewer system. These findings were reported to Ohio EPA.

-2-

On November 15, 1991, Cuyahoga County Sanitary Engineers reported a break in a 21-inch sanitary sewer that crosses under Chippewa Creek, south of Old Royalton Road bridge. On November 18, 1991, the county repaired the sanitary sewer, eliminating the infiltration to Chippewa Creek.

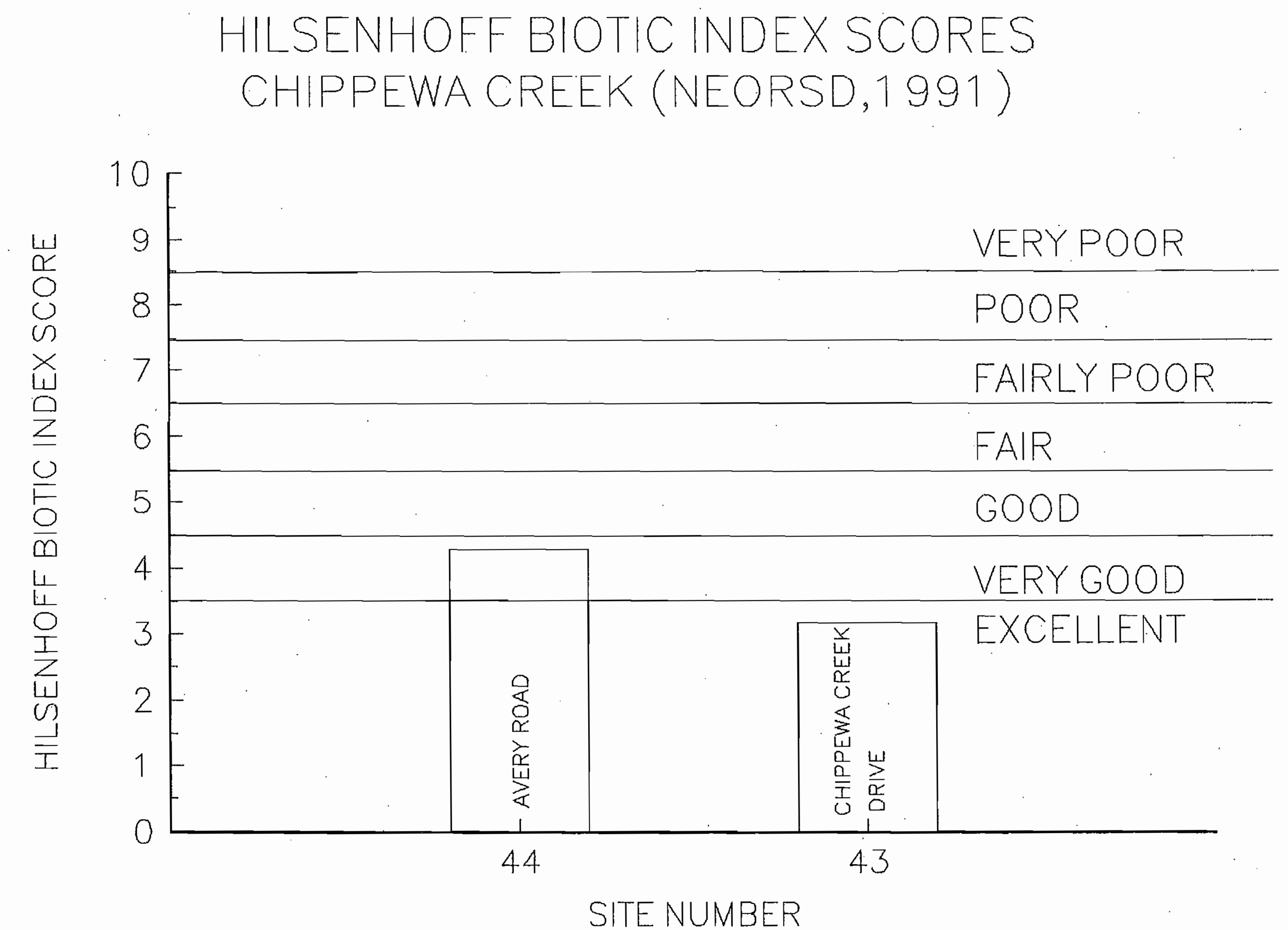

HILSENHOFF BIOTIC INDEX SCORES
CHIPPEWA CREEK (NEORSD,1991)
HILSENHOFF BIOTIC INDEX SCORE
0
1
2
3
4
5
6
7
8
9
10
VERY POOR
POOR
FAIRLY POOR
FAIR
GOOD
VERY GOOD
EXCELLENT
AVERY ROAD
CHIPPEWA CREEK
DRIVE
44
43
SITE NUMBER

Figure 22

SAGAMORE CREEK

Sagamore Creek enters the Cuyahoga River in Summit County, southwest of the intersection of Sagamore Road and Canal Road in the Cuyahoga Valley National Recreation Area (CVNRA). The creek originates in Macedonia and Sagamore Hills in Summit County as two intermittent runs flowing northwest and merging north of West Valley View Road. The combined intermittent run then flows in a mostly northwest direction, entering Cuyahoga County at Sagamore Road. While flowing toward Cuyahoga County, the creek adds five intermittent runs from the east and one intermittent run from the west.

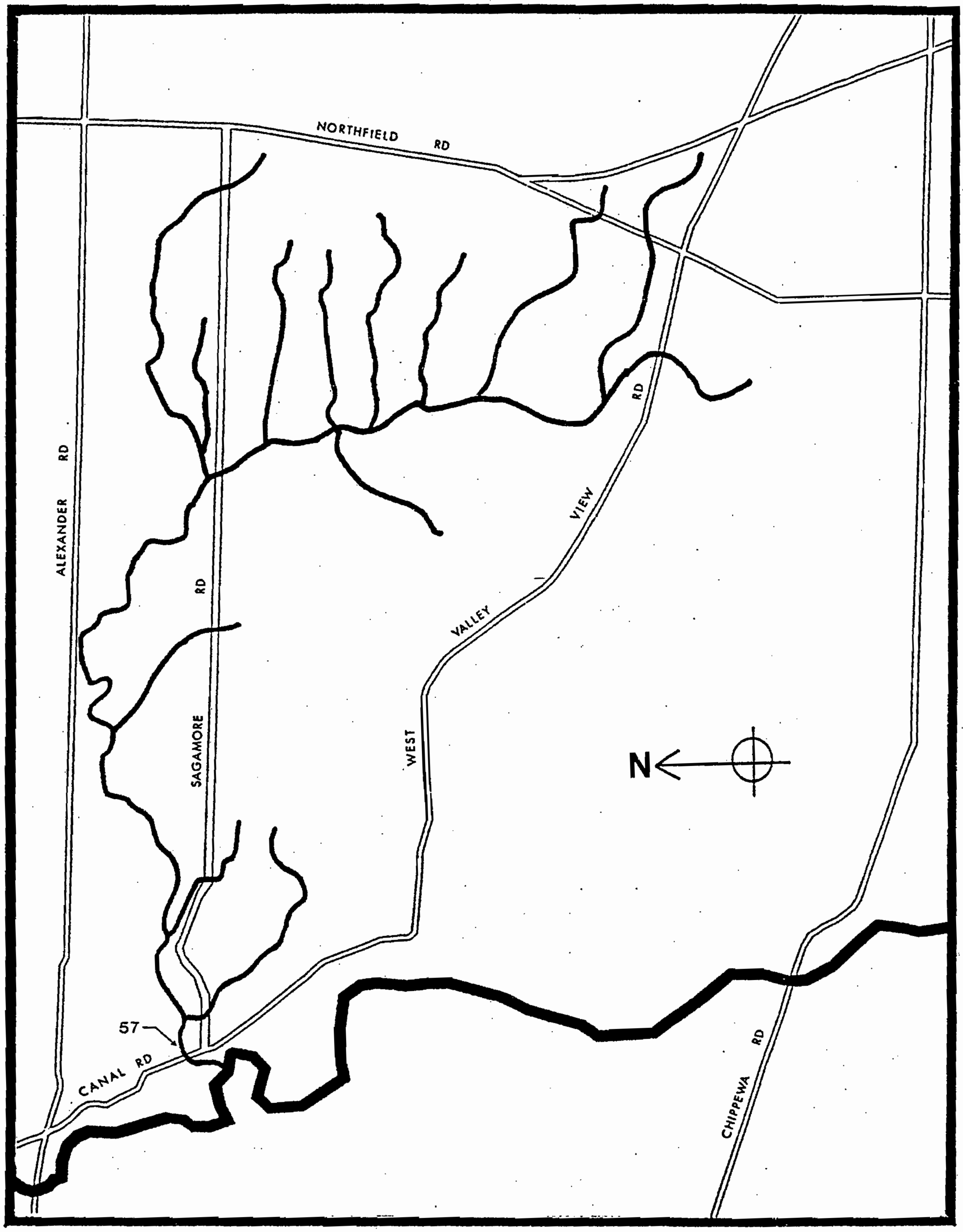
In the area of the Summit County/Cuyahoga County boundary, the creek becomes a constant flow. North of the boundary, a sixth intermittent run enters from the east. Once in Walton Hills, Cuyahoga County, the creek turns and flows in a northwest direction until it reaches the intersection of Alexander Road and Dunham Road. At this intersection the creek turns and flows generally southwest towards Canal Road. As the creek flows southwest it takes on three intermittent runs from the south. At the intersection of Sagamore Road and Canal Road the creek re-enters Summit County before it merges with the Cuyahoga River.

Sagamore Creek's drainage area is primarily low density residential with large undeveloped and recreational use areas. The Ohio EPA has no current use designation for Sagamore Creek.

Sagamore Creek has been assigned one sample location for routine chemical, bacteriological, and benthic sampling (Figure 23). Chemical and bacteriological data from Sagamore Creek are presented in Appendix II.

Site #57 (41° 21.04' N, 81° 35.56' W) is located upstream of Canal Road as it crosses the creek north of Sagamore Road. In 1992, Site #57 obtained a QHEI score of 79.5 (Appendix VI).

No environmental disruptions on Sagamore Creek were found by or reported to the NEORSD in 1991 or 1992.



Sagamore Creek
(NOT TO SCALE)

Figure 23

KINGSBURY RUN

Kingsbury Run drains the central portion of Cleveland east of the Cuyahoga River and a portion of the west end of Shaker Heights. It has a total drainage area of 7.8 square miles and a total length of 4.3 miles. Kingsbury Run flows predominantly east-to-west with two branches that merge east of East 37th Street, south of Woodland Avenue. The main stem begins at East 47th Street, south of Woodland Avenue, and eventually enters the Cuyahoga River at approximately River Mile 4.0, just north of the old Jefferson Avenue bridge, 2785 Broadway Avenue.

Kingsbury Run has the following open sections: a 1,000-foot section from the confluence with the Cuyahoga River to the mouth of the culvert; a 1,100-foot section between East 78th Street and Grand Avenue, 250 feet north of Colfax Road; a 900-foot section between East 84th Street and East 87th Street, north of Kinsman Road. The remaining portion of Kingsbury Run is entirely underground and is a combination of culverted stream sections and storm sewers, serving as an overflow-receiving sewer for combined sewers during high flow conditions.

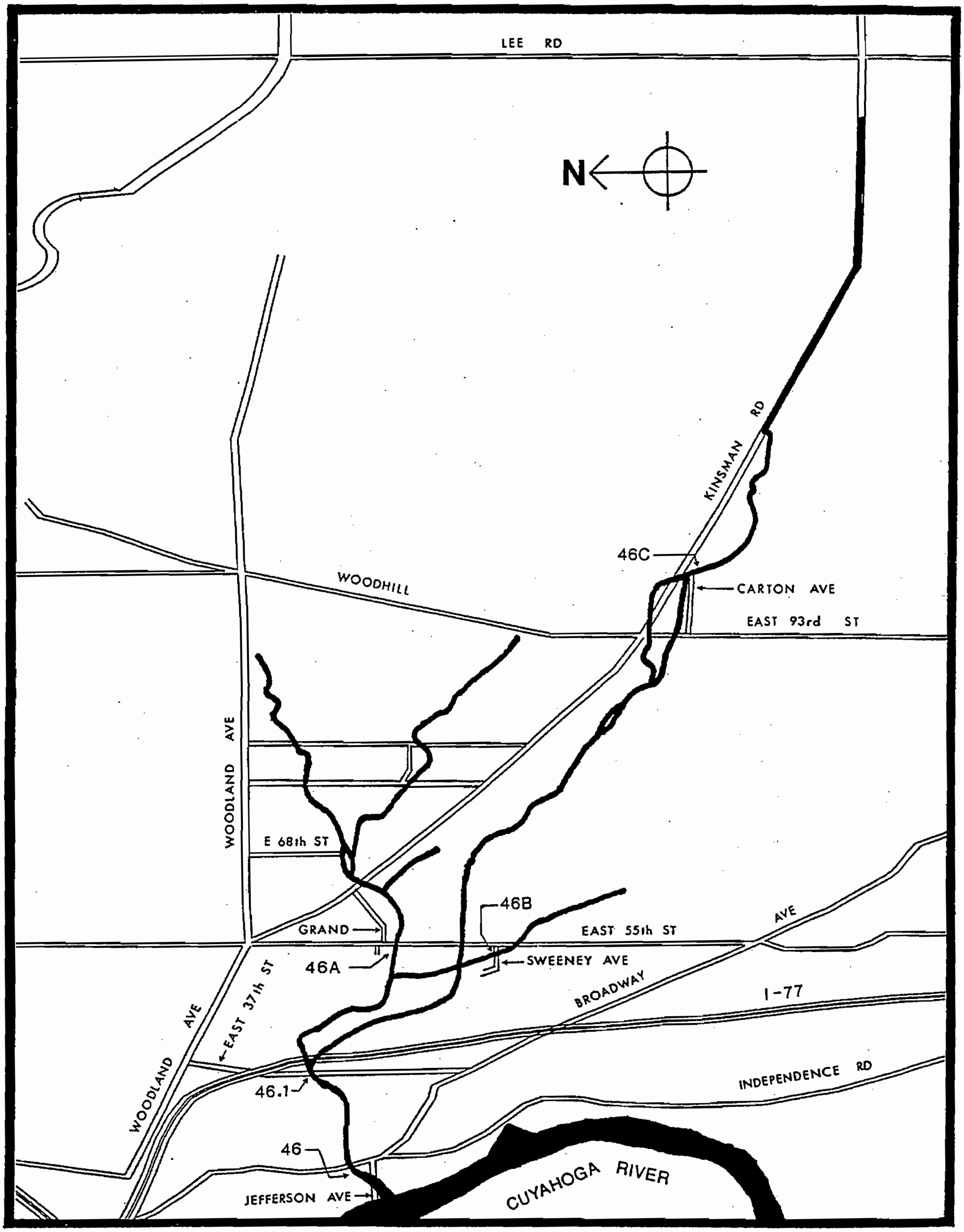
The Ohio EPA has designated Kingsbury Run Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use. Kingsbury Run has been assigned five sample sites by NEORSD Environmental Assessment for routine chemical and bacteriological sampling (Figure 24). No QHEI's were performed on Kingsbury Run since the sample sites are culverted. Chemical and bacteriological data from Kingsbury Run are presented in Appendix II.

Site #46 (41° 28.93'N, 81° 40.45'W) is located at the mouth of the culvert, approximately 1,000 feet upstream of the confluence with the Cuyahoga River and north of the old Jefferson Avenue bridge.

Site #46.1 (41° 29.07'N, 81° 40.02'W) is located on the main stem of Kingsbury Run at a manhole on the culvert, in the center of East 37 Street, approximately 2,000 feet south of Woodland Avenue.

Site #46-A (41° 27.38'N, 81° 38.33'W) is located on Kingsbury Run's North Branch, at a rectangular manhole on the culvert adjacent to the RTA Power Control Administrative Offices, 5400 Grand Avenue, approximately 200 feet west of East 55 Street.

Site #46-B (41° 27.07'N, 81° 38.45'W) is located on a tributary to Kingsbury Run's North Branch. The sample site is located at a manhole on the culvert in the center of Sweeney Avenue, approximately 100 feet west of East 55 Street, near 5407 Sweeney Avenue.



Kingsbury Run
(NOT TO SCALE)

Figure 24

Site #46-C (41° 28.17'N, 81° 37.01'W) is located on Kingsbury Run's South Branch, at a manhole at Kingsbury Boulevard and Carton Avenue, approximately 150 feet south of Kinsman Road. This site is approximately 30 feet downstream from the confluence of the 96-inch Kinsman/Union storm relief sewer and the Kingsbury Run culvert.

PROBLEMS AND REMEDIATION

-1-

On January 11, 1991, NEORSD investigators responded to a heating oil spill at the Weldon Tool Company, 3000 Woodhill Road. An estimated 3,000 gallons of the oil had spilled onto the floor and leaked to the outside of the building, saturating the ground in the area. An inspection of the nearby combined sewers and Kingsbury Run culvert revealed no visible signs of the oil. Approximately 500 gallons of the oil were recovered from the soil surface and hauled away for disposal by Research Oil Company.

On January 13, 1991, NEORSD investigators discovered oil in Kingsbury Run, at the mouth of the culvert. Containment booms and absorbant pads were positioned in the creek to prevent migration of the spill downstream. No visible signs of the oil were noted in the Cuyahoga River. Weldon Tool Company assumed responsibility for the spill and provided clean-up of the oil. Ohio EPA instructed the company to dig a trench on the property near the ground saturated with the oil so it could be collected and removed. An inspection of the area revealed that the probable route of the spilled material entering Kingsbury Run was oil migrating through the ground and infiltrating to a storm sewer tributary to the creek.

-2-

On July 10, 1991, NEORSD investigators provided assistance to the U.S. Coast Guard attempting to locate the source of oil reported in Kingsbury Run. Various locations on the Kingsbury Run culvert were inspected; however, no visible signs of oil were noted in the water. Since Kingsbury Run is predominately culverted, the oil may have been discharged to the creek days earlier than when it was first observed at the culvert opening.

-3-

On July 11, 1991, NEORSD investigators discovered sanitary sewage and oil reported in Kingsbury Run, at the mouth of the culvert. The sewage was traced back to a blocked sanitary sewer on East 37th Street at Trumball Avenue, which resulted in sewage overflowing into the storm sewer system. NEORSD Sewer Maintenance and Control personnel subsequently cleared the blockage, eliminating this source of pollution in Kingsbury Run.

-4-

A sample obtained on July 31, 1991 from Kingsbury Run Site #46-B showed elevated concentrations of nickel, copper, zinc, iron, mercury and suspended solids (See Appendix II). From 1986 through 1990, elevated concentrations of iron and zinc and low pH's have been measured at Site #46-B. Because of recurring plumbing problems documented at Northern Steel Processing Company (now Apex Steel Company), 6055 Truscon Avenue, it is believed that residue from previous discharges by this company could be the source of these metals. Leaks, a broken pipe and a ruptured rinse tank had resulted in wastewater discharges from the steel pickling and zinc phosphating operation. These previous incidents at the Northern Steel Processing Company had resulted in wastewater discharges to Kingsbury Run, upstream of Site #46-B.

While collecting the water sample at Site #46-B on July 31, NEORSD investigators noted rust-colored solids in the sample. It is probable that these residual solids, which had accumulated an the bottom of the culvert, were disturbed while collecting the sample.

-5-

Low dissolved oxygen and exceedances of the Ohio EPA numerical criteria for Warmwater Habitat were noted for copper, zinc, iron, and mercury at Site #46 on July 31, 1991. The fecal coliform concentration (greater than 60,000 organisms per 100 ml) exceeded the criterion for Primary Contact Recreational Use on this date. Also, while obtaining the grab sample on July 31, 1991, investigators observed a brown-colored oil on Kingsbury Run at this location. The source(s) of this contamination remains unexplained.

MORGANA RUN

Morgana Run drains the central portion of the City of Cleveland east of the Cuyahoga River. It has a total drainage area of 2,280 acres and a total length of 4.8 miles. Morgana Run's culvert originates at East 97th Street between Sandusky Avenue and Way Avenue. It runs predominantly east-to-west to East 49th Street, where, in dry weather, its entire flow drops into the Southerly Interceptor and is tributary to the NEORSD Southerly WWTP. The remaining section of Morgana Run enters the Cuyahoga River on the LTV Steel Company's property, south of the former location of the Clark Avenue bridge, at approximately River Mile 4.9.

In about 1910, Morgana Run was culverted, and in some places, relocated to follow Morgana Avenue. In 1960 and 1961, the Morgana Run culvert from Interstate 77 to Independence Road was reinforced, allowing the Republic Steel Corporation to use the land above Morgana Run as a bulk storage facility for coal, coke, and ore.

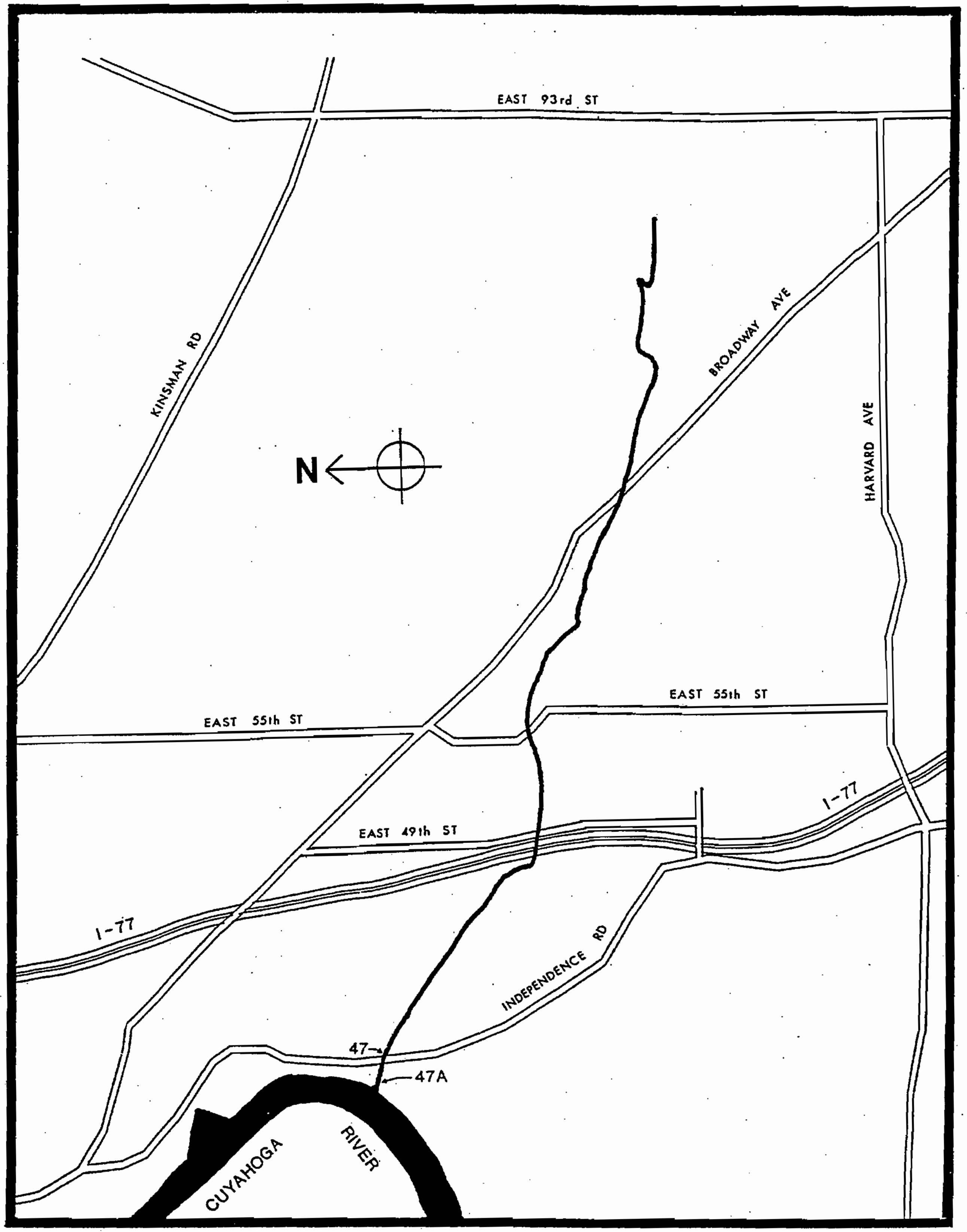
In 1969, all of the dry weather flow in Morgana Run upstream of East 49th Street was diverted by a weir, through a 42-inch pipe, into the Southerly Interceptor. The weir is overflowed only in wet weather, when many combined sewer overflows are tributary to Morgana Run upstream.

The LTV Steel Company's treated coke plant effluent and cooling waters were discharged to Morgana Run between the river and Independence Road at a rate of approximately 10,000 gallons per minute.

The Ohio EPA has designated Morgana Run Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use. Morgana Run has been assigned two sampling locations for routine chemical and bacteriological analysis (Figure 25). Chemical and bacteriological data from Morgana Run are presented in Appendix II.

Site #47-A (41° 28.15' N, 81° 40.10' W) is located at the mouth of Morgana Run where it enters the Cuyahoga River. This location was selected to include the LTV Steel Company's treated coke plant effluent into Morgana Run. Since Site #47-A is at the mouth of the culvert, no QHEI was determined at this site.

Site #47 (41° 28.04' N, 81° 39.93' W) is located at a manhole on Independence Road, approximately 200 yards upstream of its confluence with the Cuyahoga River. This site is upstream of the LTV Steel Company Coke Plant effluent discharge. Since Site #47 is culverted, no QHEI was determined at this site.



Morgana Run
(NOT TO SCALE)

Figure 25

PROBLEMS AND REMEDIATION

-1-

While collecting water samples at Site #47 on June 24, 1991, NEORSD investigators discovered a black discharge entering Morgana Run from a storm sewer outfall in the sample site manhole on Independence Road. The flow was measured at approximately 25,000 gallons per day. The discharge was traced back to Reilly Industries, a manufacturer of refined tar, 3201 Independence Road. An inspection by investigators revealed that the company's process wastewater from the pretreatment system was improperly connected to the storm sewer system. According to Reilly Tar Industries officials, the pretreatment system was installed in November 1990 and they were unaware that the effluent had been discharging to the storm sewer. In July 1991, the company's wastewater was diverted to the sanitary sewer.

Chemical analysis of the water at Site #47 on June 24, 1991, showed two parameters (ammonia and mercury) with exceedances of the Ohio EPA numerical criteria for Warmwater Habitat. Also observed were elevated concentrations of total solids (1,440 mg/L), dissolved solids (1,400 mg/L), specific conductance (2,750 umhos/cm) and chlorides (538 mg/L). These sampling results could be attributable to the Reilly Industries wastewater discharge.

-2-

Bacteriological data from Site #47 indicated that the fecal coliform concentrations on June 24, 1991 (44,000 organisms per 100 ml) and July 19, 1991 (13,000 organisms per 100 ml) exceeded the Ohio EPA criterion for Primary Contact Recreational Use.

In January 1990, NEORSD investigators had inspected Morgana Run to determine the source(s) of the elevated bacteriological concentration (23,000 organisms per 100 ml) recorded on October 31, 1989 at Site #47-A. NEORSD investigators walked the Morgana Run culvert approximately 100 to 200 feet west of East 49th Street, under Interstate 77, and obtained a sample from a 48-inch sewer tributary to the creek from the north, under Interstate 77. The sample revealed a fecal coliform concentration of 200,000 organisms per 100 ml, indicating heavy contamination by sanitary sewage. A nearby combined sewer overflow structure was dye tested for leaks to the storm sewer. This test proved negative and the source(s) of sanitary sewage in this discharge remains unknown. The flow from the 48-inch sewer was measured at approximately 100 gallons per minute but additional inspections have indicated that the flow is intermittent. This flow may have been responsible for the elevated fecal coliform concentrations noted again at Site #47 in 1991.

-3-

On December 28, 1990, NEORSD investigators responded to a report by the U.S. Coast Guard of an oil spill at LTV Steel #1 Coke Plant. An estimated 100 gallons of untreated wash oil had spilled onto the ground as the result of a broken check valve on a transfer line. An undetermined quantity of oil had entered the storm sewer tributary to Morgana Run. Containment booms were placed at the mouth of Morgana Run where it enters the Cuyahoga River. No evidence of the oil was detected in the creek at that time. Clean-up measures were conducted by Samsel Services Company under contract with the LTV Steel Company.

-4-

On September 26, 1991, NEORSD received a report of a 500 to 1,000 gallon spill of sodium phenolate by the LTV Steel Company #1 Coke Plant. According to company estimates, 100 gallons of the material entered the storm sewer tributary to Morgana Run. Containment booms were placed at the mouth of Morgana Run by Samsel Services Company, who conducted the spill clean-up.

BURKE BROOK

Burke Brook carries surface run-off water and combined sewer overflows from the southern part of Cleveland east of the Cuyahoga River and from sections of Cuyahoga Heights and Newburgh Heights. The total drainage area is 1,400 acres.

Tributary to Burke Brook are 13 combined sewer overflow (CSO) structures. These overflow structures receive flow from a drainage area of approximately 500 acres, which is over one third of the total drainage area of Burke Brook. Ten of these overflow structures are located on Burke Brook's main branch, east of Interstate 77. In July 1982, the NEORSD activated a diversion chamber east of Interstate 77, south of Fleet Avenue. This diversion chamber intercepts the entire dry weather flow of Burke Brook's main branch. From this chamber, the main branch's flow is diverted into the NEORSD Southerly Interceptor.

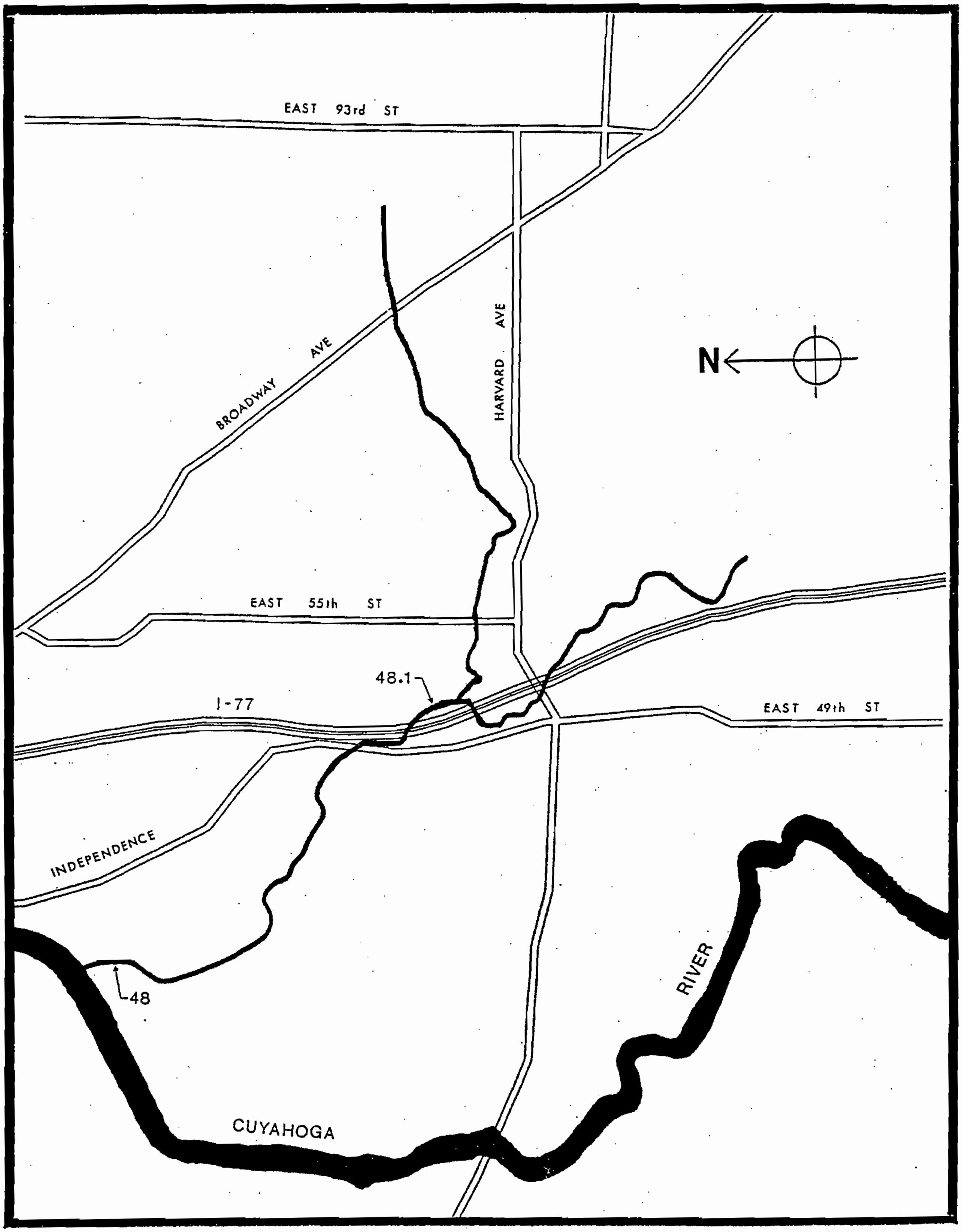
The south branch of Burke Brook originates as a 48-inch storm sewer on Grant Avenue in Cuyahoga Heights. Then, it flows through Newburgh Heights where it joins the former channel of the main branch downstream of the NEORSD's diversion chamber. From this point, Burke Brook flows under Interstate 77 and LTV Steel Company property northwest to its confluence with the Cuyahoga River at about River Mile 5.3.

Three combined sewer overflow structures are presently not tributary to the NEORSD's diversion chamber: one on Grant Avenue east of Interstate 77 in Cuyahoga Heights, and one on Harvard Avenue west of Interstate 77 in Newburgh Heights, both of which are maintained by the NEORSD; one in the Washington Park Horticultural Center, which the Village of Newburgh Heights is responsible for maintaining.

Except for 0.3 total miles of open section on both sides of Interstate 77 and about 100 yards of an open tributary near Bert Avenue, the entire length of Burke Brook is culverted. The Ohio EPA has designated Burke Brook Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use. Burke Brook has been assigned two sampling locations for routine chemical and biological analysis (Figure 26). Chemical and bacteriological data from Burke Brook are presented in Appendix II.

Site #48 (41° 29.31' N, 81° 41.02' W) is located in an open chamber on the double barrel culvert on LTV Steel Company property, about 200 yards upstream of the brook's confluence with the Cuyahoga River. Since Site #48 is culverted, no QHEI was obtained.

Site #48.1 (41° 27.07' N, 81° 39.40' W) is located off Independence Road, south of Fleet Avenue, on the open section of Burke



Burke Brook
(NOT TO SCALE)

Figure 26

Brook's main stem, just east of Interstate 77, downstream from the former confluence of the main and south branches. In 1992, Site #48.1 obtained a QHEI score of 44 (Appendix VI).

PROBLEMS AND REMEDIATION

-1-

In 1991, the clean-up and decontamination of the Bert Avenue dump site in Newburgh Heights continued. McGean Rohco Incorporated, Chemetron Corporation and possibly others had used this site for disposal of industrial wastes. According to an Oak Ridge Associated Universities report (1985), this dump site is known to have been contaminated by depleted uranium-235, uranium oxide, slag containing uranium and thorium decay series radionuclides. The dump site also contains industrial wastes contaminated with antimony oxide, antimony slag, arsenic, barium, cadmium, cobalt, copper, chromium, lead, nickel, silver, iron, zinc, tin, titanium, and trichloroethylene.

The Chemetron Corporation was found responsible by the Nuclear Regulatory Commission for the radioactive contamination and is now actively assisting with the clean-up and decontamination. Chemetron had disposed rubble and equipment at the dump following the demolition of a facility which used depleted uranium-235 as a chemical catalyst. In 1975, McGean Rohco Incorporated purchased the Chemetron property, including buildings which, unaware to company officials at that time (1975), exhibited low level radiation contamination. McGean Rohco also used the Bert Avenue dump site for disposal of industrial wastes and has also provided assistance with clean-up efforts.

The clean-up and decontamination project is being overseen by the Nuclear Regulatory Commission. According to Barry Koh, Chemetron's project manager for the clean-up, the clean-up decontamination project should take at least three years (1991-1994) to complete.

A small stream tributary to Burke Brook flows through a ditch at the dump site. Due to the proximity of the dump site to the stream, contamination of the stream by materials from the dump site is possible during heavy rainfall. In 1989, the NEORSD conducted sampling of soil, run-off, drums, and the small stream within the dump site. The results of this sampling can be found in the NEORSD Greater Cleveland Area Environmental Water Quality Assessment 1989-1990 report.

-2-

On April 22, 1991, NEORSD personnel investigated a reported malodorous discharge to Burke Brook at Site #48.1 from a storm sewer outfall. The discharge had a very strong sulfur-like odor and an elevated pH (12.0 standard units). The discharge was determined to be groundwater that had filtered through slag. Chemical analysis indicated elevated concentrations of various chemicals indicative of uncured slag leachate (high pH, BOD, COD, specific conductance, chlorides, sulfates, zinc, iron, manganese, calcium, lead, and sulfides). This material is commonly used as fill in road bed construction and as backfill in trenches where sewer pipes are placed. Several reports of malodorous discharges to other streams have been determined to be related to the use of slag in the proximity of the discharges (Appendix XIII).

-3-

The elevated fecal coliform concentration (8,000 organisms per 100 ml) at Site #48.1 on July 16, 1991 may be attributed to leakage of water contaminated by sanitary sewage from the diversion chamber upstream of the sample location. On the date the sample was collected, NEORSD investigators noted a small trickle of flow leaking from under the flap gate of the chamber. This small trickle of flow was determined to be ground water that leaked into the diversion chamber and exited from under the flap gate. The ground water can become contaminated when it makes contact with residual sewage in the diversion chamber.

-4-

On June 1, 1992, a power failure at the Ferro Corporation (4150 East 56th Street), caused an overflow of industrial wastewater to enter Burke Brook from their final effluent pump station. The industrial wastewater contained air scrubber blowdown from the lead frit production facility. The discharge was occurring at a rate of approximately 20,000 gallons per hour. A grab sample of the overflow to Burke Brook revealed elevated concentrations for lead (2.6 mg/L), cadmium (0.17 mg/L), iron (2.7 mg/L), zinc (0.89 mg/L), nickel (0.34 mg/L), copper (0.36 mg/L), and ammonia (2.04 mg/L). The Ohio EPA was notified of the situation on this date. Power was restored to the pump station later that day which eliminated this discharge of wastewater contaminated by industrial wastes to Burke Brook.

-5-

Elevated concentrations of lead (0.14 mg/L) and cadmium (0.04 mg/L) were noted at Site #48.1 on June 24, 1991. Exceptionally high concentrations for ammonia were also measured at Site #48.1 on June 24, 1991 (25.80 mg/L) and July 16, 1991 (130 mg/L). These and other, historically elevated concentrations may be attributable to the Ferro Corporation (4150 East 56th Street). A May 1993 NEORSD investigation initiated by these elevated concentrations revealed that blowdown from the air scrubbers used at the lead frit production facility were discharging directly to Burke Brook. The air scrubber blowdown contains lead and cadmium, along with ammonium sulfate which is used to neutralize the water. The discharge had been occurring for an undetermined period of time. The discharge was scheduled for tie-in to the sanitary sewer system in 1993. Further details on this situation will be included in future NEORSD reports.

EUCLID CREEK

Euclid Creek's drainage area includes the communities of Cleveland, Euclid, Highland Heights, Richmond Heights, Willoughby Hills, Lyndhurst and South Euclid. The total drainage area is approximately 15,500 acres, and the creek has a length of 9.5 miles. With the exception of a culverted section under Interstate 90, the creek is predominantly open. The section between Lake Shore Boulevard and Nottingham Road has been channelized by the U.S. Army Corps of Engineers with concrete stream beds for flood control. A dam is located downstream of the St. Clair Avenue Bridge.

The Ohio EPA has designated Euclid Creek State Resource Water, Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use. The NEORSD has selected five locations on Euclid Creek which are routinely sampled for chemical, bacteriological, and benthic analysis (Figure 27). Chemical and bacteriological data from Euclid Creek are presented in Appendix II.

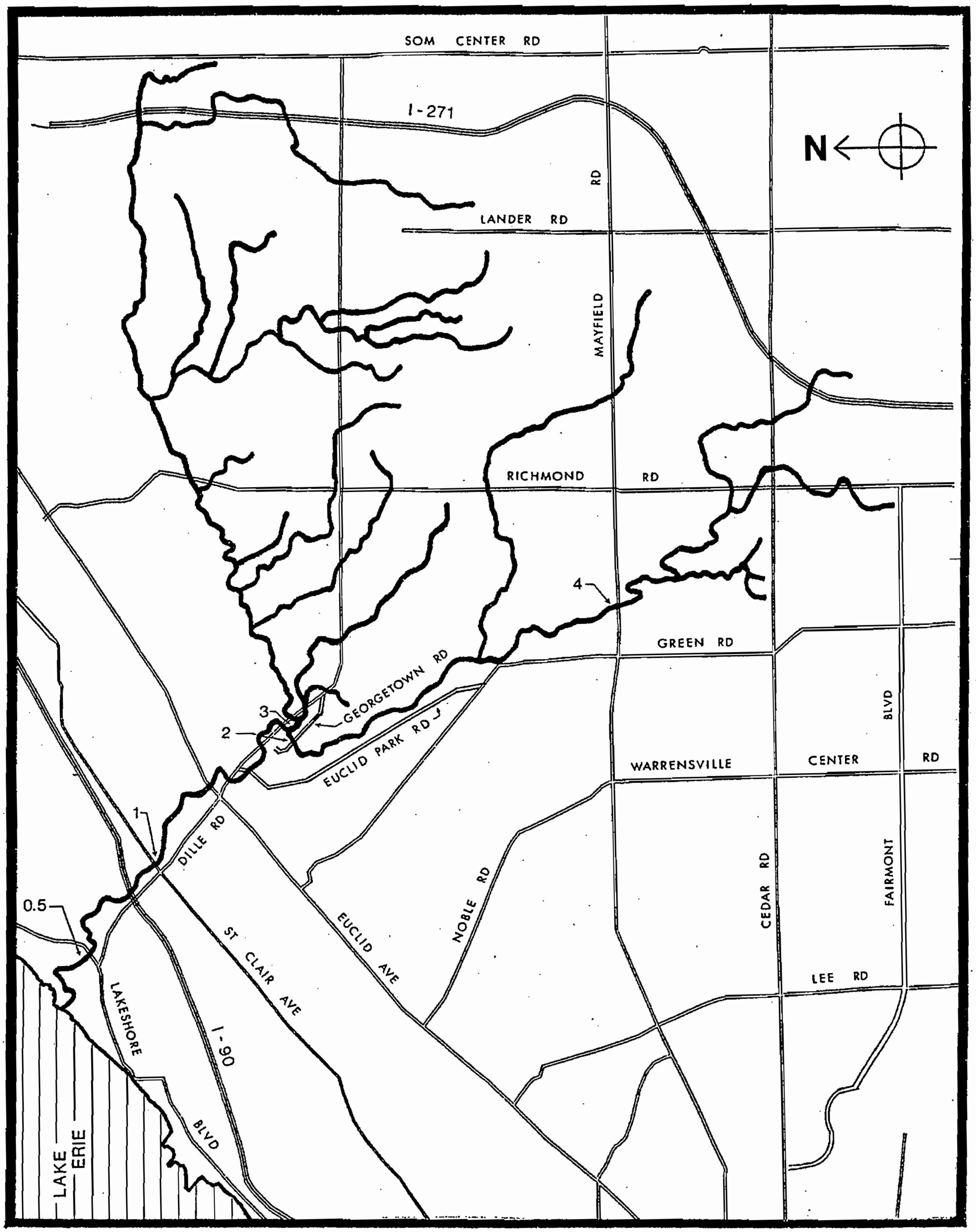
Site #0.5 (41° 34.91' N, 81° 33.58' W) is located about 150 feet downstream of Lake Shore Boulevard. Site #0.5 was selected in 1990 to reflect the environmental impact on Euclid Creek from several upstream storm sewer outfalls, and this location is the furthest downstream sampling site prior to its discharge into Lake Erie. In 1992, Site #0.5 obtained a QHEI score of 45 (Appendix VI).

Site #1 (41° 34.31' N, 81° 32.78' W) is located about 10 feet south of the St. Clair Avenue Bridge. In 1992, Site #1 obtained a QHEI score of 76 (Appendix VI).

Site #2 (41° 33.61' N, 81° 31.88' W) is located on the South Branch of Euclid Creek in the Highland Picnic Area of the Cleveland Metroparks Euclid Creek Reservation, about 100 feet upstream of its confluence with the North Branch. In 1992, Site #2 obtained a QHEI score of 66.5 (Appendix VI).

Site #3 (41° 33.59' N, 81° 31.88' W) is located on the North Branch of Euclid Creek in the Highland Picnic Area of the Cleveland Metroparks Euclid Creek Reservation, about 100 feet upstream of the confluence with the South Branch. In 1992, Site #3 obtained a QHEI score of 65.5 (Appendix VI).

Site #4 (41° 31.10' N, 81° 30.68' W) is located on the South Branch, adjacent to the South Euclid-Lyndhurst Public Library, 4645 Mayfield Road. In 1992, Site #4 obtained a QHEI score of 69 (Appendix VI).



Euclid Creek
(NOT TO SCALE)

Figure 27

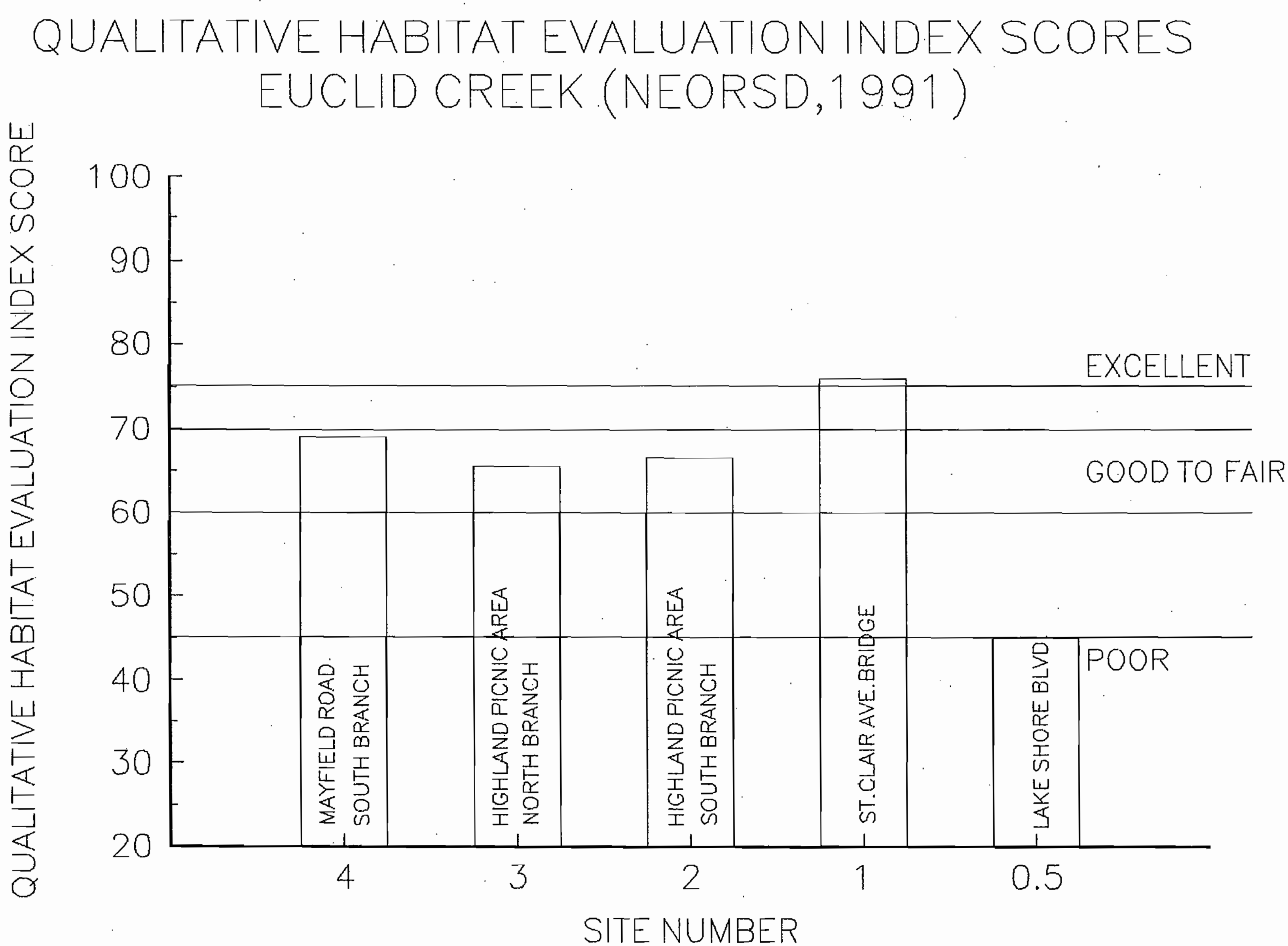

QUALITATIVE HABITAT EVALUATION INDEX SCORES
EUCLID CREEK (NEORSD,1991)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
MAYFIELD ROAD
SOUTH BRANCH
HIGHLAND PICNIC AREA
NORTH BRANCH
HIGHLAND PICNIC AREA
SOUTH BRANCH
ST.CLAIR AVE.BRIDGE
LAKE SHORE BLVD
4
3
2
1
0.5
SITE NUMBER

Figure 28

BENTHOS AT SITE #0.5

It must be be noted that the HBI score (7.15) for Site #0.5 may be artificially high and not truly reflect the water quality at this location. HBI scoring is affected by the current and habitat of a stream (Hilsenhoff, 1987, 1988). This location has a very slow current and lacks riffles as reflected in Appendix IV-B in its low QHEI score (45). Because of the poor habitat, the HBI score for Site #0.5 is intended only for temporal comparison and comparison with locations that have a similar habitat.

The ICI score, which better represents the water quality at this location than the HBI score, is within the "fair" range.

BENTHOS AT SITE #0.51

Site #0.51 is a special benthic macroinvertebrate sample location. Site #0.51 is located 100 yards upstream (south) of Lake Shore Boulevard. This location was selected because it is the furthest downstream site with a suitable habitat (riffles) for HBI determination. This location is also upstream of several storm sewer and CSO outfalls.

As noted in Appendix IV-B, Site #0.51 had a higher HBI score than Site #1. Both locations have a similar habitat and current. The assemblage of benthic macroinvertebrates at both locations were similar, with Site #0.51 having fewer total number of organisms than Site #1. The number of EPT taxa for each site was similar (3 at #0.51 and 4 at Site #1). The biggest difference in benthic macroinvertebrates between the two sites was total number of Diptera taxa (9 at #0.51 and 17 at Site #1).

The higher HBI score and lower total number of organisms at Site #0.51 may be attributed to a recent channelization and stream bank stabilization project between Lake Shore Boulevard and Creekview Drive. These construction activities temporarily introduce large amounts of silt, which may have deleterious effects on benthic fauna. The disruption of the stream bed by earth-moving equipment can also affect the structure of the benthic community. Future sampling is required to determine if any chronic environmental problems exist in this section of Euclid Creek.

PROBLEMS & REMEDIATION

On June 13, 1991, NEORSD investigators discovered a dry weather discharge entering a tributary to Euclid Creek from a storm sewer

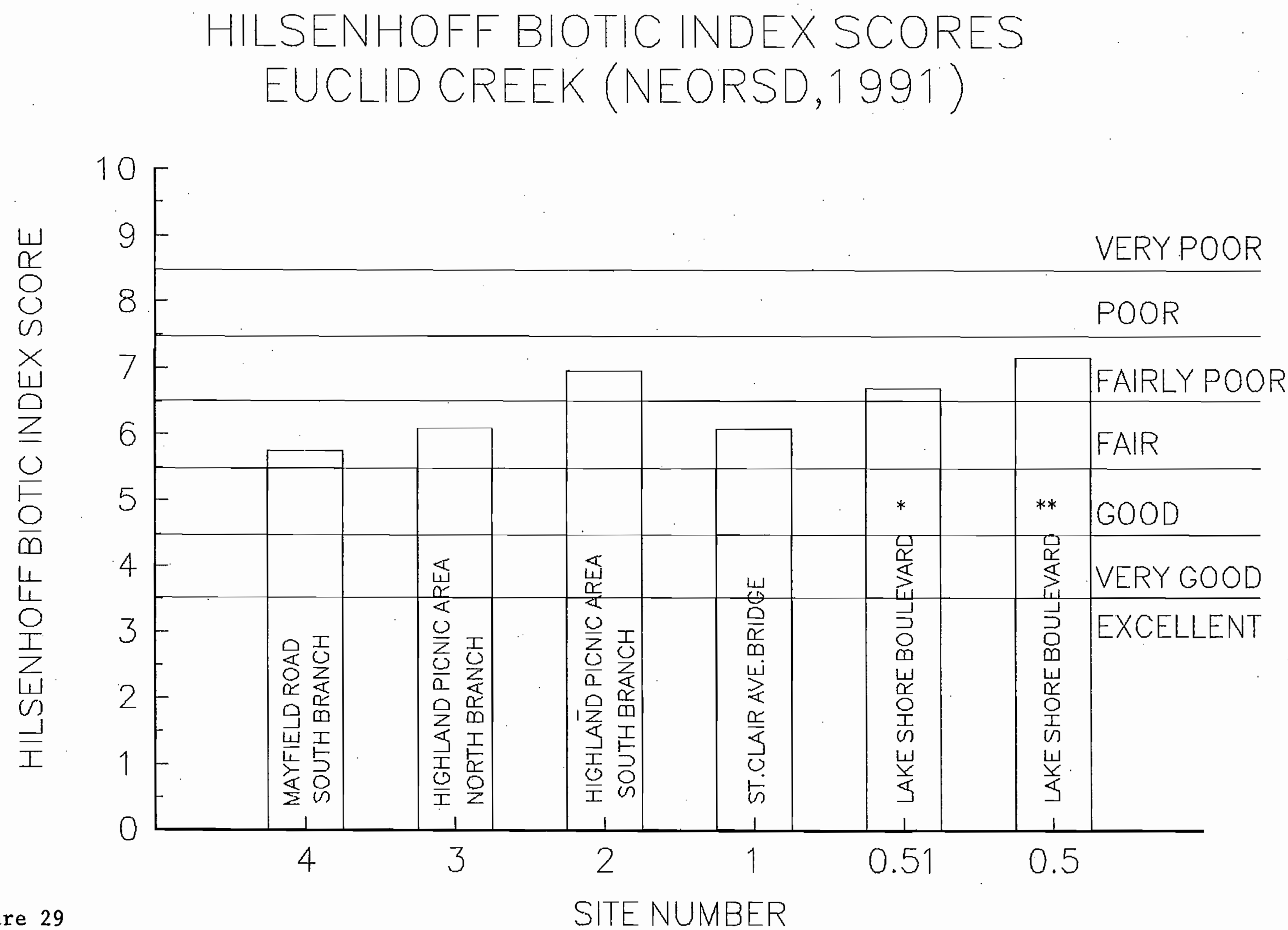


Figure 29
*Site 0.51 is 300yds upstrem of Site 0.5
** Habitat at this location does not fully meet criteria for HBI calculation;supplemental score only

outfall at 1600 Clubside Road. Investigators noted the visual appearance of sanitary sewage in the flow. A follow-up inspection by investigators on June 21 revealed that the discharge had ceased. This source of contamination may be intermittent, necessitating further investigations.

-2-

On November 23, 1991, NEORSD investigators assisted the Cleveland Fire Department in response to ground contaminated with diesel fuel on the east bank of Euclid Creek at the Union 76 Service Station, 1201 East 185 Street. Euclid Creek runs alongside the north property line of the service station. The soil in a section of the bank, below a storm sewer outfall, was saturated with what appeared to be diesel fuel. No visible signs of diesel fuel were noted in the creek. An inspection of the service station revealed that a catch basin, near the diesel fueling area, was connected to the storm sewer. A sample was obtained from the catch basin and traces of diesel fuel were present. The source of the product in the catch basin appeared to be run-off from overfills. The presence of diesel fuel in the catch basin suggests that some of the fuel may have entered the storm sewer and exfiltrated to the ground around the storm sewer outfall pipe. The station's underground storage tanks were checked for missing product; however, there was no evidence of an underground leak. The station's owner was informed that the contaminated soil would have to be excavated and hauled in accordance with applicable regulations. In addition, the product remaining in the catch basin would have to be removed for disposal. The Ohio EPA was notified of this situation.

-3-

On February 27, 1992, NEORSD investigators discovered sanitary sewage entering Euclid Creek from a storm sewer outfall on South Green Road at Urban Road. The sewage was traced back to a blocked sanitary sewer on South Green Road between Adrian Road and Urban Road, which resulted in sewage leaking into the storm sewer. Following this discovery, the problem was reported to the City of South Euclid Service Department. An inspection by NEORSD investigators on February 28 revealed that the South Green Road sanitary sewer had been unblocked and this source of pollution in Euclid Creek had been eliminated.

-4-

In July 1987, NEORSD investigators had inspected a 42-inch storm sewer outfall to Euclid Creek, upstream of Site #1 and behind Cleveland Metal Cleaning Corporation at 1423 Dille Road. Intermittent discharges from this outfall have been responsible for incidents throughout the period of 1987 to 1992, during which Euclid Creek has turned an orange color downstream of the outfall. This storm sewer, which originates on the property of the Inland Division of the General Motors Corporation on Euclid Avenue, runs east past Dille Road north of Cleveland Metal Cleaning Corporation to Euclid Creek.

Numerous samples taken in 1989 and 1990 from this 42-inch storm sewer outfall had indicated high concentrations of suspended solids (200 to 818 mg/L) and iron, which was especially elevated (14 to 660 mg/L). Additionally, low pH levels were noted (2.9 to 6.1 standard units). Iron solids, present in the storm sewer discharge have accumulated, causing a build-up of iron sludge on the creek bed. A 1990 City of Euclid-contracted video inspection of this storm sewer revealed badly decomposed joints, several cracks in the top of the pipe and numerous points of infiltration in the vicinity of Cleveland Metal Cleaning Corporation, which has a steel pickling operation. Presently, this situation is being investigated by Ohio EPA.

On May 1, 1992, NEORSD investigators responded to a report of an orange color in Euclid Creek at St. Clair Avenue. The investigators performed an inspection of the 42-inch storm sewer tributary to Euclid Creek and located an 8-inch storm sewer outlet from the Cleveland Metal Cleaning Company. A small discharge was noted from the 8-inch outlet. The flow was green in color and had a pH measured at about 3.0 standard units.

The investigators visited the Cleveland Metal Cleaning Company and spoke with the owner who explained that an accidental spill of waste pickling rinse water had occurred some time between late afternoon on April 30 and 7:30 a.m. on May 1. He explained that waste pickling rinse waters were being pumped from the rinse tank to a neutralization tank located outside the facility beginning on April 30. However, the pumping continued through the night unmonitored and on May 1, an employee noticed that the transfer line had become disconnected in the process area of the building, spilling the waste rinse water onto the floor. The quantity of spilled material had not been determined. Investigators were unable to trace the route of the wastewater from the building to the 8-inch storm sewer. This situation is also being investigated by the Ohio EPA.

-5-

On May 4, 1992, NEORSD investigators responded to a complaint of an oil sheen on Euclid Creek at Site #0.5. An attempt was made by investigators to identify the source of oil contamination to the creek. This attempt was unsuccessful in locating a source.

GREEN CREEK

Green Creek drains a small portion of Cleveland and South Euclid. the drainage area, mostly residential and industrial, is approximately 660 acres, and the stream is 6.1 miles in length. Green Creek is culverted for 2.3 miles, from Euclid Avenue to Lake Erie. The Ohio EPA has no current or proposed use designation for Green Creek. Green Creek has been assigned three sample sites by NEORSD Environmental Assessment for routine chemical, bacteriological and biological sampling (Figure 30). Chemical and bacteriological data from Green Creek are presented in Appendix II.

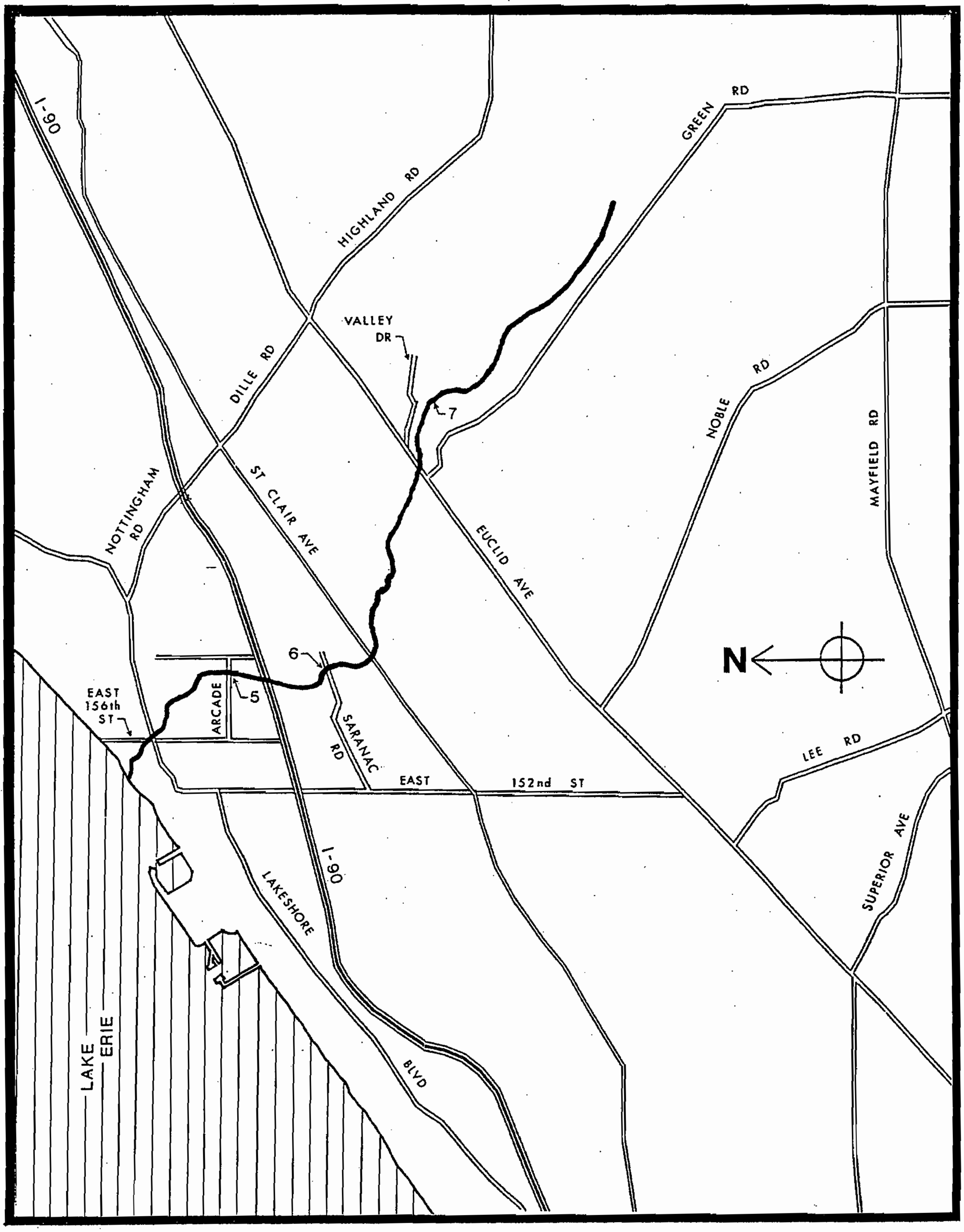
Site #5 (41° 34.32' N, 81° 33.80'W) is located at a manhole on the culvert at Arcade Avenue, west of East 167 Street. The culvert at Site #5 is 8 feet wide by 4 feet high. Since Site #5 is culverted, no QHEI was determined.

Site #6 (41° 34.01' N, 81° 33.78'W) is located at a small opening on the culvert, northeast of East 170 Street and Saranac Road. This open section of the creek is 10 feet long by 8 feet wide. No QHEI was determined at Site #6 since this location lacks habitat characteristics required for a QHEI. Specifically, Site #6 lacks the appropriate length (200-500 m) for determining a QHEI.

Site #7 (41° 33.39' N, 81° 32.76'W) is located south of Euclid Avenue on Upper Valley Drive. Samples and measurements are obtained at the downstream end of the open creek, before it enters the culvert. A metal grate, which functions as a debris screen, crosses the creek just upstream of the sample site. In 1992, Site #7 obtained a QHEI score of 64.5 (Appendix VI).

PROBLEMS AND REMEDIATION

On May 8, 1991, NEORSD investigators discovered a white substance in the culverted section of Green Creek at East 156th Street and Lake Shore Boulevard. The source of this contamination was identified as the Chief's Manufacturing and Equipment Company, 16911 St. Clair Avenue, a distributor of car wash soaps. An inspection by NEORSD investigators revealed that empty soap drums had been cleaned and flushed with water in the parking lot behind the building. Approximately 200 55-gallon drums were cleaned near a catch basin, resulting in the discharge to Green Creek. Company officials were informed that these clean-up procedures must cease and be revised to prevent further discharges to the creek.



Green Creek
(NOT TO SCALE)

Figure 30

NINE-MILE CREEK

Nine-Mile Creek's drainage area includes the communities of South Euclid, University Heights, Cleveland Heights, East Cleveland, Cleveland, and Bratenahl. The total drainage area is approximately 5,000 acres. Nine-Mile Creek is culverted from near its mouth at Lake Shore Boulevard to east of Belvoir Road at the border between the cities of Cleveland and Cleveland Heights. Upstream of this location, the creek is open, and the "Nela Park" Branch, which enters the culverted mainstem of Nine-Mile Creek south of Belvoir Boulevard, east of Hillside Avenue in East Cleveland, is also open.

The Ohio EPA has designated Nine-Mile Creek Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use. The NEORSD has selected four locations on Nine-Mile Creek which are routinely sampled for chemical, bacteriological, and benthic analysis (Figure 31). Chemical and bacteriological data from Nine-Mile Creek are presented in Appendix II.

Site #8a (41° 33.04' N, 81° 36.08' W) is located approximately 500 yards upstream of Nine-Mile Creek's confluence with Lake Erie. Samples are obtained about 50 feet north of the Lake Shore Boulevard bridge. In 1992, Site #8a obtained a QHEI score of 55 (Appendix VI).

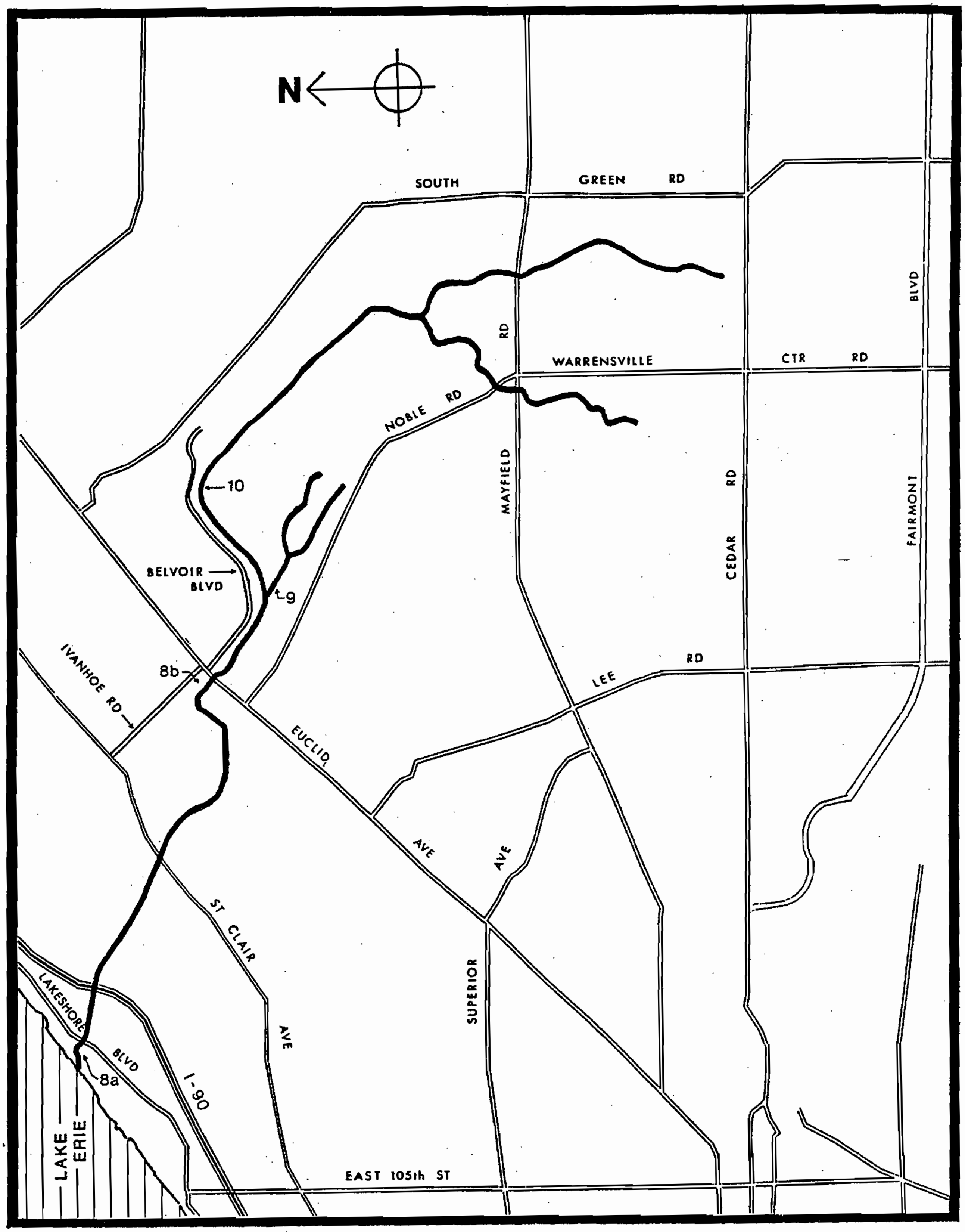
Site #8b (41° 32.87' N, 81° 34.11' W) is located on the culverted section of the main stem of Nine-Mile Creek. This site is located at a manhole west of Ivanhoe Road and approximately 20 feet north of the railroad tracks which run perpendicular to Ivanhoe Road. Since Site #8b is culverted, no QHEI was obtained.

Site #9 (41° 32.53' N, 81° 33.39' W) on the Nine-Mile Creek "Nela Park" Branch is located one-quarter mile southeast of Euclid Avenue on the southwest side of Belvoir Boulevard. Samples are obtained just upstream of this branch's entry into the Nine-Mile Creek culvert. In 1992, Site #9 obtained a QHEI score of 57 (Appendix VI).

Site #10 (41° 32.69' N, 81° 33.23' W) is located on the main stem of Nine-Mile Creek, 10 feet upstream of its entry into the Nine-Mile Creek culvert. It is on the south side of Belvoir Boulevard about one-half mile east of Euclid Avenue. In 1992, Site #10 obtained a QHEI score of 58 (Appendix VI).

PROBLEMS AND REMEDIATION

Nine-Mile Creek has twenty-six combined sewer overflow structures in its drainage area, upstream of Lake Shore Boulevard. Seven of these have been found overflowing during dry weather on a number of occasions in 1991 and 1992. The noted water quality criterion



Nine-Mile Creek
(NOT TO SCALE)

Figure 31

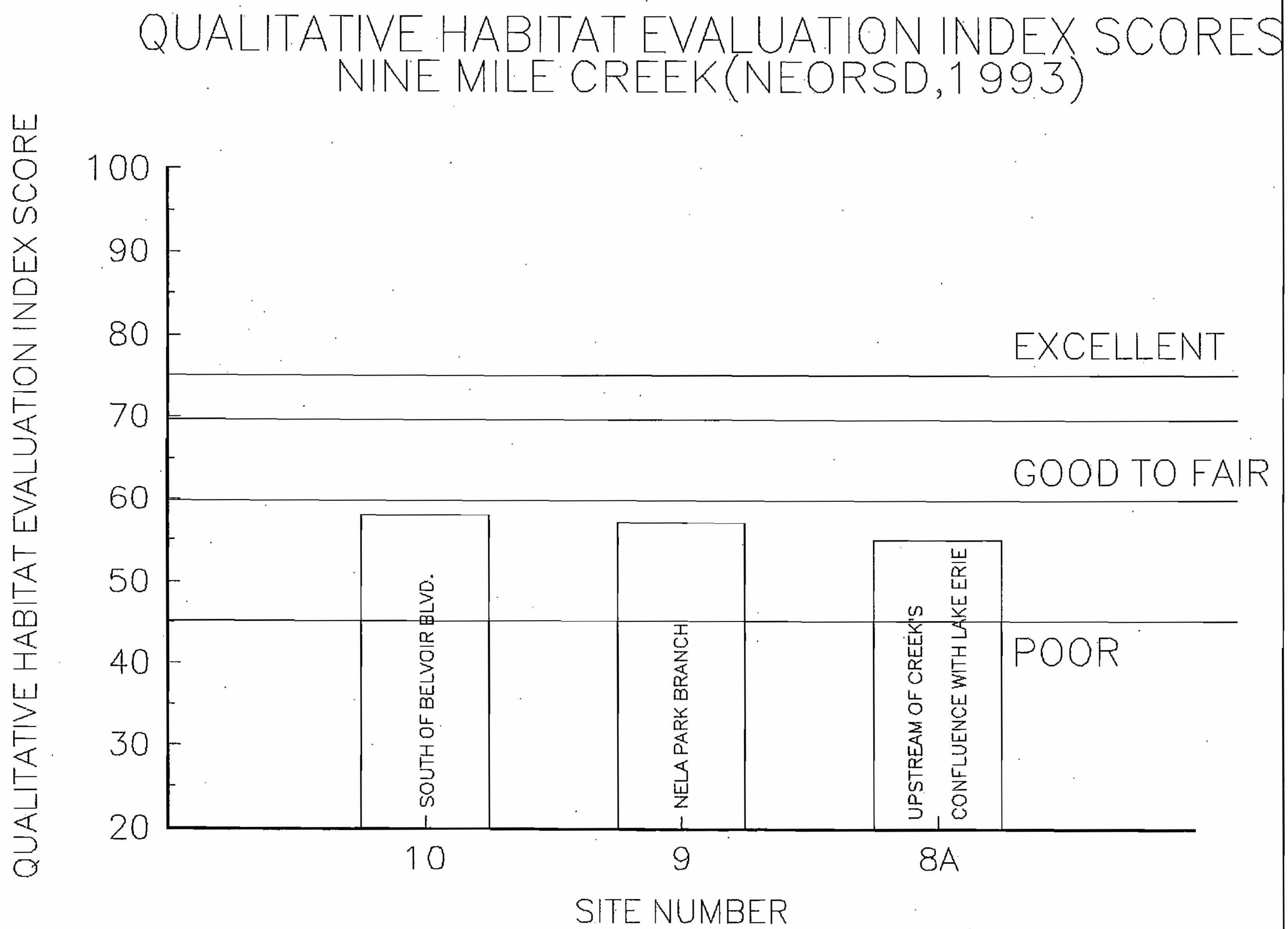

QUALITATIVE HABITAT EVALUATION INDEX SCORES
NINE MILE CREEK(NEORSD,1993)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
SOUTH OF BELVOIR BLVD.
NELA PARK BRANCH
UPSTREAM OF CREEK'S
CONFLUENCE WITH LAKE ERIE
10
9
8A
SITE NUMBER

Figure 32

exceedances in 1991 at Sites #8a, #8b and #9 may be attributable to these dry weather overflows.

-1-

Low dissolved oxygen and exceedances of the water quality criteria for fecal coliform were noted at Site #8a in 1991. These exceedances may be attributed to upstream sources of sanitary sewage. In 1991, NEORSD Sewer Maintenance and Control personnel discovered blockages in combined sewer overflow structures at Noble Road and Elderwood Avenue and at Woodworth Avenue and Coit Road. These blockages had been responsible for dry weather overflows of sanitary sewage to the Nine-Mile Creek culvert and may have contributed to the elevated fecal coliform concentrations noted during the samplings at Site #8a. Each blockage was subsequently cleared by NEORSD personnel, eliminating these sources of contamination in Nine-Mile Creek.

-2-

In 1991, NEORSD Sewer Maintenance and Control personnel also discovered blockages in the combined sewer overflow structure on Hillside Avenue at Hillside Court, where the storm sewer is tributary to Nine-Mile Creek upstream of Site #8b. These dry weather overflows of sanitary sewage may have contributed to the elevated fecal coliform concentrations noted in 1991. NEORSD personnel have routinely cleared these blockages.

-3-

Nine-Mile Creek has had recurring dry weather discharge of sanitary sewage from a storm sewer upstream of Site #9. This sanitary sewage contributed to the relatively high bacterial contamination of Nine-Mile Creek in 1991. In July 18, 1990, NEORSD investigators had first discovered the sanitary sewage entering the "Nela Park" Branch of Nine-Mile Creek through a storm sewer outfall northeast of Nela Court. The flow was traced back to a blocked sanitary sewer on Nela View Road. The blockage resulted in sewage overflowing into the storm sewer system. The overflow structure is located at the intersection of Nela View Road and Nela Court. NEORSD investigators also discovered that the overflow weir was missing at this location. The City of East Cleveland was notified of these problems and removed the blockage, significantly reducing the contamination by sanitary sewage in Nine-Mile Creek. The overflow weir has not been replaced, however, still enabling small amounts of sanitary sewage to continually enter the storm sewer.

On July 15, 1991, NEORSD investigators again found the dry weather overflow occurring and again traced its source to a blockage in the sanitary sewer on Nela View Road. The City of East Cleveland was again notified of the problem on July 16. The recurring nature of this problem warrants continued monitoring of this location. Replacement of the overflow weir would help to prevent further sanitary sewage contamination of Nine-Mile Creek.

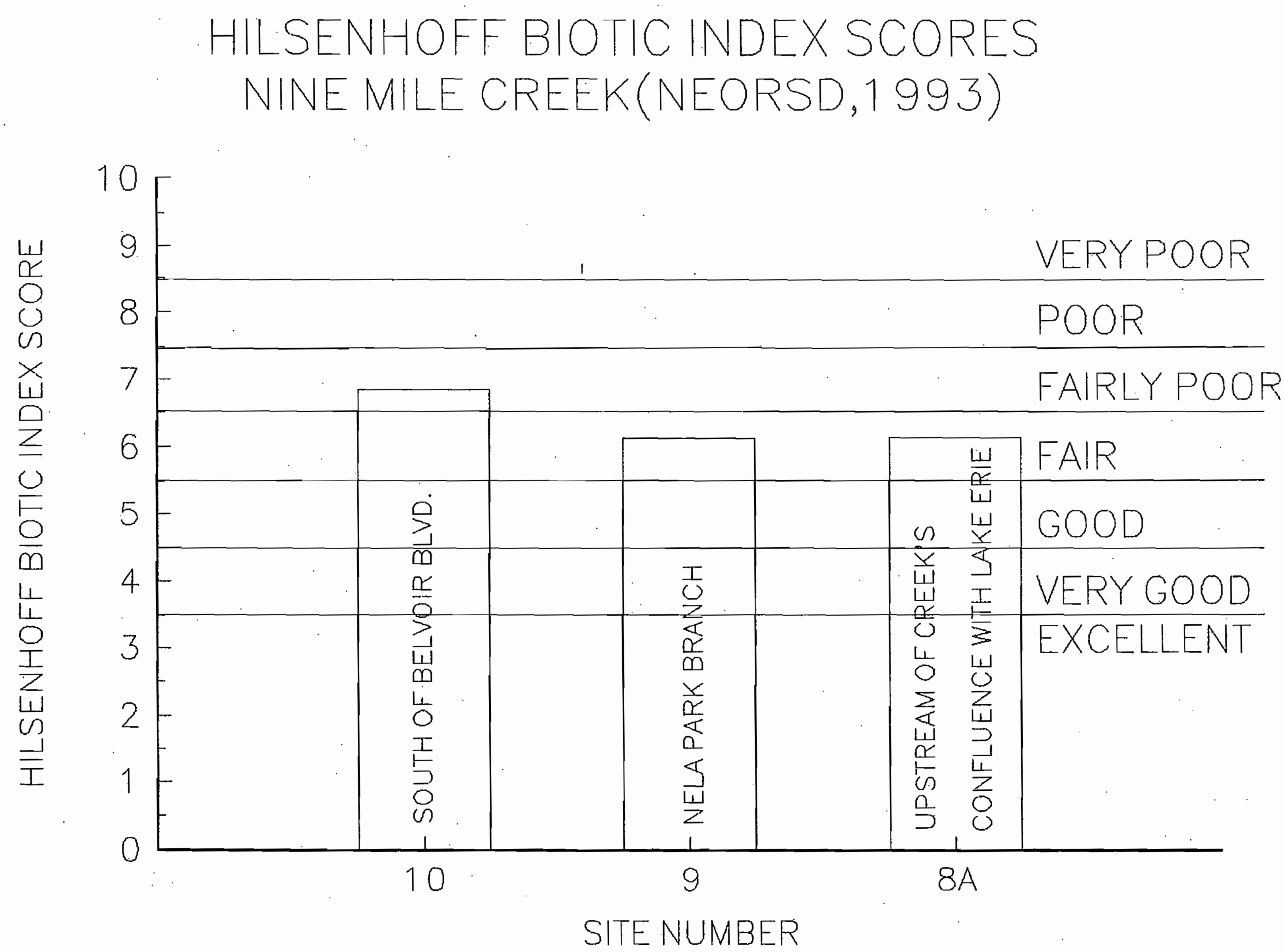

HILSENHOFF BIOTIC INDEX SCORES
NINE MILE CREEK(NEORSD,1993)
HILSENHOFF BIOTIC INDEX SCORE
10
9
8
7
6
5
4
3
2
1
0
VERY POOR
POOR
FAIRLY POOR
FAIR
GOOD
VERY GOOD
EXCELLENT
SOUTH OF BELVOIR BLVD.
NELA PARK BRANCH
UPSTREAM OF CREEK'S
CONFLUENCE WITH LAKE ERIE
10
9
8A
SITE NUMBER

Figure 33

DUGWAY BROOK

Dugway Brook's drainage area includes the communities of Cleveland, East Cleveland, Cleveland Heights, University Heights, and Bratenahl. The Brook has two main branches, East and West, and has a total length of 7.9 miles and total drainage area of 9.4 square miles. Most of Dugway Brook is culverted, with the following exceptions which are open: near the mouth, north of Lake Shore Boulevard; on a tributary to the West Branch, between Derbyshire Road and Washington Boulevard in Cleveland Heights; on the West Branch, through Lakeview Cemetery, between Mayfield Road and Euclid Avenue; on the East Branch through Cumberland Park, between Euclid Heights Boulevard and Hampshire Road, in Cleveland Heights.

The Ohio EPA has no current or proposed use designation for Dugway Brook. The NEORSD has selected four locations on Dugway Brook which are routinely sampled for chemical, bacteriological, and benthic analysis (Figure 34). Chemical and bacteriological data from Dugway Brook are presented in Appendix II.

Site #12 (41° 31.42' N, 81° 35.82' W) is located near the mouth of Dugway Brook, just north of Lake Shore Boulevard. In 1992, Site #12 obtained a QHEI score of 70 (Appendix VI).

Site #13 (41° 31.66' N, 81° 36.45' W) is located on Dugway Brook's West Branch at Primrose Avenue. The stream is culverted at this point and must be entered through the storm sewer outlet from the overflow regulator at Primrose Avenue and East 111th Street. Since Site #13 is culverted, no QHEI was determined.

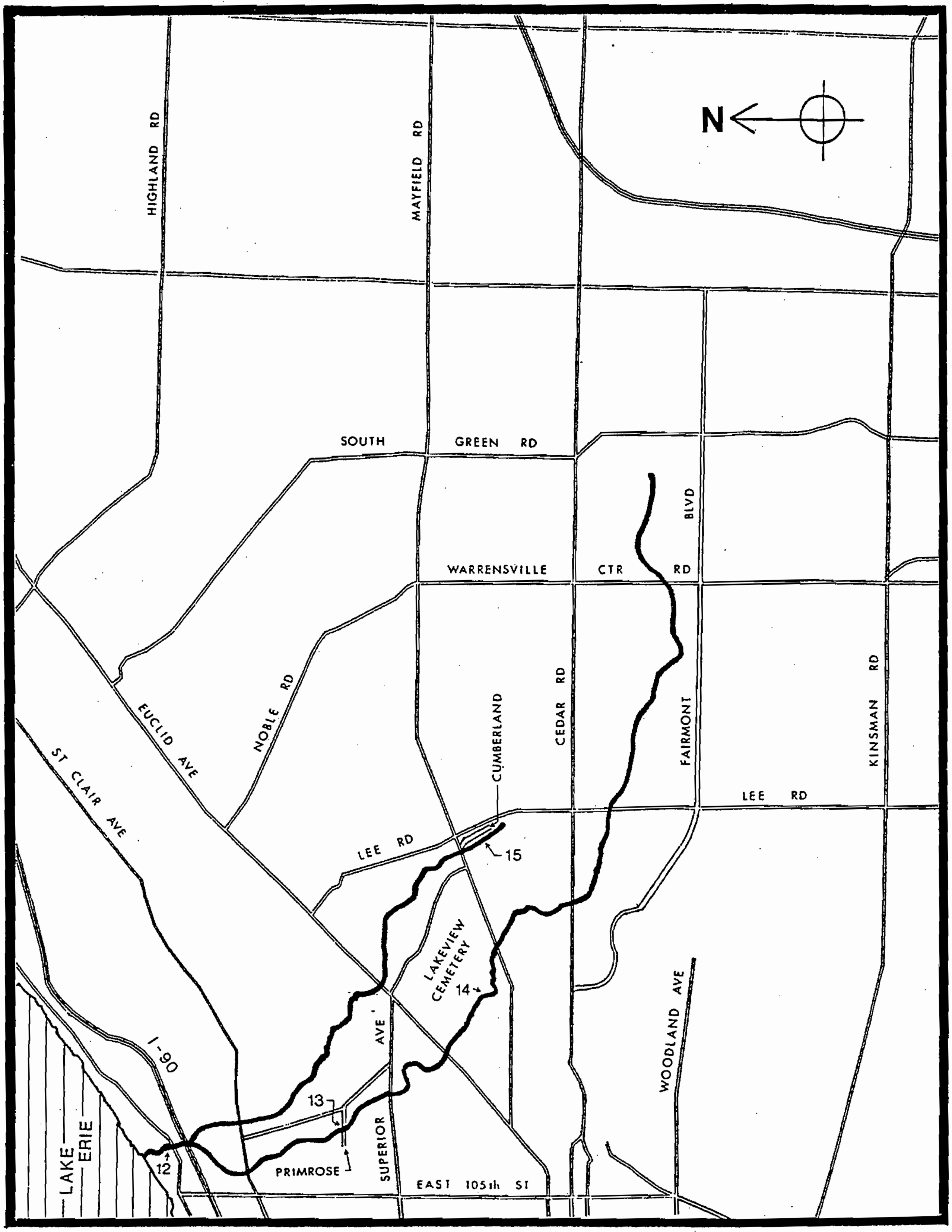
Site #14 (41° 30.66' N, 81° 35.45' W) is located on Dugway Brook's West Branch downstream of the NEORSD flood control dam at Lakeview Cemetery. In 1992, Site #14 obtained a QHEI score of 63 (Appendix VI).

Site #15 (41° 30.66' N, 81° 34.21' W) is located on the East Branch of Dugway Brook at Cumberland Park in Cleveland Heights, south of Mayfield Road. In 1992, Site #15 obtained a QHEI score of 64 (Appendix VI).

PROBLEMS AND REMEDIATION

-1-

Dugway Brook continued to be heavily contaminated by sanitary sewage at downstream Sites #12 and Site #13 in 1991. This condition is due in part to a hydraulically loaded and antiquated sewerage system. The construction of the NEORSD Heights-Hilltop Interceptor may relieve some of the load on this system and provide long-term remediation for Dugway Brook.



Dugway Brook
(NOT TO SCALE)

Figure 34

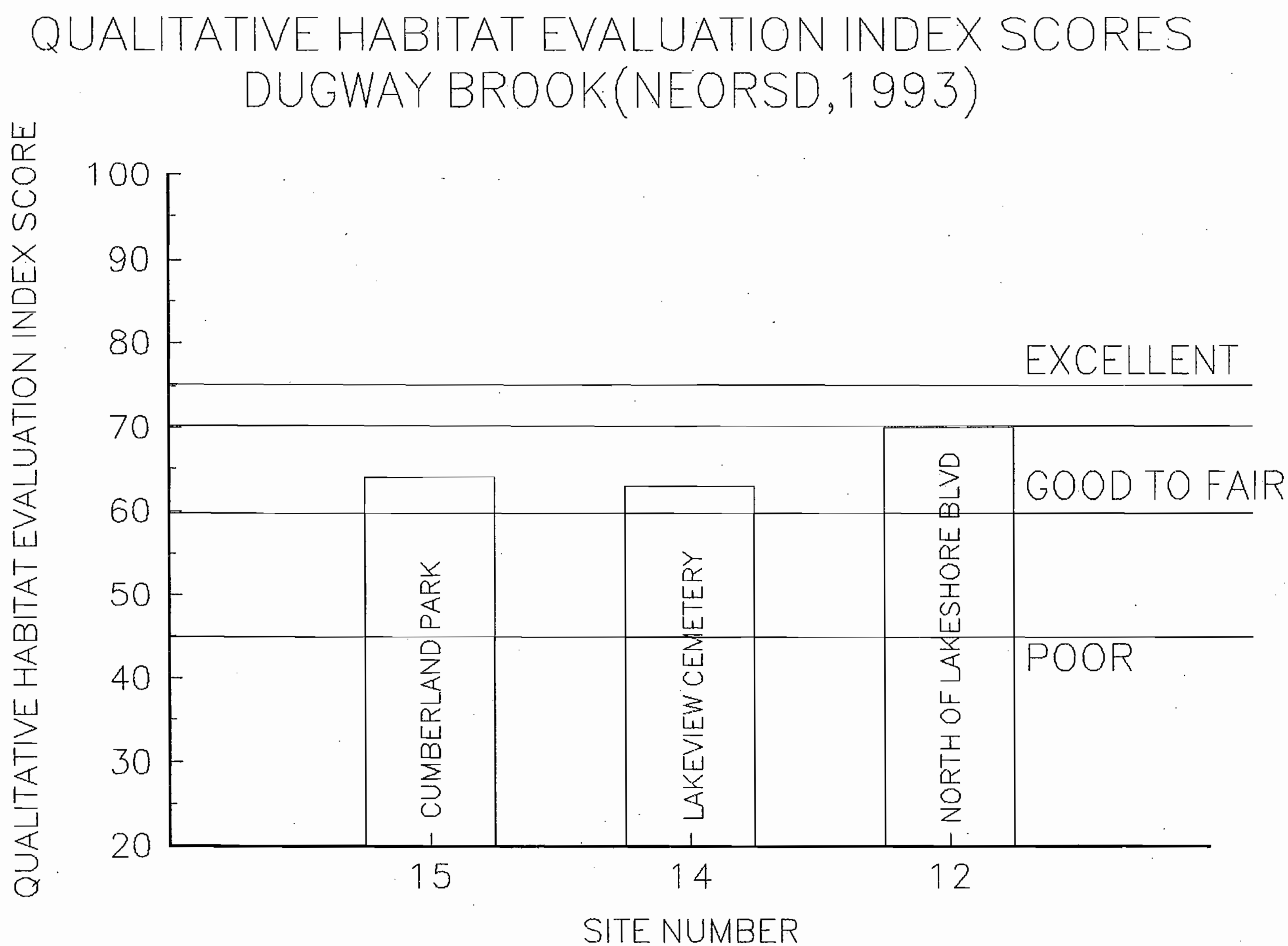

QUALITATIVE HABITAT EVALUATION INDEX SCORES
DUGWAY BROOK(NEORSD,1993)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
CUMBERLAND PARK
LAKEVIEW CEMETERY
NORTH OF LAKESHORE BLVD
15
14
12
SITE NUMBER

Figure 35

The West Branch of Dugway Brook upstream of Site #12 in the Glenville area has numerous overflow structures which periodically experience dry weather overflow events. In 1991, the fecal coliform concentrations were measured as high as 86,000 organisms per 100 ml at Site #12 and 220,000 organisms per 100 ml at Site #13. Contributing to these elevated fecal coliform concentrations were three dry weather overflows occurring at the time of sampling. NEORSD Sewer Maintenance and Control personnel identified these problems while performing inspections of the overflow structures tributary to Dugway Brook. Overflow source descriptions and remediation are as follows:

1) 13505 Euclid Avenue: Overflow regulator "Dugway Interceptor - 76" (D-76). On January 28, 1991, NEORSD personnel discovered a dry weather overflow of sanitary sewage from D-76 as a result of a blockage in the sanitary sewer at this point. The City of East Cleveland was notified of this problem. An inspection by NEORSD Sewer Maintenance and Control personnel on June 3, 1991 revealed that no remediation of this problem had yet occurred. Subsequent inspections by NEORSD personnel revealed that this source of pollution in Dugway Brook had been eliminated.

2) Shaw Avenue, north of Plymouth Plaza: Overflow regulator "Dugway Interceptor - 91" (D-91). On June 20, 1991, NEORSD personnel removed a blockage from D-91 which had been causing dry weather discharges to the East Branch of Dugway Brook.

3) 1096 East 112 Street: Overflow regulator "Dugway Interceptor - 40" (D-40). NEORSD personnel noted numerous dry weather overflow events due to blockages of the leaping weir structure at this location. NEORSD personnel have routinely cleared these blockages.

-2-

On June 11, 1991, NEORSD investigators discovered sanitary sewage in the West Branch of Dugway Brook where it enters the Lakeview Cemetery at Mayfield Road. The sanitary sewage was traced back to a storm sewer outfall under Berkshire Road. The flow was measured at approximately 14,000 gallons per day. A blockage of the sanitary sewer on Berkshire Road had resulted in sewage leaking into the storm sewer. The City of Cleveland Heights Service Department was notified and the necessary repairs were made on June 12, 1991 to eliminate this discharge to Dugway Brook.

-3-

On January 17, 1992, NEORSD investigators responded to a report of sanitary sewage in the West Branch of Dugway Brook at Lakeview Cemetery. On January 21, investigators discovered sanitary sewage entering the Dugway Brook culvert from a storm sewer at Washington

Boulevard and Edgehill Road. The sanitary sewage was traced back to 2904 Washington Boulevard, where sewage was leaking into a storm sewer due to a blockage in the sanitary sewer at this point. The City of Cleveland Heights Service Department was notified of the problem on January 21. A follow-up inspection on February 19 revealed that the flow of sanitary sewage had been reduced but not eliminated. Investigators also observed sanitary sewage in the Dugway Brook culvert, upstream of the Washington Boulevard storm sewer outfall.

On March 3, 1992, NEORSD investigators performed a walk-through inspection of the culvert in an attempt to locate the source(s) of this contamination. Investigators discovered sanitary sewage entering the Dugway Brook culvert from a 24-inch storm sewer on Euclid Heights Boulevard and a 120-inch storm sewer on Washington Boulevard.

On March 5, 1992, investigators found a blocked sanitary sewer on Euclid Heights Boulevard at Caldwell Road. This blockage of the sanitary sewer had resulted in sewage leaking into the storm sewer. The problem was reported to the City of Cleveland Heights Service Department. An inspection on March 13 revealed that the sanitary sewer had been unblocked and this source of pollution in Dugway Brook had been eliminated.

On April 2, 1992, NEORSD investigators performed inspections of the 120-inch storm sewer on Washington Boulevard in an attempt to identify the source(s) of sanitary sewage contamination. This investigation was unsuccessful and further investigation is needed.

On April 9, 1992, samples were collected for bacteriological analysis from the Dugway Brook culvert in an attempt to further identify the source(s) of sanitary sewage contamination. Samples were obtained at various locations between the culvert opening on Mayfield Road at the Lakeview Cemetery to where the culvert crosses Canterbury Road on Meadowbrook Boulevard. Elevated fecal coliform concentrations were noted throughout the samples, including several samples with concentrations exceeding 1,000,000 organisms per 100 ml. Further investigation is needed to identify the sources of pollution in Dugway Brook.

Finally, on May 12, 1992, NEORSD investigators inspected a section of the Dugway Brook culvert which follows Meadowbrook Boulevard in University Heights. Samples for bacteriological analysis were collected at various locations on the culvert. Results of the analyses revealed fecal coliform concentrations as high as 2,100,000 organisms per 100 ml and showed that the contamination by sanitary sewage was from several directions throughout the sewer system. These sources may be improper connections of residential/commercial sanitary discharges to the storm sewers and/or exfiltration/infiltration from the sanitary sewers to the storm sewers through structural leaks.

DOAN BROOK

Doan Brook's drainage area includes the communities of Cleveland, Cleveland Heights, and Shaker Heights. Doan Brook has a total length of 8.1 miles and a drainage area of 11.7 square miles. Approximately 1.3 miles of the brook is culverted. The brook flows through Shaker Lakes Park, Ambler Park, University Circle, and Rockefeller Park into Lake Erie near Gordon Park.

The Ohio EPA has designated Doan Brook Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply and Primary Contact Recreational Use. The NEORSD has selected four locations on Doan Brook which are routinely sampled for chemical, bacteriological, and benthic analysis (Figure 36). Chemical and bacteriological data from Doan Brook are presented in Appendix II.

Site #16 (41° 31.96' N, 81° 37.78' W) is located on Doan Brook, north of St. Clair Avenue, east of Martin Luther King, Jr. Drive. In 1992, Site #16 obtained a QHEI score of 56.5 (Appendix VI).

Site #17 (41° 32.01' N, 81° 37.51' W) is located on Doan Brook, north of the Cleveland Museum of Art, 11150 East Boulevard. In 1992, Site #17 obtained a QHEI score of 70.5 (Appendix VI).

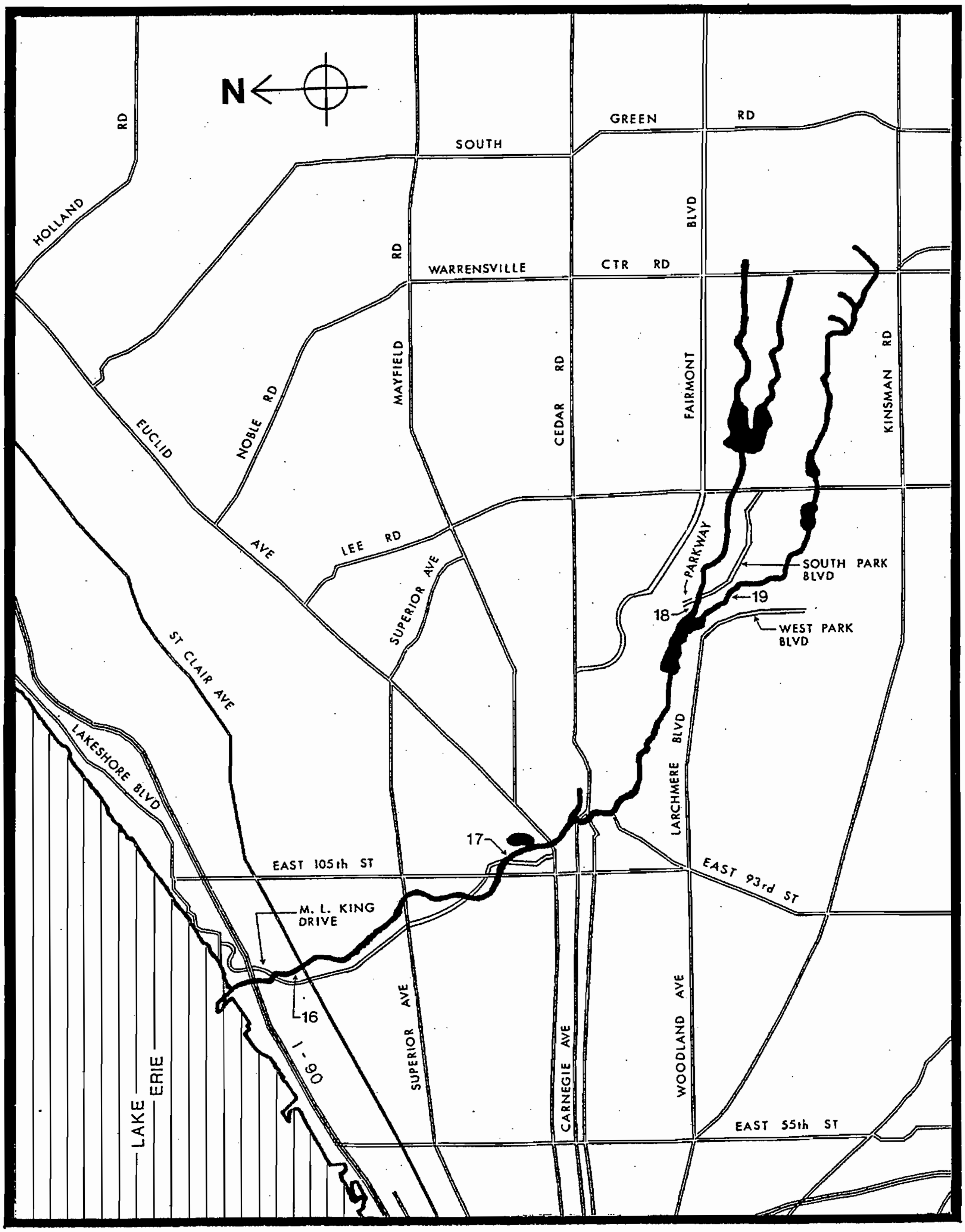
Site #18 (41° 29.13' N, 81° 34.45' W) is located on the North Branch of Doan Brook, northeast of the Shaker Lakes Regional Nature Center Office, 2600 South Park Boulevard. In 1992, Site #18 obtained a QHEI score of 61.5 (Appendix VI).

Site #19 (41° 28.97' N, 81° 34.44' W) is located on the South Branch of Doan Brook, southeast of the Shaker Lakes Regional Nature Center Office. In 1992, Site #19 obtained a QHEI score of 64 (Appendix VI).

PROBLEMS AND REMEDIATION

-1-

On June 18, 1990, NEORSD investigators discovered sanitary sewage entering Doan Brook from a storm sewer outfall at North Park Boulevard and Coventry Road. On June 20, the sanitary sewage was traced back to a storm sewer off Colchester Avenue near Fairmont Boulevard, where sewage was leaking into the storm sewer due to a blockage in the sanitary sewer at this point. This discharge had a flow rate of approximately 190,000 gallons per day. When flow in the sanitary sewer becomes obstructed, the sewage overflows the weir and enters into the storm sewer. The City of Cleveland Heights Service

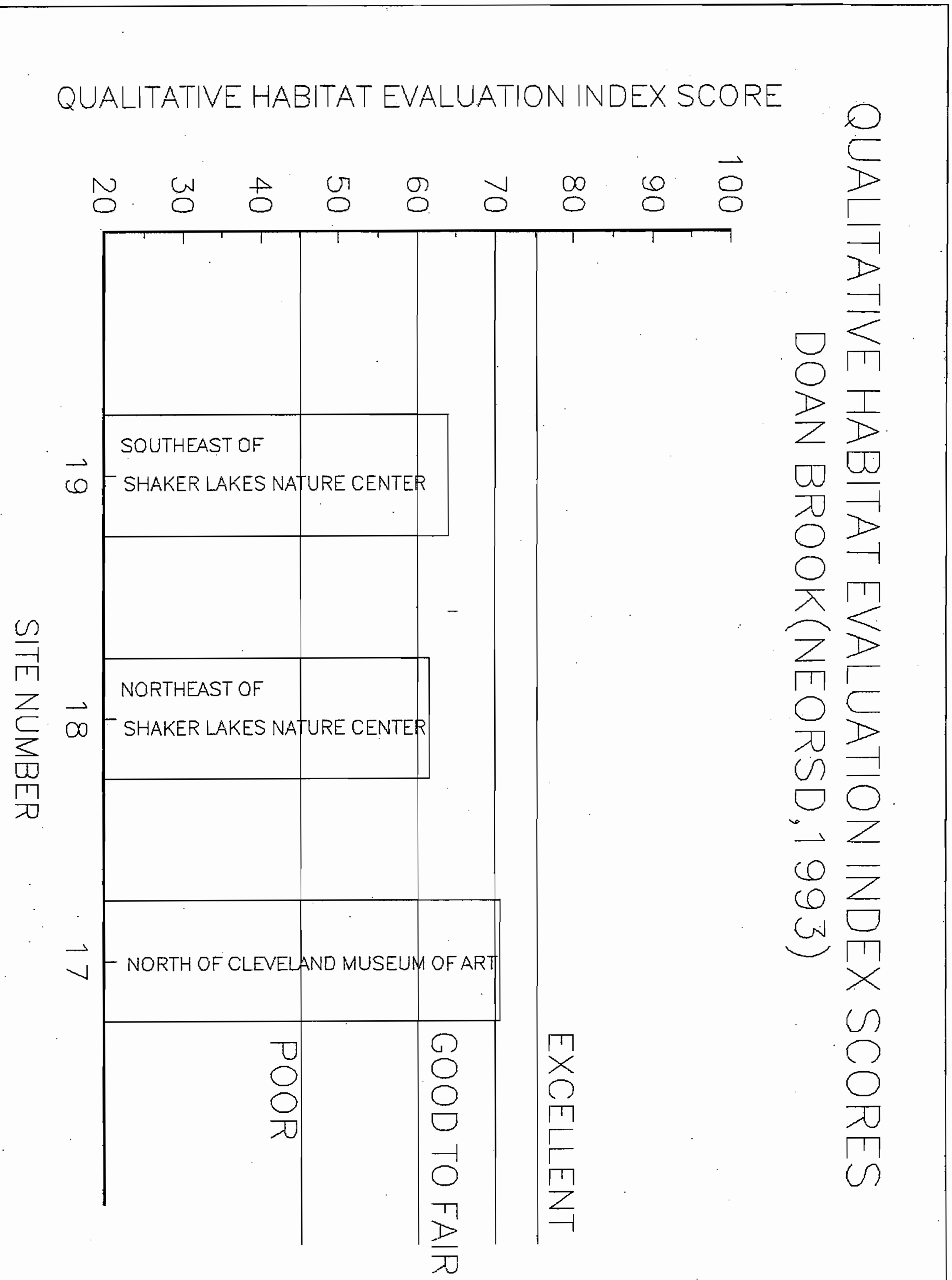


Doan Brook

(NOT TO SCALE)

Figure 36

Figure 37



QUALITATIVE HABITAT EVALUATION INDEX SCORES
DOAN BROOK(NEORSD,1993)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
SOUTHEAST OF
SHAKER LAKES NATURE CENTER
NORTHEAST OF
SHAKER LAKES NATURE CENTER
NORTH OF CLEVELAND MUSEUM OF ART
19
18
17
SITE NUMBER
EXCELLENT
GOOD TO FAIR
POOR

Department was notified of this problem on June 21. A follow-up inspection by NEORSD investigators on June 28 revealed that the sanitary sewer had been unblocked and this source of pollution in Doan Brook had been eliminated.

-2-

In March 1991, NEORSD investigators conducted an inspection of 1.3 miles of the Doan Brook culvert and the open section of Doan Brook north of the Wade Park Pond, to identify areas where the flow is restricted and has potential to cause flooding in the University Circle area. All catch basins in the University Circle area were filled with grit and debris. These obstructions may prevent adequate drainage during wet weather, thus causing a potential flooding problem. NEORSD investigators observed five problems in the culverted section and sixteen in the open section of Doan Brook from Ambler Park north to Interstate 90 which warrant attention. All of the problems discovered on this 1.3 miles of the Doan Brook culvert from Ambler Park north to Interstate 90 may have a cumulative effect resulting in the flooding problems reported in the University Heights circle area.

-3-

Elevated fecal coliform concentrations at Site #16 (as high as 2,700 organisms per 100 ml) and Site #17 (as high as 180,000 organisms per 100 ml), can be attributed to the dry weather overflow of sewage from the overflow regulator "Doan Valley Interceptor-15" (DV-15), at Cedar Hill and East Boulevard. The causes of this dry weather overflow are due to the following: a collapsed sewer near 2330 Euclid Heights Boulevard in Cleveland Heights and an improper sanitary sewer connection at 2373 Euclid Heights Boulevard. The City of Cleveland Heights Sewer Department expects remediation to begin in 1994 when the entire storm and sanitary sewer on the south side of Euclid Heights Boulevard, between Derbyshire and Cedar Road, will be replaced. The 18-inch sanitary sewer on the north side of Euclid Heights Boulevard at Overlook Drive will be connected to the new sewer on the south side of Euclid Heights Boulevard. These remedial efforts should result in water quality improvements at Site #17 and Site #16.

ROCKY RIVER

The Rocky River has two branches, East and West, the confluence of which is at Cedar Point Road in North Olmsted. The main stem of the Rocky River flows north from the confluence approximately ten miles through the communities of North Olmsted, Brook Park, Fairview Park, Cleveland, Rocky River, and finally, Lakewood, where the river enters Lake Erie.

The East Branch of the Rocky River enters Cuyahoga County from Medina County and flows northwest through the communities of North Royalton, Strongsville, Middleburg Heights, Berea, and Olmsted Township to its confluence with the West Branch in North Olmsted. The West Branch of the Rocky River enters Cuyahoga County from Lorain County and flows north through the communities of Olmsted Falls and North Olmsted to the confluence.

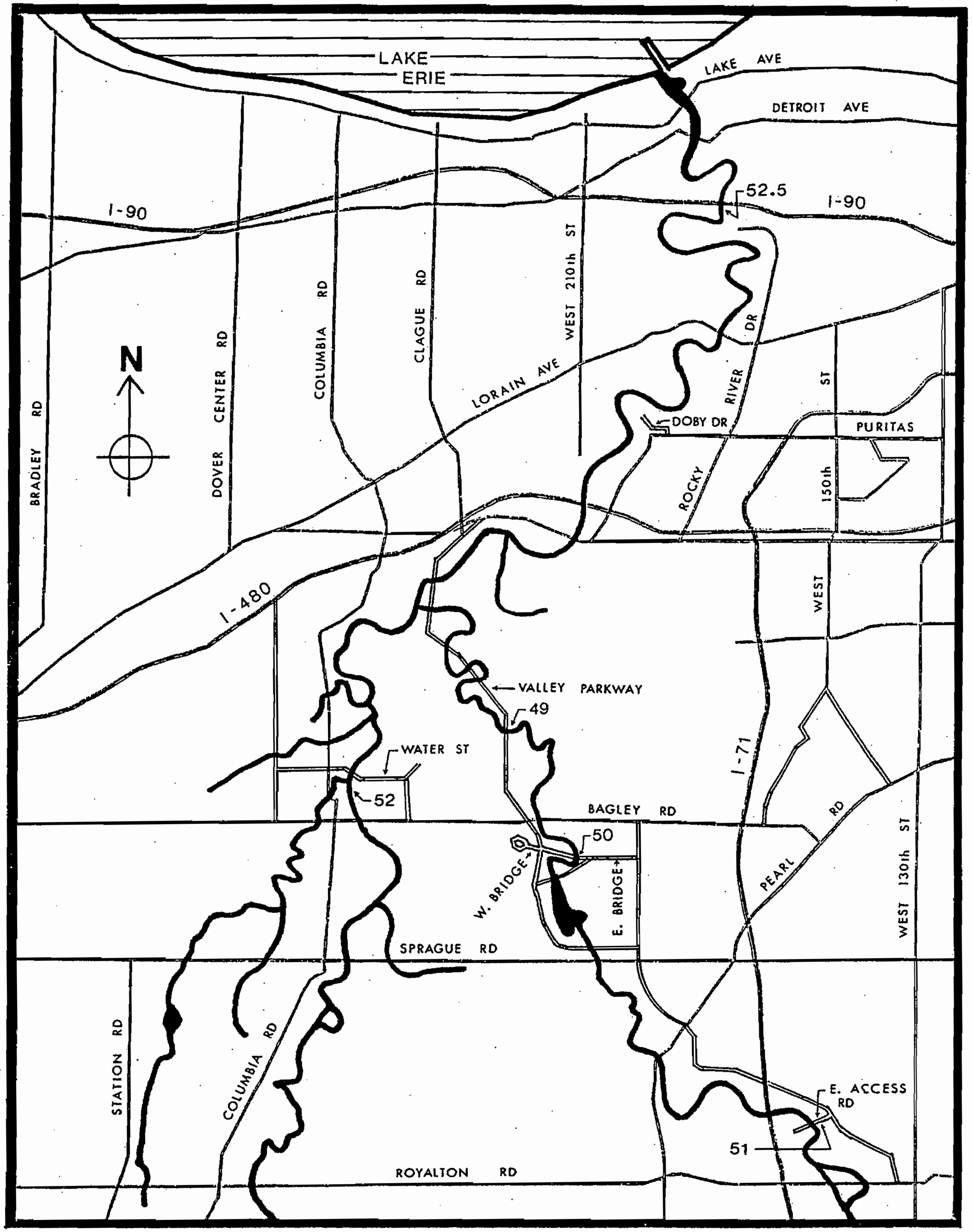
Wastewater Treatment Plants which discharge effluents to Rocky River include: Strongsville "A" WWTP (NEORSD-operated); Strongsville "B" and "C" WWTP's; North Royalton "B" WWTP; Middleburg Heights WWTP; Brook Park WWTP; Berea WWTP (NEORSD-operated); Columbia Township Subdivision WWTP; Columbia Mobile Home Park WWTP; Olmsted Trailer Park WWTP; Brentwood Subdivision WWTP; Vinewood Subdivision WWTP; and others.

Major tributaries to the Rocky River include: Plum Creek, which joins the West Branch in Olmsted Falls; Blodgett Creek, which also joins the West Branch in Olmsted Falls, and includes the Strongsville "A" WWTP effluent; Baldwin Creek, which joins the East Branch in Berea, and includes the North Royalton "B" WWTP effluent; and Abram Creek, which joins the main stem in Cleveland, and includes the Middleburg Heights and Brook Park WWTP effluents.

The Ohio EPA has designated the Rocky River State Resource Water, Aquatic Life Warmwater Habitat, Agricultural Water Supply, Industrial Water Supply, Primary Contact Recreational Use and Seasonal Salmonid Habitat. The NEORSD has selected five locations on the Rocky River which are routinely sampled for chemical, bacteriological, and benthic analysis (Figure 38). Chemical and bacteriological data from Rocky River are presented in Appendix II.

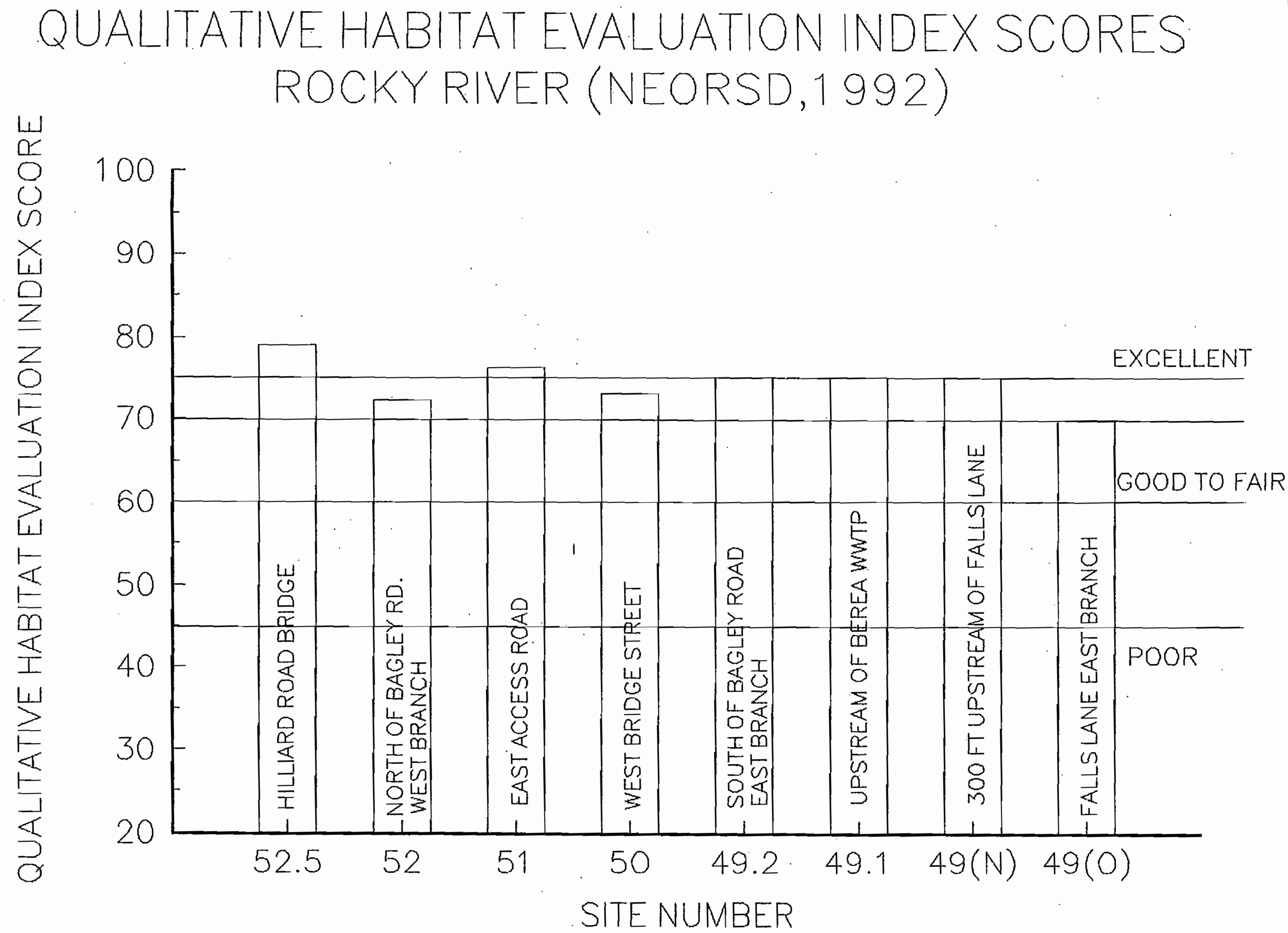
Site #49 (41° 23.16' N, 81° 51.89' W) is located in Berea on the East Branch of the Rocky River, at Valley Parkway north of Falls Lane. In 1992, Site #49 obtained a QHEI score of 75 (Appendix VI).

Site #50 (41° 23.45' N, 81° 51.97' W) is located on the East Branch of the Rocky River at West Bridge Street in Berea. This site is upstream of the Berea WWTP effluent discharge and about 100 yards



Rocky River
(NOT TO SCALE)

Figure 38



QUALITATIVE HABITAT EVALUATION INDEX SCORES
ROCKY RIVER (NEORSD,1992)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
HILLIARD ROAD BRIDGE
NORTH OF BAGLEY RD. WEST BRANCH
EAST ACCESS ROAD
WEST BRIDGE STREET
SOUTH OF BAGLEY ROAD EAST BRANCH
UPSTREAM OF BEREA WWTP
300 FT UPSTREAM OF FALLS LANE
FALLS LANE EAST BRANCH
EXCELLENT
GOOD TO FAIR
POOR
52.5
52
51
50
49.2
49.1
49(N)
49(O)
SITE NUMBER

Figure 39

downstream of the City of Berea Water Purification Plant. Site #50 obtained a QHEI score of 73 in 1992 (Appendix VI).

Site #51 (41° 19.07' N, 81° 48.47' W) is located on the East Branch of the Rocky River in Strongsville, approximately 75 feet upstream of East Access Road in the Metroparks Mill Stream Run Reservation. In 1992, Site #51 obtained a QHEI score of 76.25 (Appendix VI).

Site #52 (41° 22.68' N, 81° 53.91' W) is located on the West Branch of the Rocky River in Olmsted Falls north of Bagley Road. This site is immediately upstream of the confluence with Plum Creek. Site #52 obtained a QHEI score of 72.5 in 1992 (Appendix VI).

Site #52.5 (41° 28.31' N, 81° 49.46' W) is located on the main stem of the Rocky River in the Cleveland Metroparks Rocky River Reservation approximately 30 yards upstream of the Hilliard Road Bridge. This site is approximately 200 yards downstream of the storm sewer outfall at Riverside Drive and Hog's Back Lane, which is the northernmost point of the NEORSD jurisdiction on the Rocky River. Site #52.5 was selected to reflect the environmental impact on the Rocky River from seven upstream storm sewer outfalls, to which numerous combined sewer overflows are known to be tributary. In 1992, Site #52.5 obtained a QHEI score of 79 (Appendix VI).

SPECIAL STUDY SAMPLE LOCATIONS ON THE ROCKY RIVER

Site #49 "new" (40° 23.15' N, 81° 51.94' W) is located approximately 300 yards upstream from Site #49 "old". This site change was made in 1992, because the old site lacked an appropriate habitat for the benthic macroinvertebrate sampling used for HBI calculations. This new site has a more adequate riffle and current (greater than 0.3 m/sec) for macroinvertebrate sampling. Current and habitat are important variables affecting the HBI score (Hilsenhoff, 1987). Site #49 "new" is located downstream of the Berea WWTP effluent. This site obtained a QHEI score of 75.

Site #49.1 (40° 23.01' N, 81° 51.90' W) is located 50 feet upstream of the Berea WWTP effluent (Figure 41). This location was established in 1992 when routine sampling for benthic macroinvertebrates at Site #49 indicated that an environmental disruption was occurring. Site #49.1 was established to determine if the Berea WWTP was the source of the disruption. Site #49.1 obtained a QHEI score of 75.

Site #49.2 is located 150 feet upstream of Bagley Road (Figure 41). This location was selected to assess the impact that several storm and Sanitary Sewer Overflow (SSO) outfalls have on the Rocky River upstream of the Berea WWTP. Site #49.2 obtained a QHEI score of 75.

BENTHOS AT ROCKY RIVER SITES #49, #49.1 AND #49.2

The HBI and QHEI scores calculated for Sites #49, #49.1, and #49.2 (Appendix IV-B) indicate that an environmental disruption is occurring between Bagley Road and the Berea Falls. All three locations have the same QHEI score, suggesting that water quality differences, not habitat, are attributable for the difference in HBI scores. This area is upstream of the Berea WWTP effluent. The HBI score downstream of Site #49.2 at Site #49.1 indicates that fairly significant organic pollution exists. At Site #49.1 the number of total taxa (30) and EPT taxa (6) are significantly lower than the total taxa (53) and EPT taxa (14) found at Site #49.2.

NEORSD investigators located two sanitary sewer overflow structures, one on the west bank and the other on the east bank of Rocky River, between Bagley Road and the Berea Falls. There was a pool of sewage present in the vicinity of each outfall structure, with debris associated with sanitary sewage. The overloaded condition of the sanitary sewers in the vicinity of Bagley Road result in frequent overflows of sewage to Rocky River. The negative impact that these structures have on Rocky River is evident in the benthic data. The deleterious impact that these structures have on Rocky River should diminish following completion of the NEORSD's Southwest Interceptor. Hydraulic overloading of the sewer system downstream of the overflow structures during peak flow periods should be relieved by the Interceptor. Further sampling will be conducted to monitor the progress and effectiveness of remediations to these problems.

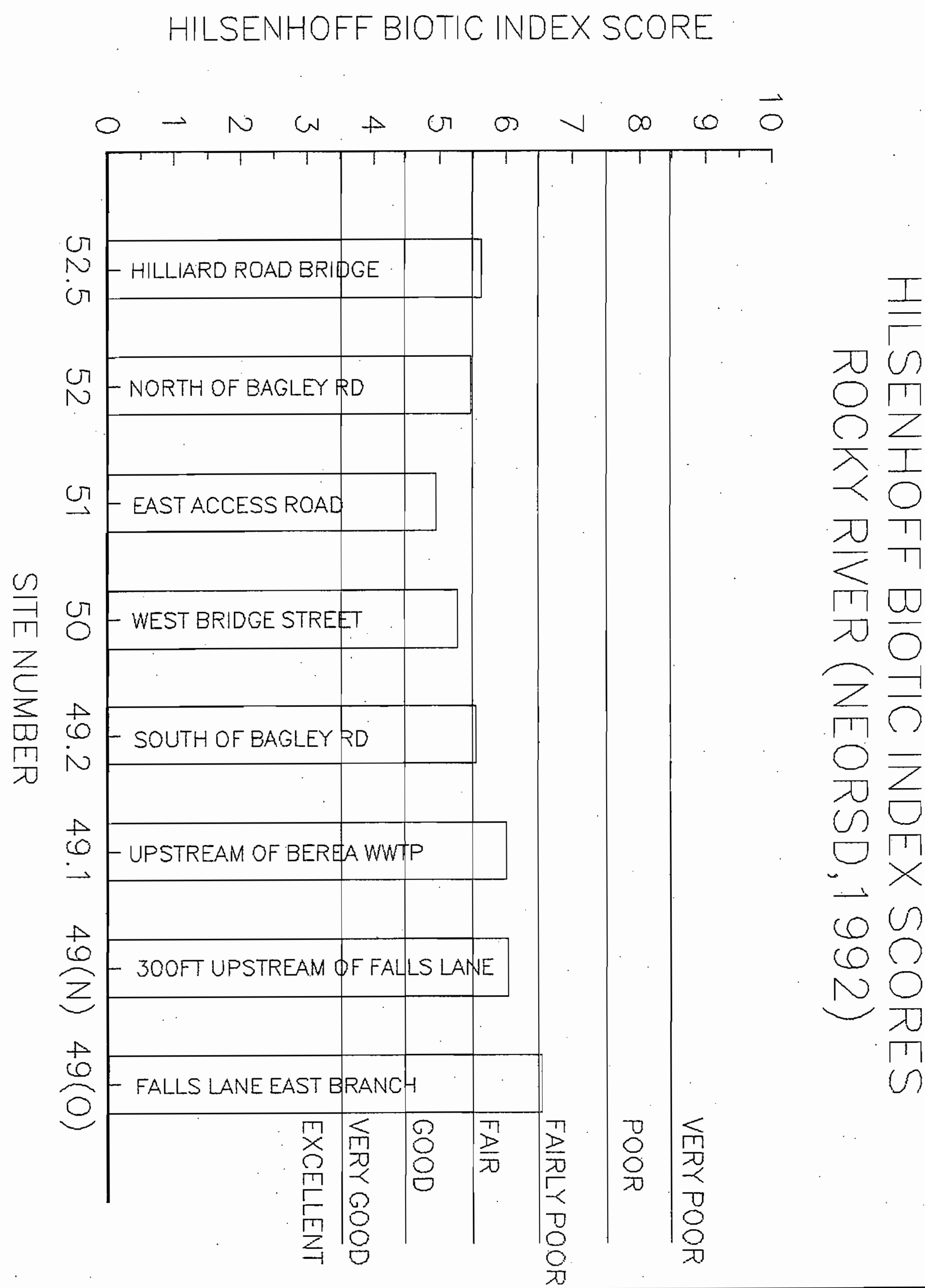
PROBLEMS & REMEDIATION

-1-

On November 25, 1991, NEORSD investigators responded to a report by Cleveland Metroparks personnel of sanitary sewage entering Rocky River from a storm sewer outfall located north of the Lorain Avenue bridge. The sewage was traced back to between 17730 and 18200 Lorain Avenue. A blockage of the sanitary sewer at this location had resulted in sewage leaking into the storm sewer.

NEORSD investigators also discovered a water main break between 17303 and 17400 Lorain Avenue which resulted in additional flow to the storm sewer, upstream of the aforementioned location. On December 17, 1991, the flow from the storm sewer outfall was measured at approximately 173,000 gallons per day. This measurement included the flow from the blocked sanitary sewer and water main break. Bacteriological analysis of this flow showed a fecal coliform concentration of 22,000 organisms per 100 ml on December 17, 1991.

Figure 40


HILSENHOFF BIOTIC INDEX SCORES
ROCKY RIVER (NEORSD, 1992)
HILSENHOFF BIOTIC INDEX SCORE
0
1
2
3
4
5
6
7
8
9
10
SITE NUMBER
52.5
52
51
50
49.2
49.1
49(N)
49(O)
HILLIARD ROAD BRIDGE
NORTH OF BAGLEY RD
EAST ACCESS ROAD
WEST BRIDGE STREET
SOUTH OF BAGLEY RD
UPSTREAM OF BEREA WWTP
300FT UPSTREAM OF FALLS LANE
FALLS LANE EAST BRANCH
EXCELLENT
VERY GOOD
GOOD
FAIR
FAIRLY POOR
POOR
VERY POOR

The City of Cleveland Division of Water Pollution Control and Water Department were notified of the situation. On December 16 and December 19, 1991, the City of Cleveland Division of Water Pollution Control removed the blockage from the sanitary sewer. However, on November 6, 1992 a second occurrence of a blockage in the Lorain Avenue sanitary sewer was discovered by NEORSD investigators. The City of Cleveland Division of Water Pollution Control was again notified of the problem. These blockages had been caused by excessive amounts of grease and cloth products entering the sewer from Fairview General Hospital, 18101 Lorain Avenue. Officials from this hospital were notified by the City of Cleveland Division of Water Pollution Control to more closely monitor its discharge to the sewer system.

-2-

On November 6, 1992, NEORSD investigators responded to a report of a greenish-white colored material entering Rocky River from a storm sewer outfall located on the east bank, north of the Puritas Road bridge. The flow, which emitted a sulfur-type odor, was measured at approximately 14,000 gallons per day. The flow appeared to be run-off from slag used as backfill on newly laid storm sewer pipes on Puritas Road. Further investigation by the Ohio EPA revealed that the Ohio Department of Transportation had used unweathered blast furnace slag as fill for the construction project. A sample of the discharge revealed elevated concentrations of chlorides (1,162 mg/L), sulfates (476 mg/L) and total dissolved solids (2,778 mg/L). Any required remedial action was to be determined by the Ohio EPA. For more information on slag run-off refer to Appendix XIII.

ABRAM CREEK SPECIAL SAMPLE SITES

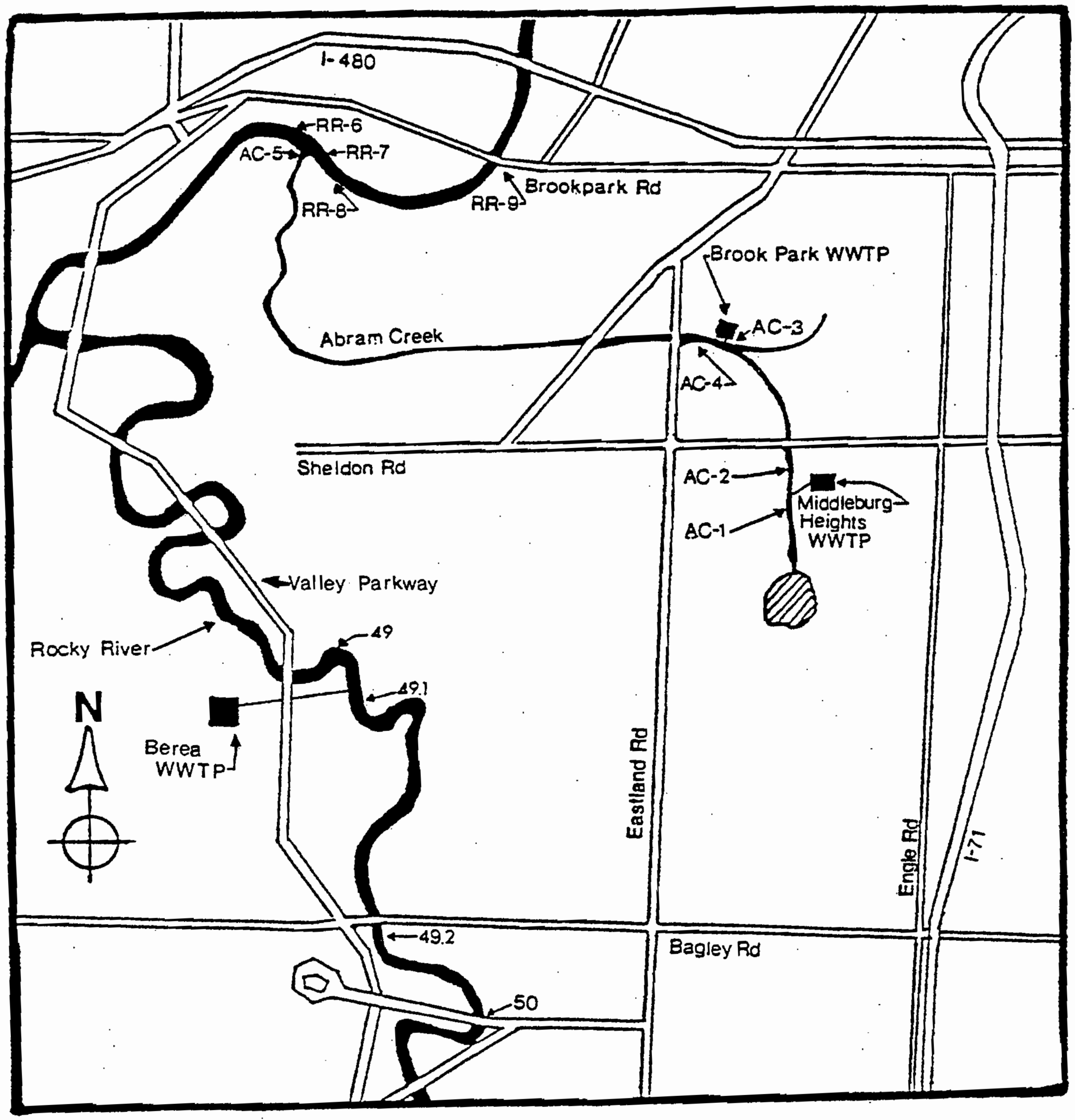
Abram Creek is a tributary of Rocky River with its confluence at River Mile 10.0. NEORSD selected five sample locations on Abram Creek and four locations on Rocky River to gather water quality data prior to the decommissioning of two community owned and operated wastewater treatment plants (WWTPs). The influents to these WWTPs were later diverted to the NEORSD's Southerly WWTP via the Southwest Interceptor west leg. The Middleburg Heights WWTP (18825 Sheldon Road, Creek Mile 4.8), with average daily flow of approximately 2 million gallons per day, was decommissioned on December 30, 1992. The Brook Park WWTP (19400 Plant Lane, Creek Mile 4.3) with average daily flow of 900,000 gallons per day, was decommissioned on January 6, 1993. Data collected prior to the decommissionings will be compared with future data to evaluate the impact on water quality and biota.

Abram Creek upstream of the two treatment plants is channelized, with very slow to nearly undetectable flow. The depth upstream of the Middleburg Heights WWTP is about 0.5 to 1.0 meters. The dark brown water is turbid with a substantial amount of peat particles suspended in the water column. The peat is attributable to the marshy bog-like area upstream. The substrate has a significant amount of peat and muck deposited at an average thickness of 0.2 to 0.3 meters. There are no riffles present upstream of Sheldon Road Creek Mile 4.6. The slow current and increased depth in this section can be attributed to the concrete box culvert structure on the Sheldon Road bridge which is narrower than the stream channel. This structure restricts the flow of the creek, causing the suspended peat to settle out. Abram Creek takes on more natural stream characteristics downstream of this location. The depth of the creek is noticeably lower with an increase in current velocity and riffles.

Samples for chemical and bacteriological analysis were collected at five locations on Abram Creek and at four locations on Rocky River (Appendix VII). Hester-Dendy artificial substrate samplers were installed at all five locations for benthic macroinvertebrate data collection. Additional kick-samples for benthic macroinvertebrates were also obtained (Appendix VIII). Electroshock fish sampling was performed at four of the five locations (Appendix IX).

Site AC-1 (41° 23.46' N 81° 50.22' W, Creek Mile 4.9) is located 50 feet upstream of the Middleburg Heights WWTP effluent. The flow at this location is nearly undetectable. The result of the nearly nonexistent current is that the effluent may backflow upstream. Site AC-1 received a QHEI score of 43.

Site AC-2 (41° 23.28' N 81° 50.18' W, Creek Mile 4.6) is located about 100 yards downstream of the Middleburg Heights WWTP effluent. This location received a QHEI score of 43.



Abram Creek/ Rocky River

(Not To Scale)

Figure 41

Site AC-3 (41° 23.46' N 81° 50.22' W, Creek Mile 4.4) is 25 yards upstream of the Brookpark WWTP effluent. The site received a QHEI score of 50.

Site AC-4 (41° 23.53' N 81° 50.31' W, Creek Mile 4.2) is 100 yards downstream of the Brookpark WWTP effluent. Site AC-4 received a QHEI score of 50.

Site AC-5 (Creek Mile 0.04) is 75 yards upstream of the confluence with Rocky River. This location received a QHEI score of 72.

Site RR-6 is located on the Rocky River approximately 100 yards upstream of the Abram Creek confluence. This location along with Sites RR-7, RR-8, RR-9, were selected for use in the impact assessment of the Middleburg Heights WWTP and Brook Park WWTP decommissioning study.

Site RR-7 is located on the Rocky River approximately 100 yards downstream of the confluence with Abram Creek and 10 feet upstream of a small tributary stream. This location is within the mixing zone of Rocky River and Abram Creek waters.

Site RR-8 is located on the Rocky River 100 yards downstream of Site RR-7 and the tributary stream which flows parallel with Abram Creek and discharges 100 yards downstream of Abram Creek. This tributary stream receives effluent from a pond used for the storage of storm water and process cooling water at NASA Lewis Research Center. Site RR-8 was established to assess the impact this stream and Abram Creek had on the Rocky River.

Site RR-9 is located on the Rocky River at a riffle 50 feet upstream of the Brookpark Road bridge. This location is about 0.5 miles downstream of the Abram Creek confluence and several noted discharges from NASA property.

BENTHOS AT SITES AC-1 THROUGH AC-4 AND RR-6 THROUGH RR-9

The HBI scores (Appendix IV-B) for the 4 upstream locations on Abram Creek were very high indicating "very poor" water quality. The narrative rating of "very poor" is not directly applicable to Sites AC-1 and AC-2 because the habitat does not meet the criteria for HBI evaluation. The absence of well-developed riffles and velocity less than 0.3 m/sec in a stream segment will result in high HBI scores. This type of habitat will have a greater proportion of tolerant organisms than intolerant organisms even if the water quality is good. The scores generated at these 2 locations are for temporal comparison and comparison with other locations that may have a similar habitat type.

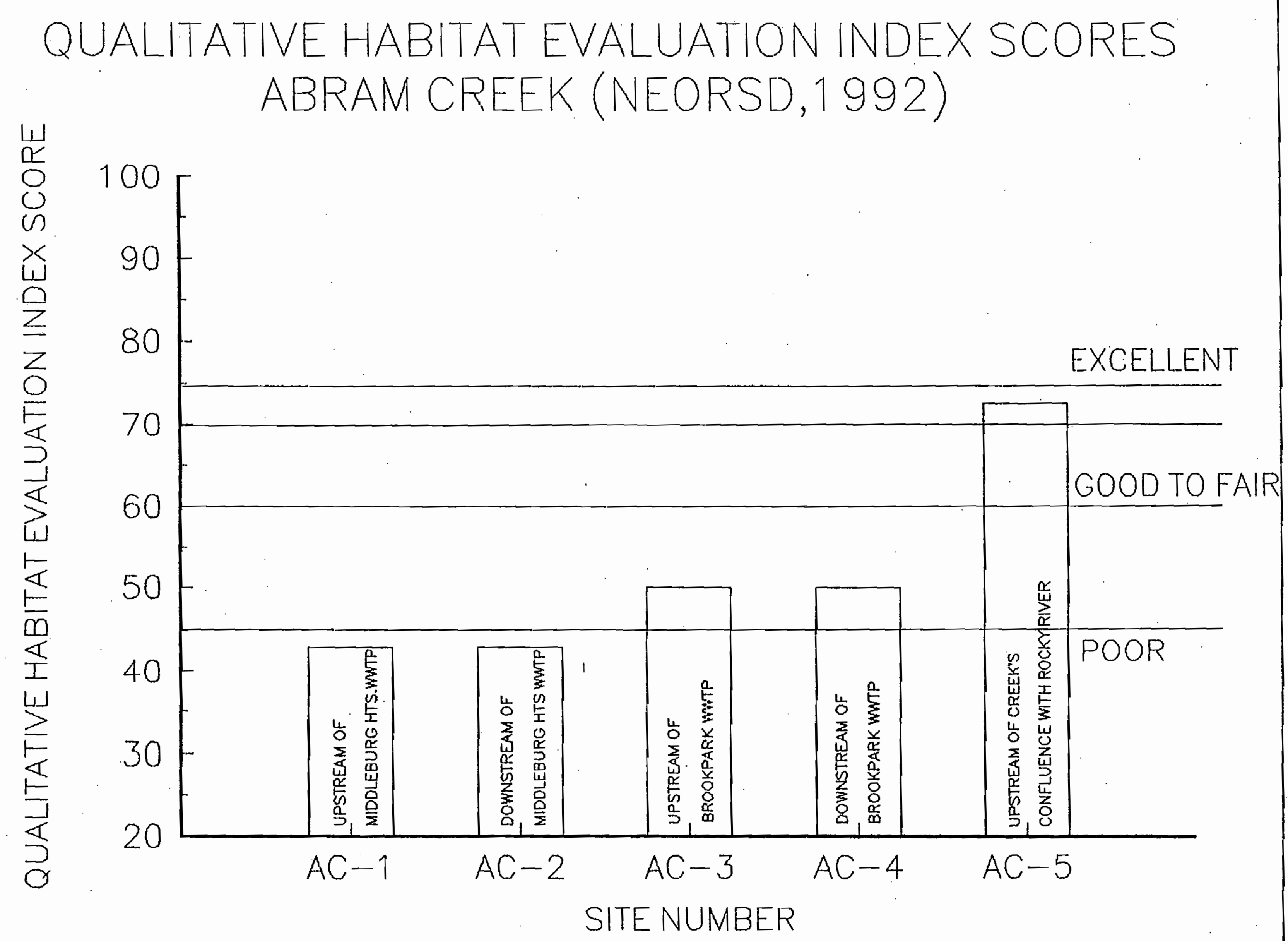
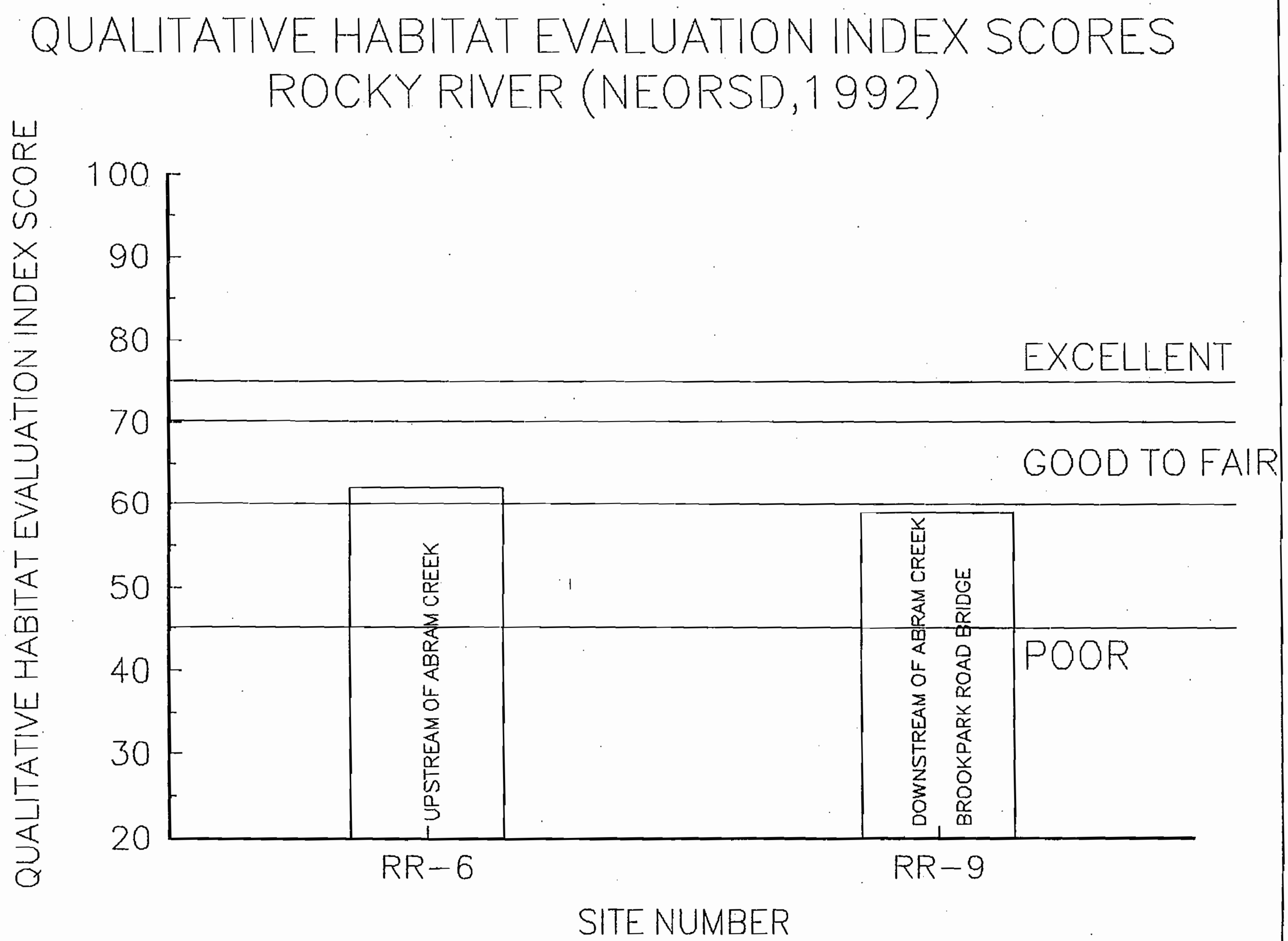

QUALITATIVE HABITAT EVALUATION INDEX SCORES
ABRAM CREEK (NEORSD,1992)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
UPSTREAM OF MIDDLEBURG HTS.WWTP
DOWNSTREAM OF MIDDLEBURG HTS WWTP
UPSTREAM OF BROOKPARK WWTP
DOWNSTREAM OF BROOKPARK WWTP
UPSTREAM OF CREEK'S CONFLUENCE WITH ROCKY RIVER
AC-1
AC-2
AC-3
AC-4
AC-5
SITE NUMBER

Figure 42



QUALITATIVE HABITAT EVALUATION INDEX SCORES
ROCKY RIVER (NEORSD,1992)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
UPSTREAM OF ABRAM CREEK
DOWNSTREAM OF ABRAM CREEK
BROOKPARK ROAD BRIDGE
RR-6
RR-9
SITE NUMBER

Figure 43

At Site AC-1, the HBI score is higher than that for AC-2. This higher score may be attributable to the stream characteristics and the close proximity of the effluent channel, which has been observed flowing upstream. The flow restriction at Sheldon Road causes it to backflow upstream. It must be noted that the HBI score at Site AC-4 is higher than at Site AC-3, indicating a detrimental impact of the Brook Park WWTP effluent on the water quality of Abram Creek.

The HBI scores for Rocky River Sites RR-6, RR-7, and RR-9 are within the "Good" narrative rating (Appendix VIII-A). However, total taxa, EPT taxa, percent EPT composition and the Shannon Diversity Index value ($\bar{d}$) are lower at Site RR-7 than at RR-6 and RR-9, indicating a possible negative impact on the benthic community of the Rocky River (Appendix VIII-A). A comparison between the assemblage of benthic macroinvertebrates at Sites RR-6 and RR-9 demonstrates a greater similarity between each other than to that found at Site RR-7 (Appendices VIII-G through VIII-I). The impact on the benthic community of the Rocky River may be more attributable to non-organic pollution and/or changes in habitat than organic pollution, because the HBI scores are not significantly different while the other indices are. The HBI, which is used to determine impacts of organic pollution, is not as sensitive to impacts from non-organic pollution and/or changes in habitat as the other indices discussed previously.

Changes in habitat at AC-5 and RR-7 have been noted. Observed on several occasions following heavy rain events are significant amounts of silt, debris, stream bed alteration and shifting substrates at Site AC-5 and just upstream of RR-7. During rain events, this siltation and shifting of substrates may have an adverse effect on the assemblage of benthic macroinvertebrates at Site RR-7. Further investigation is required to determine the source(s) of negative impact on the Rocky River biota at Site RR-7.

In 1992, Hester-Dendy artificial substrate samplers were installed at all five Abram Creek locations and three Rocky River locations. As of the writing of this report, the processing and ICI calculations are not complete. The results of the Hester-Dendy sampling and ICI's will be presented in subsequent reports. Further sampling for benthic macroinvertebrates is planned for 1994 to evaluate if any changes in biota have occurred.

ABRAM CREEK BACTERIOLOGICAL DATA

Fecal coliform and E. coli concentrations measured at Sites AC-1, AC-2, and AC-3 exceeded the water quality criterion for Primary Contact Recreational Use on August 3, 1994 (Appendix VII). Conversely, all sites downstream of the Brook Park WWTP (AC-4, AC-5, and RR-7) sampled on August 3, 1992 were meeting Primary Contact Recreational Use standards. Therefore, that date's bacteriological criterion exceedances may be attributable to the Middleburg Heights

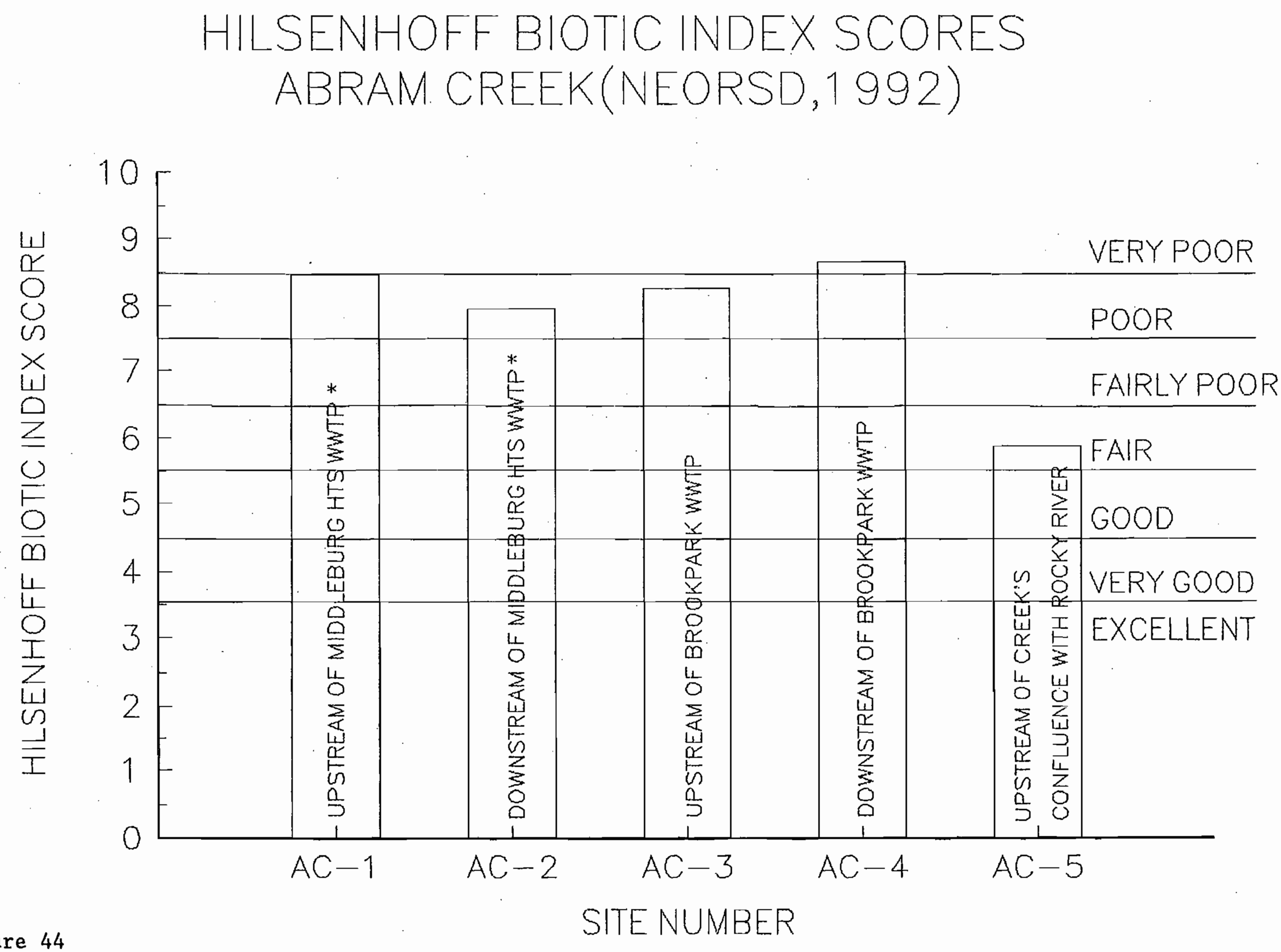


Figure 44

* HABITAT AT THIS LOCATION DOES NOT FULLY MEET CRITERIA FOR HBI CALCULATION;SUPPLEMENTAL SCORE ONLY .

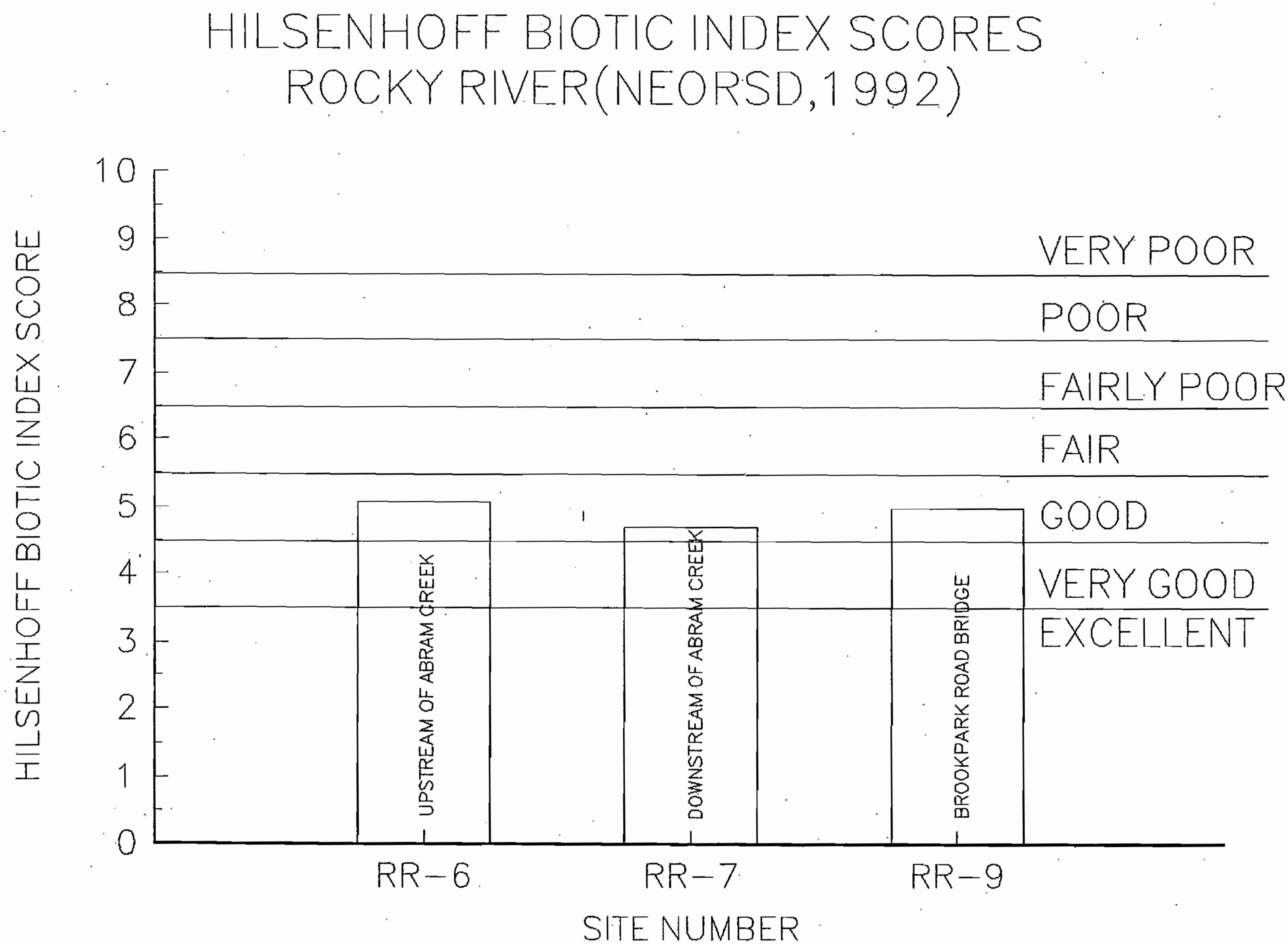

HILSENHOFF BIOTIC INDEX SCORES
ROCKY RIVER(NEORSD,1992)
HILSENHOFF BIOTIC INDEX SCORE
0
1
2
3
4
5
6
7
8
9
10
UPSTREAM OF ABRAM CREEK
DOWNSTREAM OF ABRAM CREEK
BROOKPARK ROAD BRIDGE
RR–6
RR–7
RR–9
SITE NUMBER
VERY POOR
POOR
FAIRLY POOR
FAIR
GOOD
VERY GOOD
EXCELLENT

Figure 45

WWTP, which had reported two sewage bypasses at the end of July 1992 (3.25 hours on July 30 and 14 hours on July 31). The bypassed sewage had been directed to a 10 million gallon retention lagoon, where it received primary treatment and was discharged without disinfection to Abram Creek at a controlled rate.

Fecal coliform and E. coli concentrations also exceeded Primary Contact Recreational Use criteria on August 19, 1992. However, the bacteriological criterion exceedances were noted at all Abram Creek and Rocky River sites sampled on that date, including the Rocky River site upstream of the Abram Creek confluence (RR-6). Storm events had occurred in the area on August 18 according to NEORSD rain gauge data, and elevated water levels were noted in the streams at the time of sampling. Therefore these criterion exceedances may be attributed to wet weather.

CHAGRIN RIVER

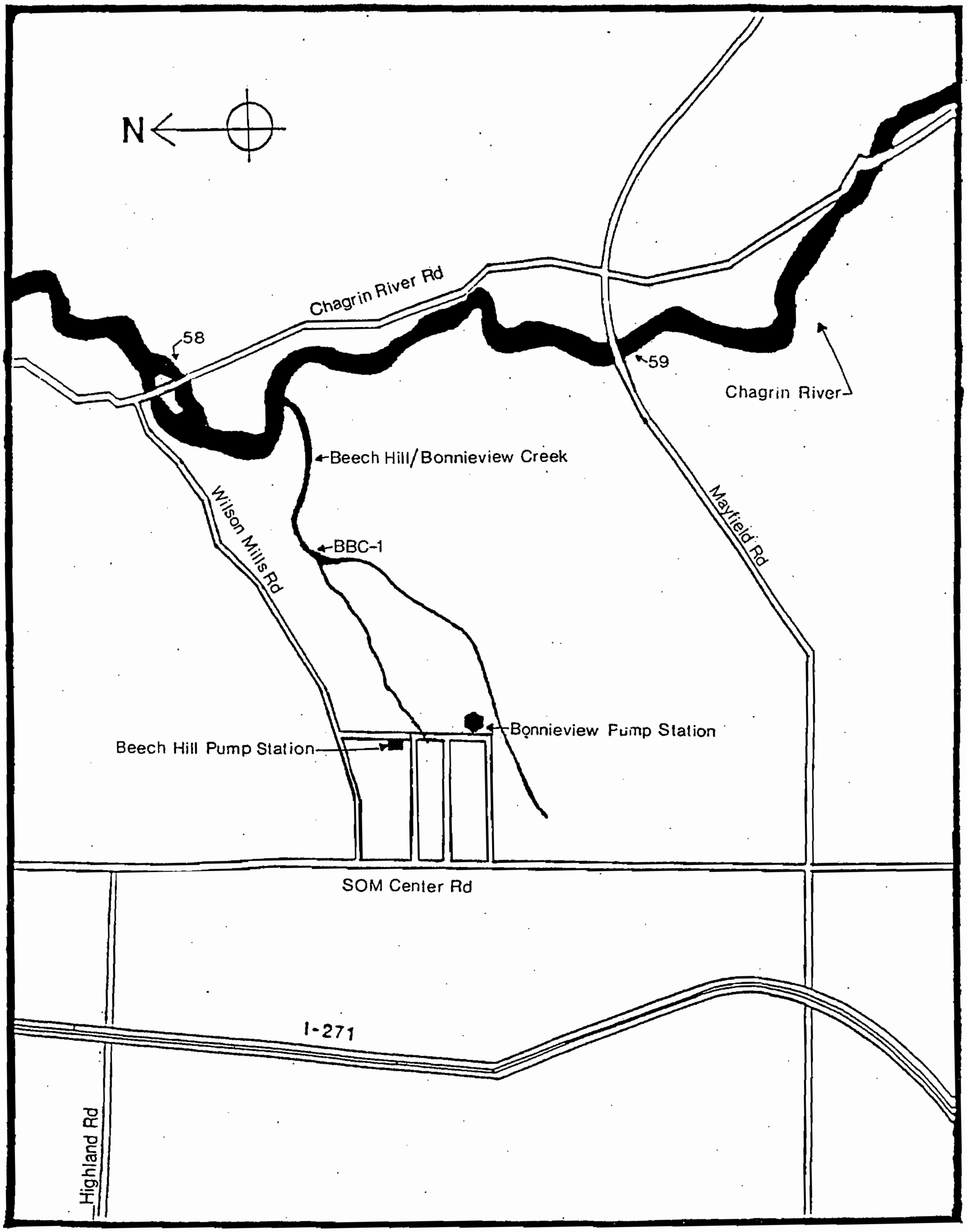
The Chagrin River has a total length of 48 miles, with a drainage area of 267 square miles. The land use is primarily rural with a low density of residential housing. Communities located in the Chagrin River drainage area include: Aurora, Chagrin Falls, Chesterland, Eastlake, Mayfield Heights, The Village of Mayfield, Newbury, Solon, Willoughby, Willoughby Hills, and several other eastern suburbs of Cleveland. Development pressures in the drainage area are potential causes of degradation of the habitat. However the majority of the Chagrin River has good to exceptional water quality with a healthy biological community.

The entire Chagrin River basin is considered a State Resource Water. The main stem of the Chagrin River from the headwaters to River Mile 4.8 has been designated by the Ohio EPA Warmwater Habitat and Primary Contact Recreational Use. From River Mile 4.8 to the mouth, the river has been designated Exceptional Warmwater and Seasonal Salmonid Habitat, and Primary Contact Recreational Use. The Ohio EPA has designated the following tributaries of the Chagrin River as Exceptional Warmwater Habitat and Primary Contact Recreational Use: Griswald Creek, Willey Creek, McFarland Creek, and Beaver Creek. Coldwater Habitat and Primary Contact Recreational Use designations apply to Silver Creek and the East Branch along with its tributaries.

The Chagrin River has been assigned two sites for routine sampling by the NEORSD. These sites were chosen to evaluate the potential impact on Chagrin River water quality from the NEORSD-owned and -operated Beech Hill Pump Station at 6830 Wilson Mills Road and Bonnieview Pump Station at Beech Hill Road and Bonnieview Road. One site is located upstream of the sewage pumping stations' bypass effluents (Site #59) and the other is located downstream of the effluents (Site #58). Chemical and bacteriological data from Chagrin River are presented in Appendix II.

Site #58 (41° 32.94' N, 81° 24.88' W) is located on the main stem of the Chagrin River at River Mile 15.1, approximately 3,500 feet downstream of the confluence with Beech Hill/Bonnieview Creek and 1,500 feet east of the Chagrin River Road bridge. Beech Hill/Bonnieview Creek receives flow from the Beech Hill and Bonnieview Pump Stations during bypass events. In 1992, Site #58 obtained a QHEI score of 76 (Appendix VI).

Site #59 (41° 31.62' N, 81° 24.69' W) is located on the main stem of the Chagrin River at River Mile 17.4, which is approximately 1.6 miles upstream of the confluence with Beech Hill/Bonnieview Creek. Samples are obtained from the south side of the Mayfield Road bridge. In 1992, Site #59 obtained a QHEI score of 78 (Appendix VI).



Chagrin River & Beech Hill/ Bonnieview Creek

(Not To Scale)

Figure 46

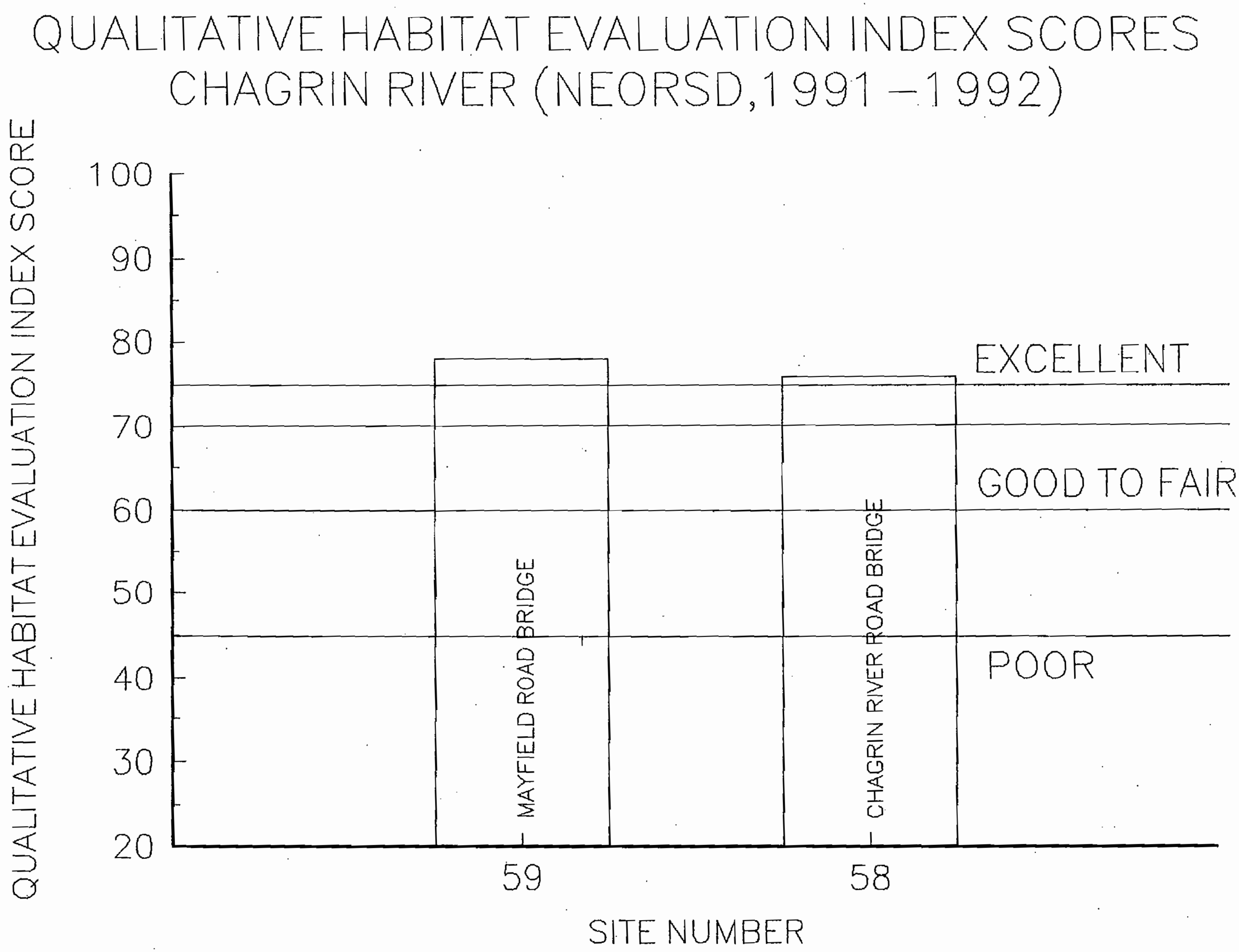

QUALITATIVE HABITAT EVALUATION INDEX SCORES
CHAGRIN RIVER (NEORSD,1991 -1992)
QUALITATIVE HABITAT EVALUATION INDEX SCORE
100
90
80
70
60
50
40
30
20
EXCELLENT
GOOD TO FAIR
POOR
MAYFIELD ROAD BRIDGE
CHAGRIN RIVER ROAD BRIDGE
59
58
SITE NUMBER

Figure 47

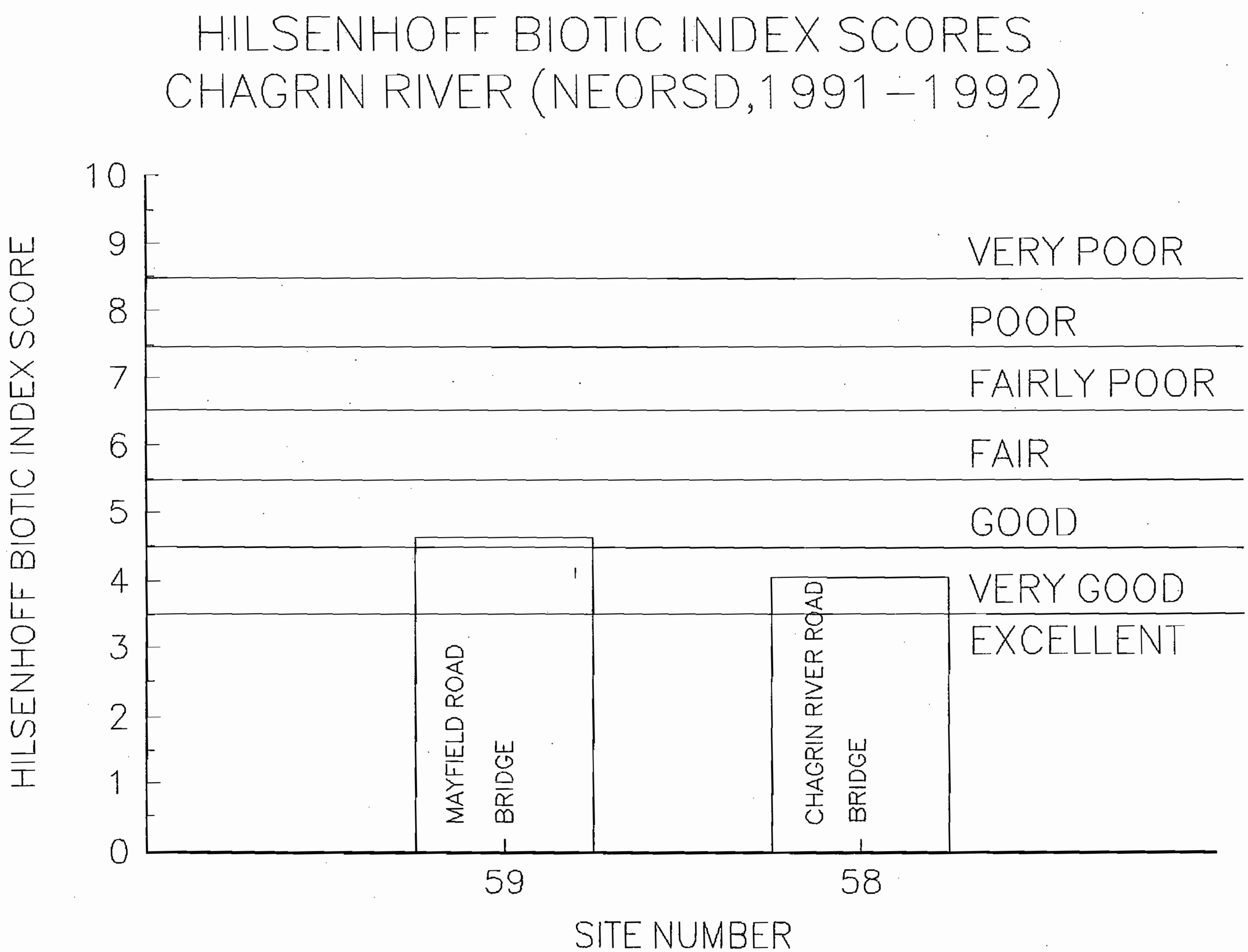

HILSENHOFF BIOTIC INDEX SCORES
CHAGRIN RIVER (NEORSD,1991-1992)
HILSENHOFF BIOTIC INDEX SCORE
10
9
8
7
6
5
4
3
2
1
0
VERY POOR
POOR
FAIRLY POOR
FAIR
GOOD
VERY GOOD
EXCELLENT
MAYFIELD ROAD
BRIDGE
CHAGRIN RIVER ROAD
BRIDGE
59
58
SITE NUMBER

Figure 48

SPECIAL SAMPLE SITE ON "BEECH HILL/BONNIEVIEW" CREEK

Beech Hill Creek is a small stream which receives the effluent from the Beech Hill Pump Station (6830 Wilson Mills Road) during occasional bypass events. The Beech Hill Creek flows east, where it is joined by the Bonnieview Creek. The Bonnieview Creek receives flow from the Bonnieview Pump Station (Beech Hill Road and Bonnieview Road) during bypass events. Downstream of the confluence of Beech Hill and Bonnieview Creeks, the stream is referred to by NEORSD investigators as the Beech Hill/Bonnieview Creek (Figure 46). The Beech Hill/Bonnieview Creek flows in an easterly direction until its confluence with the Chagrin River (RM 15.7), upstream of Site #58 (RM 15.1).

Site BBC-1 is located approximately 150 feet downstream from the confluence of the Beech Hill and Bonnieview Creeks. This site was selected in 1992 for an initial water quality assessment of Beech Hill/Bonnieview Creek. During the initial survey, several septic tank effluents from residential areas tributary to Beech Hill Creek were noted. Benthic macroinvertebrate data (Appendix IV-B) indicate that fairly significant organic pollution exists. A portion of this organic pollution can be attributed to the occasional bypass events at the pump stations, located upstream of Site BBC-1, with septic tank effluents attributable for a remaining portion of pollution. Further sampling and additional sample sites would be necessary to determine the extent of impact each source actually has on the creek.

In 1992, several new housing developments adjacent to both the Beech Hill and Bonnieview Creeks were under construction. Additional sampling and investigations would be necessary to determine if old septic tanks have been decommissioned and to assess the impact further development will have on the streams. When the Heights Hilltop Interceptor is completed, the Beech Hill, Bonnieview and Wilson Mills Pump Stations will be decommissioned, eliminating all bypasses and potentially, leading to improved water quality for Beech Hill and Bonnieview Creeks.

BENTHOS AT SITES #58 AND #59

The Invertebrate Community Index (ICI) scores calculated from 1991 Hester-Dendy samples for Sites #58 and #59 place both locations within the "Exceptional" narrative rating (Appendix IV-N). Both locations received an ICI score of 50. These ICI scores indicate that no negative impact on the benthic fauna of the Chagrin River is attributable to flow from the Beech Hill/Bonnieview Creek. The 1991 and 1992 Hilsenhoff Biotic Index (HBI) scores calculated for these locations also support this conclusion (Appendix IV-B, Figure 48).

PROBLEMS AND REMEDIATION

-1-

On November 17, 1992, NEORSD investigators responded to a report of a "fuel oil" type substance in a storm sewer at 6805 Mayfield Road in Mayfield Heights. This storm sewer discharges to a tributary stream of the Chagrin River. On this date, snow melt run-off and ground water was contributing to the flow in the storm sewer. Diesel fuel was detected in the creek downstream of the storm sewer outfall. Pooled areas and margins along the stream had a noticeable sheen and diesel fuel odor.

NEORSD investigators, with the assistance from Mayfield Heights Fire Department and Ohio EPA officials, traced the fuel oil back to a construction project at the Meridia Hillcrest Hospital, 6780 Mayfield Road in Mayfield Heights. The substance was determined to be diesel fuel which had leaked from a storage area. The construction was being performed by Webster Engineering. A Webster Engineering official indicated that the diesel fuel had leaked from a storage tank while it was being moved. Spillage of diesel fuel during transfer to machinery and possible leakage from machinery may be another source of diesel fuel entering the storm sewer. Webster Engineering and Meridia Hillcrest Hospital officials agreed to clean up the fuel spill and install containment and absorbant booms in the creek and storm sewer.

-2-

In 1991 and 1992, there were occasional bypasses of sewage from the NEORSD's Beech Hill and Bonnieview Pump Stations. These bypasses were the result of equipment malfunctions and power failures. The Bonnieview Pump Station (Beech Hill and Bonnieview Road) is tributary to the Beech Hill Pump Station (6830 Wilson Mills Road) which, in turn, is tributary to the Cuyahoga County owned and operated Wilson Mills Pump Station. Bypasses of sewage resulting from malfunction or failure at any of these three pump stations can be directed to a one million gallon retention tank located at the Bonnieview Pump Station for primary treatment and disinfection. This minimizes the environmental impact from high volume sewage bypasses.

The Beech Hill Pump Station reported four bypass events in 1991 and four bypass events in 1992 (Table 8). The Bonnieview Pump Station reported one bypass event in 1991 and none in 1992 (Table 9).

As the Heights-Hilltop Interceptor is completed, these pump stations (Bonnieview, Beech Hill and Wilson Mills) will be decommissioned. The planned date for decommissioning is December 1994. The decommissioning of the pump stations should eliminate the bypasses of sewage to the environment. Future sampling of the Beech Hill/Bonnieview Creek will be conducted to document the expected improvements in water quality resulting from completion of NEORSD's Heights-Hilltop Interceptor.

Table 8: Beech Hill Pump Station Bypasses (From NEORSD Records)

Date	Duration	Quantity	Reason
1/11/91	12 Hours	Approximately 1,000,000 gallons (1,000,000 gallons of additional flow directed to Bonnieview Pump Station retention tank for storage.)	Force main failure on discharge line from Beech Hill Pump Station at Wilson Mills Road and Lander Road.
3/17/91	1 Hour	Approximately 30,000 gallons	CEI power failure, emergency generator failed.
4/11/91	1.3 Hours	Approximately 140,000 gallons	CEI power failure, emergency generator malfunction.
11/21/91	21.5 Hours	Approximately 375,000 gallons	Force main break near Wilson Mills Road and I-271.
5/7/92	0.66 Hours	Approximately 2,500 gallons	Wilson Mills Pump Station shut down for electrical work, causing Beech Hill Pump Station to shut down.
7/2/92	Intermittent for 9 hours	Approximately 25,000 gallons	Pump and circuit board failure.
8/11/92	Intermittent bypass	Unknown volume	Ohio Bell phone line problem between Wilson Mills Pump Station and Beech Hill Pump Station causing lock-out of pumps.
9/6/92	2.17 Hours	Approximately 7,500 gallons	Transmission line failure between Wilson Mills Pump Station and Beech Hill Pump Station.

Table 9: Bonnieview Pump Station Bypasses (From NEORSD Records)

Date	Duration	Quantity	Reason
3/7/91	1 Hour	Unknown	Power failure at Beech Hill Pump Station

LAKE ERIE

In 1990, the NEORSD initiated sampling of Lake Erie water quality in the vicinity of Greater Cleveland. The NEORSD's jurisdictional area is located entirely within the Lake Erie basin, and therefore all waters from NEORSD facilities are ultimately tributary to Lake Erie.

The lake is the site of the area's heaviest recreational water use, including bathing, boating, and fishing. Additionally, the City of Cleveland uses Lake Erie as its public water supply, pumping water for domestic, commercial, and industrial uses from intakes located offshore.

The 15 NEORSD Lake Erie routine sampling sites were selected to evaluate the impact of potential sources of pollution on ambient water quality, at sites where it is most critical to the uses to be protected and where the impact is likely to be most severe (Figure 49). All chemical and bacteriological parameters measured by the NEORSD on area streams were also measured at the Lake Erie sites. Samples were collected using a NEORSD-rented boat between June 1992 and October 1992 from near the lake surface at each site for chemical and bacteriological analysis and also near the lake bottom for chemical analysis at three sites.

No attempt was made by the NEORSD to limit the routine lake sampling to conditions of dry weather pollution impacts. Wet weather sources may affect lake water quality for a much longer period of time than they affect stream water quality, although the impact is diminished by greater dilution in the lake. Water quality is less subject to variability in a large water body's lentic environment than in a stream's lotic environment.

In addition to the routine sampling, intensive Lake Erie sampling was conducted by the NEORSD between June and September 1992 during wet weather conditions to assess the water quality impact from the Westerly WWTP Combined Sewer Overflow Treatment Facility (CSOTF). This study included analysis of chemical and bacteriological parameters and benthic macroinvertebrates. Details of the study and its results and conclusions are reported in the Westerly WWTC Combined Sewer Overflow Treatment Facility Final Report on Water Quality Sampling Program prepared under contract with NEORSD for Havens and Emerson, Incorporated by Camp Dresser and McKee.

The Ohio EPA has designated Lake Erie Exceptional Warmwater Habitat, State Resource Water, Public Water Supply, Agricultural Water Supply, Industrial Water Supply, and Bathing Waters for Recreational Use. Public Water Supply criteria only apply within 500 yards of surface water intakes. Chemical and bacteriological data from the NEORSD routine sampling of Lake Erie are presented in Appendix III.

Site A is located near the submerged Crown Water Intake, at 81° 52.80' N, 41° 31.16' W. The site is about 2.6 miles offshore on a heading of 310 degrees northwest from the east side of the mouth of the Rocky River. The average water depth at Site A was measured at 46 feet.

Site B is located within 500 yards west of the visible Baldwin Water Intake Crib at 81° 45.00' N, 41° 32.90' W. Also in this vicinity is the submerged Garret A. Morgan (Division) Water Intake at 81° 45.83' N, 41° 32.83' W. The average water depth at Site B was measured at 48 feet.

Site C is located near the submerged Nottingham Water Intake at 81° 37.05' N, 41° 37.08 W. The site is about 3.5 miles offshore on a heading of 315 degrees northwest of the mouth of Euclid Creek. The average water depth at Site C was measured at 48 feet.

Site D (41° 29.57' N, 81° 50.09' W) is located east of the Rocky River mouth. Site D was selected to evaluate the impact of flow from the Rocky River on water quality in Lake Erie. The average depth at Site D was measured at 12 feet.

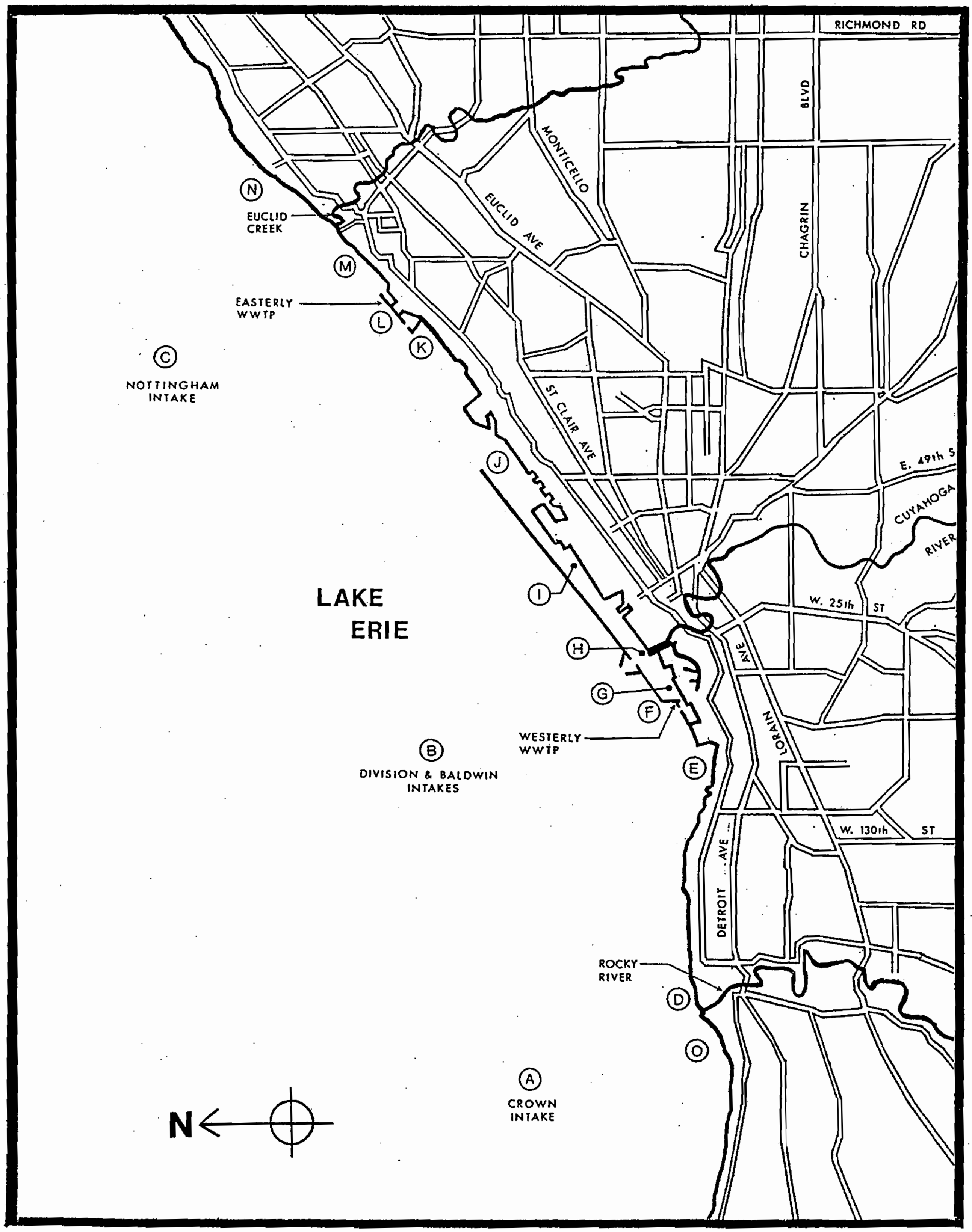
Site E (41° 29.41' N, 81° 44.45' W) is located offshore of Edgewater Beach. This site was selected to evaluate the water quality of Lake Erie in this area of heavy recreational use. The average water depth at Site E was measured at 10 feet.

Site F (41° 30.05' N, 81° 43.66' W) is located near the NEORSD Westerly WWTP treated effluent discharge to Lake Erie, which is submerged 185 feet north of the northwest corner of the Cleveland Harbor breakwall. This site was selected to evaluate the water quality of Lake Erie within the plant's effluent mixing zone. The average water depth measured at this location was 30 feet.

Site G (41° 29.74' N, 81° 43.58' W) is located inside the Cleveland Harbor, east of the location of the NEORSD Westerly Combined Sewer Overflow Treatment Facility (CSOTF) discharge to the harbor. This site was selected to evaluate the water quality in the west end of Cleveland Harbor, which is potentially impacted by flows from both the Westerly CSOTF discharge and the Cuyahoga River. The average water depth at this location was measured at 20 feet.

Site H (41° 30.25' N, 81° 42.76' W) is located within the Cleveland Harbor, approximately 50 feet northwest of the mouth of the Cuyahoga River. This site was selected to evaluate the influence of the Cuyahoga River on the water quality of Lake Erie within the Cleveland Harbor. This location is in a high-traffic area during the commercial shipping and recreational boating season. The average water depth at Site H was measured at 33 feet.

Site I (41° 31.22' N, 81° 40.93' W) is located inside the Cleveland Harbor breakwall offshore from Burke Lakefront Airport, just east of



Lake Erie
(NOT TO SCALE)

Figure 49

Channel Marker #9. This site was selected to evaluate the water quality of Lake Erie within the eastern Cleveland Harbor and potential impacts on it, including five combined sewer overflows along the lakefront between East 20th Street and East 38th Street. The average water depth at Site I was measured at 25 feet.

Site J (41° 32.33' N, 81° 38.77' W) is located approximately 200 feet offshore from Gordon Park, at the east end of the Cleveland Harbor. This site was selected to evaluate the water quality inside the harbor as it enters the open area of Lake Erie. The average water depth at Site J was measured at 27 feet.

Site K (41° 34.15' N, 81° 35.54' W) is located between Nine-Mile Creek to the west and the NEORSD Easterly WWTP to the east, approximately 200 feet offshore from White City Beach, west of its breakwall. This site was selected to evaluate the potential impact on Lake Erie water quality from several Cleveland East Side streams, including the severely polluted Dugway Brook and Nine-Mile Creek, and a major combined sewer overflow outlet located at the end of a pier between White City Beach and the Easterly WWTP. The average water depth at Site K was measured at 10 feet.

Site L (41° 34.46' N, 81° 35.33' W) is located approximately 50 feet north of the Easterly WWTP discharge to Lake Erie. This site was selected to evaluate the water quality of Lake Erie within the Easterly WWTP effluent mixing zone. The average water depth at Site L was measured at 19 feet.

Site M (41° 35.07' N, 81° 34.25' W) is located approximately 300 feet offshore from Euclid Beach and one mile northeast of the Easterly. This site was selected to evaluate the water quality of Lake Erie in the vicinity of the beach, where recreational use is relatively heavy. The average water depth at Site M was measured at 13 feet.

Site N (41° 36.01' N, 81° 33.07' W) is located approximately 300 feet offshore from Euclid General Hospital, about one mile northeast of the mouth of Euclid Creek. This site was selected to evaluate the water quality of Lake Erie entirely "down-lake" from the NEORSD jurisdictional area. The average water depth at Site N was measured at 13 feet.

Site O (41° 29.34' N, 81° 50.86' W)is located west of the mouth of the Rocky River. This site was selected to evaluate the water quality of Lake Erie entirely "up-lake" and outside of any expected influence from the NEORSD jurisdictional area. The average water depth at Site O was measured at 11 feet.

-1-

On March 22, 1991, NEORSD investigators responded to a report of a fluorescent orange-colored material entering Lake Erie from a storm sewer outfall at the Forest City Yacht Club, 5301 North Marginal Road. Investigators determined that the discolored flow entered Lake Erie via a

discharge from a combined sewer, which may have overflowed during a rain event earlier that day. Although the orange material was no longer entering the lake, NEORSD investigators attempted to trace back the source of the discolored flow. Red and orange colored solids were noted in the Hamilton Avenue sewer, between East 45 Street and East 49 Street, in the vicinity of Day Glo Color Corporation Plant #2, 4515 Hamilton Avenue. This company, which manufactures fluorescent paints and powdered pigments, was investigated as a possible source. Day Glo Color Corporation representatives agreed that a sample of the colored material resembled their product but they were unable to identify the specific source of the discharge within their facility. Samsel Services Company was contracted by Day Glo Color Corporation to remove the material from Lake Erie at the Forest City Yacht Club.

-2-

On June 12, 1992, NEORSD investigators responded to a chromic acid spill at Argo-Tech Corporation, 23555 Euclid Avenue. Approximately 200 gallons of condensate return water contaminated with chromic acid entered a storm sewer which discharges into Lake Erie at an outfall on East 222 Street. Samples obtained by Argo-Tech at the storm sewer outfall showed chromium concentrations ranging from 12 mg/L to 38 mg/L. Argo-Tech Corporation officials notified the Ohio EPA and U.S. Coast Guard of the incident.

On June 15, company officials informed NEORSD personnel that plans had been initiated to re-route the storm sewer to the sanitary sewer system. As this incident was determined to be outside of the NEORSD jurisdictional area, all follow-up investigations were performed by the Ohio EPA.

-3-

On July 1, 1992, NEORSD investigators discovered a whitish, gray-colored material entering Lake Erie from a storm sewer outfall on East 156 Street, north of Lake Shore Boulevard. Investigators were unsuccessful in identifying the source(s) of this material. A follow-up inspection on July 2 revealed no evidence of the substance at the storm sewer outfall.

GREATER CLEVELAND AREA

ENVIRONMENTAL WATER QUALITY ASSESSMENT

1991-1992 REPORT

APPENDICES

APPENDIX I

BIBLIOGRAPHY

Appendix I: Bibliography

American Public Health Association, American Water Works Association, and Water Pollution Control Federation. 1992. Standard Methods for the Examination of Water and Wastewater. 18th Edition. American Public Health Association, Washington, D.C.

Battelle Columbus Division. 1990. A Field and Laboratory Site-Specific Evaluation of Cadmium, Copper, and Zinc for the Cuyahoga River in the Vicinity of the Northeast Ohio Regional Sewer District's Southerly Effluent Discharge. Draft. Submitted to the Northeast Ohio Regional Sewer District, Cleveland, Ohio.

Baumann, P.C., W.D. Smith and M. Ribick. 1982. Hepatic Tumor Rates and Polynuclear Hydrocarbon Levels in two Populations of Brown Bullhead (Ictalurus nebulosus). In: Polynuclear Aromatic Hydrocarbons: 6th Int. Symp. Physical and Biological Chem., pp. 93-102. Battelle Press, Columbus, Ohio.

Bode, R.W. 1983. Larvae of North American Eukiefferiella and Tvetenia (Diptera: Chironomidae). Bulletin New York State Museum 452.40 pp.

Brown, H.P. 1972. Biota of Freshwater Ecosystems, Identification Manual 6: Aquatic Dryopoid Beetles (Coleoptera) of the United States. Water Pollution Control Research Series, U.S. Environmental Protection Agency, Washington, D.C.

Cairns, J. Jr., and K.L. Dickson. 1971. A Simple Method for the Biological Assessment of the Effects of Waste Discharges on Aquatic Bottom-Dwelling Organisms. Journal of Water Pollution Control Federation 43(5):755-772.

Camp, Dresser and McKee. 1993. NEORSD CSO Facilities Plan Phase 1 Study. Westerly WWTC Combined Sewer Overflow Treatment Facility. Final Report on Water Quality Sampling Program. Prepared for Havens and Emerson, Inc. Submitted to the Northeast Ohio Regional Sewer District. Cleveland, Ohio.

Cline, L.D., Short, R.A., and Ward, J.V. 1982. The Influence of Highway Construction on the Macroinvertebrates and Epilithic Algae of a High Mountain Stream. Hydrobiologia 96.149-59.

Curry, L.L. 1962. A Survey of Environmental Requirements for the Midge (Diptera: Tendipidae). In: C.M. Tarzwell, ed. Biological Problems in Water Pollution. Transactions of Third Seminar, USDHEW, PHS, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.

Cuyahoga River Remedial Action Plan Coordinating Committee, and Northeast Ohio Areawide Coordinating Agency. 1992. Cuyahoga River Remedial Action Plan Stage One Report.

Cuyahoga River Remedial Action Plan Fish Consumption Technical Committee. 1994. 1989-1992 Fish Tissue Collection and Analysis. Prepared for the Cuyahoga River Community Planning Organization.

Doeg, T.J. and G.A. Milledge, 1991. Effect of Experimentally Increasing Concentrations of Suspended Sediment on Macroinvertebrate Drift. Australian Journal of Marine and Freshwater Research. 42(5): 519-526.

EA Science and Technology. 1988. Results of a Fish Survey of the Cuyahoga River, August 1988. Prepared for the Northeast Ohio Regional Sewer District, Cleveland, Ohio.

Eddy, S. and A.C. Hodson. 1982. Taxonomic Keys to the Common Animals of the North Central States: Exclusive of the Parasite Worms, Terrestial Insects and Birds. Fourth Edition, Rev. Underhill, J.C., Schmid, W.D., and Gilbertson, D.E. Burgess Publishing. Minneapolis, Minnesota.

Englund, Göran. 1991. Effects of Disturbance on Stream Moss and Invertebrate Community Structure. Journal of the North American Benthological Society. 10(2): 143-153.

Feldmann, R.M., A.H. Coogan and R.A. Heimlich. 1977. Southern Great Lakes. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Gaufin, A.R. and C.M. Tarzwell. 1956. Aquatic Macroinvertebrate Communities as Indicators of Organic Pollution in Lytle Creek. Sewage and Industrial Wastes 28(7):906-924.

Great Lakes Water Quality Initiative. 1991. Great Lakes Water Quality Guidance. Draft.

Havens and Emerson. 1968. Master Plan for Pollution Abatement, Cleveland, Ohio. Submitted to the City of Cleveland, Ohio.

Hilsenhoff, W. L. 1979. Aquatic Insects of Wisconsin. Revised Edition. Geological and Natural History Survey, Madison, Wisconsin.

Hilsenhoff, W.L. 1982. Using a Biotic Index to Evaluate Water Quality in Streams. Technical Bulletin No. 132, Department of Natural Resources, Madison, Wisconsin.

Hilsenhoff, W.L. 1987. An Improved Biotic Index of Organic Stream Pollution. The Great Lakes Entomologist 20(1):31-39.

Hiltunen, J.K. and D.J. Klemm, 1980. A Guide to the Naididae (Annelida: Clitellata: Oligochaeta) of North America. Environmental Monitoring and Support Laboratory Office of Research and Development. U.S. Environmental Protection Agency. EPA-600/3-82-033. 61 pp.

Hogg, Ian D. and R.H. Norris, 1991. Effects of Run-Off From Land Clearing and Urban Development on the Distribution and Abundance of Macroinvertebrates in Pool Areas of a River: Australian Journal of Marine and Freshwater Research. 42(5): 507-518.

Holsinger, J.R. 1972. Biota of Freshwater Ecosystems, Identification Manual 5: The Freshwater-Amphipod Crustacean (Gammaridae) of North America. Water Pollution Control Research Series, U.S. Environmental Protection Agency, Washington, D.C.

Ingram, W.M. 1957. Use and Value of Biological Indicators of Pollution: Freshwater Clams and Snails. In: C.M. Tarzwell, ed. Biological Problems in Water Pollution, USDHEW, PHS, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.

International Joint Commission Virtual Elimination Task Force. 1991. Persistent Toxic Substances: Virtually Eliminating Inputs to the Great Lakes. Draft.

Karr, J. R. and I.J. Schlosser. 1977. Impact of Nearstream Vegetation and Stream Morphology on Water Quality and Stream Biota. USEPA, EPA-600/3-77-097, 90 pp.

Klemm, D.J. 1972. Biota of Freshwater Ecosystems, Identification Manual 8: Freshwater Leeches (Annelida: Hirudinea) of North America. Water Pollution Control Series, U.S. Environmental Protection Agency, Washington, D.C.

Krieger, K.A. 1990. Changes in the Benthic Macroinvertebrate Community of the Cleveland Harbor Area of Lake Erie from 1978 to 1989. Water Quality Laboratory, Heidelberg College, Tiffin, Ohio. Submitted to the Ohio Environmental Protection Agency, Division of Water Quality Planning and Assessment, Columbus, Ohio.

Krieger, K.A. 1992. Report on Benthic Macroinvertebrates in the Cleveland Harbor Near CSOTF. Water Quality Laboratory, Heidelberg College, Tiffin, Ohio. In: Dresser, Camp and McKee. 1993. NEORSD CSO Facilities Plan Phase 1 Study. Westerly WWTC Combined Sewer Overflow Treatment Facility. Final Report on Water Quality Sampling Program. Prepared for Havens and Emerson, Inc. Submitted to the Northeast Ohio Regional Sewer District. Cleveland, Ohio.

Lenat, D.R., D.L. Penrose, and K.W. Eagleson. 1981. Variable Effects of Sediment Addition on Stream Benthos, Hydrobiologia. 79:187-94.

Lenat, D.R. 1984. Agriculture and Stream Water Quality: A Biological Evaluation of Erosion Control Practices. Environmental Management 8:333-344.

Lenat, D.R. 1993. A Biotic Index for the Southeastern United States: Derivation and List of Tolerance Values, With Criteria for Assigning Water Quality Ratings. Journal of the North American Benthological Society. 12(3): 279-290.

Lewis, P.A. 1974. Taxonomy and Ecology of Stenonema Mayflies (Heptageniidae: Ephemeroptera). Methods Development and Quality Assurance Research Laboratory, National Environmental Research Center, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio. EPA-670/4-74-006.

Logan, P. and Brooker, M.P. (1983). The Macroinvertebrate Fauna of Riffles and Pools. Water Research 17, 263-270.

Mackie, G.L., D.S. White, and T.W. Zdeba. 1980. A Guide to Freshwater Mollusks of the Laurentian Great Lakes with Special Emphasis on the Genus Pisidium. Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Duluth, Minnesota. EPA-600/3-80-068.

Maloney, Elbert S. 1989. Chapman Piloting. 59th Edition. The Hearst Corporation.

Merritt, R.W., and K. W. Cummins, eds. 1984. An Introduction to the Aquatic Insects of North America. Second Edition. Kendall/Hunt Publishing Company, Dubuque, Iowa.

National Slag Association. (No Date.) Processed Blast Furnace Slag: The All-Purpose Construction Aggregate. National Slag Association Bulletin 188-1, 15 pp.

Northeast Ohio Areawide Coordinating Agency. 1978. Analysis of Stream Habitats, Technical Appendix A21. Water Quality Program, Cleveland, Ohio.

Northeast Ohio Regional Sewer District. 1977 to 1992. [NEORSD Laboratory Annual Reports]. Unpublished data.

Northeast Ohio Regional Sewer District. 1988. Greater Cleveland Area Stream Monitoring Program 1987 Report. Industrial Waste Section, Cleveland, Ohio.

Northeast Ohio Regional Sewer District. 1989. Greater Cleveland Area Stream Monitoring Program 1988 Report. Industrial Waste Section, Cleveland, Ohio.

Northeast Ohio Regional Sewer District. 1992. Greater Cleveland Area Environmental Water Quality Assessment 1989-1990. Water Quality and Industrial Surveillance. Cuyahoga Heights, Ohio.

Oak Ridge Associated Universities. 1985. Summary of Preliminary Results: Confirmatory Radiological Survey of Chemtron/McGean Industries Industrial Dump Site, Newburgh Heights, Ohio. Radiological Site Assessment Program, Manpower Education, Research, and Training Division, Oak Ridge, Tennessee. Prepared for U.S. Nuclear Regulatory Commission, Division of Fuel Cycle and Material Safety.

Ohio Department of Health. 1983, 1984, 1988, 1989. [Fecal Coliform Concentrations]. Unpublished raw data.

Ohio Environmental Protection Agency. 1987. Biological Criteria for the Protection of Aquatic Life: Volume I. The Role of Biological Data in Water Quality Assessment. Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1987. Biological Criteria for the Protection of Aquatic Life: Volume II. Users Manual for Biological Field Assessment of Ohio Surface Waters. Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1987. Biological and Water Quality Study of the Chagrin River - Lake, Cuyahoga, and Geauga Counties, Ohio. Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1988 to 1991. [Water Quality Monitoring and Assessment Fish Information System Data]. Unpublished raw data.

Ohio Environmental Protection Agency. 1989. Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities. Division of Water Quality Planning and Assessment, Ecological Assessment Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989. Compendium of Biological Results from Ohio Rivers, Streams, and Lakes. 1989 Edition. Division of Water Quality Planning and Assessment, Ecological Assessment Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1990. State of Ohio Water Quality Standards, Chapter 3745-1 of the Administrative Code, Effective May 1, 1990. Columbus, Ohio.

Osman, R.W. 1978. The Influence of Seasonality and Stability on the Species Equilibrium. Ecology 59:383-399.

Paine, G.H., Jr. and A.R. Gaufin. 1956. Aquatic Diptera as Indicators of Pollution in a Midwestern Stream. Ohio Journal of Science 56(5):291.

Pennak, R.W. 1978. Freshwater Invertebrates of the United States. Second Edition. John Wiley & Sons, New York, New York.

Plafkin, J.L., Barbour, M.T., Porter, K.D., Gross, S.K. and R.M. Hughes. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. U.S. Environmental Protection Agency Assessment and Watershed Protection Division. Washington, D.C. EPA/444/4-89-001.

Rankin, E.T. 1989. The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application. Ohio Environmental Protection Agency, Division of Water Quality Planning and Assessment, Ecological Assessment Section, Columbus, Ohio.

Rankin, E.T. The Use of the Qualitative Habitat Evaluation Index for Use Attainability Studies in Streams and Rivers in Ohio. Ohio Environmental Protection Agency, Division of Water Quality Planning and Assessment, Ecological Assessment Section, Columbus, Ohio.

Rankin, E.T., and C.O. Yoder. 1990. The Nature of Sampling Variability in the Index of Biotic Integrity (IBI) in Ohio Streams. In: W.S. Davis, ed. Proceedings of the 1990 Midwest Pollution Control Biologists Meeting, pp. 9-18. U.S. Environmental Protection Agency, Region V Environmental Sciences Division, Chicago, Illinois. EPA 905/9-90-005.

Roback, S.S. 1962. Environmental Requirements of Trichoptera. In: C.M. Tarzwell, ed. Biological Problems in Water Pollution. Transactions of Third Seminar, U.S.D.H.E.W. PHS, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. 118-126.

Robinson, C.T., and G. W. Minshall. 1986. Effects of Disturbance Frequency on Stream Benthic Community Structure in Relation to Canopy Cover and Season. Journal of the North American Benthological Society 9(3):240-248.

Schuster, G.A., and D.A. Etnier. 1978. A Manual for the Identification of the Larvae of the Caddisfly Genera Hydropsyche Pictet and Symphitopsyche Ulmer in Eastern and Central North America (Trichoptera: Hydropsychidae). Environmental Monitoring and Support Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio. EPA-600/4-78-060.

Science Applications International Corporation. 1986. Cuyahoga River Remedial Action Plan. Draft. Submitted to U.S. Environmental Protection Agency, Great Lakes National Program Office, Chicago, Illinois.

Shaw, D.W., and G.W. Minshall. 1980. Colonization of an Introduced Substrate by Stream Macroinvertebrates. Oikos 34:259-271.

Sinclair, R.M. 1964. Water Quality Requirements of the Family Elmidae (Coleoptera). Tennessee Stream Pollution Control Board, Department of Public Health, Nashville, Tennessee.

Simpson, K.W. and R.W. Bode. 1980. Common Larvae of Chironomidae (Diptera) from New York State Streams and Rivers: With Particular Reference to the Fauna of Artificial Substrates. Bulletin New York State Museum. 439. 105 pp.

Simpson, K.W., Bode, R.W. and Albu P. 1983. Keys for the Genus Cricotopus Adapted From "Revision der Gattung Cricotopus van der Wulp und ihrer Verwandten (Diptera, Chironomidae)" by Hirvenoja. Bulletin New York State Museum 450. 133 pp.

Soponis, A.R. 1977. A Revision of the Nearctic Species of Orthocladius (Orthocladius) Van Der Wulp (Diptera: Chironomidae) Memoirs of the Entomological Society of Canada. No. 102: 1-87.

State of Illinois Department of Transportation. Bureau of Materials and Physical Research. 1985. Crushed Slag Producer Certification and Self Testing Program. Policy Memorandum, September 1, 1985. 4 pp.

Stimpson, K.S., Klemm, D.J. and J. K. Hiltunen. 1982. A Guide to the Freshwater Tubificidae (Annelida: Clitellata: Oligochaeta) of North America. Environmental Monitoring and Support Laboratory Office of Research and Development U.S. Environmental Protection Agency. EPA-600/3-82-033. 1-61.

Trautman, M.B. 1981. The Fishes of Ohio. Revised Edition. The Ohio State University Press.

United States Army Corps of Engineers. 1981. Cuyahoga River, Ohio Restoration Study: Third Interim Preliminary Feasibility Report on Erosion and Sedimentation. Buffalo District, Corps of Engineers, Buffalo, New York.

United States Environmental Protection Agency. 1976. Quality Criteria for Water. Washington, D.C.

United States Environmental Protection Agency. 1993. Proposed Water Guidance for the Great Lakes System. 58 Federal Register 20802-21047.

United States Geological Survey. 1991. Water Resources Data for Ohio, Water Year 1991, Volume 2: St. Lawrence River Basin, Statewide Project Data. Water Resources Division, New Philadelphia, Ohio.

United States Geological Survey. 1992. [Primary Computations of Gauge Heights and Discharge: Mean & Daily Discharges for Water Year 1992 at Station 04208000, Cuyahoga River at Independence, Ohio.] Unpublished raw data.

Weber, C.I., ed. 1973. Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents. National Environmental Research Center, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio.

Whipple, T. 1986. Northeast Ohio Regional Sewer District Industrial Waste Section Stream Monitoring Program. Submitted to the Northeast Ohio Regional Sewer District, Cleveland, Ohio.

White, A.M., M.B. Trautman, E.J. Foell, M.P. Kelty, and R. Gaby. 1975. Water Quality Baseline Assessment for the Cleveland Area - Lake Erie, Volume II: The Fishes of the Cleveland Metropolitan Area Including the Lake Erie Shoreline. EPA-905/9-75-001.

Williams, W.D. 1972. Biota of Freshwater Ecosystems, Identification Manual 7: Freshwater Isopods (Asellidae) of North America. Water Pollution Control Research Series, U.S. Environmental Protection Agency, Washington, D.C.

APPENDIX II

CLEVELAND AREA STREAMS
1991 CHEMICAL AND BACTERIOLOGICAL DATA

DATA TABLE KEY

Individual data are presented by sampling date as month/day/year. The sampled water body, with the NEORSD-assigned sample site number and/or letter in parentheses, also appears in the heading. For streams, data presented are from analyses of surface grab samples obtained under dry weather conditions (following at least three days of no significant rainfall). Routine stream sampling was performed under dry weather conditions to maximize data comparability and to faciliate identification of dry weather pollutant sources. These sources have the greatest potential for environmental impact due to the combination of maximal pollutant concentration with minimal instream dilution. For Lake Erie, data presented are from analyses of surface grab samples, except A-1, B-1, and C-1, which were from analyses of grab samples collected from two feet above the lake bottom.

All chemical and bacteriological parameters analyzed in the sample are listed in the first column, followed by analytical units in parentheses. When a measured value exceeds a State of Ohio water quality criterion, the applicable water use designation, with the exceeded numerical criterion in parentheses, appears in the "Failure" column. An asterisk appears when no maximum criterion is applicable and the single value only exceeds an average criterion (therefore not necessarily representing a failure to meet water quality standards).

Applicable Ohio EPA Water Use Designations

AWS = Agricultural Water Supply
BW = Bathing Waters Recreational Use
EWH = Exceptional Warmwater Habitat Aquatic Life Use
HHSR = Human Health (Single-Route Exposure)
LRW = Limited Resource Water
PCU = Primary Contact Recreational Use
PWS = Public Water Supply
SCU = Secondary Contact Recreational Use
SSH = Seasonal Salmonid Habitat Aquatic Life Use
WHAL = Warmwater Habitat Aquatic Life Use

Other Acronyms and Abbreviations

BOD-5 = Biological Oxygen Demand (5-day test)
COD = Chemical Oxygen Demand
N = Nitrogen
NO3 = Nitrates
NO2 = Nitrites

(Continued on following page.)

DATA TABLE KEY (continued)

Other Acronyms and Abbreviations (continued)

TKN	= Total Kjeldahl Nitrogen
mg/L	= milligrams per liter
ug/L	= micrograms per liter
umhos/cm	= micromhos per centimeter
s.u.	= standard units
NTU	= Nephelometric Turbidity Units

Samples were collected by direct immersion of the sample bottles below the water surface. At bridge or manhole sites, samples were collected with an acid-cleaned, de-ionized water-rinsed plastic bucket and drop line. The bucket was further rinsed with stream water from the sample site prior to the collection of each sample. All samples obtained at bridge or manhole sites were collected from midstream, while all other stream samples were collected near the bank.

Lake Erie samples were collected from boatside by direct immersion of the sample bottle below the water surface. Samples collected from near the lake bottom were obtained using a Kemmerer-style Vertical Sampling Bottle.

Closed and labeled plastic containers were used to transport samples, on ice for preservation, to NEORSD Analytical Services. All bottles used to transport samples for bacteriological analysis had been sterilized prior to sampling.

At all sites, field measurements were obtained at the time of sampling for water temperature and dissolved oxygen concentration, using a calibrated YSI Model 51B Oxygen Meter or a Nester Instruments Model No. 8500 Oxygen Meter. At most sites, field measurements at the time of sampling were obtained for specific conductance using a Beckman Industrial Model RC-16D Conductivity Bridge, turbidity using a Monitek Model 21PE Portable Nephelometer, and pH using a Fisher Model No. 607 Digital pH Meter. Water transparency was measured at each Lake Erie site using a Secchi disk.

NEORSD

WQIS

EUCLID CREEK (0.5) - 05/08/91

Parameter		Value	Failure
Temperature	(degrees C)	11.8	-
Dissolved Oxygen	(mg/L)	11.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	7	-
Total Solids	(mg/L)	494	-
Dissolved Solids	(mg/L)	458	-
Specific Conductance	(umhos/cm)	600	-
Turbidity	(NTU)	3.5	-
Ammonia-N	(mg/L)	0.01	-
Phosphorus	(mg/L)	0.05	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.58	-
NO3+NO2 Total	(mg/L)	0.58	-
TKN	(mg/L)	0.68	-
Chlorides	(mg/L)	129	-
Sulfates	(mg/L)	85	-
Alkalinity	(mg/L)	113	-
Hardness	(mg/L)	202	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.10	-
Iron	(mg/L)	1.00	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.04	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2300	-
Fecal Coliform	(organisms/100ml)	600	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

EUCLID CREEK (0.5) - 06/19/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	8.4	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	12	-
Total Solids	(mg/L)	478	-
Dissolved Solids	(mg/L)	439	-
Specific Conductance	(umhos/cm)	765	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.14	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.27	-
NO3+NO2 Total	(mg/L)	0.27	-
TKN	(mg/L)	0.48	-
Chlorides	(mg/L)	154	-
Sulfates	(mg/L)	62	-
Alkalinity	(mg/L)	105	-
Hardness	(mg/L)	200	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.10	-
Iron	(mg/L)	0.50	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4600	-
Fecal Coliform	(organisms/100ml)	1900	-
Fecal Streptococcus	(organisms/100ml)	170	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

EUCLID CREEK (0.5) - 07/17/91

Parameter		Value	Failure
Temperature	(degrees C)	22.8	-
Dissolved Oxygen	(mg/L)	9.8	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	426	-
Dissolved Solids	(mg/L)	390	-
Specific Conductance	(umhos/cm)	650	-
Turbidity	(NTU)	3.2	-
Ammonia-N	(mg/L)	0.04	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
TKN	(mg/L)	0.56	-
Hardness	(mg/L)	188	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.29	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	450	-
Fecal Coliform	(organisms/100ml)	300	-
Fecal Streptococcus	(organisms/100ml)	480	-
pH	(s.u.)	7.8	-

NEORSD

WQIS

EUCLID CREEK (1) - 05/08/91

Parameter		Value	Failure
Temperature	(degrees C)	11.4	-
Dissolved Oxygen	(mg/L)	11.5	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	24	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	500	-
Dissolved Solids	(mg/L)	440	-
Specific Conductance	(umhos/cm)	560	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.04	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.63	-
NO3+NO2 Total	(mg/L)	0.63	-
TKN	(mg/L)	0.62	-
Chlorides	(mg/L)	125	-
Sulfates	(mg/L)	81	-
Alkalinity	(mg/L)	110	-
Hardness	(mg/L)	197	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.12	-
Iron	(mg/L)	1.10	WHAL(1.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.04	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2100	-
Fecal Coliform	(organisms/100ml)	230	-
Fecal Streptococcus	(organisms/100ml)	50	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

EUCLID CREEK (1) - 06/19/91

Parameter		Value	Failure
BOD-5	(mg/L)	3	-
COD	(mg/L)	14	-
Suspended Solids	(mg/L)	16	-
Total Solids	(mg/L)	457	-
Dissolved Solids	(mg/L)	435	-
Specific Conductance	(umhos/cm)	720	-
Turbidity	(NTU)	7.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.55	-
NO3+NO2 Total	(mg/L)	0.55	-
TKN	(mg/L)	0.58	-
Chlorides	(mg/L)	144	-
Sulfates	(mg/L)	74	-
Alkalinity	(mg/L)	99	-
Hardness	(mg/L)	214	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.98	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1100	-
Fecal Coliform	(organisms/100ml)	340	-
Fecal Streptococcus	(organisms/100ml)	500	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

EUCLID CREEK (1) - 07/17/91

Parameter		Value	Failure
Temperature	(degrees C)	21.2	-
Dissolved Oxygen	(mg/L)	8.1	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	451	-
Dissolved Solids	(mg/L)	412	-
Specific Conductance	(umhos/cm)	650	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.09	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	<0.01	-
TKN	(mg/L)	0.31	-
Hardness	(mg/L)	187	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.71	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	300	-
Fecal Coliform	(organisms/100ml)	80	-
Fecal Streptococcus	(organisms/100ml)	170	-
pH	(s.u.)	7.5	-

NEORSD

WQIS

EUCLID CREEK (2) - 05/08/91

Parameter		Value	Failure
Temperature	(degrees C)	10.0	-
Dissolved Oxygen	(mg/L)	10.3	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	565	-
Dissolved Solids	(mg/L)	522	-
Specific Conductance	(umhos/cm)	650	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.25	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.36	-
NO3+NO2 Total	(mg/L)	0.36	-
TKN	(mg/L)	0.48	-
Chlorides	(mg/L)	162	-
Sulfates	(mg/L)	85	-
Alkalinity	(mg/L)	119	-
Hardness	(mg/L)	214	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.06	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	620	-
Fecal Coliform	(organisms/100ml)	140	-
Fecal Streptococcus	(organisms/100ml)	100	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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EUCLID CREEK (2) - 06/19/91

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	7.7	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	522	-
Dissolved Solids	(mg/L)	516	-
Specific Conductance	(umhos/cm)	880	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.33	-
NO3+NO2 Total	(mg/L)	0.33	-
TKN	(mg/L)	0.56	-
Chlorides	(mg/L)	180	-
Sulfates	(mg/L)	42	-
Alkalinity	(mg/L)	109	-
Hardness	(mg/L)	214	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.07	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	620	-
Fecal Coliform	(organisms/100ml)	200	-
Fecal Streptococcus	(organisms/100ml)	160	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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EUCLID CREEK (2) - 07/17/91

Parameter		Value	Failure
Temperature	(degrees C)	21.5	-
Dissolved Oxygen	(mg/L)	7.5	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	610	-
Dissolved Solids	(mg/L)	578	-
Specific Conductance	(umhos/cm)	910	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	0.01	-
TKN	(mg/L)	0.43	-
Hardness	(mg/L)	228	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.10	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	240	-
Fecal Coliform	(organisms/100ml)	90	-
Fecal Streptococcus	(organisms/100ml)	130	-
pH	(s.u.)	7.7	-

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EUCLID CREEK (3) - 05/08/91

Parameter		Value	Failure
Temperature	(degrees C)	11.1	-
Dissolved Oxygen	(mg/L)	11.5	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	13	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	454	-
Dissolved Solids	(mg/L)	389	-
Specific Conductance	(umhos/cm)	500	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	1.17	-
NO3+NO2 Total	(mg/L)	1.17	-
TKN	(mg/L)	0.64	-
Chlorides	(mg/L)	114	-
Sulfates	(mg/L)	61	-
Alkalinity	(mg/L)	117	-
Hardness	(mg/L)	184	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.13	-
Iron	(mg/L)	0.10	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	270	-
Fecal Coliform	(organisms/100ml)	40	-
Fecal Streptococcus	(organisms/100ml)	70	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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EUCLID CREEK (3) - 06/19/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	10.6	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	365	-
Dissolved Solids	(mg/L)	356	-
Specific Conductance	(umhos/cm)	620	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.09	-
Phosphorus	(mg/L)	0.19	-
Soluble Phosphorus	(mg/L)	0.19	-
Nitrate-N	(mg/L)	1.00	-
NO3+NO2 Total	(mg/L)	1.00	-
TKN	(mg/L)	0.50	-
Chlorides	(mg/L)	140	-
Sulfates	(mg/L)	57	-
Alkalinity	(mg/L)	116	-
Hardness	(mg/L)	210	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.13	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2000	-
Fecal Coliform	(organisms/100ml)	180	-
Fecal Streptococcus	(organisms/100ml)	130	-
pH	(s.u.)	8.3	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

EUCLID CREEK (3) - 07/17/91

Parameter		Value	Failure
Temperature	(degrees C)	22.2	-
Dissolved Oxygen	(mg/L)	9.9	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	375	-
Dissolved Solids	(mg/L)	332	-
Specific Conductance	(umhos/cm)	568	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.12	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.13	-
TKN	(mg/L)	0.47	-
Hardness	(mg/L)	182	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.08	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	0.5	HHSR(0.012)*
Total Coliform	(organisms/100ml)	550	-
Fecal Coliform	(organisms/100ml)	30	-
Fecal Streptococcus	(organisms/100ml)	90	-
pH	(s.u.)	8.2	-

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EUCLID CREEK (4) - 05/08/91

Parameter		Value	Failure
Temperature	(degrees C)	11.9	-
Dissolved Oxygen	(mg/L)	10.9	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	655	-
Dissolved Solids	(mg/L)	596	-
Specific Conductance	(umhos/cm)	770	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.47	-
NO3+NO2 Total	(mg/L)	0.47	-
TKN	(mg/L)	0.79	-
Chlorides	(mg/L)	194	-
Sulfates	(mg/L)	82	-
Alkalinity	(mg/L)	128	-
Hardness	(mg/L)	168	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.37	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1500	-
Fecal Coliform	(organisms/100ml)	140	-
Fecal Streptococcus	(organisms/100ml)	40	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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EUCLID CREEK (4) - 06/19/91

Parameter		Value	Failure
Temperature	(degrees C)	23.0	-
Dissolved Oxygen	(mg/L)	10.4	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	524	-
Dissolved Solids	(mg/L)	520	-
Specific Conductance	(umhos/cm)	900	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	0.05	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.38	-
NO3+NO2 Total	(mg/L)	0.38	-
TKN	(mg/L)	0.72	-
Chlorides	(mg/L)	64	-
Sulfates	(mg/L)	72	-
Alkalinity	(mg/L)	112	-
Hardness	(mg/L)	210	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.40	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	3500	-
Fecal Coliform	(organisms/100ml)	600	-
Fecal Streptococcus	(organisms/100ml)	420	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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EUCLID CREEK (4) - 07/17/91

Parameter		Value	Failure
Temperature	(degrees C)	22.1	-
Dissolved Oxygen	(mg/L)	8.5	-
BOD-5	(mg/L)	20	-
COD	(mg/L)	52	-
Suspended Solids	(mg/L)	15	-
Total Solids	(mg/L)	570	-
Dissolved Solids	(mg/L)	487	-
Specific Conductance	(umhos/cm)	829	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.02	-
TKN	(mg/L)	1.07	-
Hardness	(mg/L)	196	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.57	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.0	-

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GREEN CREEK (5) - 05/09/91

Parameter		Value	Failure
Temperature	(degrees C)	11.3	-
Dissolved Oxygen	(mg/L)	10.5	-
BOD-5	(mg/L)	46	-
COD	(mg/L)	663	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	441	-
Dissolved Solids	(mg/L)	432	-
Specific Conductance	(umhos/cm)	499	-
Turbidity	(NTU)	55.0	-
Ammonia-N	(mg/L)	0.12	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	0.59	-
NO3+NO2 Total	(mg/L)	0.60	-
TKN	(mg/L)	9.99	-
Chlorides	(mg/L)	76	-
Sulfates	(mg/L)	164	-
Alkalinity	(mg/L)	156	-
Hardness	(mg/L)	225	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.09	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.41	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>4000	-
Fecal Coliform	(organisms/100ml)	8100	-
Fecal Streptococcus	(organisms/100ml)	1400	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	0.08	-
Nitrite-N	(mg/L)	0.01	-

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GREEN CREEK (5) - 06/19/91

Parameter		Value	Failure
Temperature	(degrees C)	16.8	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	322	-
Dissolved Solids	(mg/L)	318	-
Specific Conductance	(umhos/cm)	544	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.08	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	0.72	-
NO3+NO2 Total	(mg/L)	0.72	-
TKN	(mg/L)	0.68	-
Chlorides	(mg/L)	90	-
Sulfates	(mg/L)	78	-
Alkalinity	(mg/L)	151	-
Hardness	(mg/L)	212	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.15	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	5700	-
Fecal Coliform	(organisms/100ml)	900	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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GREEN CREEK (5) - 07/29/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	8.5	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	347	-
Dissolved Solids	(mg/L)	325	-
Specific Conductance	(umhos/cm)	507	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.03	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	0.62	-
NO3+NO2 Total	(mg/L)	0.62	-
TKN	(mg/L)	0.08	-
Chlorides	(mg/L)	104	-
Sulfates	(mg/L)	78	-
Alkalinity	(mg/L)	144	-
Hardness	(mg/L)	186	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.20	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	740	-
Fecal Coliform	(organisms/100ml)	80	-
Fecal Streptococcus	(organisms/100ml)	20	-
pH	(s.u.)	7.7	-
Nitrite-N	(mg/L)	<0.01	-

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GREEN CREEK (6) - 05/09/91

Parameter		Value	Failure
Temperature	(degrees C)	10.8	-
Dissolved Oxygen	(mg/L)	10.5	-
BOD-5	(mg/L)	30	-
COD	(mg/L)	434	-
Suspended Solids	(mg/L)	12	-
Total Solids	(mg/L)	461	-
Dissolved Solids	(mg/L)	371	-
Specific Conductance	(umhos/cm)	431	-
Turbidity	(NTU)	27.0	-
Ammonia-N	(mg/L)	0.14	-
Phosphorus	(mg/L)	0.18	-
Soluble Phosphorus	(mg/L)	0.16	-
Nitrate-N	(mg/L)	0.65	-
NO3+NO2 Total	(mg/L)	0.66	-
TKN	(mg/L)	7.49	-
Chlorides	(mg/L)	76	-
Sulfates	(mg/L)	132	-
Alkalinity	(mg/L)	110	-
Hardness	(mg/L)	190	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.40	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>4000	-
Fecal Coliform	(organisms/100ml)	>3000	-
Fecal Streptococcus	(organisms/100ml)	2200	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	0.08	-
Nitrite-N	(mg/L)	0.01	-

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WQIS

GREEN CREEK (6) - 06/19/91

Parameter		Value	Failure
Temperature	(degrees C)	12.6	-
Dissolved Oxygen	(mg/L)	8.7	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	213	-
Dissolved Solids	(mg/L)	208	-
Specific Conductance	(umhos/cm)	381	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.42	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.74	-
NO3+NO2 Total	(mg/L)	0.74	-
TKN	(mg/L)	0.60	-
Chlorides	(mg/L)	70	-
Sulfates	(mg/L)	57	-
Alkalinity	(mg/L)	103	-
Hardness	(mg/L)	173	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.12	-
Iron	(mg/L)	0.14	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.2	-
Total Coliform	(organisms/100ml)	45000	-
Fecal Coliform	(organisms/100ml)	21000	-
Fecal Streptococcus	(organisms/100ml)	1000	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

GREEN CREEK (6) - 07/29/91

Parameter		Value	Failure
Temperature	(degrees C)	18.5	-
Dissolved Oxygen	(mg/L)	7.3	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	30	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	303	-
Dissolved Solids	(mg/L)	282	-
Specific Conductance	(umhos/cm)	479	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.23	-
Phosphorus	(mg/L)	0.22	-
Soluble Phosphorus	(mg/L)	0.19	-
Nitrate-N	(mg/L)	0.83	-
NO3+NO2 Total	(mg/L)	0.85	-
TKN	(mg/L)	0.37	-
Chlorides	(mg/L)	100	-
Sulfates	(mg/L)	79	-
Alkalinity	(mg/L)	117	-
Hardness	(mg/L)	138	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.14	-
Iron	(mg/L)	0.21	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4200	-
Fecal Coliform	(organisms/100ml)	1400	-
Fecal Streptococcus	(organisms/100ml)	240	-
pH	(s.u.)	7.8	-
Nitrite-N	(mg/L)	0.02	-

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WQIS

GREEN CREEK (7) - 05/09/91

Parameter		Value	Failure
Temperature	(degrees C)	11.6	-
Dissolved Oxygen	(mg/L)	11.9	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	17	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	285	-
Dissolved Solids	(mg/L)	256	-
Specific Conductance	(umhos/cm)	332	-
Turbidity	(NTU)	1.3	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.61	-
Nitrate-N	(mg/L)	0.48	-
NO3+NO2 Total	(mg/L)	0.48	-
TKN	(mg/L)	0.61	-
Chlorides	(mg/L)	60	-
Sulfates	(mg/L)	62	-
Alkalinity	(mg/L)	96	-
Hardness	(mg/L)	169	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.13	-
Iron	(mg/L)	0.14	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	440	-
Fecal Coliform	(organisms/100ml)	180	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	0.06	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

GREEN CREEK (7) - 06/19/91

Parameter		Value	Failure
Temperature	(degrees C)	19.8	-
Dissolved Oxygen	(mg/L)	8.5	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	3	-
Total Solids	(mg/L)	432	-
Dissolved Solids	(mg/L)	370	-
Specific Conductance	(umhos/cm)	524	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.41	-
Phosphorus	(mg/L)	0.13	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	0.88	-
NO3+NO2 Total	(mg/L)	0.95	-
TKN	(mg/L)	1.31	-
Chlorides	(mg/L)	102	-
Sulfates	(mg/L)	79	-
Alkalinity	(mg/L)	107	-
Hardness	(mg/L)	204	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.09	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2900	-
Fecal Coliform	(organisms/100ml)	480	-
Fecal Streptococcus	(organisms/100ml)	520	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.07	-

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WQIS

GREEN CREEK (7) - 07/29/91

Parameter		Value	Failure
Temperature	(degrees C)	18.0	-
Dissolved Oxygen	(mg/L)	9.3	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	3	-
Total Solids	(mg/L)	251	-
Dissolved Solids	(mg/L)	228	-
Specific Conductance	(umhos/cm)	356	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.31	-
NO3+NO2 Total	(mg/L)	0.31	-
TKN	(mg/L)	<0.01	-
Chlorides	(mg/L)	68	-
Sulfates	(mg/L)	60	-
Alkalinity	(mg/L)	126	-
Hardness	(mg/L)	148	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.09	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4500	-
Fecal Coliform	(organisms/100ml)	1900	-
Fecal Streptococcus	(organisms/100ml)	620	-
pH	(s.u.)	7.6	-
Nitrite-N	(mg/L)	<0.01	-

NEORSO

WQIS

NINE-MILE CREEK (8A) - 05/16/91

Parameter		Value	Failure
Temperature	(degrees C)	15.0	-
Dissolved Oxygen	(mg/L)	3.8	WHAL(4.0)
BOD-5	(mg/L)	6	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	495	-
Dissolved Solids	(mg/L)	493	-
Specific Conductance	(umhos/cm)	859	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	0.83	-
Phosphorus	(mg/L)	0.24	-
Soluble Phosphorus	(mg/L)	0.22	-
Nitrate-N	(mg/L)	0.66	-
NO3+NO2 Total	(mg/L)	0.85	-
TKN	(mg/L)	2.03	-
Chlorides	(mg/L)	210	-
Sulfates	(mg/L)	90	-
Alkalinity	(mg/L)	136	-
Hardness	(mg/L)	237	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.06	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.57	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4800	-
Fecal Coliform	(organisms/100ml)	1800	-
Fecal Streptococcus	(organisms/100ml)	980	-
pH	(s.u.)	7.3	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.19	-

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WQIS

NINE-MILE CREEK (8A) - 06/20/91

Parameter		Value	Failure
Temperature	(degrees C)	18.5	-
Dissolved Oxygen	(mg/L)	2.4	WHAL(4.0)
BOD-5	(mg/L)	3	-
COD	(mg/L)	13	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	444	-
Dissolved Solids	(mg/L)	445	-
Specific Conductance	(umhos/cm)	711	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	0.70	-
Phosphorus	(mg/L)	0.26	-
Soluble Phosphorus	(mg/L)	0.25	-
Nitrate-N	(mg/L)	0.82	-
NO3+NO2 Total	(mg/L)	0.92	-
TKN	(mg/L)	1.22	-
Chlorides	(mg/L)	138	-
Sulfates	(mg/L)	94	-
Alkalinity	(mg/L)	145	-
Hardness	(mg/L)	242	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.12	AWS(0.10)*
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.15	-
Iron	(mg/L)	0.65	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	37000	-
Fecal Coliform	(organisms/100ml)	12000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	6500	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.10	-

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WQIS

NINE-MILE CREEK (8A) - 07/30/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	4.4	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	378	-
Dissolved Solids	(mg/L)	360	-
Specific Conductance	(umhos/cm)	594	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	0.86	-
Phosphorus	(mg/L)	0.33	-
Soluble Phosphorus	(mg/L)	0.25	-
TKN	(mg/L)	1.13	-
Hardness	(mg/L)	194	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.06	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.88	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	8400	-
Fecal Coliform	(organisms/100ml)	2600	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	1000	-
pH	(s.u.)	7.5	-

NEORSD

WQIS

NINE-MILE CREEK (8B) - 05/16/91

Parameter		Value	Failure
Temperature	(degrees C)	17.5	-
Dissolved Oxygen	(mg/L)	7.8	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	423	-
Dissolved Solids	(mg/L)	403	-
Specific Conductance	(umhos/cm)	716	-
Turbidity	(NTU)	17.0	-
Ammonia-N	(mg/L)	0.38	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	0.82	-
NO3+NO2 Total	(mg/L)	0.87	-
TKN	(mg/L)	1.42	-
Chlorides	(mg/L)	120	-
Sulfates	(mg/L)	71	-
Alkalinity	(mg/L)	112	-
Hardness	(mg/L)	184	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.72	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	44000	-
Fecal Coliform	(organisms/100ml)	21000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	4400	-
pH	(s.u.)	7.7	-
Phenolics	(ug/L)	<0.05	-
Nitrite-N	(mg/L)	0.05	-

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WQIS

NINE-MILE CREEK (8B) - 06/20/91

Parameter		Value	Failure
Temperature	(degrees C)	19.5	-
Dissolved Oxygen	(mg/L)	6.4	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	14	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	304	-
Dissolved Solids	(mg/L)	297	-
Specific Conductance	(umhos/cm)	600	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.48	-
Phosphorus	(mg/L)	0.18	-
Soluble Phosphorus	(mg/L)	0.17	-
Nitrate-N	(mg/L)	0.86	-
NO3+NO2 Total	(mg/L)	0.86	-
TKN	(mg/L)	1.36	-
Chlorides	(mg/L)	130	-
Sulfates	(mg/L)	83	-
Alkalinity	(mg/L)	124	-
Hardness	(mg/L)	210	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.14	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.5	HHSR(0.012)*
Total Coliform	(organisms/100ml)	76000	-
Fecal Coliform	(organisms/100ml)	38000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	4800	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

NINE-MILE CREEK (8B) - 07/30/91

Parameter		Value	Failure
BOD-5	(mg/L)	3	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	318	-
Dissolved Solids	(mg/L)	314	-
Specific Conductance	(umhos/cm)	534	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.48	-
Phosphorus	(mg/L)	0.18	-
Soluble Phosphorus	(mg/L)	0.17	-
TKN	(mg/L)	1.06	-
Hardness	(mg/L)	187	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.14	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	64000	-
Fecal Coliform	(organisms/100ml)	28000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	2900	-
pH	(s.u.)	7.7	-

NEORSD

WQIS

NINE-MILE CREEK (9) - 05/16/91

Parameter		Value	Failure
Temperature	(degrees C)	15.0	-
Dissolved Oxygen	(mg/L)	6.0	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	14	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	403	-
Dissolved Solids	(mg/L)	401	-
Specific Conductance	(umhos/cm)	726	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	1.58	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.14	-
Nitrate-N	(mg/L)	0.62	-
NO3+NO2 Total	(mg/L)	0.63	-
TKN	(mg/L)	2.63	-
Chlorides	(mg/L)	116	-
Sulfates	(mg/L)	79	-
Alkalinity	(mg/L)	115	-
Hardness	(mg/L)	208	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.25	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	50000	-
Fecal Coliform	(organisms/100ml)	21000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	2000	-
pH	(s.u.)	7.5	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

NINE-MILE CREEK (9) - 06/20/91

Parameter		Value	Failure
Temperature	(degrees C)	18.0	-
Dissolved Oxygen	(mg/L)	3.2	WHAL(4.0)
BOD-5	(mg/L)	8	-
COD	(mg/L)	34	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	492	-
Dissolved Solids	(mg/L)	488	-
Specific Conductance	(umhos/cm)	770	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	4.66	-
Phosphorus	(mg/L)	0.45	-
Soluble Phosphorus	(mg/L)	0.40	-
Nitrate-N	(mg/L)	0.50	-
NO3+NO2 Total	(mg/L)	0.50	-
TKN	(mg/L)	6.73	-
Chlorides	(mg/L)	154	-
Sulfates	(mg/L)	132	-
Alkalinity	(mg/L)	138	-
Hardness	(mg/L)	210	-
Nickel	(mg/L)	0.04	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.35	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	180000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	220000	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

NINE-MILE CREEK (9) - 07/30/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	6.9	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	3	-
Total Solids	(mg/L)	348	-
Dissolved Solids	(mg/L)	343	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.07	-
TKN	(mg/L)	0.12	-
Hardness	(mg/L)	170	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.12	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1300	-
Fecal Coliform	(organisms/100ml)	380	-
Fecal Streptococcus	(organisms/100ml)	180	-
pH	(s.u.)	7.5	-

NEORSD

WQIS

NINE-MILE CREEK (10) - 05/16/91

Parameter		Value	Failure
Temperature	(degrees C)	17.0	-
Dissolved Oxygen	(mg/L)	9.4	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	<1	-
Total Solids	(mg/L)	403	-
Dissolved Solids	(mg/L)	403	-
Specific Conductance	(umhos/cm)	722	-
Turbidity	(NTU)	<1.0	-
Ammonia-N	(mg/L)	0.01	-
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.06	-
Nitrate-N	(mg/L)	0.57	-
NO3+NO2 Total	(mg/L)	0.57	-
TKN	(mg/L)	0.78	-
Chlorides	(mg/L)	120	-
Sulfates	(mg/L)	68	-
Alkalinity	(mg/L)	125	-
Hardness	(mg/L)	194	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.06	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	460	-
Fecal Coliform	(organisms/100ml)	240	-
Fecal Streptococcus	(organisms/100ml)	200	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

NINE-MILE CREEK (10) - 06/20/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	7.0	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	21	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	386	-
Dissolved Solids	(mg/L)	374	-
Specific Conductance	(umhos/cm)	590	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	0.11	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	0.52	-
NO3+NO2 Total	(mg/L)	0.52	-
TKN	(mg/L)	0.70	-
Chlorides	(mg/L)	94	-
Sulfates	(mg/L)	17	-
Alkalinity	(mg/L)	121	-
Hardness	(mg/L)	184	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.05	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	1200	-
Fecal Coliform	(organisms/100ml)	340	-
Fecal Streptococcus	(organisms/100ml)	360	-
pH	(s.u.)	7.2	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

NINE-MILE CREEK (10) - 07/30/91

Parameter		Value	Failure
Temperature	(degrees C)	19.5	-
Dissolved Oxygen	(mg/L)	9.9	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	325	-
Dissolved Solids	(mg/L)	316	-
Specific Conductance	(umhos/cm)	509	-
Turbidity	(NTU)	<1.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.09	-
Soluble Phosphorus	(mg/L)	0.09	-
TKN	(mg/L)	<0.01	-
Hardness	(mg/L)	174	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.05	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	540	-
Fecal Coliform	(organisms/100ml)	220	-
Fecal Streptococcus	(organisms/100ml)	380	-
pH	(s.u.)	7.9	-

NEORSD

WQIS

DUGWAY BROOK (12) - 05/17/91

Parameter		Value	Failure
Temperature	(degrees C)	14.5	-
Dissolved Oxygen	(mg/L)	4.9	-
BOD-5	(mg/L)	18	-
COD	(mg/L)	31	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	897	-
Dissolved Solids	(mg/L)	783	-
Specific Conductance	(umhos/cm)	760	-
Turbidity	(NTU)	8.0	-
Ammonia-N	(mg/L)	3.87	-
Phosphorus	(mg/L)	0.67	-
Soluble Phosphorus	(mg/L)	0.55	-
Nitrate-N	(mg/L)	0.54	-
NO3+NO2 Total	(mg/L)	0.57	-
TKN	(mg/L)	7.05	-
Chlorides	(mg/L)	222	-
Sulfates	(mg/L)	115	-
Alkalinity	(mg/L)	207	-
Hardness	(mg/L)	306	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.24	-
Iron	(mg/L)	0.92	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>8000	-
Fecal Coliform	(organisms/100ml)	>6000	-
Fecal Streptococcus	(organisms/100ml)	>10000	-
pH	(s.u.)	7.5	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

DUGWAY BROOK (12) - 06/20/91

Parameter		Value	Failure
Temperature	(degrees C)	18.4	-
Dissolved Oxygen	(mg/L)	4.3	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	26	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	819	-
Dissolved Solids	(mg/L)	783	-
Specific Conductance	(umhos/cm)	1360	-
Turbidity	(NTU)	8.0	-
Ammonia-N	(mg/L)	1.89	-
Phosphorus	(mg/L)	0.41	-
Soluble Phosphorus	(mg/L)	0.30	-
Nitrate-N	(mg/L)	1.43	-
NO3+NO2 Total	(mg/L)	1.47	-
TKN	(mg/L)	3.65	-
Chlorides	(mg/L)	260	-
Sulfates	(mg/L)	162	-
Alkalinity	(mg/L)	179	-
Hardness	(mg/L)	324	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.88	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	120000	-
Fecal Streptococcus	(organisms/100ml)	31000	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

DUGWAY BROOK (12) - 07/30/91

Parameter		Value	Failure
Temperature	(degrees C)	12.4	-
Dissolved Oxygen	(mg/L)	5.3	-
BOD-5	(mg/L)	11	-
COD	(mg/L)	37	-
Suspended Solids	(mg/L)	11	-
Total Solids	(mg/L)	729	-
Dissolved Solids	(mg/L)	691	-
Specific Conductance	(umhos/cm)	1100	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	2.11	-
Phosphorus	(mg/L)	0.48	-
Soluble Phosphorus	(mg/L)	0.33	-
TKN	(mg/L)	3.45	-
Hardness	(mg/L)	281	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.86	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	86000	-
Fecal Streptococcus	(organisms/100ml)	22000	-
pH	(s.u.)	7.3	-

NEORSD

WQIS

DUGWAY BROOK (13) - 05/17/91

Parameter		Value	Failure
Temperature	(degrees C)	19.8	-
Dissolved Oxygen	(mg/L)	6.5	-
BOD-5	(mg/L)	25	-
COD	(mg/L)	31	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	656	-
Dissolved Solids	(mg/L)	535	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	11.0	-
Ammonia-N	(mg/L)	1.47	-
Phosphorus	(mg/L)	0.76	-
Soluble Phosphorus	(mg/L)	0.69	-
Nitrate-N	(mg/L)	1.54	-
NO3+NO2 Total	(mg/L)	1.78	-
TKN	(mg/L)	3.93	-
Chlorides	(mg/L)	134	-
Sulfates	(mg/L)	88	-
Alkalinity	(mg/L)	160	-
Hardness	(mg/L)	228	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.21	-
Iron	(mg/L)	0.83	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.06	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>8000	-
Fecal Coliform	(organisms/100ml)	>6000	-
Fecal Streptococcus	(organisms/100ml)	>10000	-
pH	(s.u.)	7.5	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.24	-

NEORSD

WQIS

DUGWAY BROOK (13) - 06/20/91

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	7.4	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	29	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	488	-
Dissolved Solids	(mg/L)	484	-
Specific Conductance	(umhos/cm)	800	-
Ammonia-N	(mg/L)	0.54	-
Phosphorus	(mg/L)	0.32	-
Soluble Phosphorus	(mg/L)	0.26	-
Nitrate-N	(mg/L)	1.83	-
NO3+NO2 Total	(mg/L)	1.87	-
TKN	(mg/L)	2.20	-
Chlorides	(mg/L)	152	-
Sulfates	(mg/L)	99	-
Alkalinity	(mg/L)	144	-
Hardness	(mg/L)	238	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.84	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	0.3	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	220000	-
Fecal Streptococcus	(organisms/100ml)	8400	-
pH	(s.u.)	7.5	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

DUGWAY BROOK (13) - 07/30/91

Parameter		Value	Failure
Temperature	(degrees C)	15.8	-
Dissolved Oxygen	(mg/L)	8.0	-
BOD-5	(mg/L)	14	-
COD	(mg/L)	46	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	483	-
Dissolved Solids	(mg/L)	455	-
Specific Conductance	(umhos/cm)	725	-
Turbidity	(NTU)	7.0	-
Ammonia-N	(mg/L)	1.09	-
Phosphorus	(mg/L)	0.45	-
Soluble Phosphorus	(mg/L)	0.32	-
TKN	(mg/L)	3.46	-
Hardness	(mg/L)	204	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.03	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.79	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.04	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	>60000	-
Fecal Streptococcus	(organisms/100ml)	18000	-
pH	(s.u.)	7.5	-

NEORSD

WQIS

DUGWAY BROOK (14) - 05/17/91

Parameter		Value	Failure
Temperature	(degrees C)	18.0	-
Dissolved Oxygen	(mg/L)	7.8	-
BOD-5	(mg/L)	12	-
COD	(mg/L)	19	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	621	-
Dissolved Solids	(mg/L)	502	-
Specific Conductance	(umhos/cm)	760	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	3.62	-
Phosphorus	(mg/L)	1.17	-
Soluble Phosphorus	(mg/L)	1.10	-
Nitrate-N	(mg/L)	0.13	-
NO3+NO2 Total	(mg/L)	0.13	-
TKN	(mg/L)	4.76	-
Chlorides	(mg/L)	130	-
Sulfates	(mg/L)	71	-
Alkalinity	(mg/L)	169	-
Hardness	(mg/L)	216	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.33	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>8000	-
Fecal Coliform	(organisms/100ml)	2500	-
Fecal Streptococcus	(organisms/100ml)	1300	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

DUGWAY BROOK (14) - 06/20/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	12.2	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	17	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	459	-
Dissolved Solids	(mg/L)	458	-
Specific Conductance	(umhos/cm)	801	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.17	-
Phosphorus	(mg/L)	0.24	-
Soluble Phosphorus	(mg/L)	0.23	-
Nitrate-N	(mg/L)	0.57	-
NO3+NO2 Total	(mg/L)	0.60	-
TKN	(mg/L)	1.08	-
Chlorides	(mg/L)	154	-
Sulfates	(mg/L)	103	-
Alkalinity	(mg/L)	131	-
Hardness	(mg/L)	232	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.15	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	0.4	-
Total Coliform	(organisms/100ml)	3500	-
Fecal Coliform	(organisms/100ml)	700	-
Fecal Streptococcus	(organisms/100ml)	2000	-
pH	(s.u.)	8.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(ug/L)	0.03	-

NECRSD

WQIS

DUGWAY BROOK (14) - 07/30/91

Parameter		Value	Failure
Temperature	(degrees C)	14.8	-
Dissolved Oxygen	(mg/L)	8.9	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	484	-
Dissolved Solids	(mg/L)	456	-
Specific Conductance	(umhos/cm)	690	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.02	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.13	-
TKN	(mg/L)	0.45	-
Hardness	(mg/L)	204	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.12	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	900	-
Fecal Coliform	(organisms/100ml)	650	-
Fecal Streptococcus	(organisms/100ml)	650	-
pH	(s.u.)	8.8	-

NEORSD

WQIS

DUGWAY BROOK (15) - 05/17/91

Parameter		Value	Failure
Temperature	(degrees C)	16.5	-
Dissolved Oxygen	(mg/L)	5.2	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	23	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	984	-
Dissolved Solids	(mg/L)	872	-
Specific Conductance	(umhos/cm)	1220	-
Turbidity	(NTU)	9.0	-
Ammonia-N	(mg/L)	2.43	-
Phosphorus	(mg/L)	0.32	-
Soluble Phosphorus	(mg/L)	0.26	-
Nitrate-N	(mg/L)	0.29	-
NO3+NO2 Total	(mg/L)	0.33	-
TKN	(mg/L)	3.47	-
Chlorides	(mg/L)	262	-
Sulfates	(mg/L)	114	-
Alkalinity	(mg/L)	220	-
Hardness	(mg/L)	254	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.86	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>8000	-
Fecal Coliform	(organisms/100ml)	2400	-
Fecal Streptococcus	(organisms/100ml)	1200	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

DUGWAY BROOK (15) - 06/20/91

Parameter		Value	Failure
Temperature	(degrees C)	18.5	-
Dissolved Oxygen	(mg/L)	6.2	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	3	-
Total Solids	(mg/L)	686	-
Dissolved Solids	(mg/L)	683	-
Specific Conductance	(umhos/cm)	1210	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	0.46	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	1.59	-
NO3+NO2 Total	(mg/L)	1.63	-
TKN	(mg/L)	0.80	-
Chlorides	(mg/L)	252	-
Sulfates	(mg/L)	103	-
Alkalinity	(mg/L)	174	-
Hardness	(mg/L)	308	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.42	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	0.2	-
Total Coliform	(organisms/100ml)	12000	-
Fecal Coliform	(organisms/100ml)	2800	-
Fecal Streptococcus	(organisms/100ml)	5200	-
pH	(s.u.)	7.5	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

DUGWAY BROOK (15) - 07/30/91

Parameter		Value	Failure
Temperature	(degrees C)	12.1	-
Dissolved Oxygen	(mg/L)	7.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	696	-
Dissolved Solids	(mg/L)	692	-
Specific Conductance	(umhos/cm)	1000	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.10	-
Soluble Phosphorus	(mg/L)	0.08	-
TKN	(mg/L)	0.35	-
Hardness	(mg/L)	286	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.36	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	3900	-
Fecal Coliform	(organisms/100ml)	1100	-
Fecal Streptococcus	(organisms/100ml)	2500	-
pH	(s.u.)	7.7	-

NEORSD

WQIS

DOAN BROOK (16) - 05/16/91

Parameter		Value	Failure
Temperature	(degrees C)	19.1	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	602	-
Dissolved Solids	(mg/L)	600	-
Specific Conductance	(umhos/cm)	915	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.29	-
Phosphorus	(mg/L)	0.27	-
Soluble Phosphorus	(mg/L)	0.25	-
Nitrate-N	(mg/L)	0.77	-
NO3+NO2 Total	(mg/L)	0.94	-
TKN	(mg/L)	1.41	-
Chlorides	(mg/L)	198	-
Sulfates	(mg/L)	80	-
Alkalinity	(mg/L)	145	-
Hardness	(mg/L)	255	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.020	-
Total Chromium	(mg/L)	0.030	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.28	-
Cadmium	(mg/L)	<0.0100	-
Lead	(mg/L)	0.030	-
Total Coliform	(organisms/100ml)	4300	-
Fecal Coliform	(organisms/100ml)	2500	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	260	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.17	-

NEORSD

WQIS

DOAN BROOK (16) - 06/18/91

Parameter		Value	Failure
Temperature	(degrees C)	21.5	-
Dissolved Oxygen	(mg/L)	6.2	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	25	-
Suspended Solids	(mg/L)	3	-
Total Solids	(mg/L)	542	-
Dissolved Solids	(mg/L)	539	-
Specific Conductance	(umhos/cm)	880	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.46	-
Phosphorus	(mg/L)	0.38	-
Soluble Phosphorus	(mg/L)	0.37	-
Nitrate-N	(mg/L)	0.48	-
NO3+NO2 Total	(mg/L)	0.57	-
TKN	(mg/L)	1.35	-
Chlorides	(mg/L)	192	-
Sulfates	(mg/L)	83	-
Alkalinity	(mg/L)	157	-
Hardness	(mg/L)	243	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.40	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	6200	-
Fecal Coliform	(organisms/100ml)	2700	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	1000	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.09	-

NEORSD

WQIS

DOAN BROOK (16) - 07/29/91

Parameter		Value	Failure
Temperature	(degrees C)	12.9	-
Dissolved Oxygen	(mg/L)	6.6	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	14	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	577	-
Dissolved Solids	(mg/L)	529	-
Specific Conductance	(umhos/cm)	820	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.23	-
Phosphorus	(mg/L)	0.32	-
Soluble Phosphorus	(mg/L)	0.31	-
TKN	(mg/L)	0.86	-
Hardness	(mg/L)	238	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.24	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2700	-
Fecal Coliform	(organisms/100ml)	540	-
Fecal Streptococcus	(organisms/100ml)	420	-
pH	(s.u.)	7.6	-

NEORSD

WQIS

DOAN BROOK (17) - 05/16/91

Parameter		Value	Failure
Temperature	(degrees C)	18.7	-
Dissolved Oxygen	(mg/L)	6.6	-
BOD-5	(mg/L)	22	-
COD	(mg/L)	30	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	427	-
Dissolved Solids	(mg/L)	421	-
Specific Conductance	(umhos/cm)	630	-
Turbidity	(NTU)	4.5	-
Ammonia-N	(mg/L)	1.31	-
Phosphorus	(mg/L)	0.67	-
Soluble Phosphorus	(mg/L)	0.59	-
Nitrate-N	(mg/L)	0.45	-
NO3+NO2 Total	(mg/L)	0.46	-
TKN	(mg/L)	3.71	-
Chlorides	(mg/L)	126	-
Sulfates	(mg/L)	71	-
Alkalinity	(mg/L)	117	-
Hardness	(mg/L)	188	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.47	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	>60000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	95000	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	0.07	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

DOAN BROOK (17) - 06/18/91

Parameter		Value	Failure
Temperature	(degrees C)	21.6	-
Dissolved Oxygen	(mg/L)	6.4	-
BOD-5	(mg/L)	14	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	22	-
Total Solids	(mg/L)	406	-
Dissolved Solids	(mg/L)	378	-
Specific Conductance	(umhos/cm)	650	-
Turbidity	(NTU)	74.0	-
Ammonia-N	(mg/L)	1.20	-
Phosphorus	(mg/L)	0.64	-
Soluble Phosphorus	(mg/L)	0.42	-
Nitrate-N	(mg/L)	0.50	-
NO3+NO2 Total	(mg/L)	0.54	-
TKN	(mg/L)	2.83	-
Chlorides	(mg/L)	192	-
Sulfates	(mg/L)	77	-
Alkalinity	(mg/L)	131	-
Hardness	(mg/L)	172	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.09	-
Iron	(mg/L)	2.10	WHAL(1.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	>60000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	67000	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

DOAN BROOK (17) - 07/29/91

Parameter		Value	Failure
Temperature	(degrees C)	14.0	-
Dissolved Oxygen	(mg/L)	3.8	WHAL(4.0)
BOD-5	(mg/L)	8	-
COD	(mg/L)	25	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	430	-
Dissolved Solids	(mg/L)	393	-
Specific Conductance	(umhos/cm)	650	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	3.15	-
Phosphorus	(mg/L)	0.89	-
Soluble Phosphorus	(mg/L)	0.77	-
TKN	(mg/L)	4.12	-
Hardness	(mg/L)	188	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.30	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>160000	-
Fecal Coliform	(organisms/100ml)	180000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	39000	-
pH	(s.u.)	7.6	-

NEORSD

WQIS

DOAN BROOK (18) - 05/16/91

Parameter		Value	Failure
Temperature	(degrees C)	19.9	-
Dissolved Oxygen	(mg/L)	6.1	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	26	-
Suspended Solids	(mg/L)	20	-
Total Solids	(mg/L)	454	-
Dissolved Solids	(mg/L)	433	-
Specific Conductance	(umhos/cm)	715	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.22	-
Phosphorus	(mg/L)	0.19	-
Soluble Phosphorus	(mg/L)	0.16	-
Nitrate-N	(mg/L)	0.36	-
NO3+NO2 Total	(mg/L)	0.38	-
TKN	(mg/L)	1.29	-
Chlorides	(mg/L)	154	-
Sulfates	(mg/L)	51	-
Alkalinity	(mg/L)	138	-
Hardness	(mg/L)	209	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.07	WHAL(0.04)
Total Chromium	(mg/L)	0.15	AWS(0.10)*
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.07	-
Iron	(mg/L)	0.80	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	280	-
Fecal Coliform	(organisms/100ml)	160	-
Fecal Streptococcus	(organisms/100ml)	80	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

DOAN BROOK (18) - 06/18/91

Parameter		Value	Failure
Temperature	(degrees C)	21.4	-
Dissolved Oxygen	(mg/L)	6.8	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	26	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	314	-
Dissolved Solids	(mg/L)	301	-
Specific Conductance	(umhos/cm)	510	-
Turbidity	(NTU)	2.4	-
Ammonia-N	(mg/L)	0.30	-
Phosphorus	(mg/L)	0.12	-
Soluble Phosphorus	(mg/L)	0.09	-
Nitrate-N	(mg/L)	0.25	-
NO3+NO2 Total	(mg/L)	0.25	-
TKN	(mg/L)	1.21	-
Chlorides	(mg/L)	114	-
Sulfates	(mg/L)	42	-
Alkalinity	(mg/L)	131	-
Hardness	(mg/L)	148	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.10	-
Iron	(mg/L)	0.30	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	400	-
Fecal Coliform	(organisms/100ml)	160	-
Fecal Streptococcus	(organisms/100ml)	960	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

DOAN BROOK (18) - 07/29/91

Parameter		Value	Failure
Temperature	(degrees C)	13.7	-
Dissolved Oxygen	(mg/L)	7.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	339	-
Dissolved Solids	(mg/L)	297	-
Specific Conductance	(umhos/cm)	470	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	0.11	-
Soluble Phosphorus	(mg/L)	0.08	-
TKN	(mg/L)	0.39	-
Hardness	(mg/L)	148	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.07	-
Iron	(mg/L)	0.62	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1200	-
Fecal Coliform	(organisms/100ml)	200	-
Fecal Streptococcus	(organisms/100ml)	460	-
pH	(s.u.)	7.7	-

NEORSD

WQIS

DOAN BROOK (19) - 05/16/91

Parameter		Value	Failure
Temperature	(degrees C)	19.2	-
Dissolved Oxygen	(mg/L)	5.2	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	450	-
Dissolved Solids	(mg/L)	426	-
Specific Conductance	(umhos/cm)	710	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.18	-
Phosphorus	(mg/L)	0.07	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.22	-
NO3+NO2 Total	(mg/L)	0.22	-
TKN	(mg/L)	1.07	-
Chlorides	(mg/L)	150	-
Sulfates	(mg/L)	51	-
Alkalinity	(mg/L)	149	-
Hardness	(mg/L)	213	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.32	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	220	-
Fecal Coliform	(organisms/100ml)	80	-
Fecal Streptococcus	(organisms/100ml)	60	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

DOAN BROOK (19) - 06/18/91

Parameter		Value	Failure
Temperature	(degrees C)	20.2	-
Dissolved Oxygen	(mg/L)	6.1	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	24	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	300	-
Dissolved Solids	(mg/L)	292	-
Specific Conductance	(umhos/cm)	515	-
Turbidity	(NTU)	1.6	-
Ammonia-N	(mg/L)	0.22	-
Phosphorus	(mg/L)	0.13	-
Soluble Phosphorus	(mg/L)	0.12	-
Nitrate-N	(mg/L)	0.30	-
NO3+NO2 Total	(mg/L)	0.30	-
TKN	(mg/L)	0.95	-
Chlorides	(mg/L)	114	-
Sulfates	(mg/L)	44	-
Alkalinity	(mg/L)	127	-
Hardness	(mg/L)	156	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.25	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1700	-
Fecal Coliform	(organisms/100ml)	350	-
Fecal Streptococcus	(organisms/100ml)	450	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

DOAN BROOK (19) - 07/29/91

Parameter		Value	Failure
Temperature	(degrees C)	13.3	-
Dissolved Oxygen	(mg/L)	6.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	12	-
Total Solids	(mg/L)	603	-
Dissolved Solids	(mg/L)	562	-
Specific Conductance	(umhos/cm)	810	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.16	-
Phosphorus	(mg/L)	0.11	-
Soluble Phosphorus	(mg/L)	0.08	-
TKN	(mg/L)	0.37	-
Hardness	(mg/L)	200	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.07	-
Iron	(mg/L)	0.54	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2100	-
Fecal Coliform	(organisms/100ml)	160	-
Fecal Streptococcus	(organisms/100ml)	660	-
pH	(s.u.)	7.6	-

NEORSD

WQIS

CUYAHOGA RIVER (20) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	5.2	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	20	-
Suspended Solids	(mg/L)	20	-
Total Solids	(mg/L)	449	-
Dissolved Solids	(mg/L)	433	-
Specific Conductance	(umhos/cm)	675	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	0.56	-
Phosphorus	(mg/L)	0.10	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	4.05	-
NO3+NO2 Total	(mg/L)	4.07	-
TKN	(mg/L)	1.88	-
Chlorides	(mg/L)	126	-
Sulfates	(mg/L)	78	-
Alkalinity	(mg/L)	123	-
Hardness	(mg/L)	224	-
Nickel	(mg/L)	0.030	-
Copper	(mg/L)	0.020	-
Total Chromium	(mg/L)	0.030	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.07	-
Iron	(mg/L)	1.00	-
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.040	-
Total Coliform	(organisms/100ml)	5800	-
Fecal Coliform	(organisms/100ml)	156	-
Fecal Streptococcus	(organisms/100ml)	156	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

CUYAHOGA RIVER (20) - 07/01/91

Parameter		Value	Failure
Temperature	(degrees C)	25.1	-
Dissolved Oxygen	(mg/L)	3.3	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	26	-
Suspended Solids	(mg/L)	15	-
Total Solids	(mg/L)	533	-
Dissolved Solids	(mg/L)	512	-
Specific Conductance	(umhos/cm)	929	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	1.07	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.09	-
Nitrate-N	(mg/L)	5.14	-
NO3+NO2 Total	(mg/L)	5.19	-
TKN	(mg/L)	2.44	-
Chlorides	(mg/L)	154	-
Sulfates	(mg/L)	106	-
Alkalinity	(mg/L)	133	-
Hardness	(mg/L)	232	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	0.02	LRW(0.015)
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.61	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	370	-
Fecal Coliform	(organisms/100ml)	40	-
Fecal Streptococcus	(organisms/100ml)	60	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.05	-

NEORSD

WQIS

CUYAHOGA RIVER (21) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	21.8	-
Dissolved Oxygen	(mg/L)	4.5	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	17	-
Total Solids	(mg/L)	550	-
Dissolved Solids	(mg/L)	568	-
Specific Conductance	(umhos/cm)	880	-
Turbidity	(NTU)	17.0	-
Ammonia-N	(mg/L)	0.82	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	5.26	-
NO3+NO2 Total	(mg/L)	5.29	-
TKN	(mg/L)	2.36	-
Chlorides	(mg/L)	156	-
Sulfates	(mg/L)	112	-
Alkalinity	(mg/L)	134	-
Hardness	(mg/L)	252	-
Nickel	(mg/L)	0.030	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.030	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	1.00	-
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.020	-
Total Coliform	(organisms/100ml)	1200	-
Fecal Coliform	(organisms/100ml)	48	-
Fecal Streptococcus	(organisms/100ml)	8	-
pH	(s.u.)	7.3	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

CUYAHOGA RIVER (21) - 07/01/91

Parameter		Value	Failure
Temperature	(degrees C)	26.8	-
Dissolved Oxygen	(mg/L)	3.0	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	23	-
Suspended Solids	(mg/L)	17	-
Total Solids	(mg/L)	634	-
Dissolved Solids	(mg/L)	610	-
Specific Conductance	(umhos/cm)	1080	-
Turbidity	(NTU)	17.0	-
Ammonia-N	(mg/L)	1.37	-
Phosphorus	(mg/L)	0.20	-
Soluble Phosphorus	(mg/L)	0.10	-
Nitrate-N	(mg/L)	5.91	-
NO3+NO2 Total	(mg/L)	5.97	-
TKN	(mg/L)	2.86	-
Chlorides	(mg/L)	182	-
Sulfates	(mg/L)	116	-
Alkalinity	(mg/L)	150	-
Hardness	(mg/L)	278	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.68	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	400	-
Fecal Coliform	(organisms/100ml)	50	-
Fecal Streptococcus	(organisms/100ml)	220	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.06	-

NEORSD

WQIS

CUYAHOGA RIVER (22) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	24.5	-
Dissolved Oxygen	(mg/L)	7.1	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	22	-
Suspended Solids	(mg/L)	15	-
Total Solids	(mg/L)	545	-
Dissolved Solids	(mg/L)	570	-
Specific Conductance	(umhos/cm)	920	-
Turbidity	(NTU)	12.0	-
Ammonia-N	(mg/L)	0.54	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	5.60	-
NO3+NO2 Total	(mg/L)	5.62	-
TKN	(mg/L)	2.07	-
Chlorides	(mg/L)	148	-
Sulfates	(mg/L)	99	-
Alkalinity	(mg/L)	138	-
Hardness	(mg/L)	255	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.75	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	3500	-
Fecal Coliform	(organisms/100ml)	92	-
Fecal Streptococcus	(organisms/100ml)	12	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

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CUYAHOGA RIVER (22) - 07/01/91

Parameter		Value	Failure
Temperature	(degrees C)	28.5	-
Dissolved Oxygen	(mg/L)	3.6	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	25	-
Total Solids	(mg/L)	695	-
Dissolved Solids	(mg/L)	670	-
Specific Conductance	(umhos/cm)	1120	-
Turbidity	(NTU)	25.0	-
Ammonia-N	(mg/L)	1.49	-
Phosphorus	(mg/L)	0.27	-
Soluble Phosphorus	(mg/L)	0.17	-
Nitrate-N	(mg/L)	6.96	-
NO3+NO2 Total	(mg/L)	6.98	-
TKN	(mg/L)	3.52	-
Chlorides	(mg/L)	184	-
Sulfates	(mg/L)	139	-
Alkalinity	(mg/L)	143	-
Hardness	(mg/L)	288	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.09	-
Iron	(mg/L)	0.94	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	73000	-
Fecal Coliform	(organisms/100ml)	6000	-
Fecal Streptococcus	(organisms/100ml)	600	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

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CUYAHOGA RIVER (22.5) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	24.0	-
Dissolved Oxygen	(mg/L)	8.0	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	537	-
Dissolved Solids	(mg/L)	553	-
Specific Conductance	(umhos/cm)	860	-
Turbidity	(NTU)	7.0	-
Ammonia-N	(mg/L)	0.27	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.12	-
Nitrate-N	(mg/L)	5.81	-
NO3+NO2 Total	(mg/L)	5.81	-
TKN	(mg/L)	1.77	-
Chlorides	(mg/L)	148	-
Sulfates	(mg/L)	85	-
Alkalinity	(mg/L)	132	-
Hardness	(mg/L)	247	-
Nickel	(mg/L)	0.040	-
Copper	(mg/L)	0.020	-
Total Chromium	(mg/L)	0.030	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.60	-
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.040	-
Total Coliform	(organisms/100ml)	4500	-
Fecal Coliform	(organisms/100ml)	96	-
Fecal Streptococcus	(organisms/100ml)	68	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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CUYAHOGA RIVER (22.5) - 07/01/91

Parameter		Value	Failure
Temperature	(degrees C)	27.1	-
Dissolved Oxygen	(mg/L)	7.6	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	28	-
Suspended Solids	(mg/L)	27	-
Total Solids	(mg/L)	605	-
Dissolved Solids	(mg/L)	578	-
Specific Conductance	(umhos/cm)	1000	-
Turbidity	(NTU)	13.0	-
Ammonia-N	(mg/L)	0.63	-
Phosphorus	(mg/L)	0.27	-
Soluble Phosphorus	(mg/L)	0.14	-
Nitrate-N	(mg/L)	7.02	-
NO3+NO2 Total	(mg/L)	7.04	-
TKN	(mg/L)	2.59	-
Chlorides	(mg/L)	154	-
Sulfates	(mg/L)	125	-
Alkalinity	(mg/L)	130	-
Hardness	(mg/L)	260	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.84	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	46000	-
Fecal Coliform	(organisms/100ml)	2100	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	250	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

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CUYAHOGA RIVER (22.51) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	22.1	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	522	-
Dissolved Solids	(mg/L)	512	-
Specific Conductance	(umhos/cm)	790	-
Turbidity	(NTU)	6.5	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.12	-
Nitrate-N	(mg/L)	5.24	-
NO3+NO2 Total	(mg/L)	5.24	-
TKN	(mg/L)	1.39	-
Chlorides	(mg/L)	128	-
Sulfates	(mg/L)	86	-
Alkalinity	(mg/L)	134	-
Hardness	(mg/L)	247	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.40	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	3500	-
Fecal Coliform	(organisms/100ml)	150	-
Fecal Streptococcus	(organisms/100ml)	16	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

CUYAHOGA RIVER (22.51) - 07/01/91

Parameter		Value	Failure
Temperature	(degrees C)	24.5	-
Dissolved Oxygen	(mg/L)	7.5	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	33	-
Suspended Solids	(mg/L)	20	-
Total Solids	(mg/L)	580	-
Dissolved Solids	(mg/L)	560	-
Specific Conductance	(umhos/cm)	925	-
Turbidity	(NTU)	13.0	-
Ammonia-N	(mg/L)	0.25	-
Phosphorus	(mg/L)	0.24	-
Soluble Phosphorus	(mg/L)	0.15	-
Nitrate-N	(mg/L)	6.66	-
NO3+NO2 Total	(mg/L)	6.66	-
TKN	(mg/L)	1.88	-
Chlorides	(mg/L)	166	-
Sulfates	(mg/L)	114	-
Alkalinity	(mg/L)	123	-
Hardness	(mg/L)	238	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.97	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	40000	-
Fecal Coliform	(organisms/100ml)	2000	-
Fecal Streptococcus	(organisms/100ml)	180	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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CUYAHOGA RIVER (22.6) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	23.5	-
Dissolved Oxygen	(mg/L)	8.0	-
BOD-5	(mg/L)	9	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	526	-
Dissolved Solids	(mg/L)	517	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	9.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	5.68	-
NO3+NO2 Total	(mg/L)	5.68	-
TKN	(mg/L)	1.22	-
Chlorides	(mg/L)	126	-
Sulfates	(mg/L)	88	-
Alkalinity	(mg/L)	139	-
Hardness	(mg/L)	249	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.40	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	3700	-
Fecal Coliform	(organisms/100ml)	8	-
Fecal Streptococcus	(organisms/100ml)	4	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

CUYAHOGA RIVER (22.6) - 07/01/91

Parameter		Value	Failure
Temperature	(degrees C)	24.8	-
Dissolved Oxygen	(mg/L)	7.6	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	31	-
Suspended Solids	(mg/L)	23	-
Total Solids	(mg/L)	597	-
Dissolved Solids	(mg/L)	574	-
Specific Conductance	(umhos/cm)	917	-
Turbidity	(NTU)	20.0	-
Ammonia-N	(mg/L)	0.12	-
Phosphorus	(mg/L)	0.27	-
Soluble Phosphorus	(mg/L)	0.18	-
Nitrate-N	(mg/L)	5.92	-
NO3+NO2 Total	(mg/L)	5.96	-
TKN	(mg/L)	1.88	-
Chlorides	(mg/L)	168	-
Sulfates	(mg/L)	121	-
Alkalinity	(mg/L)	141	-
Hardness	(mg/L)	272	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(ug/L)	0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.74	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	0.8	HHSR(0.012)*
Total Coliform	(organisms/100ml)	25000	-
Fecal Coliform	(organisms/100ml)	2200	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	2100	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

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CUYAHOGA RIVER (22.7) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	23.2	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	22	-
Suspended Solids	(mg/L)	12	-
Total Solids	(mg/L)	512	-
Dissolved Solids	(mg/L)	500	-
Specific Conductance	(umhos/cm)	780	-
Turbidity	(NTU)	6.3	-
Ammonia-N	(mg/L)	0.14	-
Phosphorus	(mg/L)	0.18	-
Soluble Phosphorus	(mg/L)	0.15	-
Nitrate-N	(mg/L)	6.92	-
NO3+NO2 Total	(mg/L)	6.92	-
TKN	(mg/L)	1.48	-
Chlorides	(mg/L)	122	-
Sulfates	(mg/L)	88	-
Alkalinity	(mg/L)	129	-
Hardness	(mg/L)	244	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.48	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4300	-
Fecal Coliform	(organisms/100ml)	190	-
Fecal Streptococcus	(organisms/100ml)	48	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CUYAHOGA RIVER (22.7) - 07/01/91

Parameter		Value	Failure
Temperature	(degrees C)	24.8	-
Dissolved Oxygen	(mg/L)	7.8	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	34	-
Suspended Solids	(mg/L)	25	-
Total Solids	(mg/L)	616	-
Dissolved Solids	(mg/L)	591	-
Specific Conductance	(umhos/cm)	992	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	0.17	-
Phosphorus	(mg/L)	0.32	-
Soluble Phosphorus	(mg/L)	0.26	-
Nitrate-N	(mg/L)	9.06	-
NO3+NO2 Total	(mg/L)	9.06	-
TKN	(mg/L)	2.01	-
Chlorides	(mg/L)	160	-
Sulfates	(mg/L)	122	-
Alkalinity	(mg/L)	133	-
Hardness	(mg/L)	276	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.67	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	5900	-
Fecal Coliform	(organisms/100ml)	3400	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	360	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

CUYAHOGA RIVER (22.8) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	7.3	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	21	-
Suspended Solids	(mg/L)	13	-
Total Solids	(mg/L)	482	-
Dissolved Solids	(mg/L)	468	-
Specific Conductance	(umhos/cm)	855	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	0.07	-
Phosphorus	(mg/L)	0.12	-
Soluble Phosphorus	(mg/L)	0.07	-
Nitrate-N	(mg/L)	2.14	-
NO3+NO2 Total	(mg/L)	2.18	-
TKN	(mg/L)	0.88	-
Chlorides	(mg/L)	114	-
Sulfates	(mg/L)	90	-
Alkalinity	(mg/L)	146	-
Hardness	(mg/L)	250	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.79	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

CUYAHOGA RIVER (22.8) - 06/05/91

Parameter		Value	Failure
Temperature	(degrees C)	20.4	-
Dissolved Oxygen	(mg/L)	7.8	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	56	-
Total Solids	(mg/L)	609	-
Dissolved Solids	(mg/L)	539	-
Specific Conductance	(umhos/cm)	825	-
Turbidity	(NTU)	19.0	-
Ammonia-N	(mg/L)	0.25	-
Phosphorus	(mg/L)	0.25	-
Soluble Phosphorus	(mg/L)	0.18	-
Nitrate-N	(mg/L)	3.62	-
NO3+NO2 Total	(mg/L)	3.63	-
TKN	(mg/L)	1.13	-
Chlorides	(mg/L)	158	-
Sulfates	(mg/L)	98	-
Alkalinity	(mg/L)	162	-
Hardness	(mg/L)	286	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	1.60	WHAL(1.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	610	-
Fecal Coliform	(organisms/100ml)	270	-
Fecal Streptococcus	(organisms/100ml)	160	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

CUYAHOGA RIVER (22.8) - 07/16/91

Parameter		Value	Failure
Temperature	(degrees C)	22.4	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	11	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	16	-
Total Solids	(mg/L)	549	-
Dissolved Solids	(mg/L)	533	-
Specific Conductance	(umhos/cm)	850	-
Turbidity	(NTU)	6.4	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.29	-
Soluble Phosphorus	(mg/L)	0.24	-
TKN	(mg/L)	1.18	-
Hardness	(mg/L)	260	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.83	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1100	-
Fecal Coliform	(organisms/100ml)	490	-
Fecal Streptococcus	(organisms/100ml)	44	-
pH	(s.u.)	8.2	-

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WQIS

CUYAHOGA RIVER (22.9) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	20.1	-
Dissolved Oxygen	(mg/L)	5.4	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	20	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	463	-
Dissolved Solids	(mg/L)	454	-
Specific Conductance	(umhos/cm)	843	-
Turbidity	(NTU)	4.8	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.11	-
Soluble Phosphorus	(mg/L)	0.09	-
Nitrate-N	(mg/L)	2.05	-
NO3+NO2 Total	(mg/L)	2.09	-
TKN	(mg/L)	0.77	-
Chlorides	(mg/L)	104	-
Sulfates	(mg/L)	82	-
Alkalinity	(mg/L)	145	-
Hardness	(mg/L)	248	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.40	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.07	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

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WQIS

CUYAHOGA RIVER (22.9) - 06/05/91

Parameter		Value	Failure
Temperature	(degrees C)	20.4	-
Dissolved Oxygen	(mg/L)	8.0	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	59	-
Suspended Solids	(mg/L)	40	-
Total Solids	(mg/L)	599	-
Dissolved Solids	(mg/L)	519	-
Specific Conductance	(umhos/cm)	815	-
Turbidity	(NTU)	14.0	-
Ammonia-N	(mg/L)	0.22	-
Phosphorus	(mg/L)	0.23	-
Soluble Phosphorus	(mg/L)	0.17	-
Nitrate-N	(mg/L)	3.63	-
NO3+NO2 Total	(mg/L)	3.63	-
TKN	(mg/L)	0.89	-
Chlorides	(mg/L)	163	-
Sulfates	(mg/L)	91	-
Alkalinity	(mg/L)	161	-
Hardness	(mg/L)	276	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.09	-
Iron	(mg/L)	1.20	WHAL(1.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1100	-
Fecal Coliform	(organisms/100ml)	76	-
Fecal Streptococcus	(organisms/100ml)	110	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSO

WQIS

CUYAHOGA RIVER (22.9) - 07/16/91

Parameter		Value	Failure
Temperature	(degrees C)	22.8	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	20	-
Suspended Solids	(mg/L)	14	-
Total Solids	(mg/L)	537	-
Dissolved Solids	(mg/L)	523	-
Specific Conductance	(umhos/cm)	860	-
Turbidity	(NTU)	5.3	-
Ammonia-N	(mg/L)	0.24	-
Phosphorus	(mg/L)	0.30	-
Soluble Phosphorus	(mg/L)	0.24	-
TKN	(mg/L)	1.05	-
Hardness	(mg/L)	264	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.75	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1700	-
Fecal Coliform	(organisms/100ml)	1300	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	8.0	-

NEORSD

WQIS

CUYAHOGA RIVER (23) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	23.1	-
Dissolved Oxygen	(mg/L)	7.8	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	19	-
Suspended Solids	(mg/L)	16	-
Total Solids	(mg/L)	489	-
Dissolved Solids	(mg/L)	473	-
Specific Conductance	(umhos/cm)	846	-
Turbidity	(NTU)	5.3	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.13	-
Soluble Phosphorus	(mg/L)	0.09	-
Nitrate-N	(mg/L)	2.21	-
NO3+NO2 Total	(mg/L)	2.23	-
TKN	(mg/L)	1.02	-
Chlorides	(mg/L)	104	-
Sulfates	(mg/L)	80	-
Alkalinity	(mg/L)	145	-
Hardness	(mg/L)	245	-
Nickel	(mg/L)	0.04	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.06	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.60	-
Cadmium	(mg/L)	0.02	WHAL(0.01)
Lead	(mg/L)	0.12	AWS(0.100)*
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

CUYAHOGA RIVER (23) - 06/05/91

Parameter		Value	Failure
Temperature	(degrees C)	20.3	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	577	-
Dissolved Solids	(mg/L)	553	-
Specific Conductance	(umhos/cm)	810	-
Turbidity	(NTU)	7.5	-
Ammonia-N	(mg/L)	0.16	-
Phosphorus	(mg/L)	0.22	-
Soluble Phosphorus	(mg/L)	0.20	-
Nitrate-N	(mg/L)	3.99	-
NO3+NO2 Total	(mg/L)	4.03	-
TKN	(mg/L)	1.00	-
Chlorides	(mg/L)	178	-
Sulfates	(mg/L)	108	-
Alkalinity	(mg/L)	159	-
Hardness	(mg/L)	271	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.04	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.84	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	700	-
Fecal Coliform	(organisms/100ml)	150	-
Fecal Streptococcus	(organisms/100ml)	92	-
pH	(s.u.)	8.2	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

CUYAHOGA RIVER (23) - 07/16/91

Parameter		Value	Failure
Temperature	(degrees C)	22.3	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	583	-
Dissolved Solids	(mg/L)	542	-
Specific Conductance	(umhos/cm)	840	-
Turbidity	(NTU)	5.3	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.35	-
Soluble Phosphorus	(mg/L)	0.30	-
TKN	(mg/L)	1.19	-
Hardness	(mg/L)	264	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.55	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1300	-
Fecal Coliform	(organisms/100ml)	170	-
Fecal Streptococcus	(organisms/100ml)	72	-
pH	(s.u.)	8.3	-

NEORSD

WQIS

CUYAHOGA RIVER (24) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	5.9	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	497	-
Dissolved Solids	(mg/L)	478	-
Specific Conductance	(umhos/cm)	821	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.16	-
Soluble Phosphorus	(mg/L)	0.10	-
Nitrate-N	(mg/L)	2.10	-
NO3+NO2 Total	(mg/L)	2.12	-
TKN	(mg/L)	1.03	-
Chlorides	(mg/L)	104	-
Sulfates	(mg/L)	86	-
Alkalinity	(mg/L)	144	-
Hardness	(mg/L)	248	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.05	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.39	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.08	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

CUYAHOGA RIVER (24) - 06/05/91

Parameter		Value	Failure
Temperature	(degrees C)	19.8	-
Dissolved Oxygen	(mg/L)	7.6	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	16	-
Total Solids	(mg/L)	561	-
Dissolved Solids	(mg/L)	545	-
Specific Conductance	(umhos/cm)	810	-
Turbidity	(NTU)	7.5	-
Ammonia-N	(mg/L)	0.01	-
Phosphorus	(mg/L)	0.21	-
Soluble Phosphorus	(mg/L)	0.19	-
Nitrate-N	(mg/L)	3.68	-
NO3+NO2 Total	(mg/L)	3.68	-
TKN	(mg/L)	1.00	-
Chlorides	(mg/L)	208	-
Sulfates	(mg/L)	120	-
Alkalinity	(mg/L)	163	-
Hardness	(mg/L)	271	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.04	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.84	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	950	-
Fecal Coliform	(organisms/100ml)	130	-
Fecal Streptococcus	(organisms/100ml)	110	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CUYAHOGA RIVER (24) - 07/16/91

Parameter		Value	Failure
Temperature	(degrees C)	21.8	-
Dissolved Oxygen	(mg/L)	7.5	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	530	-
Dissolved Solids	(mg/L)	496	-
Specific Conductance	(umhos/cm)	840	-
Turbidity	(NTU)	3.5	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	0.36	-
Soluble Phosphorus	(mg/L)	0.32	-
TKN	(mg/L)	0.91	-
Hardness	(mg/L)	264	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.31	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1800	-
Fecal Coliform	(organisms/100ml)	240	-
Fecal Streptococcus	(organisms/100ml)	200	-
pH	(s.u.)	7.8	-

NEORSD

WQIS

CUYAHOGA RIVER (24.5) - 05/13/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	4.9	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	461	-
Dissolved Solids	(mg/L)	452	-
Specific Conductance	(umhos/cm)	808	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	0.19	-
Phosphorus	(mg/L)	0.18	-
Soluble Phosphorus	(mg/L)	0.15	-
Nitrate-N	(mg/L)	2.38	-
NO3+NO2 Total	(mg/L)	2.45	-
TKN	(mg/L)	1.05	-
Chlorides	(mg/L)	97	-
Sulfates	(mg/L)	74	-
Alkalinity	(mg/L)	144	-
Hardness	(mg/L)	237	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.04	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.31	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.09	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.07	-

NEORSD

WQIS

CUYAHOGA RIVER (24.5) - 06/05/91

Parameter		Value	Failure
Temperature	(degrees C)	19.3	-
Dissolved Oxygen	(mg/L)	7.3	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	577	-
Dissolved Solids	(mg/L)	557	-
Specific Conductance	(umhos/cm)	780	-
Turbidity	(NTU)	3.5	-
Ammonia-N	(mg/L)	0.33	-
Phosphorus	(mg/L)	0.24	-
Soluble Phosphorus	(mg/L)	0.22	-
Nitrate-N	(mg/L)	4.00	-
NO3+NO2 Total	(mg/L)	4.02	-
TKN	(mg/L)	2.14	-
Chlorides	(mg/L)	134	-
Sulfates	(mg/L)	104	-
Alkalinity	(mg/L)	160	-
Hardness	(mg/L)	269	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.52	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	0.4	HHSR(0.012)*
Total Coliform	(organisms/100ml)	7000	-
Fecal Coliform	(organisms/100ml)	1000	-
Fecal Streptococcus	(organisms/100ml)	88	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

CUYAHOGA RIVER (24.5) - 07/16/91

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	7.5	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	544	-
Dissolved Solids	(mg/L)	519	-
Specific Conductance	(umhos/cm)	840	-
Turbidity	(NTU)	2.5	-
Ammonia-N	(mg/L)	0.29	-
Phosphorus	(mg/L)	0.33	-
Soluble Phosphorus	(mg/L)	0.29	-
TKN	(mg/L)	1.34	-
Hardness	(mg/L)	280	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.37	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>8000	-
Fecal Coliform	(organisms/100ml)	8000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	92	-
pH	(s.u.)	7.6	-

NEORSD

WQIS

BIG CREEK (25) - 05/03/91

Parameter		Value	Failure
Temperature	(degrees C)	9.9	-
Dissolved Oxygen	(mg/L)	10.1	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	681	-
Dissolved Solids	(mg/L)	662	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.28	-
NO3+NO2 Total	(mg/L)	0.28	-
TKN	(mg/L)	0.79	-
Chlorides	(mg/L)	220	-
Sulfates	(mg/L)	124	-
Alkalinity	(mg/L)	142	-
Hardness	(mg/L)	191	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.35	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1600	-
Fecal Coliform	(organisms/100ml)	380	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

BIG CREEK (25) - 06/21/91

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	7.6	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	7	-
Total Solids	(mg/L)	535	-
Dissolved Solids	(mg/L)	525	-
Specific Conductance	(umhos/cm)	840	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.15	-
Phosphorus	(mg/L)	0.07	-
Soluble Phosphorus	(mg/L)	0.06	-
Nitrate-N	(mg/L)	0.50	-
NO3+NO2 Total	(mg/L)	0.51	-
TKN	(mg/L)	0.43	-
Chlorides	(mg/L)	152	-
Sulfates	(mg/L)	113	-
Alkalinity	(mg/L)	122	-
Hardness	(mg/L)	214	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.19	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.3	HHSR(0.012)*
Total Coliform	(organisms/100ml)	7500	-
Fecal Coliform	(organisms/100ml)	3900	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	520	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

BIG CREEK (25) - 09/06/91

Parameter		Value	Failure
Temperature	(degrees C)	17.0	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	558	-
Dissolved Solids	(mg/L)	553	-
Specific Conductance	(umhos/cm)	750	-
Turbidity	(NTU)	3.3	-
Ammonia-N	(mg/L)	0.17	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.07	-
TKN	(mg/L)	0.99	-
Hardness	(mg/L)	187	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.38	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	20000	-
Fecal Coliform	(organisms/100ml)	3300	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	1000	-
pH	(s.u.)	7.9	-

NEORSD

WQIS

BIG CREEK (26) - 05/03/91

Parameter		Value	Failure
Temperature	(degrees C)	10.5	-
Dissolved Oxygen	(mg/L)	11.1	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	571	-
Dissolved Solids	(mg/L)	519	-
Specific Conductance	(umhos/cm)	610	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.44	-
NO3+NO2 Total	(mg/L)	0.44	-
TKN	(mg/L)	0.38	-
Chlorides	(mg/L)	143	-
Sulfates	(mg/L)	102	-
Alkalinity	(mg/L)	130	-
Hardness	(mg/L)	180	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.22	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1100	-
Fecal Coliform	(organisms/100ml)	480	-
Fecal Streptococcus	(organisms/100ml)	320	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

BIG CREEK (26) - 06/21/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	8.4	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	32	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	435	-
Dissolved Solids	(mg/L)	429	-
Specific Conductance	(umhos/cm)	610	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.05	-
Soluble Phosphorus	(mg/L)	0.05	-
Nitrate-N	(mg/L)	0.53	-
NO3+NO2 Total	(mg/L)	0.53	-
TKN	(mg/L)	0.70	-
Chlorides	(mg/L)	88	-
Sulfates	(mg/L)	77	-
Alkalinity	(mg/L)	114	-
Hardness	(mg/L)	212	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.30	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>8000	-
Fecal Coliform	(organisms/100ml)	8900	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	760	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

BIG CREEK (26) - 09/06/91

Parameter		Value	Failure
Temperature	(degrees C)	15.0	-
Dissolved Oxygen	(mg/L)	10.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	7	-
Total Solids	(mg/L)	383	-
Dissolved Solids	(mg/L)	314	-
Specific Conductance	(umhos/cm)	480	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	0.08	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.07	-
TKN	(mg/L)	1.02	-
Hardness	(mg/L)	190	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.78	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	12000	-
Fecal Coliform	(organisms/100ml)	3100	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	800	-
pH	(s.u.)	8.0	-

NEORSD

WQIS

BIG CREEK (27) - 05/03/91

Parameter		Value	Failure
Temperature	(degrees C)	10.6	-
Dissolved Oxygen	(mg/L)	12.3	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	33	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	979	-
Dissolved Solids	(mg/L)	941	-
Specific Conductance	(umhos/cm)	1100	-
Turbidity	(NTU)	7.0	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.20	-
Soluble Phosphorus	(mg/L)	0.18	-
Nitrate-N	(mg/L)	0.45	-
NO3+NO2 Total	(mg/L)	0.47	-
TKN	(mg/L)	0.80	-
Chlorides	(mg/L)	325	-
Sulfates	(mg/L)	156	-
Alkalinity	(mg/L)	190	-
Hardness	(mg/L)	259	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.11	-
Iron	(mg/L)	0.69	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1000	-
Fecal Coliform	(organisms/100ml)	180	-
Fecal Streptococcus	(organisms/100ml)	<20	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

BIG CREEK (27) - 06/21/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	7.6	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	32	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	702	-
Dissolved Solids	(mg/L)	696	-
Specific Conductance	(umhos/cm)	980	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.24	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.14	-
Nitrate-N	(mg/L)	0.76	-
NO3+NO2 Total	(mg/L)	0.79	-
TKN	(mg/L)	0.83	-
Chlorides	(mg/L)	176	-
Sulfates	(mg/L)	120	-
Alkalinity	(mg/L)	161	-
Hardness	(mg/L)	274	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.54	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	3000	-
Fecal Coliform	(organisms/100ml)	300	-
Fecal Streptococcus	(organisms/100ml)	1100	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.03	-

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WQIS

BIG CREEK (27) - 09/06/91

Parameter		Value	Failure
Temperature	(degrees C)	16.5	-
Dissolved Oxygen	(mg/L)	7.0	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	1	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	525	-
Dissolved Solids	(mg/L)	506	-
Specific Conductance	(umhos/cm)	770	-
Turbidity	(NTU)	2.4	-
Ammonia-N	(mg/L)	0.27	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.14	-
TKN	(mg/L)	1.49	-
Hardness	(mg/L)	208	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.51	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	8000	-
Fecal Coliform	(organisms/100ml)	1100	-
Fecal Streptococcus	(organisms/100ml)	500	-
pH	(s.u.)	7.7	-

NEORSD

WQIS

BIG CREEK (28) - 05/03/91

Parameter		Value	Failure
Temperature	(degrees C)	12.2	-
Dissolved Oxygen	(mg/L)	14.5	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	30	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	742	-
Dissolved Solids	(mg/L)	709	-
Specific Conductance	(umhos/cm)	900	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.05	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.39	-
NO3+NO2 Total	(mg/L)	0.39	-
TKN	(mg/L)	0.99	-
Chlorides	(mg/L)	252	-
Sulfates	(mg/L)	92	-
Alkalinity	(mg/L)	146	-
Hardness	(mg/L)	185	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.11	-
Iron	(mg/L)	0.45	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2900	-
Fecal Coliform	(organisms/100ml)	780	-
Fecal Streptococcus	(organisms/100ml)	<20	-
pH	(s.u.)	8.3	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

BIG CREEK (28) - 06/21/91

Parameter		Value	Failure
Temperature	(degrees C)	23.0	-
Dissolved Oxygen	(mg/L)	13.1	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	34	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	663	-
Dissolved Solids	(mg/L)	649	-
Specific Conductance	(umhos/cm)	940	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.12	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	0.29	-
NO3+NO2 Total	(mg/L)	0.30	-
TKN	(mg/L)	0.73	-
Chlorides	(mg/L)	170	-
Sulfates	(mg/L)	93	-
Alkalinity	(mg/L)	130	-
Hardness	(mg/L)	232	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.34	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.4	HHSR(0.012)*
Total Coliform	(organisms/100ml)	6600	-
Fecal Coliform	(organisms/100ml)	2400	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	860	-
pH	(s.u.)	8.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

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WQIS

BIG CREEK (28) - 09/06/91

Parameter		Value	Failure
Temperature	(degrees C)	17.8	-
Dissolved Oxygen	(mg/L)	8.4	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	24	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	617	-
Dissolved Solids	(mg/L)	613	-
Specific Conductance	(umhos/cm)	830	-
Turbidity	(NTU)	3.6	-
Ammonia-N	(mg/L)	0.30	-
Phosphorus	(mg/L)	0.09	-
Soluble Phosphorus	(mg/L)	0.09	-
TKN	(mg/L)	1.59	-
Hardness	(mg/L)	258	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.46	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	5400	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	1400	-
pH	(s.u.)	7.6	-

NEORSD

WQIS

BIG CREEK (29) - 05/03/91

Parameter		Value	Failure
Temperature	(degrees C)	10.0	-
Dissolved Oxygen	(mg/L)	9.7	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	77	-
Suspended Solids	(mg/L)	1000	-
Total Solids	(mg/L)	1700	-
Dissolved Solids	(mg/L)	574	-
Specific Conductance	(umhos/cm)	660	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	0.15	-
Phosphorus	(mg/L)	2.04	-
Soluble Phosphorus	(mg/L)	0.56	-
Nitrate-N	(mg/L)	0.48	-
NO3+NO2 Total	(mg/L)	0.48	-
TKN	(mg/L)	2.92	-
Chlorides	(mg/L)	128	-
Sulfates	(mg/L)	119	-
Alkalinity	(mg/L)	143	-
Hardness	(mg/L)	165	-
Nickel	(mg/L)	0.07	-
Copper	(mg/L)	0.04	WHAL(0.03)
Total Chromium	(mg/L)	0.05	-
Hexavalent Chromium	(mg/L)	0.02	WHAL(0.015)
Zinc	(mg/L)	0.12	-
Iron	(mg/L)	24.00	WHAL(1.0)* AWS(5.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	65000	-
Fecal Coliform	(organisms/100ml)	13000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	3600	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSO

WQTS

BIG CREEK (29) - 06/21/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	21	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	531	-
Dissolved Solids	(mg/L)	515	-
Specific Conductance	(umhos/cm)	600	-
Turbidity	(NTU)	7.0	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.07	-
Nitrate-N	(mg/L)	0.78	-
NO3+NO2 Total	(mg/L)	0.79	-
TKN	(mg/L)	0.45	-
Chlorides	(mg/L)	94	-
Sulfates	(mg/L)	110	-
Alkalinity	(mg/L)	113	-
Hardness	(mg/L)	222	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.44	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	19000	-
Fecal Coliform	(organisms/100ml)	13000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	1100	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

NEORSO

WQTS

BIG CREEK (29) - 09/06/91

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	9.4	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	421	-
Dissolved Solids	(mg/L)	417	-
Specific Conductance	(umhos/cm)	520	-
Turbidity	(NTU)	5.5	-
Ammonia-N	(mg/L)	0.58	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.07	-
TKN	(mg/L)	1.76	-
Hardness	(mg/L)	196	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.31	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	4700	-
Fecal Coliform	(organisms/100ml)	900	-
Fecal Streptococcus	(organisms/100ml)	920	-
pH	(s.u.)	8.0	-

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WQIS

BIG CREEK (30) - 05/03/91

Parameter		Value	Failure
Temperature	(degrees C)	9.5	-
Dissolved Oxygen	(mg/L)	12.0	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	21	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	382	-
Dissolved Solids	(mg/L)	368	-
Specific Conductance	(umhos/cm)	430	-
Turbidity	(NTU)	1.3	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.54	-
NO3+NO2 Total	(mg/L)	0.54	-
TKN	(mg/L)	0.36	-
Chlorides	(mg/L)	162	-
Sulfates	(mg/L)	56	-
Alkalinity	(mg/L)	112	-
Hardness	(mg/L)	93	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.10	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2700	-
Fecal Coliform	(organisms/100ml)	480	-
Fecal Streptococcus	(organisms/100ml)	160	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

BIG CREEK (30) - 06/21/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	21	-
Suspended Solids	(mg/L)	3	-
Total Solids	(mg/L)	379	-
Dissolved Solids	(mg/L)	376	-
Specific Conductance	(umhos/cm)	460	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.09	-
Phosphorus	(mg/L)	0.11	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	0.80	-
NO3+NO2 Total	(mg/L)	0.80	-
TKN	(mg/L)	0.23	-
Chlorides	(mg/L)	64	-
Sulfates	(mg/L)	69	-
Alkalinity	(mg/L)	105	-
Hardness	(mg/L)	174	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.08	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>8000	-
Fecal Coliform	(organisms/100ml)	15000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	1200	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

BIG CREEK (30) - 09/06/91

Parameter		Value	Failure
Temperature	(degrees C)	15.5	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	337	-
Dissolved Solids	(mg/L)	335	-
Specific Conductance	(umhos/cm)	460	-
Turbidity	(NTU)	1.5	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.13	-
Soluble Phosphorus	(mg/L)	0.10	-
TKN	(mg/L)	0.46	-
Hardness	(mg/L)	160	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.10	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	15000	-
Fecal Coliform	(organisms/100ml)	3900	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	560	-
pH	(s.u.)	7.9	-

NEORSD

WQIS

MILL CREEK (31) - 04/26/91

Parameter		Value	Failure
Temperature	(degrees C)	10.3	-
Dissolved Oxygen	(mg/L)	9.1	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	17	-
Total Solids	(mg/L)	861	-
Dissolved Solids	(mg/L)	840	-
Specific Conductance	(umhos/cm)	1020	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	3.03	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	1.00	-
NO3+NO2 Total	(mg/L)	1.15	-
TKN	(mg/L)	3.88	-
Chlorides	(mg/L)	254	-
Sulfates	(mg/L)	146	-
Alkalinity	(mg/L)	226	-
Hardness	(mg/L)	318	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.03	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.13	-
Iron	(mg/L)	2.00	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	30000	-
Fecal Coliform	(organisms/100ml)	940	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.15	-

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MILL CREEK (31) - 06/06/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	7.4	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	20	-
Suspended Solids	(mg/L)	15	-
Total Solids	(mg/L)	987	-
Dissolved Solids	(mg/L)	919	-
Specific Conductance	(umhos/cm)	1320	-
Turbidity	(NTU)	12.0	-
Ammonia-N	(mg/L)	2.72	-
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	1.51	-
NO3+NO2 Total	(mg/L)	1.88	-
TKN	(mg/L)	4.25	-
Chlorides	(mg/L)	240	-
Sulfates	(mg/L)	169	-
Alkalinity	(mg/L)	231	-
Hardness	(mg/L)	388	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	1.80	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	440	-
Fecal Coliform	(organisms/100ml)	220	-
Fecal Streptococcus	(organisms/100ml)	400	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.37	-

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WQIS

MILL CREEK (31) - 06/27/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	8.1	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	29	-
Suspended Solids	(mg/L)	15	-
Total Solids	(mg/L)	986	-
Dissolved Solids	(mg/L)	925	-
Turbidity	(NTU)	50.0	-
Ammonia-N	(mg/L)	3.25	-
Phosphorus	(mg/L)	0.09	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.81	-
NO3+NO2 Total	(mg/L)	1.12	-
TKN	(mg/L)	4.26	-
Chlorides	(mg/L)	242	-
Sulfates	(mg/L)	174	-
Alkalinity	(mg/L)	219	-
Hardness	(mg/L)	370	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	2.00	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	460	-
Fecal Coliform	(organisms/100ml)	340	-
Fecal Streptococcus	(organisms/100ml)	240	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.31	-

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WQIS

MILL CREEK (31) - 09/09/91

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	6.4	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	42	-
Suspended Solids	(mg/L)	12	-
Total Solids	(mg/L)	762	-
Dissolved Solids	(mg/L)	762	-
Specific Conductance	(umhos/cm)	1025	-
Turbidity	(NTU)	8.5	-
Ammonia-N	(mg/L)	6.67	-
Phosphorus	(mg/L)	0.48	-
Soluble Phosphorus	(mg/L)	0.27	-
TKN	(mg/L)	8.92	-
Hardness	(mg/L)	340	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	1.40	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.04	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	>60000	SCU(5000)
Fecal Streptococcus	(organisms/100ml)	56000	-
pH	(s.u.)	7.6	-

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WQIS

MILL CREEK (32) - 04/26/91

Parameter		Value	Failure
Temperature	(degrees C)	8.8	-
Dissolved Oxygen	(mg/L)	10.0	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	22	-
Total Solids	(mg/L)	504	-
Dissolved Solids	(mg/L)	470	-
Specific Conductance	(umhos/cm)	515	-
Turbidity	(NTU)	8.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.81	-
NO3+NO2 Total	(mg/L)	0.85	-
TKN	(mg/L)	0.83	-
Chlorides	(mg/L)	108	-
Sulfates	(mg/L)	112	-
Alkalinity	(mg/L)	128	-
Hardness	(mg/L)	210	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.80	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	860	-
Fecal Coliform	(organisms/100ml)	260	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

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WQIS

MILL CREEK (32) - 06/06/91

Parameter		Value	Failure
Temperature	(degrees C)	17.5	-
Dissolved Oxygen	(mg/L)	8.3	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	318	-
Dissolved Solids	(mg/L)	299	-
Specific Conductance	(umhos/cm)	370	-
Turbidity	(NTU)	<1.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.45	-
NO3+NO2 Total	(mg/L)	0.45	-
TKN	(mg/L)	0.95	-
Chlorides	(mg/L)	48	-
Sulfates	(mg/L)	58	-
Alkalinity	(mg/L)	95	-
Hardness	(mg/L)	162	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	<0.10	-
Iron	(mg/L)	0.10	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	460	-
Fecal Coliform	(organisms/100ml)	60	-
Fecal Streptococcus	(organisms/100ml)	40	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

MILL CREEK (32) - 06/27/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	7.7	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	264	-
Dissolved Solids	(mg/L)	259	-
Turbidity	(NTU)	1.5	-
Ammonia-N	(mg/L)	0.14	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.43	-
NO3+NO2 Total	(mg/L)	0.43	-
TKN	(mg/L)	1.20	-
Chlorides	(mg/L)	38	-
Sulfates	(mg/L)	68	-
Alkalinity	(mg/L)	107	-
Hardness	(mg/L)	158	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.16	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	720	-
Fecal Coliform	(organisms/100ml)	260	-
Fecal Streptococcus	(organisms/100ml)	240	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

MILL CREEK (32) - 09/09/91

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	3.0	-
BOD-5	(mg/L)	36	-
COD	(mg/L)	99	-
Suspended Solids	(mg/L)	15	-
Total Solids	(mg/L)	403	-
Dissolved Solids	(mg/L)	368	-
Specific Conductance	(umhos/cm)	670	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	15.41	LRW(13.0)
Phosphorus	(mg/L)	1.76	-
Soluble Phosphorus	(mg/L)	1.88	-
TKN	(mg/L)	19.78	-
Hardness	(mg/L)	176	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.42	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	>60000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	>100000	-
pH	(s.u.)	7.6	-

NEORSD

WQIS

MILL CREEK (33) - 04/26/91

Parameter		Value	Failure
Temperature	(degrees C)	10.5	-
Dissolved Oxygen	(mg/L)	11.1	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	728	-
Dissolved Solids	(mg/L)	699	-
Specific Conductance	(umhos/cm)	840	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.75	-
NO3+NO2 Total	(mg/L)	0.83	-
TKN	(mg/L)	0.85	-
Chlorides	(mg/L)	231	-
Sulfates	(mg/L)	114	-
Alkalinity	(mg/L)	156	-
Hardness	(mg/L)	247	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.41	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4000	-
Fecal Coliform	(organisms/100ml)	1200	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.08	-

NEORSD

WQIS

MILL CREEK (33) - 06/06/91

Parameter		Value	Failure
Temperature	(degrees C)	20.4	-
Dissolved Oxygen	(mg/L)	9.9	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	739	-
Dissolved Solids	(mg/L)	699	-
Specific Conductance	(umhos/cm)	1020	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.12	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	0.93	-
NO3+NO2 Total	(mg/L)	0.94	-
TKN	(mg/L)	1.17	-
Chlorides	(mg/L)	190	-
Sulfates	(mg/L)	145	-
Alkalinity	(mg/L)	145	-
Hardness	(mg/L)	290	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.80	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	400	-
Fecal Coliform	(organisms/100ml)	300	-
Fecal Streptococcus	(organisms/100ml)	400	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

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WQIS

MILL CREEK (33) - 06/27/91

Parameter		Value	Failure
Temperature	(degrees C)	23.0	-
Dissolved Oxygen	(mg/L)	12.3	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	731	-
Dissolved Solids	(mg/L)	694	-
Specific Conductance	(umhos/cm)	659	-
Turbidity	(NTU)	1.4	-
Ammonia-N	(mg/L)	0.02	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	0.56	-
NO3+NO2 Total	(mg/L)	0.56	-
TKN	(mg/L)	1.39	-
Chlorides	(mg/L)	180	-
Sulfates	(mg/L)	130	-
Alkalinity	(mg/L)	130	-
Hardness	(mg/L)	263	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.18	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1200	-
Fecal Coliform	(organisms/100ml)	240	-
Fecal Streptococcus	(organisms/100ml)	380	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

MILL CREEK (33) - 09/09/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	9.9	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	22	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	1608	-
Dissolved Solids	(mg/L)	383	-
Specific Conductance	(umhos/cm)	639	-
Turbidity	(NTU)	1.5	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.12	-
Soluble Phosphorus	(mg/L)	0.09	-
TKN	(mg/L)	1.49	-
Hardness	(mg/L)	180	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.19	-
Cadmium	(mg/L)	<.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	600	-
Fecal Coliform	(organisms/100ml)	120	-
Fecal Streptococcus	(organisms/100ml)	1400	-
pH	(s.u.)	8.5	-

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WQIS

MILL CREEK (33.5) - 04/26/91

Parameter		Value	Failure
Temperature	(degrees C)	9.9	-
Dissolved Oxygen	(mg/L)	9.0	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	19	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	708	-
Dissolved Solids	(mg/L)	691	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	0.55	-
Phosphorus	(mg/L)	0.11	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	0.93	-
NO3+NO2 Total	(mg/L)	1.05	-
TKN	(mg/L)	1.46	-
Chlorides	(mg/L)	197	-
Sulfates	(mg/L)	94	-
Alkalinity	(mg/L)	209	-
Hardness	(mg/L)	269	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.51	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	31000	-
Fecal Coliform	(organisms/100ml)	4000	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.12	-

NEORSD

WQIS

MILL CREEK (33.5) - 06/06/91

Parameter		Value	Failure
Temperature	(degrees C)	15.5	-
Dissolved Oxygen	(mg/L)	7.1	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	502	-
Dissolved Solids	(mg/L)	474	-
Specific Conductance	(umhos/cm)	610	-
Turbidity	(NTU)	14.0	-
Ammonia-N	(mg/L)	0.99	-
Phosphorus	(mg/L)	0.19	-
Soluble Phosphorus	(mg/L)	0.15	-
Nitrate-N	(mg/L)	0.72	-
NO3+NO2 Total	(mg/L)	0.82	-
TKN	(mg/L)	2.00	-
Chlorides	(mg/L)	102	-
Sulfates	(mg/L)	78	-
Alkalinity	(mg/L)	142	-
Hardness	(mg/L)	214	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	<0.01	-
Iron	(mg/L)	0.86	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2500	-
Fecal Coliform	(organisms/100ml)	2000	-
Fecal Streptococcus	(organisms/100ml)	1600	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.10	-

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WQIS

MILL CREEK (33.5) - 06/27/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	6.3	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	638	-
Dissolved Solids	(mg/L)	581	-
Specific Conductance	(umhos/cm)	585	-
Turbidity	(NTU)	3.5	-
Ammonia-N	(mg/L)	0.55	-
Phosphorus	(mg/L)	0.23	-
Soluble Phosphorus	(mg/L)	0.18	-
Nitrate-N	(mg/L)	1.24	-
NO3+NO2 Total	(mg/L)	1.45	-
TKN	(mg/L)	1.79	-
Chlorides	(mg/L)	134	-
Sulfates	(mg/L)	104	-
Alkalinity	(mg/L)	156	-
Hardness	(mg/L)	264	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.38	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	6700	-
Fecal Coliform	(organisms/100ml)	2700	-
Fecal Streptococcus	(organisms/100ml)	1800	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.21	-

NEORSD

WQIS

MILL CREEK (33.5) - 09/09/91

Parameter		Value	Failure
Temperature	(degrees C)	18.9	-
Dissolved Oxygen	(mg/L)	6.4	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	597	-
Dissolved Solids	(mg/L)	577	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	2.4	-
Ammonia-N	(mg/L)	0.07	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.14	-
TKN	(mg/L)	1.44	-
Hardness	(mg/L)	254	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.22	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	5100	-
Fecal Coliform	(organisms/100ml)	700	-
Fecal Streptococcus	(organisms/100ml)	860	-
pH	(s.u.)	7.8	-

NEORSD

WQIS

MILL CREEK (34) - 04/26/91

Parameter		Value	Failure
Temperature	(degrees C)	10.1	-
Dissolved Oxygen	(mg/L)	10.3	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	678	-
Dissolved Solids	(mg/L)	668	-
Specific Conductance	(umhos/cm)	780	-
Turbidity	(NTU)	7.0	-
Ammonia-N	(mg/L)	0.18	-
Phosphorus	(mg/L)	0.75	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	0.58	-
NO3+NO2 Total	(mg/L)	0.67	-
TKN	(mg/L)	1.39	-
Chlorides	(mg/L)	238	-
Sulfates	(mg/L)	66	-
Alkalinity	(mg/L)	178	-
Hardness	(mg/L)	222	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.46	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	49000	-
Fecal Coliform	(organisms/100ml)	35000	PCU(2000)
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.09	-

NEORSD

WQIS

MILL CREEK (34) - 06/06/91

Parameter		Value	Failure
Temperature	(degrees C)	18.1	-
Dissolved Oxygen	(mg/L)	13.3	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	580	-
Dissolved Solids	(mg/L)	574	-
Specific Conductance	(umhos/cm)	770	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.25	-
Phosphorus	(mg/L)	2.18	-
Soluble Phosphorus	(mg/L)	0.14	-
Nitrate-N	(mg/L)	0.49	-
NO3+NO2 Total	(mg/L)	0.50	-
TKN	(mg/L)	1.65	-
Chlorides	(mg/L)	156	-
Sulfates	(mg/L)	70	-
Alkalinity	(mg/L)	138	-
Hardness	(mg/L)	216	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	<0.01	-
Iron	(mg/L)	0.20	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4100	-
Fecal Coliform	(organisms/100ml)	480	-
Fecal Streptococcus	(organisms/100ml)	160	-
pH	(s.u.)	9.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

MILL CREEK (34) - 06/27/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	11.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	7	-
Total Solids	(mg/L)	598	-
Dissolved Solids	(mg/L)	520	-
Specific Conductance	(umhos/cm)	533	-
Turbidity	(NTU)	1.7	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.15	-
Soluble Phosphorus	(mg/L)	0.09	-
Nitrate-N	(mg/L)	0.42	-
NO3+NO2 Total	(mg/L)	0.45	-
TKN	(mg/L)	0.92	-
Chlorides	(mg/L)	134	-
Sulfates	(mg/L)	80	-
Alkalinity	(mg/L)	132	-
Hardness	(mg/L)	214	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.39	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	6900	-
Fecal Coliform	(organisms/100ml)	820	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	8.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

MILL CREEK (34) - 09/09/91

Parameter		Value	Failure
Temperature	(degrees C)	19.2	-
Dissolved Oxygen	(mg/L)	9.9	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	412	-
Dissolved Solids	(mg/L)	389	-
Specific Conductance	(umhos/cm)	660	-
Turbidity	(NTU)	2.1	-
Ammonia-N	(mg/L)	0.25	-
Phosphorus	(mg/L)	0.20	-
Soluble Phosphorus	(mg/L)	0.19	-
TKN	(mg/L)	0.78	-
Hardness	(mg/L)	190	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.26	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	66000	-
Fecal Coliform	(organisms/100ml)	4100	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	540	-
pH	(s.u.)	8.6	-

NEORSD

WQTS

MILL CREEK (35) - 04/26/91

Parameter		Value	Failure
Temperature	(degrees C)	10.9	-
Dissolved Oxygen	(mg/L)	9.6	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	618	-
Dissolved Solids	(mg/L)	615	-
Specific Conductance	(umhos/cm)	740	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.19	-
NO3+NO2 Total	(mg/L)	0.23	-
TKN	(mg/L)	0.86	-
Chlorides	(mg/L)	231	-
Sulfates	(mg/L)	54	-
Alkalinity	(mg/L)	174	-
Hardness	(mg/L)	175	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.38	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	200	-
Fecal Coliform	(organisms/100ml)	20	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

MILL CREEK (35) - 06/06/91

Parameter		Value	Failure
Temperature	(degrees C)	16.7	-
Dissolved Oxygen	(mg/L)	8.1	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	764	-
Dissolved Solids	(mg/L)	723	-
Specific Conductance	(umhos/cm)	1000	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.34	-
NO3+NO2 Total	(mg/L)	0.35	-
TKN	(mg/L)	1.02	-
Chlorides	(mg/L)	238	-
Sulfates	(mg/L)	76	-
Alkalinity	(mg/L)	170	-
Hardness	(mg/L)	262	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.22	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4000	-
Fecal Coliform	(organisms/100ml)	3700	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	500	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

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WQIS

MILL CREEK (35) - 06/27/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	743	-
Dissolved Solids	(mg/L)	693	-
Specific Conductance	(umhos/cm)	631	-
Turbidity	(NTU)	1.5	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.08	-
NO3+NO2 Total	(mg/L)	0.08	-
TKN	(mg/L)	0.64	-
Chlorides	(mg/L)	218	-
Sulfates	(mg/L)	90	-
Alkalinity	(mg/L)	122	-
Hardness	(mg/L)	239	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	<0.01	-
Iron	(mg/L)	0.22	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	580	-
Fecal Coliform	(organisms/100ml)	220	-
Fecal Streptococcus	(organisms/100ml)	380	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

MILL CREEK (35) - 09/09/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	442	-
Dissolved Solids	(mg/L)	441	-
Specific Conductance	(umhos/cm)	740	-
Turbidity	(NTU)	1.4	-
Ammonia-N	(mg/L)	0.17	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.04	-
TKN	(mg/L)	0.39	-
Hardness	(mg/L)	188	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.17	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1300	-
Fecal Coliform	(organisms/100ml)	640	-
Fecal Streptococcus	(organisms/100ml)	1200	-
pH	(s.u.)	7.8	-

NEORSD

WQIS

WEST CREEK (36) - 05/10/91

Parameter		Value	Failure
Temperature	(degrees C)	14.2	-
Dissolved Oxygen	(mg/L)	12.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	14	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	651	-
Dissolved Solids	(mg/L)	608	-
Specific Conductance	(umhos/cm)	811	-
Turbidity	(NTU)	2.2	-
Ammonia-N	(mg/L)	0.28	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.45	-
NO3+NO2 Total	(mg/L)	0.45	-
TKN	(mg/L)	1.04	-
Chlorides	(mg/L)	240	-
Sulfates	(mg/L)	129	-
Alkalinity	(mg/L)	122	-
Hardness	(mg/L)	268	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.17	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.3	-
Total Coliform	(organisms/100ml)	820	-
Fecal Coliform	(organisms/100ml)	180	-
Fecal Streptococcus	(organisms/100ml)	185	-
pH	(s.u.)	8.3	-
Phenolics	(mg/L)	0.06	-
Nitrite-N	(mg/L)	<0.01	-

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WQIS

WEST CREEK (36) - 06/24/91

Parameter		Value	Failure
Temperature	(degrees C)	17.5	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	638	-
Dissolved Solids	(mg/L)	636	-
Specific Conductance	(umhos/cm)	900	-
Turbidity	(NTU)	1.5	-
Ammonia-N	(mg/L)	0.14	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.50	-
NO3+NO2 Total	(mg/L)	0.52	-
TKN	(mg/L)	0.32	-
Chlorides	(mg/L)	184	-
Sulfates	(mg/L)	119	-
Alkalinity	(mg/L)	116	-
Hardness	(mg/L)	232	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.29	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	460	-
Fecal Coliform	(organisms/100ml)	340	-
Fecal Streptococcus	(organisms/100ml)	220	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSO

WQIS

WEST CREEK (36) - 07/26/91

Parameter		Value	Failure
Temperature	(degrees C)	13.7	-
Dissolved Oxygen	(mg/L)	7.5	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	40	-
Total Solids	(mg/L)	556	-
Dissolved Solids	(mg/L)	516	-
Specific Conductance	(umhos/cm)	820	-
Turbidity	(NTU)	17.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.07	-
Soluble Phosphorus	(mg/L)	0.02	-
TKN	(mg/L)	0.45	-
Hardness	(mg/L)	226	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.07	-
Iron	(mg/L)	1.40	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2000	-
Fecal Coliform	(organisms/100ml)	1900	-
Fecal Streptococcus	(organisms/100ml)	670	-
pH	(s.u.)	8.1	-

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WQIS

WEST CREEK (37) - 05/10/91

Parameter		Value	Failure
Temperature	(degrees C)	13.6	-
Dissolved Oxygen	(mg/L)	12.2	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	553	-
Dissolved Solids	(mg/L)	525	-
Specific Conductance	(umhos/cm)	690	-
Turbidity	(NTU)	1.2	-
Ammonia-N	(mg/L)	0.02	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.70	-
NO3+NO2 Total	(mg/L)	0.70	-
TKN	(mg/L)	0.75	-
Chlorides	(mg/L)	164	-
Sulfates	(mg/L)	142	-
Alkalinity	(mg/L)	115	-
Hardness	(mg/L)	251	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.11	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	0.2	-
Total Coliform	(organisms/100ml)	3400	-
Fecal Coliform	(organisms/100ml)	200	-
Fecal Streptococcus	(organisms/100ml)	75	-
pH	(s.u.)	8.3	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

WEST CREEK (37) - 06/24/91

Parameter		Value	Failure
Temperature	(degrees C)	17.5	-
Dissolved Oxygen	(mg/L)	9.6	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	19	-
Total Solids	(mg/L)	519	-
Dissolved Solids	(mg/L)	500	-
Specific Conductance	(umhos/cm)	630	-
Turbidity	(NTU)	19.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.05	-
Nitrate-N	(mg/L)	0.76	-
NO3+NO2 Total	(mg/L)	0.76	-
TKN	(mg/L)	1.06	-
Chlorides	(mg/L)	124	-
Sulfates	(mg/L)	107	-
Alkalinity	(mg/L)	111	-
Hardness	(mg/L)	230	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	1.16	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	0.6	-
Total Coliform	(organisms/100ml)	11000	-
Fecal Coliform	(organisms/100ml)	900	-
Fecal Streptococcus	(organisms/100ml)	620	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

WEST CREEK (37) - 07/26/91

Parameter		Value	Failure
Temperature	(degrees C)	14.2	-
Dissolved Oxygen	(mg/L)	8.4	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	423	-
Dissolved Solids	(mg/L)	400	-
Specific Conductance	(umhos/cm)	615	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.02	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.02	-
TKN	(mg/L)	0.57	-
Hardness	(mg/L)	214	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.14	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.06	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1400	-
Fecal Coliform	(organisms/100ml)	600	-
Fecal Streptococcus	(organisms/100ml)	720	-
pH	(s.u.)	8.1	-

NEORSD

WQIS

WEST CREEK (38) - 05/10/91

Parameter		Value	Failure
Temperature	(degrees C)	14.4	-
Dissolved Oxygen	(mg/L)	12.3	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	612	-
Dissolved Solids	(mg/L)	585	-
Specific Conductance	(umhos/cm)	750	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.19	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	1.13	-
NO3+NO2 Total	(mg/L)	1.13	-
TKN	(mg/L)	0.72	-
Chlorides	(mg/L)	178	-
Sulfates	(mg/L)	152	-
Alkalinity	(mg/L)	144	-
Hardness	(mg/L)	314	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.05	-
Cadmium	(mg/L)	0.13	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	0.2	-
Total Coliform	(organisms/100ml)	3000	-
Fecal Coliform	(organisms/100ml)	570	-
Fecal Streptococcus	(organisms/100ml)	300	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

WEST CREEK (38) - 06/24/91

Parameter		Value	Failure
Temperature	(degrees C)	17.0	-
Dissolved Oxygen	(mg/L)	9.8	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	644	-
Dissolved Solids	(mg/L)	618	-
Specific Conductance	(umhos/cm)	905	-
Turbidity	(NTU)	1.1	-
Ammonia-N	(mg/L)	0.25	-
Phosphorus	(mg/L)	0.05	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	1.48	-
NO3+NO2 Total	(mg/L)	1.49	-
TKN	(mg/L)	0.27	-
Chlorides	(mg/L)	162	-
Sulfates	(mg/L)	182	-
Alkalinity	(mg/L)	150	-
Hardness	(mg/L)	324	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	0.02	-
Zinc	(mg/L)	<0.01	-
Iron	(mg/L)	0.10	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2600	-
Fecal Coliform	(organisms/100ml)	1600	-
Fecal Streptococcus	(organisms/100ml)	160	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

WEST CREEK (38) - 07/26/91

Parameter		Value	Failure
Temperature	(degrees C)	12.6	-
Dissolved Oxygen	(mg/L)	8.3	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	498	-
Dissolved Solids	(mg/L)	477	-
Specific Conductance	(umhos/cm)	685	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.23	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.08	-
Hardness	(mg/L)	256	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.07	-
Iron	(mg/L)	0.18	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	>16000	-
Fecal Coliform	(organisms/100ml)	>12000	-
Fecal Streptococcus	(organisms/100ml)	700	-
pH	(s.u.)	8.1	-

NEORSD

WQIS

TINKERS CREEK (39) - 05/23/91

Parameter		Value	Failure
Temperature	(degrees C)	20.8	-
Dissolved Oxygen	(mg/L)	8.6	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	16	-
Total Solids	(mg/L)	553	-
Dissolved Solids	(mg/L)	537	-
Specific Conductance	(umhos/cm)	880	-
Turbidity	(NTU)	5.8	-
Ammonia-N	(mg/L)	0.05	-
Phosphorus	(mg/L)	0.11	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	5.94	-
NO3+NO2 Total	(mg/L)	5.97	-
TKN	(mg/L)	1:26	-
Chlorides	(mg/L)	142	-
Sulfates	(mg/L)	81	-
Alkalinity	(mg/L)	157	-
Hardness	(mg/L)	269	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.60	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	420	-
Fecal Streptococcus	(organisms/100ml)	40	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

TINKERS CREEK (39) - 06/28/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	8.3	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	22	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	548	-
Dissolved Solids	(mg/L)	538	-
Specific Conductance	(umhos/cm)	1060	-
Turbidity	(NTU)	4.5	-
Ammonia-N	(mg/L)	0.02	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.09	-
Nitrate-N	(mg/L)	5.30	-
NO3+NO2 Total	(mg/L)	5.35	-
TKN	(mg/L)	1.44	-
Chlorides	(mg/L)	122	-
Sulfates	(mg/L)	120	-
Alkalinity	(mg/L)	147	-
Hardness	(mg/L)	260	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	0.02	WHAL(0.015)
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.41	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	0.4	HHSR(0.012)*
Total Coliform	(organisms/100ml)	500	-
Fecal Coliform	(organisms/100ml)	220	-
Fecal Streptococcus	(organisms/100ml)	360	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.05	-

NEORSD

WQIS

TINKERS CREEK (40) - 05/23/91

Parameter		Value	Failure
Temperature	(degrees C)	21.1	-
Dissolved Oxygen	(mg/L)	8.7	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	19	-
Suspended Solids	(mg/L)	28	-
Total Solids	(mg/L)	584	-
Dissolved Solids	(mg/L)	556	-
Specific Conductance	(umhos/cm)	920	-
Turbidity	(NTU)	13.0	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	0.23	-
Soluble Phosphorus	(mg/L)	0.17	-
Nitrate-N	(mg/L)	5.81	-
NO3+NO2 Total	(mg/L)	5.85	-
TKN	(mg/L)	1.72	-
Chlorides	(mg/L)	166	-
Sulfates	(mg/L)	92	-
Alkalinity	(mg/L)	163	-
Hardness	(mg/L)	263	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.82	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	4000	-
Fecal Coliform	(organisms/100ml)	700	-
Fecal Streptococcus	(organisms/100ml)	140	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

TINKERS CREEK (40) - 06/28/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	8.6	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	19	-
Suspended Solids	(mg/L)	11	-
Total Solids	(mg/L)	544	-
Dissolved Solids	(mg/L)	543	-
Specific Conductance	(umhos/cm)	951	-
Turbidity	(NTU)	6.7	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.20	-
Soluble Phosphorus	(mg/L)	0.15	-
Nitrate-N	(mg/L)	6.56	-
NO3+NO2 Total	(mg/L)	6.56	-
TKN	(mg/L)	1.64	-
Chlorides	(mg/L)	124	-
Sulfates	(mg/L)	129	-
Alkalinity	(mg/L)	144	-
Hardness	(mg/L)	262	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.41	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1800	-
Fecal Coliform	(organisms/100ml)	600	-
Fecal Streptococcus	(organisms/100ml)	340	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

TINKERS CREEK (41) - 05/23/91

Parameter		Value	Failure
Temperature	(degrees C)	20.2	-
Dissolved Oxygen	(mg/L)	7.1	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	40	-
Total Solids	(mg/L)	579	-
Dissolved Solids	(mg/L)	539	-
Specific Conductance	(umhos/cm)	860	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	0.31	-
Phosphorus	(mg/L)	0.26	-
Soluble Phosphorus	(mg/L)	0.19	-
Nitrate-N	(mg/L)	5.91	-
NO3+NO2 Total	(mg/L)	5.96	-
TKN	(mg/L)	1.90	-
Chlorides	(mg/L)	146	-
Sulfates	(mg/L)	91	-
Alkalinity	(mg/L)	167	-
Hardness	(mg/L)	270	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	1.20	WHAL(1.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	6400	-
Fecal Coliform	(organisms/100ml)	3400	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	1060	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.05	-

NEORSD

WQIS

TINKERS CREEK (41) - 06/28/91

Parameter		Value	Failure
Temperature	(degrees C)	22.5	-
Dissolved Oxygen	(mg/L)	7.0	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	20	-
Suspended Solids	(mg/L)	20	-
Total Solids	(mg/L)	563	-
Dissolved Solids	(mg/L)	543	-
Specific Conductance	(umhos/cm)	947	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	0.18	-
Phosphorus	(mg/L)	0.37	-
Soluble Phosphorus	(mg/L)	0.27	-
Nitrate-N	(mg/L)	7.26	-
NO3+NO2 Total	(mg/L)	7.27	-
TKN	(mg/L)	1.98	-
Chlorides	(mg/L)	124	-
Sulfates	(mg/L)	127	-
Alkalinity	(mg/L)	160	-
Hardness	(mg/L)	272	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.80	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	37000	-
Fecal Coliform	(organisms/100ml)	4300	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	1500	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

TINKERS CREEK (42) - 05/23/91

Parameter		Value	Failure
Temperature	(degrees C)	20.1	-
Dissolved Oxygen	(mg/L)	7.4	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	23	-
Suspended Solids	(mg/L)	65	-
Total Solids	(mg/L)	582	-
Dissolved Solids	(mg/L)	517	-
Specific Conductance	(umhos/cm)	820	-
Turbidity	(NTU)	30.0	-
Ammonia-N	(mg/L)	0.27	-
Phosphorus	(mg/L)	0.34	-
Soluble Phosphorus	(mg/L)	0.21	-
Nitrate-N	(mg/L)	5.87	-
NO3+NO2 Total	(mg/L)	5.89	-
TKN	(mg/L)	1.81	-
Chlorides	(mg/L)	118	-
Sulfates	(mg/L)	83	-
Alkalinity	(mg/L)	173	-
Hardness	(mg/L)	277	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.03	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.09	-
Iron	(mg/L)	2.50	WHAL(1.0)*
Cadmium	(mg/L)	0.10	WHAL(0.02) AWS(0.050)*
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	620	-
Fecal Coliform	(organisms/100ml)	480	-
Fecal Streptococcus	(organisms/100ml)	80	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

TINKERS CREEK (42) - 06/28/91

Parameter		Value	Failure
Temperature	(degrees C)	22.5	-
Dissolved Oxygen	(mg/L)	9.7	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	580	-
Dissolved Solids	(mg/L)	552	-
Specific Conductance	(umhos/cm)	929	-
Turbidity	(NTU)	13.0	-
Ammonia-N	(mg/L)	0.08	-
Phosphorus	(mg/L)	0.30	-
Soluble Phosphorus	(mg/L)	0.15	-
Nitrate-N	(mg/L)	6.68	-
NO3+NO2 Total	(mg/L)	6.70	-
TKN	(mg/L)	1.41	-
Chlorides	(mg/L)	132	-
Sulfates	(mg/L)	126	-
Alkalinity	(mg/L)	172	-
Hardness	(mg/L)	284	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.71	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	420	-
Fecal Coliform	(organisms/100ml)	180	-
Fecal Streptococcus	(organisms/100ml)	200	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

CHIPPEWA CREEK (43) - 05/22/91

Parameter		Value	Failure
Temperature	(degrees C)	18.1	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	714	-
Dissolved Solids	(mg/L)	679	-
Specific Conductance	(umhos/cm)	960	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.90	-
NO3+NO2 Total	(mg/L)	0.90	-
TKN	(mg/L)	0.63	-
Chlorides	(mg/L)	130	-
Sulfates	(mg/L)	206	-
Alkalinity	(mg/L)	175	-
Hardness	(mg/L)	396	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.02	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	460	-
Fecal Coliform	(organisms/100ml)	40	-
Fecal Streptococcus	(organisms/100ml)	20	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CHIPPEWA CREEK (43) - 06/28/91

Parameter		Value	Failure
Temperature	(degrees C)	20.9	-
Dissolved Oxygen	(mg/L)	8.5	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	1050	-
Dissolved Solids	(mg/L)	1020	-
Specific Conductance	(umhos/cm)	1480	-
Turbidity	(NTU)	<1.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.27	-
NO3+NO2 Total	(mg/L)	0.27	-
TKN	(mg/L)	0.60	-
Chlorides	(mg/L)	96	-
Sulfates	(mg/L)	388	-
Alkalinity	(mg/L)	270	-
Hardness	(mg/L)	724	-
Nickel	(mg/L)	0.05	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.05	-
Hexavalent Chromium	(mg/L)	0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.07	-
Cadmium	(mg/L)	0.02	-
Lead	(mg/L)	0.04	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	160	-
Fecal Coliform	(organisms/100ml)	40	-
Fecal Streptococcus	(organisms/100ml)	180	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CHIPPEWA CREEK (43) - 07/26/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	655	-
Dissolved Solids	(mg/L)	650	-
Specific Conductance	(umhos/cm)	847	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	0.09	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Hardness	(mg/L)	364	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.04	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.15	-
Iron	(mg/L)	0.30	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.06	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	300	-
Fecal Coliform	(organisms/100ml)	80	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	8.0	-

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WQTS

CHIPPEWA CREEK (43.5) - 05/22/91

Parameter		Value	Failure
Temperature	(degrees C)	14.2	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	101	-
Dissolved Solids	(mg/L)	702	-
Specific Conductance	(umhos/cm)	1100	-
Turbidity	(NTU)	1.2	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.52	-
NO3+NO2 Total	(mg/L)	0.52	-
TKN	(mg/L)	0.43	-
Chlorides	(mg/L)	90	-
Sulfates	(mg/L)	409	-
Alkalinity	(mg/L)	271	-
Hardness	(mg/L)	691	-
Nickel	(mg/L)	0.05	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.05	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.11	-
Cadmium	(mg/L)	0.02	-
Lead	(mg/L)	0.06	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	280	-
Fecal Coliform	(organisms/100ml)	20	-
Fecal Streptococcus	(organisms/100ml)	40	-
pH	(s.u.)	8.2	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CHIPPEWA CREEK (43.5) - 06/28/91

Parameter		Value	Failure
Temperature	(degrees C)	17.7	-
Dissolved Oxygen	(mg/L)	9.1	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	793	-
Dissolved Solids	(mg/L)	746	-
Specific Conductance	(umhos/cm)	1160	-
Turbidity	(NTU)	<1.0	-
Ammonia-N	(mg/L)	0.02	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.17	-
NO3+NO2 Total	(mg/L)	0.17	-
TKN	(mg/L)	0.69	-
Chlorides	(mg/L)	118	-
Sulfates	(mg/L)	307	-
Alkalinity	(mg/L)	150	-
Hardness	(mg/L)	436	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	0.01	-
Zinc	(mg/L)	0.10	-
Iron	(mg/L)	0.02	-
Cadmium	(mg/L)	0.02	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	0.6	HHSR(0.012)*
Total Coliform	(organisms/100ml)	280	-
Fecal Coliform	(organisms/100ml)	60	-
Fecal Streptococcus	(organisms/100ml)	400	-
pH	(s.u.)	8.2	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CHIPPEWA CREEK (43.5) - 07/26/91

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	10.0	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	1140	-
Dissolved Solids	(mg/L)	1100	-
Specific Conductance	(umhos/cm)	1240	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.02	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.02	-
TKN	(mg/L)	0.06	-
Hardness	(mg/L)	758	-
Nickel	(mg/L)	0.05	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.07	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.09	-
Cadmium	(mg/L)	0.02	-
Lead	(mg/L)	0.05	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	520	-
Fecal Coliform	(organisms/100ml)	320	-
Fecal Streptococcus	(organisms/100ml)	360	-
pH	(s.u.)	8.2	-

NEORSD

WQIS

CHIPPEWA CREEK (44) - 05/22/91

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	10.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	646	-
Dissolved Solids	(mg/L)	608	-
Specific Conductance	(umhos/cm)	820	-
Turbidity	(NTU)	1.2	-
Ammonia-N	(mg/L)	0.14	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.26	-
NO3+NO2 Total	(mg/L)	0.26	-
TKN	(mg/L)	0.58	-
Chlorides	(mg/L)	92	-
Sulfates	(mg/L)	179	-
Alkalinity	(mg/L)	212	-
Hardness	(mg/L)	435	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.04	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.20	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.05	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	200	-
Fecal Coliform	(organisms/100ml)	140	-
Fecal Streptococcus	(organisms/100ml)	40	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CHIPPEWA CREEK (44) - 06/28/91

Parameter		Value	Failure
Temperature	(degrees C)	18.1	-
Dissolved Oxygen	(mg/L)	8.5	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	731	-
Dissolved Solids	(mg/L)	702	-
Specific Conductance	(umhos/cm)	1470	-
Turbidity	(NTU)	27.0	-
Ammonia-N	(mg/L)	0.01	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.05	-
NO3+NO2 Total	(mg/L)	0.05	-
TKN	(mg/L)	0.62	-
Chlorides	(mg/L)	62	-
Sulfates	(mg/L)	258	-
Alkalinity	(mg/L)	242	-
Hardness	(mg/L)	[illegible]	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.07	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.28	-
Cadmium	(mg/L)	0.02	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	1900	-
Fecal Coliform	(organisms/100ml)	980	-
Fecal Streptococcus	(organisms/100ml)	460	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CHIPPEWA CREEK (44) - 07/26/91

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	8.3	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	724	-
Dissolved Solids	(mg/L)	691	-
Specific Conductance	(umhos/cm)	860	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	0.22	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.03	-
TKN	(mg/L)	0.31	-
Hardness	(mg/L)	458	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.03	-
Total Chromium	(mg/L)	0.05	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.38	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.04	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	540	-
Fecal Coliform	(organisms/100ml)	420	-
Fecal Streptococcus	(organisms/100ml)	1800	-
pH	(s.u.)	7.8	-

NEORSD

WQIS

KINGSBURY RUN (46) - 07/31/91

Parameter		Value	Failure
Temperature	(degrees C)	24.5	-
Dissolved Oxygen	(mg/L)	3.6	WHAL(4.0)
BOD-5	(mg/L)	520	-
COD	(mg/L)	1580	-
Suspended Solids	(mg/L)	452	-
Total Solids	(mg/L)	1750	-
Dissolved Solids	(mg/L)	693	-
Specific Conductance	(umhos/cm)	1120	-
Turbidity	(NTU)	23.0	-
Ammonia-N	(mg/L)	0.18	-
Phosphorus	(mg/L)	3.13	-
Soluble Phosphorus	(mg/L)	0.05	-
TKN	(mg/L)	23.40	-
Hardness	(mg/L)	307	-
Nickel	(mg/L)	0.07	-
Copper	(mg/L)	0.11	WHAL(0.05)
Total Chromium	(mg/L)	0.58	AWS(0.10)*
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.54	WHAL(0.30)
Iron	(mg/L)	11.00	WHAL(1.0)* AWS(5.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.20	AWS(0.100)*
Mercury	(ug/L)	0.5	HHSR(0.012)*
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	>60000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	45000	-
pH	(s.u.)	7.3	-

NEORSD

WQIS

KINGSBURY RUN (46-A) - 07/31/91

Parameter		Value	Failure
Temperature	(degrees C)	16.5	-
Dissolved Oxygen	(mg/L)	7.2	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	19	-
Suspended Solids	(mg/L)	20	-
Total Solids	(mg/L)	1110	-
Dissolved Solids	(mg/L)	1040	-
Specific Conductance	(umhos/cm)	1320	-
Turbidity	(NTU)	9.0	-
Ammonia-N	(mg/L)	2.38	-
Phosphorus	(mg/L)	0.29	-
Soluble Phosphorus	(mg/L)	0.07	-
TKN	(mg/L)	3.21	-
Hardness	(mg/L)	517	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	2.50	AWS(0.10)*
Hexavalent Chromium	(mg/L)	1.00	WHAL(0.015)
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	2.40	WHAL(1.0)*
Cadmium	(mg/L)	0.02	-
Lead	(mg/L)	0.05	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	3000	-
Fecal Coliform	(organisms/100ml)	2000	-
Fecal Streptococcus	(organisms/100ml)	220	-
pH	(s.u.)	7.6	-

NEORSD

WQIS

KINGSBURY RUN (46-B) - 07/31/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
Dissolved Oxygen	(mg/L)	6.0	-
BOD-5	(mg/L)	26	-
COD	(mg/L)	320	-
Suspended Solids	(mg/L)	344	-
Total Solids	(mg/L)	1020	-
Dissolved Solids	(mg/L)	693	-
Specific Conductance	(umhos/cm)	865	-
Turbidity	(NTU)	37.0	-
Ammonia-N	(mg/L)	0.72	-
Phosphorus	(mg/L)	1.41	-
Soluble Phosphorus	(mg/L)	0.01	-
TKN	(mg/L)	2.34	-
Hardness	(mg/L)	-	-
Nickel	(mg/L)	0.22	-
Copper	(mg/L)	0.10	-
Total Chromium	(mg/L)	0.35	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.79	-
Iron	(mg/L)	89.0	WHAL(1.0)* AWS(5.0)*
Cadmium	(mg/L)	0.03	-
Lead	(mg/L)	0.14	-
Mercury	(ug/L)	0.3	HHSR(0.012)*
Total Coliform	(organisms/100ml)	2100	-
Fecal Coliform	(organisms/100ml)	1000	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	7.3	-

NEORSD

WQIS

KINGSBURY RUN (46-C) - 07/31/91

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	774	-
Dissolved Solids	(mg/L)	704	-
Specific Conductance	(umhos/cm)	980	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.07	-
Soluble Phosphorus	(mg/L)	0.05	-
TKN	(mg/L)	0.36	-
Hardness	(mg/L)	184	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.61	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.02	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	950	-
Fecal Coliform	(organisms/100ml)	720	-
Fecal Streptococcus	(organisms/100ml)	110	-
pH	(s.u.)	8.3	-

NEORSD

WQIS

KINGSBURY RUN (46.1) - 07/31/91

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	7.0	-
BOD-5	(mg/L)	9	-
COD	(mg/L)	23	-
Suspended Solids	(mg/L)	60	-
Total Solids	(mg/L)	1370	-
Dissolved Solids	(mg/L)	1220	-
Specific Conductance	(umhos/cm)	1420	-
Turbidity	(NTU)	16.0	-
Ammonia-N	(mg/L)	1.18	-
Phosphorus	(mg/L)	0.34	-
Soluble Phosphorus	(mg/L)	0.02	-
TKN	(mg/L)	2.04	-
Hardness	(mg/L)	623	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	1.00	AWS(0.10)*
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	3.30	WHAL(1.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.05	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	1300	-
Fecal Coliform	(organisms/100ml)	310	-
Fecal Streptococcus	(organisms/100ml)	120	-
pH	(s.u.)	7.7	-

NEORSD

WQIS

MORGANA RUN (47) - 06/24/91

Parameter		Value	Failure
BOD-5	(mg/L)	7	-
COD	(mg/L)	79	-
Suspended Solids	(mg/L)	37	-
Total Solids	(mg/L)	1440	-
Dissolved Solids	(mg/L)	1400	-
Specific Conductance	(umhos/cm)	2750	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	90.90	WHAL(12.7)
Phosphorus	(mg/L)	0.67	-
Soluble Phosphorus	(mg/L)	0.58	-
Nitrate-N	(mg/L)	10.00	-
NO3+NO2 Total	(mg/L)	10.20	-
TKN	(mg/L)	91.20	-
Chlorides	(mg/L)	538	-
Sulfates	(mg/L)	91	-
Alkalinity	(mg/L)	62	-
Hardness	(mg/L)	336	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.53	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.3	HHSR(0.012)*
Total Coliform	(organisms/100ml)	>80000	-
Fecal Coliform	(organisms/100ml)	44000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	3000	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.20	-

NEORSD

WQIS

MORGANA RUN (47) - 07/19/91

Parameter		Value	Failure
BOD-5	(mg/L)	39	-
COD	(mg/L)	84	-
Suspended Solids	(mg/L)	14	-
Total Solids	(mg/L)	1250	-
Dissolved Solids	(mg/L)	1120	-
Specific Conductance	(umhos/cm)	1920	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	5.46	WHAL(5.4)
Phosphorus	(mg/L)	0.39	-
Soluble Phosphorus	(mg/L)	0.12	-
TKN	(mg/L)	7.82	-
Hardness	(mg/L)	384	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.020	-
Total Chromium	(mg/L)	0.030	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.09	-
Iron	(mg/L)	1.40	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	13000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	4100	-
pH	(s.u.)	8.3	-
Phenolics	(mg/L)	<0.05	-

NEORSD

WQIS

MORGANA RUN (47-A) - 06/24/91

Parameter		Value	Failure
Temperature	(degrees C)	28.9	-
Dissolved Oxygen	(mg/L)	6.9	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	42	-
Suspended Solids	(mg/L)	33	-
Total Solids	(mg/L)	804	-
Dissolved Solids	(mg/L)	771	-
Specific Conductance	(umhos/cm)	1110	-
Turbidity	(NTU)	16.0	-
Ammonia-N	(mg/L)	1.62	-
Phosphorus	(mg/L)	0.31	-
Soluble Phosphorus	(mg/L)	0.16	-
Nitrate-N	(mg/L)	7.72	-
NO3+NO2 Total	(mg/L)	7.72	-
TKN	(mg/L)	3.27	-
Chlorides	(mg/L)	210	-
Sulfates	(mg/L)	141	-
Alkalinity	(mg/L)	140	-
Hardness	(mg/L)	288	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	1.40	WHAL(1.0)*
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	450	-
Fecal Coliform	(organisms/100ml)	290	-
Fecal Streptococcus	(organisms/100ml)	100	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

MORGANA RUN (47-A) - 07/19/91

Parameter		Value	Failure
Temperature	(degrees C)	30.0	WHAL(29.4)
Dissolved Oxygen	(mg/L)	5.0	-
BOD-5	(mg/L)	13	-
COD	(mg/L)	30	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	776	-
Dissolved Solids	(mg/L)	717	-
Specific Conductance	(umhos/cm)	1210	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	1.85	-
Phosphorus	(mg/L)	0.40	-
Soluble Phosphorus	(mg/L)	0.30	-
TKN	(mg/L)	5.09	-
Hardness	(mg/L)	256	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.95	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	2000	-
Fecal Coliform	(organisms/100ml)	1000	-
Fecal Streptococcus	(organisms/100ml)	170	-
pH	(s.u.)	7.4	-
Phenolics	(mg/L)	<0.05	-

NEORSO

WQIS

BURKE BROOK (48) - 06/24/91

Parameter		Value	Failure
Temperature	(degrees C)	25.9	-
Dissolved Oxygen	(mg/L)	7.1	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	28	-
Suspended Solids	(mg/L)	52	-
Total Solids	(mg/L)	839	-
Dissolved Solids	(mg/L)	750	-
Specific Conductance	(umhos/cm)	964	-
Turbidity	(NTU)	21.0	-
Ammonia-N	(mg/L)	1.59	-
Phosphorus	(mg/L)	0.31	-
Soluble Phosphorus	(mg/L)	0.18	-
Nitrate-N	(mg/L)	8.62	-
NO3+NO2 Total	(mg/L)	8.62	-
TKN	(mg/L)	3.41	-
Chlorides	(mg/L)	200	-
Sulfates	(mg/L)	145	-
Alkalinity	(mg/L)	142	-
Hardness	(mg/L)	294	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	1.90	WHAL(1.0)*
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2600	-
Fecal Coliform	(organisms/100ml)	610	-
Fecal Streptococcus	(organisms/100ml)	160	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQTS

BURKE BROOK (48) - 07/16/91

Parameter		Value	Failure
Temperature	(degrees C)	25.0	-
Dissolved Oxygen	(mg/L)	6.6	-
BOD-5	(mg/L)	30	-
COD	(mg/L)	32	-
Suspended Solids	(mg/L)	16	-
Total Solids	(mg/L)	754	-
Dissolved Solids	(mg/L)	738	-
Specific Conductance	(umhos/cm)	1205	-
Turbidity	(NTU)	13.0	-
Ammonia-N	(mg/L)	5.57	-
Phosphorus	(mg/L)	0.34	-
Soluble Phosphorus	(mg/L)	0.26	-
TKN	(mg/L)	7.33	-
Hardness	(mg/L)	266	-
Nickel	(mg/L)	0.04	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	1.20	WHAL(1.0)*
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	11000	-
Fecal Coliform	(organisms/100ml)	3000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	370	-
pH	(s.u.)	8.0	-

NEORSD

WQIS

BURKE BROOK (48.1) - 06/24/91

Parameter		Value	Failure
Temperature	(degrees C)	19.6	-
Dissolved Oxygen	(mg/L)	8.3	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/t)	6	-
Total Solids	(mg/L)	873	-
Dissolved Solids	(mg/L)	805	-
Specific Conductance	(umhos/cm)	1390	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	25.80	WHAL(4.7)
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	1.13	-
NO3+NO2 Total	(mg/L)	2.18	-
TKN	(mg/L)	88.90	-
Chlorides	(mg/L)	210	-
Sulfates	(mg/L)	170	-
Alkalinity	(mg/L)	220	-
Hardness	(mg/L)	374	-
Nickel	(mg/L)	0.06	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.12	-
Iron	(mg/L)	0.42	-
Cadmium	(mg/L)	0.04	WHAL(0.02)
Lead	(mg/L)	0.14	AWS(0.100)*
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	26000	-
Fecal Coliform	(organisms/100ml)	690	-
Fecal Streptococcus	(organisms/100ml)	600	-
pH	(s.u.)	8.3	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	1.05	-

NEORSD

WQIS

BURKE BROOK (48.1) - 07/16/91

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	8.1	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	673	-
Dissolved Solids	(mg/L)	567	-
Specific Conductance	(umhos/cm)	921	-
Turbidity	(NTU)	2.0	-
Phosphorus	(mg/L)	0.18	-
Soluble Phosphorus	(mg/L)	0.16	-
Hardness	(mg/L)	152	-
Nickel	(mg/L)	0.06	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.19	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.09	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	9200	-
Fecal Coliform	(organisms/100ml)	8000	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	2400	-
pH	(s.u.)	8.4	-

NEORSD

WQIS

ROCKY RIVER (49) - 06/25/91

Parameter		Value	Failure
Temperature	(degrees C)	20.5	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	611	-
Dissolved Solids	(mg/L)	586	-
Specific Conductance	(umhos/cm)	844	-
Turbidity	(NTU)	3.5	-
Ammonia-N	(mg/L)	2.17	-
Phosphorus	(mg/L)	0.21	-
Soluble Phosphorus	(mg/L)	0.16	-
Nitrate-N	(mg/L)	5.46	-
NO3+NO2 Total	(mg/L)	5.87	-
TKN	(mg/L)	3.22	-
Chlorides	(mg/L)	140	-
Sulfates	(mg/L)	138	-
Alkalinity	(mg/L)	106	-
Hardness	(mg/L)	216	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.37	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2000	-
Fecal Coliform	(organisms/100ml)	180	-
Fecal Streptococcus	(organisms/100ml)	1100	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.41	-

NEORSD

WQIS

ROCKY RIVER (50) - 06/25/91

Parameter		Value	Failure
Temperature	(degrees C)	21.5	-
Dissolved Oxygen	(mg/L)	6.2	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	12	-
Total Solids	(mg/L)	569	-
Dissolved Solids	(mg/L)	535	-
Specific Conductance	(umhos/cm)	715	-
Turbidity	(NTU)	70.0	-
Ammonia-N	(mg/L)	0.27	-
Phosphorus	(mg/L)	0.12	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	2.80	-
NO3+NO2 Total	(mg/L)	2.85	-
TKN	(mg/L)	1.17	-
Chlorides	(mg/L)	100	-
Sulfates	(mg/L)	125	-
Alkalinity	(mg/L)	126	-
Hardness	(mg/L)	242	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	1.10	WHAL(1.0)*
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.2	PWS(0.012)* HHSR(0.012)*
Total Coliform	(organisms/100ml)	5600	-
Fecal Coliform	(organisms/100ml)	2700	PCU(2000)
Fecal Streptococcus	(organisms/100ml)	520	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.05	-

NEORSD

WQIS

ROCKY RIVER (51) - 06/25/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	9.5	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	532	-
Dissolved Solids	(mg/L)	490	-
Specific Conductance	(umhos/cm)	637	-
Turbidity	(NTU)	4.0	-
Ammonia-N	(mg/L)	0.05	-
Phosphorus	(mg/L)	0.21	-
Soluble Phosphorus	(mg/L)	0.15	-
Nitrate-N	(mg/L)	5.44	-
NO3+NO2 Total	(mg/L)	5.53	-
TKN	(mg/L)	1.12	-
Chlorides	(mg/L)	92	-
Sulfates	(mg/L)	110	-
Alkalinity	(mg/L)	129	-
Hardness	(mg/L)	210	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	<0.01	-
Iron	(mg/L)	0.30	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	5000	-
Fecal Coliform	(organisms/100ml)	240	-
Fecal Streptococcus	(organisms/100ml)	200	-
pH	(s.u.)	8.2	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.09	-

NEORSD

WQIS

ROCKY RIVER (52) - 06/25/91

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	7.0	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	21	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	628	-
Dissolved Solids	(mg/L)	583	-
Specific Conductance	(umhos/cm)	819	-
Turbidity	(NTU)	5.5	-
Ammonia-N	(mg/L)	1.97	-
Phosphorus	(mg/L)	0.20	-
Soluble Phosphorus	(mg/L)	0.17	-
Nitrate-N	(mg/L)	4.97	-
NO3+NO2 Total	(mg/L)	5.43	-
TKN	(mg/L)	3.31	-
Chlorides	(mg/L)	110	-
Sulfates	(mg/L)	143	-
Alkalinity	(mg/L)	146	-
Hardness	(mg/L)	264	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	<0.01	-
Iron	(mg/L)	0.32	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	9100	-
Fecal Coliform	(organisms/100ml)	1200	-
Fecal Streptococcus	(organisms/100ml)	440	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.46	-

NEORSD

WQIS

ROCKY RIVER (52.5) - 06/25/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	25	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	601	-
Dissolved Solids	(mg/L)	564	-
Specific Conductance	(umhos/cm)	783	-
Turbidity	(NTU)	4.5	-
Ammonia-N	(mg/L)	0.02	-
Phosphorus	(mg/L)	0.10	-
Soluble Phosphorus	(mg/L)	0.06	-
Nitrate-N	(mg/L)	5.13	-
NO3+NO2 Total	(mg/L)	5.17	-
TKN	(mg/L)	1.65	-
Chlorides	(mg/L)	150	-
Sulfates	(mg/L)	129	-
Alkalinity	(mg/L)	130	-
Hardness	(mg/L)	216	-
Nickel	(mg/L)	<0.01	-
Copper	(mg/L)	<0.01	-
Total Chromium	(mg/L)	<0.01	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.34	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.9	HHSR(0.012)*
Fecal Coliform	(organisms/100ml)	1100	-
Fecal Streptococcus	(organisms/100ml)	14000	-
pH	(s.u.)	8.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.04	-

NEORSD

WQIS

OHIO CANAL (53) - 05/21/91

Parameter		Value	Failure
Temperature	(degrees C)	21.3	-
Dissolved Oxygen	(mg/L)	8.0	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	387	-
Total Solids	(mg/L)	871	-
Dissolved Solids	(mg/L)	484	-
Specific Conductance	(umhos/cm)	770	-
Turbidity	(NTU)	82.0	-
Ammonia-N	(mg/L)	0.25	-
Phosphorus	(mg/L)	0.34	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	2.41	-
NO3+NO2 Total	(mg/L)	2.51	-
TKN	(mg/L)	1.81	-
Chlorides	(mg/L)	152	-
Sulfates	(mg/L)	85	-
Alkalinity	(mg/L)	157	-
Hardness	(mg/L)	261	-
Nickel	(mg/L)	0.03	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.09	-
Iron	(mg/L)	6.80	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.06	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	80	-
Fecal Streptococcus	(organisms/100ml)	40	-
pH	(s.u.)	8.0	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.10	-

NEORSD

NQIS

OHIO CANAL (53) - 07/19/91

Parameter		Value	Failure
Temperature	(degrees C)	26.3	-
Dissolved Oxygen	(mg/L)	8.7	-
BOD-5	(mg/L)	27	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	45	-
Total Solids	(mg/L)	635	-
Dissolved Solids	(mg/L)	539	-
Specific Conductance	(umhos/cm)	924	-
Turbidity	(NTU)	20.0	-
Ammonia-N	(mg/L)	0.15	-
Phosphorus	(mg/L)	0.30	-
Soluble Phosphorus	(mg/L)	0.11	-
TKN	(mg/L)	1.88	-
Hardness	(mg/L)	278	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	1.40	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	85	-
Fecal Streptococcus	(organisms/100ml)	30	-
pH	(s.u.)	8.6	-

NEORSD

NQIS

OHIO CANAL (54) - 05/21/91

Parameter		Value	Failure
Temperature	(degrees C)	21.2	-
Dissolved Oxygen	(mg/L)	7.6	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	16	-
Suspended Solids	(mg/L)	46	-
Total Solids	(mg/L)	554	-
Dissolved Solids	(mg/L)	442	-
Specific Conductance	(umhos/cm)	750	-
Turbidity	(NTU)	28.0	-
Ammonia-N	(mg/L)	0.19	-
Phosphorus	(mg/L)	0.19	-
Soluble Phosphorus	(mg/L)	0.12	-
Nitrate-N	(mg/L)	2.81	-
NO3+NO2 Total	(mg/L)	2.92	-
TKN	(mg/L)	1.21	-
Chlorides	(mg/L)	146	-
Sulfates	(mg/L)	88	-
Alkalinity	(mg/L)	152	-
Hardness	(mg/L)	260	-
Nickel	(mg/L)	0.04	-
Copper	(mg/L)	0.02	-
Total Chromium	(mg/L)	0.05	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.10	-
Iron	(mg/L)	3.80	-
Cadmium	(mg/L)	0.02	-
Lead	(mg/L)	0.05	-
Mercury	(ug/L)	0.3	-
Fecal Coliform	(organisms/100ml)	280	-
Fecal Streptococcus	(organisms/100ml)	30	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.11	-

NEORSD

WQIS

OHIO CANAL (54) - 07/19/91

Parameter		Value	Failure
Temperature	(degrees C)	25.9	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	10	-
COD	(mg/L)	24	-
Suspended Solids	(mg/L)	40	-
Total Solids	(mg/L)	642	-
Dissolved Solids	(mg/L)	565	-
Specific Conductance	(umhos/cm)	940	-
Turbidity	(NTU)	19.0	-
Ammonia-N	(mg/L)	0.17	-
Phosphorus	(mg/L)	0.25	-
Soluble Phosphorus	(mg/L)	0.09	-
TKN	(mg/L)	1.67	-
Hardness	(mg/L)	290	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	1.30	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.01	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	640	-
Fecal Streptococcus	(organisms/100ml)	95	-
pH	(s.u.)	8.6	-

NEORSD

WQTS

OHIO CANAL (55) - 05/21/91

Parameter		Value	Failure
Temperature	(degrees C)	18.9	-
Dissolved Oxygen	(mg/L)	8.1	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	12	-
Total Solids	(mg/L)	551	-
Dissolved Solids	(mg/L)	460	-
Specific Conductance	(umhos/cm)	750	-
Turbidity	(NTU)	20.0	-
Ammonia-N	(mg/L)	0.24	-
Phosphorus	(mg/L)	0.20	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	2.95	-
NO3+NO2 Total	(mg/L)	3.02	-
TKN	(mg/L)	0.97	-
Chlorides	(mg/L)	134	-
Sulfates	(mg/L)	79	-
Alkalinity	(mg/L)	148	-
Hardness	(mg/L)	265	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	1.50	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	520	-
Fecal Coliform	(organisms/100ml)	140	-
Fecal Streptococcus	(organisms/100ml)	80	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.07	-

NEORSD

WQIS

OHIO CANAL (55) - 07/19/91

Parameter		Value	Failure
Temperature	(degrees C)	25.1	-
Dissolved Oxygen	(mg/L)	7.9	-
BOD-5	(mg/L)	7	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	35	-
Total Solids	(mg/L)	651	-
Dissolved Solids	(mg/L)	520	-
Specific Conductance	(umhos/cm)	921	-
Turbidity	(NTU)	14.0	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.20	-
Soluble Phosphorus	(mg/L)	0.10	-
TKN	(mg/L)	1.48	-
Hardness	(mg/L)	284	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.92	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	90	-
Fecal Streptococcus	(organisms/100ml)	20	-
pH	(s.u.)	8.4	-

NEORSD

WQIS

OHIO CANAL (56) - 05/21/91

Parameter		Value	Failure
Temperature	(degrees C)	18.8	-
Dissolved Oxygen	(mg/L)	8.6	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	19	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	728	-
Dissolved Solids	(mg/L)	482	-
Specific Conductance	(umhos/cm)	740	-
Turbidity	(NTU)	6.1	-
Ammonia-N	(mg/L)	0.14	-
Phosphorus	(mg/L)	0.20	-
Soluble Phosphorus	(mg/L)	0.18	-
Nitrate-N	(mg/L)	3.42	-
NO3+NO2 Total	(mg/L)	3.49	-
TKN	(mg/L)	1.15	-
Chlorides	(mg/L)	128	-
Sulfates	(mg/L)	81	-
Alkalinity	(mg/L)	154	-
Hardness	(mg/L)	252	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.58	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	0.03	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	2500	-
Fecal Coliform	(organisms/100ml)	250	-
Fecal Streptococcus	(organisms/100ml)	30	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.07	-

NEORSD

WQIS

OHIO CANAL (56) - 07/19/91

Parameter		Value	Failure
Temperature	(degrees C)	24.5	-
Dissolved Oxygen	(mg/L)	7.3	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	593	-
Dissolved Solids	(mg/L)	552	-
Specific Conductance	(umhos/cm)	920	-
Turbidity	(NTU)	4.5	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.23	-
Soluble Phosphorus	(mg/L)	0.17	-
TKN	(mg/L)	1.49	-
Hardness	(mg/L)	290	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.30	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	165	-
Fecal Streptococcus	(organisms/100ml)	45	-
pH	(s.u.)	8.3	-

NEORSD

WQIS

SAGAMORE CREEK (57) - 05/23/91

Parameter		Value	Failure
Temperature	(degrees C)	18.8	-
Dissolved Oxygen	(mg/L)	7.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	482	-
Dissolved Solids	(mg/L)	480	-
Specific Conductance	(umhos/cm)	770	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.07	-
Soluble Phosphorus	(mg/L)	0.06	-
Nitrate-N	(mg/L)	0.58	-
NO3+NO2 Total	(mg/L)	0.58	-
TKN	(mg/L)	0.63	-
Chlorides	(mg/L)	118	-
Sulfates	(mg/L)	77	-
Alkalinity	(mg/L)	166	-
Hardness	(mg/L)	282	-
Nickel	(mg/L)	0.02	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.03	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.07	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	0.20	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	180	-
Fecal Coliform	(organisms/100ml)	20	-
Fecal Streptococcus	(organisms/100ml)	40	-
pH	(s.u.)	7.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

SAGAMORE CREEK (57) - 07/19/91

Parameter		Value	Failure
Temperature	(degrees C)	20.0	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	3	-
Total Solids	(mg/L)	573	-
Dissolved Solids	(mg/L)	511	-
Specific Conductance	(umhos/cm)	811	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	0.09	-
Phosphorus	(mg/L)	0.11	-
Soluble Phosphorus	(mg/L)	0.11	-
TKN	(mg/L)	0.99	-
Hardness	(mg/L)	298	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	<0.01	-
Iron	(mg/L)	0.04	-
Cadmium	(mg/L)	0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	<0.2	-
Total Coliform	(organisms/100ml)	60	-
Fecal Coliform	(organisms/100ml)	<20	-
Fecal Streptococcus	(organisms/100ml)	600	-
pH	(s.u.)	7.4	-

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WQIS

CHAGRIN RIVER (58) - 06/26/91

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	9.6	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	366	-
Dissolved Solids	(mg/L)	356	-
Specific Conductance	(umhos/cm)	515	-
Turbidity	(NTU)	5.5	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.07	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.24	-
NO3+NO2 Total	(mg/L)	0.24	-
TKN	(mg/L)	0.52	-
Chlorides	(mg/L)	62	-
Sulfates	(mg/L)	79	-
Alkalinity	(mg/L)	148	-
Hardness	(mg/L)	208	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.53	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	250	-
Fecal Coliform	(organisms/100ml)	160	-
Fecal Streptococcus	(organisms/100ml)	150	-
pH	(s.u.)	8.4	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

CHAGRIN RIVER (59) - 06/26/91

Parameter		Value	Failure
Temperature	(degrees C)	26.0	-
Dissolved Oxygen	(mg/L)	11.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	13	-
Suspended Solids	(mg/L)	7	-
Total Solids	(mg/L)	349	-
Dissolved Solids	(mg/L)	342	-
Specific Conductance	(umhos/cm)	560	-
Turbidity	(NTU)	5.2	-
Ammonia-N	(mg/L)	0.07	-
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.06	-
Nitrate-N	(mg/L)	0.23	-
NO3+NO2 Total	(mg/L)	0.23	-
TKN	(mg/L)	0.57	-
Chlorides	(mg/L)	58	-
Sulfates	(mg/L)	69	-
Alkalinity	(mg/L)	140	-
Hardness	(mg/L)	192	-
Nickel	(mg/L)	0.01	-
Copper	(mg/L)	0.01	-
Total Chromium	(mg/L)	0.02	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	<0.01	-
Iron	(mg/L)	0.41	-
Cadmium	(mg/L)	<0.01	-
Lead	(mg/L)	<0.01	-
Mercury	(ug/L)	0.2	HHSR(0.012)*
Total Coliform	(organisms/100ml)	200	-
Fecal Coliform	(organisms/100ml)	80	-
Fecal Streptococcus	(organisms/100ml)	360	-
pH	(s.u.)	8.6	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	<0.01	-

APPENDIX III

LAKE ERIE
1992 CHEMICAL AND BACTERIOLOGICAL DATA

DATA TABLE KEY

Individual data are presented by sampling date as month/day/year. The sampled water body, with the NEORSD-assigned sample site number and/or letter in parentheses, also appears in the heading. For streams, data presented are from analyses of surface grab samples obtained under dry weather conditions (following at least three days of no significant rainfall). Routine stream sampling was performed under dry weather conditions to maximize data comparability and to facilitate identification of dry weather pollutant sources. These sources have the greatest potential for environmental impact due to the combination of maximal pollutant concentration with minimal instream dilution. For Lake Erie, data presented are from analyses of surface grab samples, except A-1, B-1, and C-1, which were from analyses of grab samples collected from two feet above the lake bottom.

All chemical and bacteriological parameters analyzed in the sample are listed in the first column, followed by analytical units in parentheses. When a measured value exceeds a State of Ohio water quality criterion, the applicable water use designation, with the exceeded numerical criterion in parentheses, appears in the "Failure" column. An asterisk appears when no maximum criterion is applicable and the single value only exceeds an average criterion (therefore not necessarily representing a failure to meet water quality standards).

Applicable Ohio EPA Water Use Designations

AWS = Agricultural Water Supply
BW = Bathing Waters Recreational Use
EWH = Exceptional Warmwater Habitat Aquatic Life Use
HHSR = Human Health (Single-Route Exposure)
LRW = Limited Resource Water
PCU = Primary Contact Recreational Use
PWS = Public Water Supply
SCU = Secondary Contact Recreational Use
SSH = Seasonal Salmonid Habitat Aquatic Life Use
WHAL = Warmwater Habitat Aquatic Life Use

Other Acronyms and Abbreviations

BOD-5 = Biological Oxygen Demand (5-day test)
COD = Chemical Oxygen Demand
N = Nitrogen
NO3 = Nitrates
NO2 = Nitrites

(Continued on following page.)

<u>Other Acronyms and Abbreviations (continued)</u>

TKN	=	Total Kjeldahl Nitrogen
mg/L	=	milligrams per liter
ug/L	=	micrograms per liter
umhos/cm	=	micromhos per centimeter
s.u.	=	standard units
NTU	=	Nephelometric Turbidity Units

Samples were collected by direct immersion of the sample bottles below the water surface. At bridge or manhole sites, samples were collected with an acid-cleaned, de-ionized water-rinsed plastic bucket and drop line. The bucket was further rinsed with stream water from the sample site prior to the collection of each sample. All samples obtained at bridge or manhole sites were collected from midstream, while all other stream samples were collected near the bank.

Lake Erie samples were collected from boatside by direct immersion of the sample bottle below the water surface. Samples collected from near the lake bottom were obtained using a Kemmerer-style Vertical Sampling Bottle.

Closed and labeled plastic containers were used to transport samples, on ice for preservation, to NEORSD Analytical Services. All bottles used to transport samples for bacteriological analysis had been sterilized prior to sampling.

At all sites, field measurements were obtained at the time of sampling for water temperature and dissolved oxygen concentration, using a calibrated YSI Model 51B Oxygen Meter or a Nester Instruments Model No. 8500 Oxygen Meter. At most sites, field measurements at the time of sampling were obtained for specific conductance using a Beckman Industrial Model RC-16D Conductivity Bridge, turbidity using a Monitek Model 21PE Portable Nephelometer, and pH using a Fisher Model No. 607 Digital pH Meter. Water transparency was measured at each Lake Erie site using a Secchi disk.

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WQIS

LAKE ERIE (A) - 06/25/92

Parameter		Value	Failure
Temperature	(degrees C)	16.4	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	180	-
Dissolved Solids	(mg/L)	161	-
Specific Conductance	(umhos/cm)	260	-
Turbidity	(NTU)	2.3	-
Ammonia-N	(mg/L)	0.04	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.52	-
NO3+NO2 Total	(mg/L)	0.52	-
TKN	(mg/L)	0.88	-
Chlorides	(mg/L)	26	-
Sulfates	(mg/L)	15	-
Alkalinity	(mg/L)	123	-
Hardness	(mg/L)	128	-
Nickel	(mg/L)	0.120	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.13	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	0.001	-
Mercury	(ug/L)	0.2	PWS(0.012)* HHSR(0.012)*
Fecal Coliform	(organisms/100ml)	<1	-
pH	(s.u.)	7.8	-
E. coli	(organisms/100ml)	<1	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	8.25	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

LAKE ERIE (A-1) - 06/25/92

Parameter		Value	Failure
Temperature	(degrees C)	16.3	-
Dissolved Oxygen	(mg/L)	9.0	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	183	-
Dissolved Solids	(mg/L)	161	-
Specific Conductance	(umhos/cm)	240	-
Turbidity	(NTU)	2.6	-
Ammonia-N	(mg/L)	0.07	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.57	-
NO3+NO2 Total	(mg/L)	0.57	-
TKN	(mg/L)	0.97	-
Chlorides	(mg/L)	28	-
Alkalinity	(mg/L)	128	-
Hardness	(mg/L)	128	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.003	-
Total Chromium	(mg/L)	0.002	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.14	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.001	-
Mercury	(ug/L)	0.3	PWS(0.012)* HHSR(0.012)*
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	8.25	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

LAKE ERIE (A) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	22.7	-
Dissolved Oxygen	(mg/L)	8.5	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Dissolved Solids	(mg/L)	147	-
Specific Conductance	(umhos/cm)	260	-
Turbidity	(NTU)	11.0	-
Ammonia-N	(mg/L)	0.12	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.61	-
NO3+NO2 Total	(mg/L)	0.62	-
TKN	(mg/L)	0.94	-
Chlorides	(mg/L)	22	-
Sulfates	(mg/L)	23	-
Hardness	(mg/L)	124	-
Nickel	(mg/L)	<0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.04	-
Cadmium	(mg/L)	0.0100	EWH(0.0071)
Lead	(mg/L)	0.160	PWS(0.050)* AWS(0.100)*
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.3	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	13.00	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (A-1) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	22.5	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Dissolved Solids	(mg/L)	144	-
Specific Conductance	(umhos/cm)	260	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.62	-
NO3+NO2 Total	(mg/L)	0.63	-
TKN	(mg/L)	0.59	-
Chlorides	(mg/L)	38	-
Sulfates	(mg/L)	24	-
Hardness	(mg/L)	134	-
Nickel	(mg/L)	0.003	-
Copper	(mg/L)	0.004	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.04	-
Cadmium	(mg/L)	0.0030	-
Lead	(mg/L)	0.007	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.3	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	13.00	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (A-1) - 10/13/92

Parameter		Value	Failure
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	7	-
Total Solids	(mg/L)	178	-
Dissolved Solids	(mg/L)	151	-
Turbidity	(NTU)	3.8	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.19	-
NO3+NO2 Total	(mg/L)	0.20	-
TKN	(mg/L)	0.43	-
Chlorides	(mg/L)	24	-
Sulfates	(mg/L)	26	-
Alkalinity	(mg/L)	93	-
Hardness	(mg/L)	118	-
Nickel	(mg/L)	0.001	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.30	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.9	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	0.009	-
Manganese	(mg/L)	0.01	-
Selenium	(mg/L)	0.008	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	7.0	-
Potassium	(mg/L)	<1.0	-
Sodium	(mg/L)	6.8	-
Calcium	(mg/L)	39.31	-
Cobalt	(mg/L)	0.0009	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (B) - 06/25/92

Parameter		Value	Failure
Temperature	(degrees C)	15.6	-
Dissolved Oxygen	(mg/L)	9.3	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	167	-
Dissolved Solids	(mg/L)	144	-
Specific Conductance	(umhos/cm)	260	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.51	-
NO3+NO2 Total	(mg/L)	0.51	-
TKN	(mg/L)	0.73	-
Chlorides	(mg/L)	26	-
Sulfates	(mg/L)	15	-
Alkalinity	(mg/L)	131	-
Hardness	(mg/L)	120	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.06	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.001	-
Mercury	(ug/L)	0.2	PWS(0.012)* HHSR(0.012)*
Fecal Coliform	(organisms/100ml)	<1	-
pH	(s.u.)	8.0	-
E. coli	(organisms/100ml)	<1	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	14.50	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

LAKE ERIE (B) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	22.5	-
Dissolved Oxygen	(mg/L)	10.4	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Dissolved Solids	(mg/L)	159	-
Specific Conductance	(umhos/cm)	270	-
Turbidity	(NTU)	1.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.61	-
NO3+NO2 Total	(mg/L)	0.62	-
TKN	(mg/L)	0.91	-
Chlorides	(mg/L)	16	-
Sulfates	(mg/L)	23	-
Hardness	(mg/L)	128	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.007	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.05	-
Cadmium	(mg/L)	0.0020	-
Lead	(mg/L)	0.017	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.2	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	14.00	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (B-1) - 06/25/92

Parameter		Value	Failure
Temperature	(degrees C)	15.4	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	166	-
Dissolved Solids	(mg/L)	163	-
Specific Conductance	(umhos/cm)	260	-
Turbidity	(NTU)	2.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.53	-
NO3+NO2 Total	(mg/L)	0.53	-
TKN	(mg/L)	0.97	-
Chlorides	(mg/L)	22	-
Sulfates	(mg/L)	9	-
Alkalinity	(mg/L)	130	-
Hardness	(mg/L)	118	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	<0.001	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.24	EWH(0.13)
Iron	(mg/L)	0.20	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.003	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	14.50	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

LAKE ERIE (8-1) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	21.8	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Total Solids	(mg/L)	198	-
Dissolved Solids	(mg/L)	153	-
Specific Conductance	(umhos/cm)	255	-
Turbidity	(NTU)	1.1	-
Ammonia-N	(mg/L)	0.03	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.60	-
NO3+NO2 Total	(mg/L)	0.61	-
TKN	(mg/L)	0.78	-
Chlorides	(mg/L)	26	-
Sulfates	(mg/L)	21	-
Hardness	(mg/L)	120	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.007	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.02	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.004	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.9	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	14.00	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (B) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	14.0	-
Dissolved Oxygen	(mg/L)	7.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	163	-
Dissolved Solids	(mg/L)	153	-
Specific Conductance	(umhos/cm)	190	-
Turbidity	(NTU)	3.5	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.19	-
NO3+NO2 Total	(mg/L)	0.20	-
TKN	(mg/L)	1.03	-
Chlorides	(mg/L)	68	-
Sulfates	(mg/L)	29	-
Alkalinity	(mg/L)	89	-
Hardness	(mg/L)	120	-
Nickel	(mg/L)	0.002	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.28	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
pH	(s.u.)	8.2	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.01	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	7.8	-
Potassium	(mg/L)	1.4	-
Sodium	(mg/L)	8.1	-
Calcium	(mg/L)	35.26	-
Cobalt	(mg/L)	0.0009	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (C) - 06/25/92

Parameter		Value	Failure
Temperature	(degrees C)	15.4	-
Dissolved Oxygen	(mg/L)	9.3	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	186	-
Dissolved Solids	(mg/L)	172	-
Specific Conductance	(umhos/cm)	260	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.01	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.54	-
NO3+NO2 Total	(mg/L)	0.54	-
TKN	(mg/L)	2.99	-
Chlorides	(mg/L)	24	-
Sulfates	(mg/L)	15	-
Alkalinity	(mg/L)	137	-
Hardness	(mg/L)	119	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.003	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.13	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.001	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	<1	-
pH	(s.u.)	7.8	-
E. coli	(organisms/100ml)	<1	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	6.50	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

LAKE ERIE (C) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	20.7	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Dissolved Solids	(mg/L)	133	-
Specific Conductance	(umhos/cm)	250	-
Turbidity	(NTU)	0.5	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.36	-
NO3+NO2 Total	(mg/L)	0.37	-
TKN	(mg/L)	0.62	-
Chlorides	(mg/L)	20	-
Sulfates	(mg/L)	10	-
Hardness	(mg/L)	230	-
Nickel	(mg/L)	0.002	-
Copper	(mg/L)	0.008	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.13	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.005	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.4	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	14.00	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (C-1) - 06/25/92

Parameter		Value	Failure
Temperature	(degrees C)	15.3	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	158	-
Dissolved Solids	(mg/L)	155	-
Specific Conductance	(umhos/cm)	230	-
Turbidity	(NTU)	3.1	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.62	-
NO3+NO2 Total	(mg/L)	0.62	-
TKN	(mg/L)	1.40	-
Chlorides	(mg/L)	22	-
Sulfates	(mg/L)	16	-
Alkalinity	(mg/L)	108	-
Hardness	(mg/L)	124	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.003	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.001	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.7	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	6.50	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

LAKE ERIE (C-1) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	20.4	-
Dissolved Oxygen	(mg/L)	8.2	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	1	-
Dissolved Solids	(mg/L)	136	-
Specific Conductance	(umhos/cm)	250	-
Turbidity	(NTU)	0.9	-
Ammonia-N	(mg/L)	0.07	-
Phosphorus	(mg/L)	<0.01	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.53	-
NO3+NO2 Total	(mg/L)	0.54	-
TKN	(mg/L)	0.29	-
Chlorides	(mg/L)	24	-
Sulfates	(mg/L)	25	-
Hardness	(mg/L)	130	-
Nickel	(mg/L)	0.002	-
Copper	(mg/L)	0.008	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.08	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.006	-
pH	(s.u.)	7.8	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	14.00	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (D) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	23.5	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	201	-
Dissolved Solids	(mg/L)	169	-
Specific Conductance	(umhos/cm)	280	-
Turbidity	(NTU)	2.8	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.69	-
NO3+NO2 Total	(mg/L)	0.71	-
TKN	(mg/L)	1.19	-
Chlorides	(mg/L)	28	-
Sulfates	(mg/L)	28	-
Hardness	(mg/L)	126	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.007	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.14	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.004	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	4.50	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

LAKE ERIE (E) - 06/17/92

Parameter		Value	Failure
Temperature	(degrees C)	14.0	-
Dissolved Oxygen	(mg/L)	9.4	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	14	-
Total Solids	(mg/L)	183	-
Dissolved Solids	(mg/L)	166	-
Specific Conductance	(umhos/cm)	220	-
Turbidity	(NTU)	8.9	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.77	-
NO3+NO2 Total	(mg/L)	0.77	-
TKN	(mg/L)	1.00	-
Chlorides	(mg/L)	28	-
Sulfates	(mg/L)	12	-
Alkalinity	(mg/L)	92	-
Hardness	(mg/L)	149	-
Nickel	(mg/L)	0.007	-
Copper	(mg/L)	0.016	-
Total Chromium	(mg/L)	0.003	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.63	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.004	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	113	-
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	3	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	2.00	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

LAKE ERIE (E) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	24.7	-
Dissolved Oxygen	(mg/L)	8.0	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	3	-
Dissolved Solids	(mg/L)	212	-
Specific Conductance	(umhos/cm)	370	-
Turbidity	(NTU)	5.7	-
Ammonia-N	(mg/L)	0.64	-
Phosphorus	(mg/L)	0.05	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	1.05	-
NO3+NO2 Total	(mg/L)	1.08	-
TKN	(mg/L)	1.04	-
Chlorides	(mg/L)	40	-
Sulfates	(mg/L)	38	-
Hardness	(mg/L)	142	-
Nickel	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.20	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.1	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	3.50	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (E) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	12.0	-
Dissolved Oxygen	(mg/L)	9.6	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	191	-
Dissolved Solids	(mg/L)	171	-
Specific Conductance	(umhos/cm)	200	-
Turbidity	(NTU)	4.5	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.52	-
NO3+NO2 Total	(mg/L)	0.54	-
TKN	(mg/L)	0.79	-
Chlorides	(mg/L)	24	-
Sulfates	(mg/L)	24	-
Alkalinity	(mg/L)	90	-
Hardness	(mg/L)	122	-
Nickel	(mg/L)	0.001	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.36	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.8	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	0.007	-
Manganese	(mg/L)	0.01	-
Selenium	(mg/L)	0.010	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	8.1	-
Potassium	(mg/L)	1.1	-
Sodium	(mg/L)	10.8	-
Transparency	(ft.)	3.00	-
Calcium	(mg/L)	38.30	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

LAKE ERIE (F) - 06/17/92

Parameter		Value	Failure
Temperature	(degrees C)	15.0	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	203	-
Dissolved Solids	(mg/L)	197	-
Specific Conductance	(umhos/cm)	270	-
Turbidity	(NTU)	2.9	-
Ammonia-N	(mg/L)	0.15	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.98	-
NO3+NO2 Total	(mg/L)	0.98	-
TKN	(mg/L)	1.14	-
Chlorides	(mg/L)	34	-
Sulfates	(mg/L)	22	-
Alkalinity	(mg/L)	94	-
Hardness	(mg/L)	146	-
Nickel	(mg/L)	0.005	-
Copper	(mg/L)	0.012	-
Total Chromium	(mg/L)	0.002	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	0.18	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	3500	BV(400)
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	1820	BV(235)
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	4.25	-
Nitrite-N	(mg/L)	<0.01	-

NEORSD

WQIS

LAKE ERIE (F) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	22.6	-
Dissolved Oxygen	(mg/L)	7.7	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	2	-
Dissolved Solids	(mg/L)	223	-
Specific Conductance	(umhos/cm)	390	-
Turbidity	(NTU)	2.8	-
Ammonia-N	(mg/L)	1.08	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.80	-
NO3+NO2 Total	(mg/L)	0.82	-
TKN	(mg/L)	1.95	-
Chlorides	(mg/L)	58	-
Sulfates	(mg/L)	48	-
Hardness	(mg/L)	154	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.009	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.18	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.007	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	38	-
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	34	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	5.50	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

LAKE ERIE (F) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	14.0	-
Dissolved Oxygen	(mg/L)	10.0	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	24	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	194	-
Dissolved Solids	(mg/L)	189	-
Specific Conductance	(umhos/cm)	215	-
Turbidity	(NTU)	3.6	-
Ammonia-N	(mg/L)	0.39	-
Phosphorus	(mg/L)	0.07	-
Soluble Phosphorus	(mg/L)	0.05	-
Nitrate-N	(mg/L)	1.68	-
NO3+NO2 Total	(mg/L)	1.71	-
TKN	(mg/L)	2.13	-
Chlorides	(mg/L)	60	-
Sulfates	(mg/L)	33	-
Alkalinity	(mg/L)	96	-
Hardness	(mg/L)	130	-
Nickel	(mg/L)	0.001	-
Copper	(mg/L)	0.002	-
Total Chromium	(mg/L)	0.020	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.40	-
Cadmium	(mg/L)	<0.0100	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.0	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.03	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	8.3	-
Potassium	(mg/L)	2.8	-
Sodium	(mg/L)	15.0	-
Transparency	(ft.)	3.00	-
Calcium	(mg/L)	40.44	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (G) - 06/17/92

Parameter		Value	Failure
Temperature	(degrees C)	17.5	-
Dissolved Oxygen	(mg/L)	7.4	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	277	-
Dissolved Solids	(mg/L)	263	-
Specific Conductance	(umhos/cm)	380	-
Turbidity	(NTU)	7.7	-
Ammonia-N	(mg/L)	0.11	-
Phosphorus	(mg/L)	0.05	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	1.86	-
NO3+NO2 Total	(mg/L)	1.89	-
TKN	(mg/L)	1.14	-
Chlorides	(mg/L)	52	-
Sulfates	(mg/L)	33	-
Alkalinity	(mg/L)	97	-
Hardness	(mg/L)	158	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	2.00	EWH(1.0)*
Cadmium	(mg/L)	<0.0003	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	16	-
pH	(s.u.)	7.6	-
E. coli	(organisms/100ml)	10	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	2.50	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (G) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	23.3	-
Dissolved Oxygen	(mg/L)	6.4	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	10	-
Dissolved Solids	(mg/L)	272	-
Specific Conductance	(umhos/cm)	460	-
Turbidity	(NTU)	13.0	-
Ammonia-N	(mg/L)	0.31	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.06	-
Nitrate-N	(mg/L)	1.64	-
NO3+NO2 Total	(mg/L)	1.67	-
TKN	(mg/L)	1.17	-
Chlorides	(mg/L)	68	-
Sulfates	(mg/L)	53	-
Hardness	(mg/L)	190	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.012	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.72	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.009	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	120	-
pH	(s.u.)	7.6	-
E. coli	(organisms/100ml)	120	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	1.50	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (G) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	13.0	-
Dissolved Oxygen	(mg/L)	9.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	12	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	199	-
Dissolved Solids	(mg/L)	194	-
Specific Conductance	(umhos/cm)	220	-
Turbidity	(NTU)	5.7	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.76	-
NO3+NO2 Total	(mg/L)	0.78	-
TKN	(mg/L)	1.08	-
Chlorides	(mg/L)	56	-
Sulfates	(mg/L)	33	-
Alkalinity	(mg/L)	90	-
Hardness	(mg/L)	128	-
Nickel	(mg/L)	0.003	-
Copper	(mg/L)	0.020	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.40	-
Cadmium	(mg/L)	<0.0100	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.7	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.02	-
Selenium	(mg/L)	0.007	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	8.3	-
Potassium	(mg/L)	1.3	-
Sodium	(mg/L)	14.3	-
Transparency	(ft.)	2.50	-
Calcium	(mg/L)	39.29	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

LAKE ERIE (H) - 06/17/92

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	4.6	EWH(6.0)
BOD-5	(mg/L)	4	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	508	-
Dissolved Solids	(mg/L)	478	-
Specific Conductance	(umhos/cm)	700	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	1.05	-
Phosphorus	(mg/L)	0.13	-
Soluble Phosphorus	(mg/L)	0.07	-
Nitrate-N	(mg/L)	4.72	-
NO3+NO2 Total	(mg/L)	4.81	-
TKN	(mg/L)	2.41	-
Chlorides	(mg/L)	138	-
Sulfates	(mg/L)	64	-
Alkalinity	(mg/L)	117	-
Hardness	(mg/L)	204	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	0.72	-
Cadmium	(mg/L)	0.0050	-
Lead	(mg/L)	0.004	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	102	-
pH	(s.u.)	7.4	-
E. coli	(organisms/100ml)	50	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	1.00	-
Nitrite-N	(mg/L)	0.09	-

NEORSD

WQIS

LAKE ERIE (H) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	23.1	-
Dissolved Oxygen	(mg/L)	6.6	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	6	-
Dissolved Solids	(mg/L)	267	-
Specific Conductance	(umhos/cm)	440	-
Turbidity	(NTU)	9.6	-
Ammonia-N	(mg/L)	0.28	-
Phosphorus	(mg/L)	0.10	-
Soluble Phosphorus	(mg/L)	0.06	-
Nitrate-N	(mg/L)	1.52	-
NO3+NO2 Total	(mg/L)	1.55	-
TKN	(mg/L)	1.48	-
Chlorides	(mg/L)	66	-
Sulfates	(mg/L)	57	-
Hardness	(mg/L)	162	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.52	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.009	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	300	-
pH	(s.u.)	7.5	-
E. coli	(organisms/100ml)	160	-
Transparency	(ft.)	2.00	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (H) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	6.0	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	24	-
Total Solids	(mg/L)	528	-
Dissolved Solids	(mg/L)	495	-
Specific Conductance	(umhos/cm)	480	-
Turbidity	(NTU)	13.0	-
Ammonia-N	(mg/L)	0.70	-
Phosphorus	(mg/L)	0.13	-
Soluble Phosphorus	(mg/L)	0.09	-
Nitrate-N	(mg/L)	4.58	-
NO3+NO2 Total	(mg/L)	4.67	-
TKN	(mg/L)	3.33	-
Chlorides	(mg/L)	152	-
Sulfates	(mg/L)	98	-
Alkalinity	(mg/L)	130	-
Hardness	(mg/L)	230	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	1.20	EWH(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.004	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.6	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.13	-
Selenium	(mg/L)	0.005	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	13.4	-
Potassium	(mg/L)	6.2	-
Sodium	(mg/L)	65.9	-
Transparency	(ft.)	1.00	-
Calcium	(mg/L)	67.11	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.09	-

NEORSD

WQIS

LAKE ERIE (I) - 06/25/92

Parameter		Value	Failure
Temperature	(degrees C)	16.8	-
Dissolved Oxygen	(mg/L)	7.2	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	285	-
Dissolved Solids	(mg/L)	281	-
Specific Conductance	(umhos/cm)	400	-
Turbidity	(NTU)	6.1	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	1.72	-
NO3+NO2 Total	(mg/L)	1.73	-
TKN	(mg/L)	1.53	-
Chlorides	(mg/L)	66	-
Sulfates	(mg/L)	102	-
Alkalinity	(mg/L)	132	-
Hardness	(mg/L)	154	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.26	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	53	-
pH	(s.u.)	7.4	-
E. coli	(organisms/100ml)	15	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	3.50	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (T) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	22.7	-
Dissolved Oxygen	(mg/L)	6.8	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	3	-
Dissolved Solids	(mg/L)	196	-
Specific Conductance	(umhos/cm)	360	-
Turbidity	(NTU)	4.7	-
Ammonia-N	(mg/L)	0.26	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	1.31	-
NO3+NO2 Total	(mg/L)	1.34	-
TKN	(mg/L)	1.19	-
Chlorides	(mg/L)	38	-
Sulfates	(mg/L)	50	-
Hardness	(mg/L)	162	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.008	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.30	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.006	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.6	-
Transparency	(ft.)	3.50	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (T) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	13.0	-
Dissolved Oxygen	(mg/L)	10.0	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	13	-
Suspended Solids	(mg/L)	7	-
Total Solids	(mg/L)	274	-
Dissolved Solids	(mg/L)	244	-
Specific Conductance	(umhos/cm)	285	-
Turbidity	(NTU)	5.3	-
Ammonia-N	(mg/L)	0.04	-
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	1.53	-
NO3+NO2 Total	(mg/L)	1.56	-
TKN	(mg/L)	1.21	-
Chlorides	(mg/L)	56	-
Sulfates	(mg/L)	46	-
Alkalinity	(mg/L)	98	-
Hardness	(mg/L)	150	-
Nickel	(mg/L)	0.005	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.39	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.9	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	0.010	-
Manganese	(mg/L)	0.03	-
Selenium	(mg/L)	0.010	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	8.7	-
Potassium	(mg/L)	2.0	-
Sodium	(mg/L)	23.8	-
Transparency	(ft.)	3.00	-
Calcium	(mg/L)	44.19	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (J) - 06/17/92

Parameter		Value	Failure
Temperature	(degrees C)	15.0	-
Dissolved Oxygen	(mg/L)	10.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	180	-
Dissolved Solids	(mg/L)	175	-
Specific Conductance	(umhos/cm)	240	-
Turbidity	(NTU)	35.0	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.73	-
NO3+NO2 Total	(mg/L)	0.74	-
TKN	(mg/L)	0.82	-
Chlorides	(mg/L)	28	-
Sulfates	(mg/L)	13	-
Alkalinity	(mg/L)	86	-
Hardness	(mg/L)	152	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.39	-
Cadmium	(mg/L)	<0.0003	-
Lead	(mg/L)	0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	2	-
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	3	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	3.00	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (J) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	22.3	-
Dissolved Oxygen	(mg/L)	7.6	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	3	-
Dissolved Solids	(mg/L)	182	-
Specific Conductance	(umhos/cm)	300	-
Turbidity	(NTU)	2.6	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.90	-
NO3+NO2 Total	(mg/L)	0.92	-
TKN	(mg/L)	1.02	-
Chlorides	(mg/L)	34	-
Sulfates	(mg/L)	21	-
Hardness	(mg/L)	142	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.011	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.19	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.007	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	52	-
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	37	-
Transparency	(ft.)	5.50	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

LAKE ERIE (J) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	13.0	-
Dissolved Oxygen	(mg/L)	8.8	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	215	-
Dissolved Solids	(mg/L)	177	-
Specific Conductance	(umhos/cm)	210	-
Turbidity	(NTU)	2.4	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.66	-
NO3+NO2 Total	(mg/L)	0.68	-
TKN	(mg/L)	0.87	-
Chlorides	(mg/L)	28	-
Sulfates	(mg/L)	31	-
Alkalinity	(mg/L)	89	-
Hardness	(mg/L)	128	-
Nickel	(mg/L)	0.003	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.33	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	255	-
pH	(s.u.)	8.0	-
E. coli	(organisms/100ml)	213	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	0.006	-
Manganese	(mg/L)	0.01	-
Selenium	(mg/L)	0.006	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	8.2	-
Potassium	(mg/L)	1.8	-
Sodium	(mg/L)	13.5	-
Transparency	(ft.)	4.50	-
Calcium	(mg/L)	43.32	-
Cobalt	(mg/L)	0.0008	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

LAKE ERIE (K) - 06/17/92

Parameter		Value	Failure
Temperature	(degrees C)	15.0	-
Dissolved Oxygen	(mg/L)	12.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	180	-
Dissolved Solids	(mg/L)	185	-
Specific Conductance	(umhos/cm)	245	-
Turbidity	(NTU)	3.4	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.03	-
Nitrate-N	(mg/L)	0.74	-
NO3+NO2 Total	(mg/L)	0.75	-
TKN	(mg/L)	0.95	-
Chlorides	(mg/L)	40	-
Sulfates	(mg/L)	18	-
Alkalinity	(mg/L)	86	-
Hardness	(mg/L)	122	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.003	-
Total Chromium	(mg/L)	0.002	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.22	-
Cadmium	(mg/L)	<0.0003	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	10	-
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	5	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	4.50	-
Nitrite-N	(mg/L)	0.01	-

HEORSD

WQIS

LAKE ERIE (K) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	22.0	-
Dissolved Oxygen	(mg/L)	8.4	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Dissolved Solids	(mg/L)	164	-
Specific Conductance	(umhos/cm)	290	-
Turbidity	(NTU)	2.4	-
Ammonia-N	(mg/L)	0.13	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.71	-
NO3+NO2 Total	(mg/L)	0.73	-
TKN	(mg/L)	1.04	-
Chlorides	(mg/L)	20	-
Sulfates	(mg/L)	33	-
Hardness	(mg/L)	138	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.16	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.007	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	67	-
pH	(s.u.)	8.0	-
E. coli	(organisms/100ml)	50	-
Transparency	(ft.)	5.50	-
Nitrite-N	(mg/L)	0.02	-

HEORSD

WQIS

LAKE ERIE (K) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	13.0	-
Dissolved Oxygen	(mg/L)	11.0	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	30	-
Total Solids	(mg/L)	263	-
Dissolved Solids	(mg/L)	159	-
Specific Conductance	(umhos/cm)	190	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	0.10	-
Phosphorus	(mg/L)	0.10	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.36	-
NO3+NO2 Total	(mg/L)	0.38	-
TKN	(mg/L)	1.15	-
Chlorides	(mg/L)	28	-
Sulfates	(mg/L)	26	-
Alkalinity	(mg/L)	87	-
Hardness	(mg/L)	128	-
Nickel	(mg/L)	0.002	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.10	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	1700	BW(400)
pH	(s.u.)	7.9	-
E. coli	(organisms/100ml)	413	BW(235)
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.02	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	7.5	-
Potassium	(mg/L)	1.6	-
Sodium	(mg/L)	8.7	-
Transparency	(ft.)	1.50	-
Calcium	(mg/L)	40.66	-
Cobalt	(mg/L)	0.0005	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

LAKE ERIE (L) - 06/17/92

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	10.2	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	11	-
Suspended Solids	(mg/L)	5	-
Total Solids	(mg/L)	326	-
Dissolved Solids	(mg/L)	324	-
Specific Conductance	(umhos/cm)	360	-
Turbidity	(NTU)	3.4	-
Ammonia-N	(mg/L)	5.70	-
Phosphorus	(mg/L)	0.19	-
Soluble Phosphorus	(mg/L)	0.14	-
Nitrate-N	(mg/L)	0.65	-
NO3+NO2 Total	(mg/L)	0.74	-
TKN	(mg/L)	6.86	-
Chlorides	(mg/L)	88	-
Sulfates	(mg/L)	28	-
Alkalinity	(mg/L)	112	-
Hardness	(mg/L)	178	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.004	-
Total Chromium	(mg/L)	0.002	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.09	-
Iron	(mg/L)	0.28	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	0.004	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	94	-
pH	(s.u.)	7.5	-
E. coli	(organisms/100ml)	78	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	2.50	-
Nitrite-N	(mg/L)	0.09	-

NEORSD

WQIS

LAKE ERIE (L) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	20.2	-
Dissolved Oxygen	(mg/L)	8.3	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	2	-
Dissolved Solids	(mg/L)	262	-
Specific Conductance	(umhos/cm)	280	-
Turbidity	(NTU)	2.2	-
Ammonia-N	(mg/L)	0.39	-
Phosphorus	(mg/L)	0.08	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	1.54	-
NO3+NO2 Total	(mg/L)	1.66	-
TKN	(mg/L)	0.97	-
Chlorides	(mg/L)	46	-
Sulfates	(mg/L)	94	-
Hardness	(mg/L)	144	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.60	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	0.008	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	55	-
pH	(s.u.)	7.4	-
E. coli	(organisms/100ml)	35	-
Transparency	(ft.)	5.00	-
Nitrite-N	(mg/L)	0.12	-

NEORSD

WQIS

LAKE ERIE (L) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	14.0	-
Dissolved Oxygen	(mg/L)	9.2	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	17	-
Suspended Solids	(mg/L)	26	-
Total Solids	(mg/L)	211	-
Dissolved Solids	(mg/L)	209	-
Specific Conductance	(umhos/cm)	250	-
Turbidity	(NTU)	11.0	-
Ammonia-N	(mg/L)	1.57	-
Phosphorus	(mg/L)	0.16	-
Soluble Phosphorus	(mg/L)	0.14	-
Nitrate-N	(mg/L)	0.70	-
NO3+NO2 Total	(mg/L)	0.76	-
TKN	(mg/L)	2.21	-
Chlorides	(mg/L)	72	-
Sulfates	(mg/L)	37	-
Alkalinity	(mg/L)	92	-
Hardness	(mg/L)	142	-
Nickel	(mg/L)	0.005	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.88	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	310	-
pH	(s.u.)	7.6	-
E. coli	(organisms/100ml)	170	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.02	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	8.2	-
Potassium	(mg/L)	1.4	-
Sodium	(mg/L)	21.4	-
Transparency	(ft.)	1.00	-
Calcium	(mg/L)	38.63	-
Cobalt	(mg/L)	0.0007	-
Nitrite-N	(mg/L)	0.06	-

NEORSD

WQIS

LAKE ERIE (M) - 06/17/92

Parameter		Value	Failure
Temperature	(degrees C)	14.0	-
Dissolved Oxygen	(mg/L)	7.8	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	198	-
Dissolved Solids	(mg/L)	232	-
Specific Conductance	(umhos/cm)	230	-
Turbidity	(NTU)	3.3	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.69	-
NO3+NO2 Total	(mg/L)	0.73	-
TKN	(mg/L)	2.19	-
Chlorides	(mg/L)	28	-
Sulfates	(mg/L)	10	-
Alkalinity	(mg/L)	86	-
Hardness	(mg/L)	122	-
Nickel	(mg/L)	<0.001	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.002	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.20	-
Cadmium	(mg/L)	<0.0003	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	5	-
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	3	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	5.00	-
Nitrite-N	(mg/L)	0.04	-

NEORSO

WQIS

LAKE ERIE (M) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	21.4	-
Dissolved Oxygen	(mg/L)	8.4	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	4	-
Dissolved Solids	(mg/L)	158	-
Specific Conductance	(umhos/cm)	270	-
Turbidity	(NTU)	3.4	-
Ammonia-N	(mg/L)	0.08	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.01	-
Nitrate-N	(mg/L)	0.65	-
NO3+NO2 Total	(mg/L)	0.67	-
TKN	(mg/L)	0.90	-
Chlorides	(mg/L)	26	-
Sulfates	(mg/L)	16	-
Hardness	(mg/L)	126	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.012	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.34	-
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.006	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	150	-
pH	(s.u.)	8.2	-
E. coli	(organisms/100ml)	150	-
Transparency	(ft.)	3.00	-
Nitrite-N	(mg/L)	0.02	-

NEORSO

WQIS

LAKE ERIE (M) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	13.0	-
Dissolved Oxygen	(mg/L)	9.8	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	14	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	208	-
Dissolved Solids	(mg/L)	167	-
Specific Conductance	(umhos/cm)	180	-
Turbidity	(NTU)	8.7	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.41	-
NO3+NO2 Total	(mg/L)	0.44	-
TKN	(mg/L)	1.04	-
Chlorides	(mg/L)	42	-
Sulfates	(mg/L)	30	-
Alkalinity	(mg/L)	88	-
Hardness	(mg/L)	120	-
Nickel	(mg/L)	0.002	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.13	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	420	BW(400)
pH	(s.u.)	7.9	-
E. coli	(organisms/100ml)	363	BW(235)
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.02	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	8.7	-
Potassium	(mg/L)	2.0	-
Sodium	(mg/L)	11.0	-
Transparency	(ft.)	1.50	-
Calcium	(mg/L)	38.02	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (N) - 06/25/92

Parameter		Value	Failure
Temperature	(degrees C)	15.7	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Total Solids	(mg/L)	200	-
Dissolved Solids	(mg/L)	203	-
Specific Conductance	(umhos/cm)	260	-
Turbidity	(NTU)	3.4	-
Ammonia-N	(mg/L)	0.20	-
Phosphorus	(mg/L)	0.03	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.88	-
NO3+NO2 Total	(mg/L)	0.89	-
TKN	(mg/L)	1.17	-
Chlorides	(mg/L)	32	-
Sulfates	(mg/L)	20	-
Alkalinity	(mg/L)	107	-
Hardness	(mg/L)	134	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.002	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.14	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.003	-
Mercury	(ug/L)	0.3	HHSR(0.012)*
Fecal Coliform	(organisms/100ml)	200	-
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	47	-
Phenolics	(mg/L)	<0.05	-
Transparency	(ft.)	5.25	-
Nitrite-N	(mg/L)	0.01	-

NEORSD

WQIS

LAKE ERIE (N) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	21.3	-
Dissolved Oxygen	(mg/L)	7.8	-
BOD-5	(mg/L)	1	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	5	-
Dissolved Solids	(mg/L)	161	-
Specific Conductance	(umhos/cm)	275	-
Turbidity	(NTU)	6.6	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.07	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.72	-
NO3+NO2 Total	(mg/L)	0.75	-
TKN	(mg/L)	0.94	-
Chlorides	(mg/L)	36	-
Sulfates	(mg/L)	9	-
Hardness	(mg/L)	144	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.62	-
Cadmium	(mg/L)	0.0200	EWH(0.0083)
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	1200	BW(400)
pH	(s.u.)	7.9	-
E. coli	(organisms/100ml)	440	BW(235)
Transparency	(ft.)	2.50	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (N) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	13.0	-
Dissolved Oxygen	(mg/L)	10.2	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	18	-
Suspended Solids	(mg/L)	24	-
Total Solids	(mg/L)	195	-
Dissolved Solids	(mg/L)	164	-
Specific Conductance	(umhos/cm)	180	-
Turbidity	(NTU)	13.0	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.06	-
Soluble Phosphorus	(mg/L)	0.04	-
Nitrate-N	(mg/L)	0.44	-
NO3+NO2 Total	(mg/L)	0.47	-
TKN	(mg/L)	0.81	-
Chlorides	(mg/L)	64	-
Sulfates	(mg/L)	32	-
Alkalinity	(mg/L)	88	-
Hardness	(mg/L)	122	-
Nickel	(mg/L)	0.040	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.17	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.1	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.02	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	8.6	-
Potassium	(mg/L)	1.8	-
Sodium	(mg/L)	11.2	-
Transparency	(ft.)	1.50	-
Calcium	(mg/L)	35.55	-
Cobalt	(mg/L)	0.0009	-
Nitrite-N	(mg/L)	0.03	-

NEORSD

WQIS

LAKE ERIE (O) - 07/28/92

Parameter		Value	Failure
Temperature	(degrees C)	23.8	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	2	-
Dissolved Solids	(mg/L)	158	-
Specific Conductance	(umhos/cm)	280	-
Turbidity	(NTU)	2.2	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.02	-
Soluble Phosphorus	(mg/L)	<0.01	-
Nitrate-N	(mg/L)	0.71	-
NO3+NO2 Total	(mg/L)	0.73	-
TKN	(mg/L)	0.68	-
Chlorides	(mg/L)	26	-
Sulfates	(mg/L)	28	-
Hardness	(mg/L)	156	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.009	-
Total Chromium	(mg/L)	0.001	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.16	-
Cadmium	(mg/L)	<0.0005	-
Lead	(mg/L)	0.003	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	8.4	-
Transparency	(ft.)	4.50	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

LAKE ERIE (0) - 10/13/92

Parameter		Value	Failure
Temperature	(degrees C)	12.0	-
Dissolved Oxygen	(mg/L)	9.8	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	15	-
Suspended Solids	(mg/L)	19	-
Total Solids	(mg/L)	185	-
Dissolved Solids	(mg/L)	164	-
Specific Conductance	(umhos/cm)	185	-
Turbidity	(NTU)	8.4	-
Ammonia-N	(mg/L)	<0.01	-
Phosphorus	(mg/L)	0.04	-
Soluble Phosphorus	(mg/L)	0.02	-
Nitrate-N	(mg/L)	0.45	-
NO3+NO2 Total	(mg/L)	0.47	-
TKN	(mg/L)	1.36	-
Chlorides	(mg/L)	48	-
Sulfates	(mg/L)	29	-
Alkalinity	(mg/L)	86	-
Hardness	(mg/L)	120	-
Nickel	(mg/L)	0.002	-
Copper	(mg/L)	0.004	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.01	-
Iron	(mg/L)	0.12	-
Cadmium	(mg/L)	0.0010	-
Lead	(mg/L)	<0.003	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	20	-
pH	(s.u.)	8.1	-
E. coli	(organisms/100ml)	5	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Manganese	(mg/L)	0.02	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Magnesium	(mg/L)	7.8	-
Potassium	(mg/L)	1.4	-
Sodium	(mg/L)	8.1	-
Transparency	(ft.)	2.50	-
Calcium	(mg/L)	35.45	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.02	-

APPENDIX IV

1991-1992 RESULTS OF SAMPLING FOR BENTHIC MACROINVERTEBRATES

Including scores for Hilsenhoff Biotic Index (HBI), Ephemeropteran, Plecopteran, Trichopteran (EPT) Richness, Shannon Diversity Index ($\bar{d}$), Invertebrate Community Index (ICI) and a master list of Benthic Macroinvertebrates collected and identified by the NEORSD in 1991 and 1992, with HBI tolerance values, locations and dates.

BENTHOS COLLECTION METHODS

In 1991 and 1992, the NEORSD performed qualitative, semi-quantitative and quantitative sampling for benthic macroinvertebrates. Organisms were collected using a D-frame kicknet, hand picking, and Hester-Dendy artificial substrate samplers. Only organisms large enough to be retained by a No. 30 mesh screen were collected. Benthic macroinvertebrate samples were retained in labeled vials and preserved with AGW (a mixture of 85% denatured ethanol, 5% glycerol, and 10% water) for laboratory identification. All organisms were identified to the lowest possible taxonomic level.

Qualitative Multiple Habitat sampling was performed at all accessible microhabitats at a site until no new taxa were being collected. This period of time usually ranged from one-half hour to one hour at each site. This Qualitative Multiple Habitat sampling provided a list of taxa present within a sample site. A master list of all taxa collected, regardless of sampling method, is presented in Appendix IV-C.

Semi-Quantitative samples were collected from riffle and/or swift run segments of a sample site. A D-frame kicknet was placed in the stream with the open end facing upstream. The substrate upstream of the net was disturbed by kicking for approximately 30 seconds. All large rocks were scraped to dislodge all invertebrates. The large rocks and debris were then visually inspected for any organisms that may be clinging to the surface. These were removed using forceps and placed in a vial. All large and/or rare taxa were placed in a vial because they may interfere with splitting and/or be lost when large samples are split using a Folsom sample splitter. Due to the naturally irregular distribution of benthic macroinvertebrates in streams, 3 to 5 kick samples within a sampling reach are collected and composited. This composite sample is placed in an enamel pan and sorted until no new taxa are collected and/or 200-300 organism have been picked. To ensure equal effort, a time period of 30 to 60 minutes is used. The time period used at the first sample site of a given stream must be used for all other sample sites of that stream. Sorting may be performed in the field or in the laboratory depending upon the amount of time available. The Semi-Quantitative samples provide data for Hilsenhoff Biotic Index (HBI) calculations (see Appendix X). HBI scores are presented in Appendices IV-A and IV-B. Numbers of organisms used in the calculations are on file at the NEORSD Water Quality & Industrial Surveillance offices.

Quantitative samples were obtained using five replicate Hester-Dendy Artificial Substrate samplers per sample site. The five Hester-Dendy samplers were secured to an object (i.e., block, brick etc.) and submerged in the stream for approximately 6 weeks.

For non-wadeable sites (i.e. Cuyahoga River Navigation Channel) the Hester-Dendy samplers were suspended in the water column approximately one foot from the surface using a float and anchor block. The Quantitative samples were used for the calculation of the Invertebrate Community Index (ICI). ICI scores are presented in Appendices IV-D through IV-M.

Appendix IV-A: Summary of 1991-1993 QHEI and 1991-1992 HBI Narrative Ratings

	QHEI		HBI	
ABRAM CREEK				
Upstream of Middleburg Hts. WWTP	Poor	(43)	*Poor	(8.46)
Downstream of Middleburg Hts. WWTP	Poor	(43)	*Poor	(7.96)
Upstream of Brook Park WWTP	Poor/Fair	(50)	Poor	(8.26)
Downstream of Brook Park WWTP	Poor/Fair	(50)	Very Poor	(8.65)
Upstream of Creek's Confluence with Rocky River	Good/Fair	(72)	Fair	(5.88)
BIG CREEK				
Stickney Creek	Good/Fair	(69.5)	–	
Fernhill Picnic Area	Poor/Fair	(52.5)	Fair	(6.38)
Puritas Avenue	Poor	(33.5)	–	
Memphis/Tiedeman Road (West Branch)	Good/Fair	(62)	Poor	(7.72)
Memphis/Tiedeman Road (East Branch)	Good/Fair	(67)	Fair	(5.63)
Jennings Road	Poor/Fair	(59.5)	Good	(5.31)
CHAGRIN RIVER				
Mayfield Road Bridge	Excellent	(78)	Good	(4.61)
Chagrin River Road Bridge	Excellent	(76)	Very Good	(4.06)
CHIPPEWA CREEK				
Avery Road	Excellent	(77)	Very Good	(4.27)
Bramblewood Branch	Good/Fair	(62.5)	–	–
Chippewa Creek Drive	Excellent	(80)	Excellent	(3.16)
CUYAHOGA RIVER				
Bolanz Road Bridge (RM 33.2)	Poor/Fair	(53.5)	Good	(4.92)
Station Road Bridge (RM 20.8)	Good/Fair	(67)	Very Good	(3.84)
Riverview Road Bridge (RM 16.8)	Excellent	(81)	Very Good	(4.22)
East 71st and Canal Road (RM 11.7)	Poor/Fair	(59)	Very Good	(4.44)
Chlorine Access Bridge (RM 11.3)	Good/Fair	(61)	Good	(4.51)
Southwest Interceptor (RM 9.7)	Poor/Fair	(54)	Good	(5.14)
Bradley Road (RM 7.9)	Poor/Fair	(45.5)	–	
Lower Harvard Bridge (RM 7.1)	Good/Fair	(62)	Good	(4.82)
Center Street Bridge (RM 1.0)	–		Fairly Poor	(7.4)
Old River Bed	–		Poor	(7.62)

*Habitat at this location does not fully meet criteria for HBI calculation; supplemental score for temporal comparison.

(Continued on following page.)

Appendix IV-A: Summary of 1991-1993 QHEI and 1991-1992 HBI Narrative Ratings (continued)

	QHEI		HBI	
DOAN BROOK				
Southeast of Shaker Lakes Nature Ctr.	Good/Fair	(64)	-	
Northeast of Shaker Lakes Nature Ctr.	Good/Fair	(61.5)	-	
North of Cleveland Museum of Art	Good/Excellent	(70.5)	-	
DUGWAY BROOK				
Cumberland Park	Good/Fair	(64)	-	
Lakeview Cemetery	Good/Fair	(63)		
North of Lakeshore Blvd.	Good	(70)	-	
EUCLID CREEK				
Mayfield Road (South Branch)	Good/Fair	(69)	Fair	(5.75)
Highland Picnic Area (North Branch)	Good/Fair	(65.5)	Fair	(6.1)
Highland Picnic Area (South Branch)	Good/Fair	(66.5)	Fairly Poor	(6.96)
St. Clair Avenue Bridge	Excellent	(76)	Fair	(6.09)
Lakeshore Boulevard (300 yds upstream of Site 0.5)	-		Fairly Poor	(6.71)
Lakeshore Boulevard (Site 0.5)	Poor/Fair	(45)	*Fairly Poor	(7.15)
GREEN CREEK				
South of Euclid Avenue	Good/Fair	(64.5)	Good	(5.36)
MILL CREEK				
Northfield Road	Good/Fair	(66)	Good	(4.58)
Rex Avenue	Poor/Fair	(51.5)	Fair	(5.76)
Mapletown Branch	Good/Fair	(61.5)	Fairly Poor	(6.83)
Wolf Creek	Poor/Fair	(54.5)	Fair	(5.93)
Warner Road	Good/Fair	(64)	Fairly Poor	(6.6)
Canal Road	Good/Fair	(61)	Very Good	(3.57)
NINE MILE CREEK				
South of Belvoir Boulevard	Poor/Fair	(58)	Fairly Poor	(6.83)
Nela Park Branch	Poor/Fair	(57)	-	-
Upstream of Creek's Confluence with Lake Erie	Poor/Fair	(55)	Fair	(6.15)

*Habitat at this location does not fully meet criteria for HBI calculation; supplemental score for temporal comparison.

(Continued on following page.)

Appendix IV-A: Summary of 1991-1993 QHEI and 1991-1992 HBI Narrative Ratings (continued)

	QHEI		HBI	
ROCKY RIVER				
Hilliard Road Bridge	Excellent	(79)	Fair	(5.62)
North of Bagley Road	Good/Excellent	(72.5)	Good	(5.46)
East Access Road	Excellent	(76.25)	Good	(4.95)
West Bridge Street	Good/Excellent	(73)	Good	(5.26)
South of Bagley Road	Excellent	(75)	Fair	(5.54)
Upstream of Berea WWTP	Excellent	(75)	Fair	(6.0)
Upstream of Falls Lane	Excellent	(75)	Fair	(6.03)
Falls Lane (East Branch)	Good	(70)	Fairly Poor	(6.54)
Upstream of Abram Creek	Good/Fair	(62)	Good	(5.07)
Downstream of Abram Creek	-		Good	(4.7)
Brookpark Road Bridge	Poor/Fair	(59)	Good	(4.99)
SAGAMORE CREEK				
Canal Road	Excellent	(79.5)	Good	(4.59)
TINKERS CREEK				
Glenwood Drive Bridge	Poor/Fair	(59.5)	-	
Richmond Road	Good/Fair	(61)	Good	(5.24)
Northfield Road Bridge	Good/Fair	(69.5)	Good	(5.21)
Tinkers Creek Road	Good/Fair	(64)		
WEST CREEK				
West Ridgewood Drive	Poor/Fair	(59.5)	Good	(5.4)
Broadview Road Bridge	Poor/Fair	(56.5)	Very Good	(3.86)
Granger Road	Poor/Fair	(51)	Very Good	(4.38)

*Habitat at this location does not fully meet criteria for HBI calculation; supplemental score for temporal comparison.

Appendix IV-B: 1991, 1992 Benthic Macroinvertebrate Data
(All June, July and August scores reflect a recommended seasonal correction factor of -0.6.)

Sample Location	Date	Total Taxa	$\bar{d}$	EPT Taxa	Percent EPT Composition	HBI Score/ Rating	QHEI Score
Euclid Creek							
*0.5	8/13/91	16	2.2	3	7.4	7.15	45
0.51	5/8/91	17	2.3	3	11.4	6.71/Fairly Poor	-
1	5/14/91	27	2.4	4	19.0	6.09/Fair	76
2	5/7/91	9	1.9	1	12.5	6.96/Fairly Poor	66.5
3	5/7/91	28	3.0	8	15.2	6.1/Fair	65.5
4	5/13/91	27	1.8	3	14.7	5.75/Fair	69
Green Creek							
7	5/15/91	8	1.1	1	6.0	5.36/Good	64.5
Nine Mile Creek							
8a	9/12/91	13	2.3	1	15.0	6.15/Fair	55
8a	10/31/91	5	1.4	0	0	6.13/Fair	55
10	5/16/91	5	1.0	0	0	6.83/Fairly Poor	58
Cuyahoga River							
*20.1	8/14/91	32	1.6	3	1.2	7.62	-
*21	8/13/91	10	1.6	0	0	7.4	-
22.51	7/3/91	40	2.3	11	78.8	4.39/Very Good	62
22.51	8/14/91	25	2.5	8	35.6	5.26/Good	62
22.7	8/13/91	28	2.9	5	20.4	5.14/Good	54
22.8	8/14/91	24	2.4	10	76.0	4.51/Good	61
22.9	7/3/91	32	2.0	12	87.0	4.44/Very Good	59
23	7/1/91	37	2.3	14	76.8	4.40/Very Good	81
23	7/1/91	42	2.0	12	85.5	3.85/Very Good	81
23	8/15/91	37	2.5	14	74.8	4.42/Very Good	81
24	7/1/91	46	2.2	17	75.8	3.58/Very Good	67
24	7/1/91	28	2.0	9	75.9	4.1/Very Good	67
24.5	7/1/91	35	2.3	13	64.3	4.92/Good	53.5

*Habitat at this location does not fully meet criteria for HBI calculation; supplemental score for temporal comparison.

(Continued on following page.)

Appendix IV-B: 1991, 1992 Benthic Macroinvertebrate Data (continued)

Sample Location	Date	Total Taxa	$\bar{d}$	EPT Taxa	Percent EPT Composition	HBI Score/ Rating	QHEI Score
Big Creek							
25	9/19/91	23	2.3	5	54.5	5.31/Good	59.5
26	9/23/91	22	2.1	7	81.2	5.63/Fair	67
27	9/23/91	15	2.4	0	0	7.72/Poor	62
29	10/17/91	14	1.8	3	60.6	6.38/Fair	52.5
BC-"C"	10/17/91	14	2.1	4	39.5	6.61/Fairly Poor	-
Mill Creek							
31	7/3/91	11	1.4	3	59.8	3.57/Very Good	61
32	7/5/91	12	1.8	0	0	6.6/Fairly Poor	64
33	7/5/91	18	1.7	2	28.2	5.93/Fair	54.5
33.5	7/5/91	16	1.5	2	6.0	6.24/Fair	61.5
33.5	10/26/92	7	1.5	1	2.6	7.42/Fairly Poor	61.5
34	7/5/91	28	2.3	2	7.8	5.76/Fair	51.5
35	7/9/91	26	2.1	3	48.0	4.58/Good	66
West Creek							
36	7/11/91	20	2.0	5	69.6	4.38/Very Good	51
37	7/9/91	33	1.8	7	79.2	3.86/Very Good	56.5
38	7/9/91	28	2.6	8	46.6	5.4/Good	59.5
Tinkers Creek							
40	7/11/91	22	1.9	9	76.4	5.21/Good	69.5
41	7/11/91	24	1.6	7	89.5	5.24/Good	61
Chippewa Creek							
43	7/24/91	27	2.4	10	66.5	3.16/Excellent	80
44 upstream	7/26/91	31	2.8	11	61.7	4.43/Very Good	77
44 downstream	7/26/91	25	2.6	10	78.3	4.11/Very Good	77

*Habitat at this location does not fully meet criteria for HBI calculation; supplemental score for temporal comparison.

(Continued on following page.)

Appendix IV-B: 1991, 1992 Benthic Macroinvertebrate Data (continued)

Sample Location	Date	Total Taxa	$\overline{d}$	EPT Taxa	Percent EPT Composition	HBI Score/ Rating	QHEI Score
Rocky River							
49 old	6/3/92	15	1.9	2	3.8	6.54/Fairly Poor	70
49 new	6/10/92	23	2.4	3	4.6	6.03/Fair	75
49.1	6/5/92	30	2.3	6	6.6	6.0/Fair	75
49.2	6/8/92	53	2.7	14	25.3	5.54/Fair	75
50	6/5/92	39	3.1	11	37.7	5.26/Good	73
51	6/3/92	44	3.2	14	40.1	4.95/Good	76.25
52	6/16/92	41	3.0	8	14.2	5.46/Good	72.5
52.5	6/4/92	37	2.8	6	34.6	5.62/Fair	79
RR-6	9/25/92	32	2.7	9	57.2	5.07/Good	62
RR-7	9/25/92	18	2.5	7	54.3	4.7/Good	–
RR-9	8/12/92	32	2.7	9	60.8	4.99/Good	59
Abram Creek							
*AC-1	9/15/92	15	2.1	0	0	8.46	43
*AC-2	9/17/92	19	2.6	0	0	7.96	43
AC-3	9/17/92	20	2.4	0	0	8.26/Poor	50
AC-4	9/17/92	16	2.4	0	0	8.65/Very Poor	50
AC-5	9/28/92	19	2.6	3	23.4	5.88/Fair	72
Sagamore Creek							
57	5/20/91	25	2.7	7	39.7	4.59/Good	79.5
Chagrin River							
58	6/26/91	21	2.7	9	66.0	4.03/Very Good	76
58	8/19/91	32	2.1	10	84.7	3.98/Very Good	76
58	7/2/92	26	2.6	15	77.4	4.16/Very Good	76
59	7/25/91	26	2.5	12	78.5	4.11/Very Good	78
59	8/19/91	44	2.3	14	79.8	4.53/Good	78
59	7/7/92	61	2.7	18	40.5	5.0/Good	78
59	7/7/92	26	1.9	12	88.3	4.62/Good	78

*Habitat at this location does not fully meet criteria for HBI calculation; supplemental score for temporal comparison.

(Continued on following page.)

Appendix IV-B: 1991, 1992 Benthic Macroinvertebrate Data (continued)

Sample Location	Date	Total Taxa	$\bar{d}$	EPT Taxa	Percent EPT Composition	HBI Score/ Rating	QHEI Score
Beechhill/Bonnieview Creek							
BBC-1	7/2/92	56	3.1	6	10.3	5.82/Fair	-

KEY

$\bar{d}$ = Shannon Diversity Index = $- \text{Summation} \left(\frac{n_i}{n} \ln \frac{n_i}{n}\right)$

n_i = Total number of individuals in the ith taxa
n = Total number of individuals in sample

HBI = Hilsenhoff Biotic Index = $\text{Summation} \left(\frac{n_i a_i}{N}\right)$

n_i = Total number of individuals in the ith taxa
a_i = Tolerance value of ith taxa
N = Total number of individuals in sample

EPT = Ephemeropteran + Plecoptera + Trichopteran

QHEI = Qualitative Habitat Evaluation Index

The Shannon Diversity Index measures the diversity of organisms in a stream. The index score becomes higher with an increase in diversity of stream organisms. Increased diversity may be correlated to improved water quality and/or habitat quality.

The Hilsenhoff Biotic Index may be correlated to the amount of organic pollution in a stream. All other variables remaining the same, the index score becomes higher as the amount of organic pollution increases (range 0-10).

The number of EPT taxa and the EPT percent composition generally increase with improving water quality, habitat quality and/or stream size.

(Continued on following page.)

Appendix IV-B: 1991, 1992 Benthic Macroinvertebrate Data (continued)

QHEI measures habitat quality. The index score increases as the habitat quality increases. QHEI's were derived based upon fish community habitats but may be useful in evaluating habitats for benthic macroinvertebrates also.

Consideration of one index in isolation can lead to misinterpretation of stream conditions. Therefore, characterization of water and/or habitat quality using the benthos data collected here involves the Shannon Diversity Index, EPT Taxa, Percent EPT composition and Hilsenhoff Biotic Index. Discussed below are four possible scenarios:

1) A high HBI score, high $\bar{d}$, low percent EPT composition and low EPT taxa may indicate poor water quality although high diversity. A sample in this scenario may contain many more pollution tolerant species. Examples of this scenario can be found in Appendix IV-B for Sites #AC-3, #AC-4, and #27.

2) A high HBI score, low $\bar{d}$, low EPT and low percent EPT composition generally indicates poor water and/or habitat quality. In this scenario, the presence of only a few different species of pollution tolerant organisms may be the result of organic pollution and/or poor habitat, either of which can negatively impact the benthic community. Examples of this scenario can be found in Appendix IV-B for Sites #10 and #33.5.

3) Conversely, a low HBI score, high $\bar{d}$, high percent EPT composition and high EPT taxa generally indicates good water and/or habitat quality. In this scenario, the benthic community is well balanced with many species of pollution sensitive organisms present. Examples of this scenario can be found in Appendix IV-B for sites #44, #58, #59, and RR-9.

4) As can be observed in Appendix IV-B, some locations had a low $\bar{d}$, low HBI, high EPT taxa and high percent EPT composition, which indicate good water and/or habitat quality. The low diversity ($\bar{d}$) may be due to the high percent EPT composition. The high percent EPT composition may be attributed to the selective sampling techniques utilized for HBI determination which target riffles and runs. In these microhabitats (riffles and runs) of larger streams, trichopterans often become the predominant macroinvertebrate present and collected. Also, removing only large obvious arthropods from a sample can lead to disproportionate numbers of these organisms, resulting in underestimated diversity. Examples of this scenario can be found in Appendix IV-B for Sites #59, #40, #41, and #37.

Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites

Taxon	HBI Tolerance Value	(Site, Date Collected)
Coelenterata		
Hydrozoa		
Hydroida		
Hydridae		
Hydra sp.	-	(21.1, 8/13/91)
Hydra americana	-	(AC-1, 9/15/92)
Platyhelmenthes		
Turbellaria		
Tricladida		
Planariidae		
Dugesia tigrina	-	(0.5, 8/13/91) (1, 5/14/91) (2, 5/7/91) (4, 5/13/91) (8a, 9/12/91) (8a, 10/31/91) (10, 5/16/91) (20.1, 8/14/91) (22.51, 7/3/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 8/15/91) (24, 7/1/91) (25, 9/19/91) (26, 9/23/91) (27, 9/23/91) (29, 10/17/91) (BC "C" 10/17/91) (32, 7/5/91) (33.5, 10/26/92) (35, 7/9/91) (36, 7/11/91) (37, 7/9/91) (38, 7/9/91) (44, 7/26/91) (49, 6/3/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/91) (52, 6/16/92) (52.5, 6/4/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (AC-1, 9/15/92) (AC-2, 9/17/92) (AC-3, 9/17/92) (AC-4, 9/17/92) (AC-5, 9/28/92) (59, 7/7/92) (BBC-1, 7/2/92) (3, 5/7/91)
Annelida		
Oligochaeta		
Haplotaxida		

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Naididae	-	(8a, 10/31/91) (22.7, 8/13/91) (22.8, 8/14/91) (21.1, 8/13/91) (0.5, 8/13/91) (1, 5/14/91) (50, 6/5/92)
Chaetogaster diastrophus	-	(AC-1, 9/15/92) (8a, 10/31/91) (23, 8/15/91) 59, 8/19/91) (49.1, 6/5/92) (52, 6/16/92)
Ophidonais serpentina	-	(20.1, 8/14/91)
Pristina longiseta longiseta	-	(23, 8/15/91)
Tubificidae	-	(8a, 10/31/91) (22.7, 8/13/91) (22.51, 8/14/91)
Limnodrilus udekemianus	-	(49.1, 6/5/92)
Rhyacodrilus coccineus	-	(49, 6/3/92) (49, 6/10/92) (49.1, 6/5/92)
Enchytracidae	-	(BBC-1, 7/2/92)
Lumbriculidae	-	(8a, 10/31/91) (49.1, 6/5/92)
Lumbriculus variegata	-	(49o, 6/3/92) (49n, 6/10/92)
Hirudinea		
Rhynchobdellida		
Helobdella stagnalis	-	(0.5, 8/13/91) (20.1, 8/14/91) (22.51, 8/14/91) (23, 8/15/91) (33, 7/5/91) (36, 7/11/91) (52, 6/16/92) (AC-2, 9/17/92)
Helobdella sp.	-	(31, 7/3/91)
Placobdella sp.	-	(22.51, 7/3/91) (22.8, 8/14/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Placobdella papilifera	-	(0.5, 8/13/91) (20.1, 8/14/91) (AC-3, 9/17/92) (AC-4, 9/17/92)
Gnathobdellida		
Bdlellarogatis (= Haemopis) plumbea	-	(34, 7/5/91)
Pharyngobdellida		
Dina (Mooreobdella) sp.	-	(22.8, 8/14/91) (23, 7/1/91) (31, 7/1/91) (33, 7/5/91)
Dina (Mooreobdella) microstoma	-	(27, 9/23/91) (33, 9/7/91)
Erpobdella sp.	-	(40, 7/11/91)
Erpobdella punctata	-	(8a, 9/12/91) (21, 8/13/91) (22.51, 7/3/91) (27, 9/23/91) (31, 7/3/91) (34, 7/5/91) (22.51, 8/14/91)
Erpobdella triannulata	-	(AC-3, 9/17/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (20.1, 8/14/91) (24, 7/1/91) (49, 6/10/92) (52, 6/16/92) (52.5, 6/4/92)
Arthropoda		
Crustacea		
Cladocera		
Simocephalus exspinosis	-	(20.1, 8/14/91)
Ceriodaphnia reticulata	-	(20.1, 8/14/91) (52, 6/16/92)
Ilyocryptus sordidus	-	(22.7, 8/14/91)
Ilyocryptus spinifer	-	(0.5, 8/13/91) (21, 8/13/91) (22.51, 8/14/91)
Copepoda		
Paracyclops fimbriatus poppei (Rehberg)	-	(22.7, 8/13/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Cyclops sp.	-	(22.51, 8/14/91)
Eucyclops agilis (Kock)	-	(22.7, 8/13/91)
Mesocyclops sp.	-	(0.5, 8/13/91) (21, 8/13/91)
Mesocyclops edax	-	(20.1, 8/13/91) (22.7, 8/13/91)
Ostracoda		
Cypridopsis sp.	-	(20.1, 8/13/91)
Lymnocythere sp.	-	(20.1, 8/13/91)
Isopoda		
Asellus sp.	8	(0.51, 5/8/91) (1, 5/14/91) (22.7, 8/13/91) (27, 9/23/91) (29, 10/17/91) (36, 7/11/91) (37, 7/9/91) (25, 9/19/91) (57, 5/20/91) (RR-7, 9/25/91)
Asellus laticaudatis	8	(0.5, 8/13/91)
Asellus communis	8	(3, 5/7/91) (0.5, 8/13/91) (20.1, 8/14/91) (21, 8/13/91) (22.8, 8/14/91) (24.5, 7/1/91) (22.7, 8/14/91) (RR-9, 8/12/92) (8a, 9/12/91) (38, 7/9/91) (40, 7/11/91) (41, 7/11/91) (26, 9/23/91) (BC-"C", 10/17/91) (AC-1, 9/15/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92)
Asellus racovitzai racovitzai	8	(33, 7/5/91) (Dst 33, 9/7/91)
Amphipoda		
Hyalella azteca	8	(20.1, 8/14/91) (21, 8/14/91)

(Continued on following page.)

Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Gammarus fasciatus	-	(20.1, 8/14/91) (22.51, 7/3/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (22.7, 8/13/91) (20.1, 8/14/91) (22.8, 8/14/91) (22.51, 8/14/91)
Crangonyx sp.	8	(8a, 9/12/91) (21, 8/13/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91) (33 dst, 9/7/91) (38, 7/9/91) (40, 7/11/91)
Crangonyx gracilis complex	8	(0.51, 5/8/91) (1, 5/14/91) (0.5, 8/13/91) (33.5, 10/26/92) (35, 7/9/91) (10, 5/16/91) (37, 7/9/91) (26, 9/23/91) (27, 9/23/91) (29, 10/17/91) (BC-"C", 10/17/91) (49.1, 6/5/92) (50, 6/5/92) (52, 6/16/92) (52.5, 6/4/92) (RR-9, 8/12/92) (22.7, 8/13/91) (21, 8/13/91)
Crangonyx pseudogracilis complex	8	(3, 5/7/91) (33.5, 7/5/91) (23, 7/1/91) (7, 5/15/91) (AC-3, 9/17/92) (AC-4, 9/17/92) (AC-5, 9/28/92)
Decapoda		
Cambaridae	-	(59, 7/7/92)
Orconectes sp.	-	(8a, 10/31/91) (22.7, 8/13/91)
Orconectes obscurus	-	(24, 7/1/91)
Orconectes virilis (Hagen)	-	(52.5, 6/4/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Arachnoidea		
Hydracarina		
Arrenurus sp.	-	(20.1, 8/14/91)
Hygrobates sp.	-	(49.1, 6/5/92) (52, 6/16/92) (52.5, 6/4/92)
Mideopsis sp.	-	(23, 8/15/91)
Sperchon sp.	-	(59, 8/19/91)
Tyrellia sp.	-	(22.7, 8/13/91) (59, 8/19/91)
Insecta		
Collembola		
Isotomidae	-	(22.9, 7/3/91)
Sminthuridae	-	(59, 7/7/92)
Plecoptera		
Amphinemura sp.	-	(57, 5/20/91)
Nemoura sp.	-	(49.2, 6/8/92)
Leuctra sp.	0	(23, 7/1/91) (43, 7/24/91) (44, 7/26/91) (58, 7/2/92)
Paraleuctra sp.	-	(24, 7/1/91)
Paragnetina sp.	-	(58, 8/19/91)
Plecoptera		
Acroneuria sp.	0	(23, 8/15/91)
Perlesta sp.	-	(49.1, 6/5/92) (51, 6/3/92)
Perlesta placida	5	(49.2, 6/8/92) (50, 6/5/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Haloperla sp (= Hastaperla sp.)	0	(57, 5/20/91)
Ephemeroptera		
Siphlonuridae		
Siphlonurus sp.	7	(59, 7/25/91)
Baetidae		
Baetis sp.	4	(0.5, 8/13/91) (22.51, 8/14/91)
Baetis flavistriga	4	(0.51, 5/8/91) (1, 5/14/91) (2, 5/7/91) (3, 5/7/91) (4, 5/13/91) (31, 7/3/91) (33, 7/5/91) (33.5, 7/5/91) (33.5, 10/16/92) (34, 7/5/91) (35, 7/9/91) (33 dst, 9/7/91) (22.51, 7/3/91) (22.51, 8/14/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (7, 5/15/91) (8a, 9/12/91) (43, 7/24/91) (44 up, 7/26/91) (44dst, 7/26/91) (36, 7/11/91) (37, 7/9/91) (38, 7/9/91) (40, 7/11/91) (41, 7/11/91) (57, 5/20/91) (59, 5/7/92) (BBC-1, 7/2/92) (20.1, 8/14/91) (59, 8/19/91) (RR6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 8/19/91) (58, 6/26/91) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (25, 9/19/91) (26, 9/23/91) (29, 10/17/91) (BC-"C" 10/17/91) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Baetis intercalaris	6	(22.51, 7/3/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (37, 7/9/91) (38, 7/9/91) (22.8, 8/14/91) (59, 8/19/91) (40, 7/11/91) (41, 7/11/91) (26, 9/23/91) (49.2, 6/8/92) (52, 6/16/92) (52.5, 6/4/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 6/26/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 7/7/92)
Baetis brunneicolor	4	(24.5, 7/1/91) (23 8/15/91)
Baetis vagans	2	(22.8, 8/14/91) (40, 7/11/91) (44 up, 7/26/91) (57, 5/20/91) (59, 7/7/92) (44 dst, 7/26/91)
Cloeon sp.	4	(33.5, 7/5/91)
Oligoneuridae		
Isonychia sp.	2	(24, 7/1/91) (24.5, 7/1/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92)
Heptageniidae		
Heptagenia pulla	0	(58, 7/2/92) (59, 7/7/92)
Leucrocuta sp. (= Heptagenia hebe)	1	(22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (58, 7/2/92) (59, 8/19/91) (59, 7/7/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Nixe sp. (= Heptagenia lucidipennis)	2	(49.1, 6/5/92) (58, 6/26/91) (59, 8/19/91)
Interpunctatum Group		
Stenonema candidum	-	(43, 7/24/91)
Stenonema minnetonka	-	(51, 6/3/92 (52, 6/16/92) (59, 7/7/92)
Stenonema pallidum	-	(59, 7/7/92)
Stenonema interpunctatum	7	(22.51, 7/3/91) (22.51, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (24, 5/13/91) (24.5, 7/1/91) (44 up, 7/26/91) (26, 9/23/91) (49 n, 6/10/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/91) (RR-6, 9/25/92) (RR-9, 8/12/92) (58, 6/26/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (23, 8/14/91) (22.7, 8/13/91)
Stenonema interpunctatum canadense	7	(23, 8/15/91) (24, 7/1/91) (44 dst 7/26/91) (40, 7/11/91) (41, 7/11/91)
Stenonema interpunctatum interpunctatum	7	(24, 7/1/91) (44 dst, 7/26/91) (40, 7/11/91) (41, 7/11/91)
Femoratum Group		
Stenonema tripunctatum	5	(0.5, 8/13/91) (24, 7/1/91) (43, 7/24/91) (44 up, 7/26/91) (37, 7/9/91) (44 dst, 7/26/91) (38, 7/9/91) (26, 9/23/91) (29, 10/17/91) (BC-"C", 10/17/91) (49.2, 6/8/92) (50, 6/5/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Femoratum Group		
Stenonema tripunctatum (continued)	5	(52, 6/16/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92)
Pulchellum Group		
Stenonema exiguum	5	(59, 7/7/92)
Stenonema integrum	4	(22.51, 7/3/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (51, 6/3/92)
Stenonema pulchellum	3	(22.51, 7/3/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (50, 6/5/92) (51, 6/3/92) (58, 6/26/91) (RR-6, 9/25/92) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 7/7/92) (59, 8/19/91)
Stenonema quinquespinum	5	(49.2, 6/8/92) (51, 6/3/92)
Stenonema terminatum	4	(22.51, 7/3/91) (22.51, 8/14/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (58, 7/2/92) (59, 7/25/91) (59, 7/7/92) (22.7, 8/13/92)
Stenonema vicarium	2	(24.5, 7/1/91) (44 dst, 7/26/91) (44 up, 7/26/91) (59, 8/19/91) (59, 7/7/92)
Tricorythidae		
Tricorythodes sp.	4	(22.51, 7/3/91) (22.51, 8/14/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Tricorythodes sp. (continued)	4	(22.7, 8/13/91) (22.8, 8/14/91) (23, 7/1/91) (23, 8/15/91) (59, 7/7/92) (22.7, 8/13/91) (22.8, 8/14/91)
Caenidae		
Caenis sp.	7	(0.5, 8/13/91) (3, 5/7/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (49, 6/3/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (59, 8/19/91) (23, 8/15/91) (20.1,8/14/91)
Leptophlebiidae		
Paraleptophlebia sp.	1	(59, 7/7/92)
Potamanthidae		
Potamanthus sp.	4	(59, 8/19/91)
Ephemeridae		
Ephemera sp.	-	(51, 6/3/92)
Odonata		
Anisoptera		
Arigomphus sp. (= *Orcus* sp.)	-	(44 dst, 7/26/91)
Lanthus sp.	-	(59, 7/7/92)
Aeshna sp.	5	(AC-4, 9/17/92) (37, 7/9/91)
Boyeria sp.	-	(AC-3, 9/17/92) (51, 6/3/92) (23, 8/15/91) (24.5, 7/1/91) (43, 7/24/91) (44 dst, 7/26/91) (38, 7/9/91)
Somatochlora sp.	1	(0.5, 8/13/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Tetragoneuria sp. (= Epitheca sp.)	7	(0.5, 8/13/91)
Erythrodiplax sp.	-	(20.1, 8/14/91)
Ladona sp.	-	(AC-4, 9/17/92)
Libellula sp.	9	(20.1, 8/14/91)
Nanothemis sp.	-	(0.5, 8/13/91)
Perithemis sp.	-	(20.1, 8/14/91)
Plathemis sp.	8	(27, 9/23/91)
Tramea sp. (= Trapezostigma sp.)	-	(22.51, 8/14/91)
Zygoptera		
Calopteryx sp.	5	(29, 10/17/91) (BC-"C", 10/17/91) (59, 8/19/91) (22.8, 8/14/91) (22.51, 8/14/91) (0.51, 5/8/91) (22.7, 8/13/91) (43, 7/24/91)
Hetaerina sp.	6	(25, 9/19/91) (RR-9, 8/12/92) (22.7, 8/13/91) (33 dst, 9/7/91) (23, 7/1/91) (24, 7/1/91)
Archilestes sp.	9	(33, 7/5/91) (33.5, 7/5/91)
Argia sp.	7	(22.51, 7/1/91)
Argia apicalis	8	(52, 6/16/92)
Argia moesta	6	(58, 8/19/91)
Argia tibialis	6	(59, 7/25/91) (59, 8/19/91) (22.8, 8/14/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Argia violacea	7	(49.2, 6/8/92) (50, 6/5/92) (RR-6, 9/25/92) (0.5, 8/13/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.8, 8/14/91) (23, 8/15/91)
Ischnura sp./ Anomalagrion sp. complex	9	(BC-"C", 10/17/91) (20.1, 8/14/91)
Coenagrion sp./ Enallagma sp. complex	8	(27, 9/23/91) (AC-2, 9/17/92) (AC-3, 9/17/92) (AC-4, 9/17/92) (0.5, 8/13/91) (34, 7/5/91) (35, 7/9/91) (20.1, 8/14/91) (27.1, 8/13/91)
Ischnura sp.	9	(27, 9/23/91) (0.5, 8/13/91)
Enallagma sp.	8	(26, 9/23/91) (27, 9/23/91) (AC-1, 9/15/92) (20.1, 8/14/91)
Hemiptera		
Microvelia sp.	-	(BBC-1, 7/2/92)
Limnophorus sp.	-	(BBC-1, 7/2/92)
Rheumatobates sp.	-	(41, 7/11/91)
Trepobates sp.	-	(44 up, 7/26/91)
Belostoma sp.	-	(BC-"C", 10/17/91)
Sigara sp.	-	(22.7, 8/13/91) (22.9, 7/3/91) (AC-1, 9/15/92)
Trichocorixa sp.	-	(4, 5/13/91) (22.7, 8/13/91) (23, 7/1/91) (59, 8/19/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Mesovelia sp.	-	(22.7, 8/13/91)
Megaloptera		
Sialis sp.	4	(22.7, 8/13/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (44 up,7/26/91) (38, 7/9/91) (51, 6/3/92) (52, 6/16/92) (58, 7/2/92) (59, 8/19/91)
Corydalus sp.	6	(22.51, 7/3/91) (22.51, 8/14/91) (22.9, 7/3/91) (23, 8/15/91) (24, 7/1/91) (43, 7/24/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91)
Nigronia serricornis	0	(23, 8/15/91) (41, 7/11/91) (51, 6/3/92)
Trichoptera		
Philopotamidae		
Chimarra obscura	4	(59, 8/19/91)
Dolophilodes sp.	0	(57, 5/20/91)
Polycentropodidae		
Cernotina sp./ *Polycentropus* sp.	6	(3, 5/7/91)
Hydropsychidae		
Diplectrona sp.	0	(3, 5/7/91) (38, 7/9/91) (BBC-1, 7/2/92)
Symphitopsyche bifida group	6	(3, 5/7/91) (24, 7/1/91) (43, 7/24/91) (44 dst, 7/26/91) (36,7/11/91) (38, 7/9/91) (40, 7/11/91) (41, 7/11/91) (49.2, 6/8/92) (50, 6/5/92)

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Taxon	HBI Tolerance Value	(Site, Date Collected)
Symphitopsyche bifida group (continued)	6	(51, 6/3/92) (RR-6, 7/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 6/26/91) (58, 8/19/91) (58,7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92) (23, 8/15/91)
Symphitopsyche alhedra	3	(24.5, 7/1/91)
Symphitopsyche slossonae	4	(0.51, 5/8/91) (1, 5/14/91) (3, 5/7/91) (43, 7/24/91) (44, 7/26/91) (37, 7/9/91) (38, 7/9/91) (57, 5/20/91)
Symphitopsyche sparna	1	(24.5, 7/1/91) (43, 7/24/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92)
Cheumatopsyche sp.	5	(3, 5/7/91) (0.5, 8/13/91) (20.1, 8/14/91) (22.51, 7/3/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 5/13/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (44, 7/26/91) (49.2, 6/8/92) (50,6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92) (RR-6, 9/25/92) (RR-7, 7/25/92) (RR-9, 8/12/92) (58,6/26/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Hydropsyche betteni	6	(0.51, 5/8/91) (1, 5/14/91) (3, 5/7/91) (4, 5/13/91) (31, 7/3/91) (35, 7/9/91) (33 dst, 9/7/91) (22.51, 7/3/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 5/13/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (44, 7/26/91) (36, 7/11/91) (37, 7/9/91) (38,7/9/91) (40, 7/11/91) (41, 7/11/91) (57, 5/20/91) (25, 9/19/91) (26, 9/23/91) (29, 10/17/91) (BC-"C" 10/17/91) (AC-5, 9/28/92) (49, 6/3/92) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (BBC-1, 9/2/92) (22.51, 8/14/91)
Hydropsyche cuanis	6	(22.8, 8/14/91)
Hydropsyche dicantha	2	(31, 7/3/91) (33 dst, 9/7/91) (22.51, 7/3/91) (22.51, 8/14/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (44 up, 7/26/91) (36, 7/11/91) (37, 7/9/91) (40, 7/11/91) (41, 7/11/91) (25, 9/19/91) (26, 9/23/91) (BC-"C", 10/17/91) (AC-5, 9/28/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5 6/4/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 6/26/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Hydropsyche demora	-	(58, 7/2/92)
Potamyia sp.	5	(23, 7/1/91)
Hydroptilidae		
Agraylea sp.	8	(20.1, 8/14/91)
Ochrotrichia sp.	4	(23, 8/15/91) (25, 9/19/91)
Leucotrichia sp.	2	(58, 6/26/91)
Hydroptila sp.	6	(1, 5/14/91) (4, 5/13/91) (33, 7/5/91) (34, 7/5/91) (35, 7/9/91) (20.1, 8/14/91) (22.51, 7/3/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (43, 7/24/91) (44 up, 7/26/91) (36, 7/11/91) (37, 7/9/91) (38, 7/9/91) (40, 7/11/91) (25, 9/19/91) (26, 9/23/91) (AC-5, 9/28/92) (49 n, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52.5, 6/4/92) (RR-6, 9/25/92) (RR-9, 8/12/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (22.51, 8/14/91)
Leptoceridae	3	(59, 8/19/91)
Ceraclea sp.		(23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (49.2, 6/8/92) (52.5, 6/4/92) (58, 7/2/92) (22.8, 8/14/91) (22.51, 8/14/91)
Lepidoptera		
Crambus sp.	-	(AC-2, 9/17/92)
Petrophila sp. (= Paragyractis sp.)	5	(58, 8/19/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Pyroderces sp.	-	(49.2, 6/8/92)
Symira sp.	-	(20.1, 8/14/91)
Coleoptera		
Gyrinidae		
Dineutus sp.	-	(22.7, 8/13/91)
Haliplidae		
Peltodytes sp.	-	(AC-1, 9/15/92)
Dytiscidae		
Agabetes sp.	-	(20.1, 8/14/91)
Graphoderus sp.	-	(BBC-1, 7/2/92)
Hydroporus sp.	-	(BBC-1, 7/2/92)
Hydrophilidae		
Berosus sp.	-	(23, 8/15/91) (20.1, 8/14/91) (22.8, 8/14/91) (21, 8/13/91) (22.51, 8/14/91)
Cymbiodyta sp.	-	(BBC-1, 7/2/92)
Enochrus sp.	-	(20.1, 8/14/91)
Laccobius sp.	-	(43, 7/24/91)
Paracymus sp.	-	(49, 6/10/92) (52.5, 6/4/92) (34, 7/5/91)
Staphylinidae		
Stenus sp.	-	(0.5, 8/13/91)
Psephenidae		
Psephenus sp.	4	(49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (23, 7/1/91) (43, 7/24/91) (57, 5/20/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Dryopidae		
Helichus basalis	5	(59, 8/19/91)
Scirtidae		
Cyphon sp.	-	(50, 6/5/92)
Elmidae		
Ancyronyx variegata	6	(52, 6/16/92) (52.5, 6/4/92) (22.8, 8/14/91) (22.51, 8/13/91) (22.51, 7/3/91) (22.7, 8/13/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91)
Machronychus glabratus	4	(RR-6, 9/25/92) (58, 8/19/91) (59, 8/19/91) (22.8, 8/14/91) (22.51, 8/13/91) (23, 7/1/91) (23, 8/15/91) (41, 7/11/91)
Stenelmis sp.	5	(49, 6/3/92) (49.1, 6/5/92) (RR-9, 8/12/92) (59, 7/7/92)
Stenelmis sp. (continued)	5	(22.8, 8/14/91) (0.5, 8/13/91) (24, 7/1/91)
Stenelmis crenata group	5	(49, 6/10/92) (51, 6/3/92) (52.5, 6/4/92) (58, 8/19/91) (1, 5/14/91) (3, 5/7/91) (0.5, 8/13/91)
Stenelmis crenata	5	(49.2, 6/8/92) (50, 6/5/92) (58, 7/2/92) (59, 8/19/91) (59, 8/19/91) (22.51, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (44 up, 7/26/91) (37, 7/9/91) (41, 7/11/91) (57, 5/20/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Stenelmis sexlineata	5	(52, 6/16/92) (RR-6, 9/25/92) (RR-7, 9/25/92)
Curculionidae		
Hyperodes sp.	-	(7, 5/15/91)
Lixus sp.	-	(BBC-1, 7/2/92)
Tortricidae		
Bactra sp.	-	(33.5, 10/26/92)
Carabidae	-	(BBC-1, 7/2/92)
Diptera		
Tipulidae		
Antocha sp.	3	(22.51, 7/1/91) (24, 7/1/91) (24, 7/1/91) (43, 7/24/91) (49.2, 6/8/92) (58, 8/19/91) (59, 8/19/91) (59, 8/19/91) (59, 8/19/91) (59, 8/19/91) (59, 7/7/92)
Brackypremna sp.	-	(49.1, 6/5/92) (BBC-1, 7/2/92)
Dicranota sp. (= *Raphidolabina* sp.)	3	(25, 9/19/91)
Hexatoma sp.	2	(24, 7/1/91) (51, 6/3/92) (59, 7/7/92)
Limonia sp.	6	(35, 7/9/91)
Pedicia sp.	6	(20.1, 8/14/91)
Rhabdomastix sp.	-	(1, 5/14/91)
Tipula sp.	4	(27, 9/23/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Tipula prob. *furca*	4	(25, 9/19/91) (58, 8/19/91) (BBC-1, 7/2/92) (22.8, 8/14/91) (23, 7/1/91) (24.5, 7/1/91)
Tipula prob. *abdominalis*	4	(AC-5, 9/28/92) (BBC-1, 7/2/92) (33.5, 7/5/91) (24, 5/13/91)
Psychodidae	-	(22.51, 8/14/91) (43, 7/24/91)
Pericoma sp.	4	(BBC-1, 7/2/92) (34, 7/5/91)
Psychoda sp.	10	(26, 9/23/91) (34, 7/5/91)
Culicidae		
Anopheles sp.	-	(AC-1, 9/15/92)
Culex, sp.	-	(33, 7/5/91)
Orthopodomyia sp.	-	(33, 7/5/91)
Simuliidae		
Cnephia sp.	0	(33, 7/5/91) (24, 5/13/91) (24.5, 7/1/91)
Prosimulium sp.	4	(59, 7/7/92) (35, 7/9/91)
Simulium sp.	7	(24, 7/1/91)
Simulium corbis	2	(59, 7/7/92)
Simulium vittatum	7	(25, 9/19/91) (AC-5, 9/28/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/91) (52.5, 6/4/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 6/26/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
<u>Simulium vittatum</u> (continued)	7	(0.51, 5/3/91) (1, 5/14/91) (2, 5/7/91) (3, 5/7/91) (4, 5/13/91) (33, 7/5/91) (33.5, 7/5/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (44, 7/26/91) (36, 7/11/91) (37, 7/9/91) (38, 7/9/91) (40, 7/11/91) (41, 7/11/91) (57, 5/20/91)
Chironomidae		
Tanypodinae		
<u>Clinotanypus</u> sp.	8	(AC-1, 9/15/92)
<u>Coelotanypus</u> sp.	-	(22.7, 8/13/91)
<u>Alotanypus</u> sp.	-	(AC-3, 9/17/92) (AC-4, 9/17/92) (52, 6/16/92) (BBC-1, 7/2/92) (33.5, 7/5/91) (34, 7/5/91) (8a, 9/12/91) (8a, 10/31/91)
<u>Procladius</u> sp.	9	(AC-1, 9/15/92) (0.5, 10/31/91) (34,7/5/91) (24, 7/1/91)
<u>Procladius subletti</u> (Roback)	9	(22.7, 8/13/91)
<u>Psectrotanypus</u> sp.	10	(BBC-1, 7/2/92) (8a, 9/12/91)
<u>Natarsia</u> sp.	8	(AC-3, 9/17/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.51, 8/14/91) (1, 5/14/91) (2, 5/7/91) (33, 7/5/91) (33.5, 7/5/91) (8a, 10/31/91) (36, 7/11/91) (41, 7/11/91)
<u>Ablabesmyia</u> sp.	8	(33 dst, 9/7/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Ablabesmyia mallochi (Walley)	8	(26, 9/23/91) (49, 6/10/92) (49.1, 6/5/92) (59, 8/19/91) (23, 8/15/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.51, 8/14/91) (59, 8/19/91) (0.5, 8/13/91) (31, 7/3/91) (33.5, 7/5/91) (34, 7/5/91) (35, 7/9/91) (22.51, 7/3/91) (22.7, 8/13/91) (23, 7/1/91) (8a, 9/12/91) (8a, 10/31/91) (43, 7/24/91) (44dst, 7/26/91) (36, 7/11/91) (37, 7/9/91) (38, 7/9/91) (40, 7/11/91)
Ablabesmyia parajanta	8	(20.1, 8/14/91)
Thienemannimyia sp. group	6	(25, 9/19/91) (27, 9/23/91) (33 dst, 9/7/91) (23, 7/1/91)
Meropelopia sp.	6	(59, 8/19/91)
Thienemannimyia sp.	6	(26, 9/23/91) (52, 6/16/92) (RR-6, 9/25/92) (58, 6/26/91) (58, 8/19/91) (BBC-1, 7/2/92) (23, 8/15/91) (20.1, 8/14/91) (21, 8/13/91) (59, 8/19/91) (0.51, 5/8/91) (1, 5/14/91) (3, 5/7/91) (4, 5/13/91) (0.5, 8/13/91) (33, 7/5/91) (21.1, 8/13/91) (22.51, 7/3/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (24, 7/1/91) (24.5, 7/1/91) (8a, 9/12/91) (8a, 10/31/91) (44 up, 7/26/91) (36, 7/11/91) (38, 7/9/91) (40, 7/11/91) (41, 7/11/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Helopelopia sp.	6	(26, 9/23/91) (29, 10/17/91) (BC-"C", 10/17/91) (AC-2, 9/17/92) (AC-3, 9/17/92) (AC-5, 9/28/92) (49, 6/10/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92) (58, 6/26/91) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92) (23, 8/15/91) (22.51, 8/14/91) (22.8, 8/14/91) (3, 5/7/91) (0.5, 8/13/91) (33.5, 7/5/91) (33.5, 10/26/92) (34, 7/5/91) (35, 7/9/91) (22.51, 7/3/91) (23, 7/1/91) (24, 7/10/91) (24, 7/1/91) (24.5, 7/1/91) (8a, 9/12/91) (8a, 10/31/91) (43, 7/24/91) (44, 7/26/91) (36, 7/11/91) (37, 7/9/91) (38, 7/9/91) (40, 7/11/91) (41, 7/11/91) (57, 5/20/91)
Conchapelopia sp.	6	(AC-5, 9/28/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (52.5, 6/4/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 8/19/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92) (22.7, 8/13/91) (22.8, 8/14/91) (21, 8/13/91) (22.51, 8/14/91) (3, 5/7/91) (4, 5/13/91) (0.5, 8/13/91) (31, 7/3/91) (32, 7/5/91) (33, 7/5/91) (34, 7/5/91) (22.51, 7/3/91) (23, 7/1/91) (8a, 10/31/91) (37, 7/9/91) (38, 7/9/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Guttipelopia sp. (Malloch)	5	(22.7, 8/13/91)
Labrundinia sp.	7	(20.1, 8/14/91)
Labrundinia pilosella (Loew)	7	(52, 6/16/92)
Nilotanypus fimbriatus	6	(59, 7/7/92) (23, 8/15/91) (22.8, 8/14/91) (59, 8/19/91) (43, 7/24/91) (36, 7/11/91)
Paramerina sp.	-	(BBC-1, 7/2/92)
Pentaneura sp.	6	(59, 8/19/91) (23, 8/15/91) (35, 7/9/91) (44 dst, 7/26/91)
Zavrelimyia sp.	8	(58, 8/19/91) (BBC-1, 7/2/92) (59, 8/19/91) (32, 7/5/91) (33, 7/5/91) (33.5 7/5/91)
Tribe: Tanytarsini		
Lenziella sp.	-	(59, 7/7/92)
Micropsectra sp.	7	(59, 8/19/91) (3, 5/7/91) (35, 7/9/91) (57, 5/20/91)
Micropsectra prob. *polita*	7	(59, 7/7/92) (BBC-1, 7/2/92) (22.51, 7/3/91)
Paratanytarsus sp.	6	(AC-2, 9/17/92) (49.2, 6/8/92) (51, 6/3/92) (52, 6/16/92) (58, 7/7/92) (59, 7/7/92) (BBC-1, 7/2/92) (20.1, 8/14/91) (22.51, 8/14/91) (1, 5/14/91) (0.5, 8/13/91) (21, 8/13/91) (22.51, 7/3/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Paratanytarsus sp. (continued)	6	(23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (8a, 10/31/91) (37, 7/9/91) (38, 7/9/91) (41, 7/11/91)
Rheotanytarsus distinctissimus group	6	(49.2, 6/8/92) (58, 8/19/91) (59, 7/7/92) (22.7, 8/13/91) (22.8, 8/14/91) (22.51, 8/14/91) (59, 8/19/91) (0.5, 8/13/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (43, 7/24/91) (36, 7/11/91)
Rheotanytarsus exiguus group	6	(49.2, 6/8/92) (RR-6, 9/25/92) (58, 8/19/91) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92) (22.51, 8/14/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (44 dst, 7/26/91) (37, 7/9/91) (38, 7/9/91) (40, 7/11/91) (41, 7/11/91) (57, 5/20/91)
Stempelinella sp.	4	(22.7, 8/13/91) (59, 8/19/91)
Tanytarsus sp.	6	(24, 7/1/91)
Tanytarsus glabrescens group	6	(49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (RR-9, 8/12/92) (59, 7/7/92) (22.7, 8/13/91) (BBC-1, 7/2/92) (23,8/15/91) (22.8, 8/14/91) (22.51, 8/14/91) (59, 8/19/91) (0.5, 8/13/91) (35, 7/9/91) (8a, 10/31/91) (43, 7/24/91) (37, 7/9/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Tanytarsus guerlus group	6	(59, 7/7/92) (23, 8/15/91) (22.7, 8/13/91) (22.51, 8/14/91) (59, 8/19/91) (4, 5/13/91) (44 up, 7/26/91)
Tanytarsus coffmani	6	(59, 8/19/91)
Chironomini		
Chironomus sp.	10	(AC-2, 9/17/92) (AC-3, 9/17/92) (AC-4, 9/17/92) (52, 6/16/92) (52.5, 6/4/92) (RR-6, 9/25/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92) (21, 8/13/91) (24, 5/13/91) (0.5, 8/13/91) (32, 7/5/91) (33, 7/5/91) (34, 7/5/91) (23, 7/1/91) (8a, 10/31/91) (41, 7/11/91)
Chironomus decorus group	10	(49, 6/3/92) (51, 6/3/92) (58, 6/26/91) (22.8, 8/14/91) (22.51, 8/14/91) (1, 5/14/91) (24.5, 7/1/91) (44 up, 7/26/91) (37, 7/9/91)
Chironomus riparius group	10	(22.7, 8/13/91)
Cryptochironomus fulvus group	8	(49, 6/10/92) (49.2, 6/8/92) (52.5, 6/4/92) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (23, 8/15/91) (22.7, 8/13/91) (3, 5/7/91) (4, 5/13/91) (34, 7/5/91) (35, 7/9/91) (22.51, 7/3/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (44 up, 7/26/91) (36, 7/11/91) (37, 7/9/91) (41, 7/11/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Dicrotendipes sp.	8	(AC-5, 9/28/92) (52.5, 6/4/92) (BBC-1, 7/2/92) (35, 7/9/91) (33 dst, 9/7/91)
Dicrotendipes neomodestus	8	(49, 6/10/92) (49.2, 6/8/92) (52, 6/16/92) (RR-6, 9/25/92) (58, 6/26/91) (58, 8/19/91) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92) (4, 5/13/91) (0.5, 8/13/91) (34, 7/5/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.8, 8/14/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (8a, 10/31/91) (44 dst, 7/26/91) (38, 7/9/91)
Dicrotendipes nervosus Type I (Staeger)	8	(22.7, 8/13/91) (22.51, 8/14/91) (20.1, 8/14/91)
Dicrotendipes nervosus Type II (Staeger)	8	(AC-1, 9/15/92) (AC-2, 9/17/92) (AC-3, 9/17/92) (AC-4, 9/17/92) (49, 6/3/92) (49, 6/10/92) (22.7, 8/13/91) (20.1, 8/14/91) (21, 8/13/91) (22.51, 8/14/91) (0.5, 8/13/91) (23, 7/1/91)
Endochironomus nigricans (Johannsen)	10	(AC-3, 9/17/92) (AC-4, 9/17/92) (58, 6/26/92) (22.51, 8/14/91) (24, 7/1/91) (43, 7/24/91) (44 up, 7/26/91) (37, 7/9/91)
Glyptotendipes sp.	10	(29, 10/17/91) (AC-1, 9/15/92) (AC-3, 9/17/92) (AC-4, 9/17/92) (49.1, 6/5/92) (50, 6/5/92) (23, 8/15/91) (22.8, 8/14/91) (21, 8/13/91) (23, 7/1/91) (24, 7/1/91) (22.51, 8/14/91) (59, 8/19/91) (20.1, 8/14/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Glyptotendipes sp. (continued)	10	(22.7, 8/13/91) (AC-2, 9/17/92)
Harnischia sp.	8	(23, 8/15/91) (22.7, 8/13/91)
Kiefferulus sp.	10	(57, 5/20/91)
Microtendipes caelum (Townes)	6	(59, 8/19/91) (59, 7/7/92)
Parachironomus abortivus (Malloch)	10	(AC-3, 9/17/92) (20.1, 8/14/91) (21, 8/13/91) (23, 7/1/91)
Parachironomus carinatus	10	(22.51, 8/14/91) (22.7, 8/13/91) (24, 7/1/91)
Parachironomus frequens	10	(52.5, 6/4/92) (BBC-1, 7/2/92) (22.51, 8/14/91) (23, 7/1/91) (24, 7/1/91) (40, 7/11/91)
Parachironomus hirtalatus	10	(AC-2, 9/17/92) (AC-4, 9/17/92) (21, 8/13/91)
Paratendipes sp.	8	(BBC-1, 7/2/92)
Paratendipes albimanus	8	(59, 7/25/91) (BBC-1, 7/2/92) (3, 5/7/91) (44 up, 7/26/91)
Phaenopsectra prob. dyari (Townes)	7	(AC-2, 9/17/92) (49, 6/3/92) (51, 6/3/92) (59, 7/7/92) (BBC-1, 7/2/92) (23, 8/15/91) (22.7, 8/13/91) (22.8, 8/14/91) (59, 8/19/91) (20.1, 8/14/91) (22.8, 8/14/91) (23, 7/1/91) (24.5, 7/1/91) (43, 7/24/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Phaenopsectra flavipes	7	(BBC-1, 7/2/92) (22.7, 8/13/91) (22.8, 8/14/91) (22.51, 8/14/91) (8a, 10/31/91)
Polypedilum sp	6	(1, 5/14/91)
Polypedilum (Tripodura) sp.	6	(22.7, 8/13/91)
Polypedilum convictum (Walker)	6	(29, 10/17/91) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9 8/12/92) (58, 6/26/91) (58, 8/19/91) (58, 7/2/92) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (20.1, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 5/13/91) (24, 7/1/91) (24.5, 7/1/91) (22.51, 8/14/91) (8a, 10/31/91) (43, 7/24/91) (44, 7/26/91) (37, 7/9/91) (57, 5/20/91) (3, 5/7/91) (22.51, 7/3/91) (22.7, 8/14/91) (22.8, 8/13/91)
Polypedilum fallax group	6	(AC-3, 9/17/92) (AC-5, 9/28/92) (49, 6/3/92) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92) (58, 8/19/91) (23, 8/15/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.51, 8/14/91) (59, 8/19/91) (43, 7/24/91) (44 up, 7/26/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Polypedilum illinoense	6	(25, 9/19/91) (26, 9/23/91) (AC-2, 9/17/92) (AC-3, 9/17/92) (AC-4, 9/17/92) (AC-5, 9/28/92) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (RR-6, 9/25/92) (8a, 9/12/91) (RR-9 8/12/92) (58, 8/19/91) (59, 7/25/91) (59, 8/19/91) (59, 7/7/92) (BBC-1, 7/2/92) (22.7, 8/13/91) (22.8, 8/14/91) (4, 5/13/91) (0.5, 8/13/91) (31, 7/3/91) (32, 7/5/91) (33, 7/5/91) (33.5, 7/5/91) (33.5, 10/26/92) (34, 7/5/91) (33 dst, 9/7/91) (22.51, 7/3/91) (22.51, 8/14/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24, 5/7/91) (8a, 10/31/91) (43, 7/24/91) (36, 7/11/91) (38, 7/9/91) (41, 7/11/91)
Polypedilum (Tripodura) nr. scalaenum (Schrank)	6	(49.1, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92) (23, 8/15/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.51, 8/14/91) (59, 8/19/91) (4, 5/13/91) (22.9, 7/3/91)
Pseudochironomus sp.	5	(50, 6/5/92)
Stenochironomus sp. (Keiffer)	5	(23, 8/15/91)
Stictochironomus sp. (Keiffer)	9	(29, 10/17/91) (44 up, 7/26/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Tribelos sp.	5	(22.8, 8/14/91)
Xenochironomus xenolobis	0	(22.7, 8/13/91) (59, 8/19/91)
Orthocladiinae		
Brillia flavifrons	5	(49, 6/3/92) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (51, 6/3/92) (BBC-1, 7/2/92) (23, 8/15/91) (0.51, 5/8/91) (1, 5/14/91) (24, 5/13/91) (41, 7/11/91) (57, 5/20/91)
Cardiocladius obscurus	5	(25, 9/19/92) (AC-5, 9/28/92) (49.2, 6/8/92) (51, 6/3/92) (52, 6/16/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 6/26/91) (58, 7/2/92) (59, 8/19/91) (59, 7/7/92) (22.51, 7/3/91) (22.9, 7/3/91) (23, 7/1/91) (24, 5/13/91) (24.5, 7/1/91) (44 dst, 7/26/91) (57, 5/20/91)
Chaetocladius sp.	6	(22.51, 8/14/91)
Corynoneura taris (Roback)	7	(AC-2, 9/17/92) (59, 7/7/92) (59, 8/19/91)
Cricotopus (Isocladius) intersectus	7	(BBC-1, 7/2/92) (22.51, 8/14/91)
Cricotopus (Isocladius) laetus	7	(1, 5/14/91)
Cricotopus (Isocladius) ornatus	7	(AC-1, 9/15/92) (AC-2, 9/17/92) (1, 5/14/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Cricotopus (Isocladius) reversus	7	(22.7, 8/13/91) (22.51, 7/3/91)
Cricotopus (Isocladius) sylvestris (Fabr)	7	(AC-2, 9/17/92) (49.1, 6/5/92) (50, 6/5/92) (51, 6/3/92) (52.5, 6/4/92) (RR-9, 8/12/92) (22.7, 8/13/91) (21, 8/13/91) (22.51, 8/14/91) (59, 8/19/91) (0.51, 5/8/91) (4, 5/13/91) (0.5, 8/13/91) (32, 7/5/91) (34, 7/5/91) (35, 7/9/91) (20.1, 8/14/91) (22.51, 7/3/91) (8a, 10/31/91)
Cricotopus sp. (pupae)	7	(RR-9, 8/12/92)
fuscus group		
Cricotopus pirifer	7	(23, 7/1/91)
tremulus group		
Cricotopus sp.	7	(2, 5/7/91)
Cricotopus tremulus	7	(49.2, 6/8/92) (50, 6/5/92) (52, 6/16/92) (52.5, 6/4/92) (RR-9, 8/12/92) (BBC-1, 7/2/92) (59, 8/19/91) (4, 5/13/91) (22.51, 7/3/91) (23, 7/1/91) (7, 5/15/91) (38, 7/9/91)
Cricotopus curtus (Hirv.)	7	(49.2, 6/8/92) (59, 8/19/91) (4, 5/13/91) (35, 7/9/91)
Cricotopus annulator (Geotgh.)	7	(26, 9/23/91) (AC-5, 9/28/91) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 6/26/91) (59, 7/7/92)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Cricotopus annulator (Geotgh.) (continued)	7	(BBC-1, 7/2/92) (22.51, 8/14/91) (59, 8/19/91) (1, 5/14/91) (3, 5/7/91) (4, 5/13/91) (0.5, 8/13/91) (32, 7/5/91) (34, 7/5/91) (35, 7/9/91) (22.51, 7/3/91) (22.9,7/3/91) (23, 8/15/91) (10, 5/16/91)
Cricotopus triannulatus	7	(25, 9/19/91) (26, 9/23/91) (49, 6/3/92) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (52.5, 6/4/92) (RR-6, 9/25/92) (58, 6/26/91) (59, 7/7/92) (BBC-1, 7/2/92) (22.51, 8/14/91) (0.51, 5/8/91) (1, 5/14/91) (4, 5/13/91) (34, 7/5/91) (22.51, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 5/13/91) (24, 7/1/91) (7, 5/13/91) (36, 7/11/91)
festivellus group		
Cricotopus albiforceps	7	(22.7, 8/13/91)
bicinctus group		
Cricotopus bicintus (Meig.)	7	(25, 9/19/91) (26, 9/23/91) (27, 9/23/91) (29, 10/17/91) (AC-2, 9/12/92) (AC-5, 9/28/92) (49, 6/3/92) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (58, 6/26/91) (59, 7/7/92) (BBC-1, 7/2/92) (22.7, 8/13/91) (20.1, 8/14/91) (22.8, 8/14/91) (59, 8/19/91) (0.51, 5/8/91) (0.5, 8/13/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
bicinctus group		
Cricotopus bicintus (Meig.) (continued)	7	(1, 5/14/91) (2, 5/7/91) (3, 5/7/91) (4, 5/13/91) (0.5, 8/13/91) (32, 7/5/91) (34, 7/5/91) (35, 7/9/91) (22.51, 7/3/91) (22.51, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (23, 8/15/91) (24, 5/13/91) (24.5, 7/1/91) (7, 5/15/91) (8a, 10/31/91) (44 up, 7/26/91) (36, 7/11/91) (37, 7/9/91) (38, 7/9/91) (40, 7/11/91) (57, 5/20/91)
Cricotopus vierriensis (Geotgh.)	7	(26, 9/23/91), (AC-5, 9/28/92) (RR-6, 9/25/92) (RR-7, 9/25/92) (RR-9, 8/12/92) (22.8, 8/14/91) (59, 8/19/91) (4, 5/13/91) (0.5, 8/13/91) (34, 7/5/91) (35, 7/9/91) (23, 7/1/91) (23, 8/15/91) (24, 5/13/91)
trifascia group		
Cricotopus trifascia	7	(25, 9/19/91) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (51, 6/3/92) (52, 6/16/92) (52.5, 6/4/92) (RR-9, 8/12/92) (58, 6/26/91) (58, 8/19/91) (58, 7/2/92) (59, 7/7/92) (0.5, 8/13/91) (22.9, 7/3/91) (23, 7/1/91) (24.5, 7/1/91) (44 up, 7/26/91) (36, 7/11/91) (37, 7/9/91)
Cricotopus/Orthocladius sp. complex	7	(2, 5/7/91) (22.8, 8/14/91)
Eukiefferiella sp.	8	(2, 5/7/91 [L]) (59, 8/19/91 [P])

(Continued on following page.)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Eukiefferiella brehmi group	8	(35, 7/9/91)
Eukiefferiella claripennis group	8	(AC-5, 9/28/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (RR-9, 8/12/92) (BBC-1, 7/2/92) (0.51, 5/8/91) (1, 5/14/91) (3, 5/7/91) (4, 5/13/91) (31, 7/3/91) (32, 7/5/91) (34, 7/5/91) (57, 5/20/91)
Eukiefferiella devonica group	8	(59, 7/7/92)
Nanocladius sp.	3	(33.5, 7/5/91) (8a, 10/31/91)
Nanocladius crassicornus (Saether)	3	(52, 6/16/92) (22.51, 8/14/91)
Nanocladius distinctus	3	(49.2, 6/8/92) (50, 6/5/92) (RR-6, 9/25/92) (59, 8/19/91) (59, 7/7/92) (23, 8/15/91) (22.7, 8/13/91) (20.1, 8/14/91) (22.8, 8/14/91) (21, 8/13/91) (59, 8/19/91) (0.5, 8/13/91) (22.51, 7/3/91) (22.51, 8/14/91)
Nanocladius minimus	3	(25, 9/19/91) (RR-6, 9/25/92) (RR-9, 8/12/92) (0.5, 8/13/91) (35, 7/9/91)
Nanocladius rectinervus	3	(52.5, 6/4/92) (RR-6, 9/25/92) (RR-6, 9/25/92) (RR-9, 8/12/92) (22.51, 8/14/91) (59, 8/19/91)
Nanocladius spiniplenus	3	(1, 5/14/91)
Orthocladius sp.	6	(23, 8/15/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Orthocladius carlatus	6	(59,7/7/92) (23, 8/15/91) (59 , 8/19/91)
Orthocladius curtiseta	6	(57, 5/20/91)
Orthocladius dorenus	6	(BC-"C", 10/17/91) (59, 8/19/91)
Orthocladius nigritus	6	(23, 8/15/91)
Orthocladius obumbratus (Johannsen)	6	(49, 6/3/92) (49, 6/10/92) (49.1, 6/5/92) (49.2, 6/8/92) (50, 6/5/92) (51, 6/3/92) (52.5, 6/4/92) (0.51, 5/8/91) (1, 5/14/91) (3, 5/7/91) (4, 5/13/91) (34, 7/5/91) (22.51, 7/3/91) (24, 5/13/91) (57, 5/20/91)
Parametriocneums sp.	5	(49.2, 6/8/92) (51, 6/3/92) (RR-6, 9/25/92) (4, 5/13/91)
Parametriocnemus lundbecki (Johannson)	5	(59, 7/7/92) (BBC-1, 7/2/92) (24, 7/1/91) (57, 5/20/91)
Paraphaenocladius sp.	4	(BBC-1, 7/2/92)
Pseudosmittia sp.	6	(59, 7/7/92)
Psilometriocnemus sp. (Saether)	-	(AC-2, 9/17/92) (4, 5/13/91)
Rheocricotopus sp.	6	(49.2, 6/8/92) (RR-6, 9/25/92) (10, 5/16/91) (57, 5/20/91)
Rheocricotopus prob. robacki	6	(44 dst, 7/26/91) (37, 7/9/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Thienemanniella prob. *xena* (Roback)	6	(49.2, 6/8/92) (52, 6/16/92) (RR-9, 8/12/92) (59, 8/19/91) (3, 5/7/91) (37, 7/9/91) (38, 7/9/91)
Tvetenia bavarica group	5	(BBC-1, 7/2/92)
Tvetenia discoloripes group	5	(58, 8/19/91) (58, 7/2/92) (BBC-1, 7/2/92) (59, 8/19/91) (24, 7/1/91) (59, 7/7/92)
Diamesinae		
Diamesa sp.	5	(BBC-1, 7/2/92) (3, 5/7/91) (7, 5/13/91) (37, 7/9/91)
Athericidae (= Rhagionidae)		
Atherix variegata	2	(58, 8/19/91) (59, 7/25/91) (23, 7/1/91) (23, 8/15/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (37, 7/9/91) (38, 7/9/91)
Empididae	6	(BBC-1, 7/2/92)
Hemerodromia sp.	6	(25, 9/19/91) (26, 9/23/91) (BC-C, 10/17/91) (AC-5, 9/28/92) (49.2, 6/8/92) (59, 7/7/92) (23, 8/14/91) (59,8/19/91) (0.51, 5/18/91) (1, 5/14/91) (4, 5/13/91) (33.5, 7/5/91) (34, 7/5/91) (35, 7/9/91) (22.51, 7/3/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.8, 8/14/91) (22.9, 7/3/91) (23, 7/1/91) (24, 7/1/91) (24.5, 7/1/91) (43, 7/24/91) (44, 7/26/91) (37, 7/9/91) (38, 7/9/91) (40, 7/11/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Ceratopogonidae		
Culicoides sp.	10	(29, 10/17/91) (23, 8/15/91) (22.7, 8/13/91) (22.51, 8/14/91) (23, 7/1/91) (8a, 10/31/91)
Bezzia sp.	6	(49.2, 6/8/92) (51, 6/3/92) (22.7, 8/13/91) (20.1, 8/14/91)
Bezzia/Probezzia sp. complex	6	(20.1, 8/14/91)
Stilobezzia sp.	6	(22.7, 8/13/91) (22.8, 8/14/91) (22.51, 8/14/91)
Chaoboridae		
Machlonyx sp.	-	(AC-3, 9/17/92)
Dolichopodidae	4	(52.5, 6/4/92)
Rhaphium sp.	4	(33, 7/5/91)
Muscidae		
Limnophora sp.	6	(23, 7/1/91) (24, 7/1/91) (44 up, 7/26/91) (37, 7/9/91) (57, 5/20/91)
Mollusca		
Gastropoda		
Ancylidae		
Ferrissia sp.	-	(25, 9/19/91) (26, 9/23/91) (RR-6, 9/25/92) (22.51, 8/14/91) (3, 5/7/91) (0.5, 8/13/91) (20.1, 8/14/91) (22.7, 8/13/91) (44 dst, 7/26/91) (40, 7/11/91) (41, 7/11/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Ferrissia parallela	-	(29, 10/17/91) (49, 6/10/92) (50, 6/5/92) (52, 6/16/92) (52.5, 6/4/92) (59, 8/19/91) (59, 7/7/92) (22.7, 8/13/91) (22.8, 8/14/91) (21, 8/13/91) (23, 8/15/91)
Hydrobiidae		
Bithynia tentaculata	-	(20.1, 8/14/91) (20.1, 8/14/91)
Lymnaeidae		
Fossaria humilis	-	(58, 8/19/91) (BBC-1, 7/2/92) (20.1, 8/14/91)
Fossaria obrussa	-	(AC-1, 9/15/92)
Physidae		
Physella sp.	- -	(25, 9/19/91) (27, 9/23/91) (AC-2, 9/17/92) (AC-3, 9/17/92) (AC-4, 9/17/92) (49.1, 6/5/92) (50, 6/5/92) (51, 6/3/92) (52.5, 6/4/92) (3, 5/7/91) (59, 7/25/91) (59, 8/19/91) (0.51, 5/8/91) (0.5, 8/13/91) (31, 7/3/91) (32, 7/5/91) (33.5, 7/5/91) (33.5, 10/26/92) (33, 7/5/91) (34, 7/5/91) (33 dst, 9/7/91) (20.1, 8/14/91) (22.51, 7/3/91) (22.51, 8/14/91) (22.7, 8/13/91) (22.9, 7/3/91) (23, 7/1/91) (24, 7/1/91) (24.5, 7/1/91) (8a, 9/12/91) (8a, 10/31/91) (10, 5/16/91) (43, 7/24/91) (37, 7/9/91) (38, 7/9/91) (41, 7/11/91)
Physella gyrina	-	(22.7, 8/13/91) (22.8, 8/13/91) (21, 8/13/91) (0.5, 8/13/91)

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Appendix IV-C: Benthic Macroinvertebrate Master List for 1991-1992 NEORSD Sites (continued)

Taxon	HBI Tolerance Value	(Site, Date Collected)
Physella vinosa	-	(58, 8/19/91) (BBC-1, 7/2/92) (44, 7/26/91) (40, 7/11/91)
Planorbidae		
Helisoma sp.	-	(27, 9/23/91) (35, 7/9/91)
Helisoma anceps	-	(21, 8/13/91) (0.5 HD, 8/13/91) (20.1, 8/14/91)
Gyraulus parvus	-	(AC-1, 9/15/92) (AC-2, 9/17/92) (AC-3, 9/17/92) (AC-4, 9/17/92) (22.7, 8/13/91) (22.51, 8/14/91) (35, 7/9/91) (20.1, 8/14/91) (22.9, 7/3/91)
Promentus prob. *exacuous*	-	(20.1, 8/14/91)
Pleuroceridae		
Goniobasis livescens	-	(52, 6/16/92) (BBC-1, 7/2/92)
Valvatidae		
Valvata sincera	-	(20.1, 8/14/91)
Pelecypoda		
Corbiculidae		
Corbicula manilensis	-	(49.2, 6/8/92) (51, 6/3/92)
Spaeriidae		
Musculium sp.	-	(49, 6/10/92) (49.2, 6/8/92) (52.5, 6/4/92) (BBC-1, 7/2/92)
Pisidium sp.	-	(59, 7/7/92)
Pisidium amnicum	-	(24, 7/1/91)
Sphaerium sp.	-	(50, 6/5/92) (59,7/7/92) (24, 7/1/91)

Appendix IV-D: Site #0.5, Euclid Creek

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (32)	4
2.	Total Number of Mayfly Taxa (1)	0
3.	Total Number of Caddisfly Taxa (1)	4
4.	Total Number of Dipteran Taxa (16)	4
5.	Percent Mayfly Composition (1/445 = 0.22%)	2
6.	Percent Caddisfly Composition (1/445 = 0.22%)	2
7.	Percent Tribe Tanytarsini Midge Composition (6/445 = 1.3%)	2
8.	Percent Other Dipteran and Non-Insect Composition (420/445 = 94.4%)	0
9.	Percent Tolerant Organisms (161/445 = 36%)	0
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (3)	2
	Total ICI Value	20
		"Fair"

Appendix IV-E: Site #8a, Nine Mile Creek

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (23)	2
2.	Total Number of Mayfly Taxa (0)	0
3.	Total Number of Caddisfly Taxa (0)	0
4.	Total Number of Dipteran Taxa (17)	4
5.	Percent Mayfly Composition (0%)	0
6.	Percent Caddisfly Composition (0%)	0
7.	Percent Tribe Tanytarsini Midge Composition (2/549 = 0.36%)	2
8.	Percent Other Dipteran and Non-Insect Composition (547/549 = 99.6%)	0
9.	Percent Tolerant Organisms (277/549 = 50.5%)	0
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (0)	0
	Total ICI Value	8
		"Poor"

Appendix IV-F: Site #20.1, Cuyahoga River, Old Riverbed

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (35)	6
2.	Total Number of Mayfly Taxa (2)	0
3.	Total Number of Caddisfly Taxa (2)	2
4.	Total Number of Dipteran Taxa (13)	6
5.	Percent Mayfly Composition (4/2626 = 0.15 %)	2
6.	Percent Caddisfly Composition (3/2626 = 0.1%)	0
7.	Percent Tribe Tanytarsini Midge Composition (1/2626 = 0.04%)	2
8.	Percent Other Dipteran and Non-Insect Composition (2539/2626 = 96.7%)	0
9.	Percent Tolerant Organisms (943/2626 = 35.5%)	0
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (3)	0
	Total ICI Value	18
		"Fair"

Appendix IV-G: Site #21, Cuyahoga River Navigation Channel

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (15)	0
2.	Total Number of Mayfly Taxa (0)	0
3.	Total Number of Caddisfly Taxa (0)	0
4.	Total Number of Dipteran Taxa (8)	4
5.	Percent Mayfly Composition (0)	0
6.	Percent Caddisfly Composition (0)	0
7.	Percent Tribe Tanytarsini Midge Composition (0)	0
8.	Percent Other Dipteran and Non-Insect Composition (886/887 = 99.9%)	0
9.	Percent Tolerant Organisms (722/887 = 81.4%)	0
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (0)	0
	Total ICI Value	4
		"Poor"

Appendix IV-H: Site #22.51, Cuyahoga River

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (56)	6
2.	Total Number of Mayfly Taxa (4)	2
3.	Total Number of Caddisfly Taxa (4)	4
4.	Total Number of Dipteran Taxa (34)	6
5.	Percent Mayfly Composition (44/1294 = 3.4%)	2
6.	Percent Caddisfly Composition (13/1294 = 1.0%)	0
7.	Percent Tribe Tanytarsini Midge Composition (25/1294 = 1.9%)	2
8.	Percent Other Dipteran and Non-Insect Composition (1181/1294 = 91.2%)	0
9.	Percent Tolerant Organisms (438/1294 = 33.8%)	0
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (8)	4
	Total ICI Value	26
		"Fair"

Appendix IV-I: Site #22.7, Cuyahoga River

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (56)	6
2.	Total Number of Mayfly Taxa (4)	2
3.	Total Number of Caddisfly Taxa (1)	2
4.	Total Number of Dipteran Taxa (36)	6
5.	Percent Mayfly Composition (36/1542 = 2.3%)	2
6.	Percent Caddisfly Composition (16/1542 = 1.08%)	2
7.	Percent Tribe Tanytarsini Midge Composition (31/1542 = 2.0%)	2
8.	Percent Other Dipteran and Non-Insect Composition (1626/1542 = 85.9%)	0
9.	Percent Tolerant Organisms (768/1542 = 49.8%)	0
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (5)	2
	Total ICI Value	24
		"Fair"

Appendix IV-J: Site #22.8, Cuyahoga River

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (49)	6
2.	Total Number of Mayfly Taxa (6)	4
3.	Total Number of Caddisfly Taxa (4)	4
4.	Total Number of Dipteran Taxa (26)	6
5.	Percent Mayfly Composition (193/818 = 23.6%)	4
6.	Percent Caddisfly Composition (109/818 = 13.3%)	4
7.	Percent Tribe Tanytarsini Midge Composition (68/818 = 8.3%)	2
8.	Percent Other Dipteran and Non-Insect Composition (424/818 = 51.8%)	0
9.	Percent Tolerant Organisms (103/818 = 12.6%)	0
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (10)	4
	Total ICI Value	34
		"Good"

Appendix IV-K: Site #23, Cuyahoga River

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (56)	6
2.	Total Number of Mayfly Taxa (7)	4
3.	Total Number of Caddisfly Taxa (5)	4
4.	Total Number of Dipteran Taxa (29)	6
5.	Percent Mayfly Composition (97/1732 = 5.6%)	2
6.	Percent Caddisfly Composition (666/1732 = 38%)	6
7.	Percent Tribe Tanytarsini Midge Composition (272/1732 = 15.7%)	4
8.	Percent Other Dipteran and Non-Insect Composition (686/1732 = 39.6%)	2
9.	Percent Tolerant Organisms (285/1732 = 16.4%)	0
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (14)	6
	Total ICI Value	40
		"Good"

Appendix IV-L: Site #58, Chagrin River

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (47)	6
2.	Total Number of Mayfly Taxa (7)	4
3.	Total Number of Caddisfly Taxa (6)	6
4.	Total Number of Dipteran Taxa (28)	6
5.	Percent Mayfly Composition (218/2159 = 10.1%)	4
6.	Percent Caddisfly Composition (422/2159 = 19.6%)	6
7.	Percent Tribe Tanytarsini Midge Composition (1028/2159 = 47.6%)	6
8.	Percent Other Dipteran and Non-Insect Composition (1131/2159 = 52.4%)	2
9.	Percent Tolerant Organisms (19/2159 = 0.88%)	6
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (10)	4
	Total ICI Value	50
		"Exceptional"

Appendix IV-M: Site #59, Chagrin River

Metric	Invertebrate Community Index (ICI)	Score
1.	Total Number of Taxa (57)	6
2.	Total Number of Mayfly Taxa (7)	4
3.	Total Number of Caddisfly Taxa (6)	6
4.	Total Number of Dipteran Taxa (37)	6
5.	Percent Mayfly Composition (112/3073 = 3.6%)	2
6.	Percent Caddisfly Composition (759/3073 = 24.7%)	6
7.	Percent Tribe Tanytarsini Midge Composition (1123/3073 = 36.5%)	6
8.	Percent Other Dipteran and Non-Insect Composition (1067/3073 = 34.7%)	4
9.	Percent Tolerant Organisms (71/3073 = 2.3%)	6
10.	Total Number of Qualitative Ephemeropteran, Plecopteran, Trichopteran Taxa (14)	4
	Total ICI Value	50
		"Exceptional"

Appendix IV-N: 1991 ICI Scores for Sites Sampled with Hester-Dendy (HD) Artificial Substrates

Location	Dates (HD set/ collected)	Total Taxa	EPT Taxa	ICI Score	QHEI Score
Euclid Creek					
Site #0.5	6-21-91/8-13-91	32	3	20	45
Nine Mile Creek					
Site #8a	9-12-91/10-13-91	23	0	8	55
Cuyahoga River					
Site #20.1	6-2-91/8-13-91	35	3	18	(-)
Site #21	6-2-91/8-13-91	15	0	4	(-)
Site #22.51	6-25-91/8-14-91	56	8	26	62
Site #22.7	6-25-91/8-14-91	56	5	24	54
Site #22.8	6-25-91/8-14-91	49	10	34	61
Site #23	6-25-91/8-15-91	56	14	40	81
Chagrin River					
Site #58	6-26-91/8-19-91	47	13	50	76
Site #59	6-26-91/8-19-91	57	14	50	78

APPENDIX V

1991-1992 NEORSD CUYAHOGA RIVER
QUANTITATIVE FISH SURVEYS

INTRODUCTION

Electroshocking fish surveys of the Cuyahoga River upstream and downstream of Southerly Wastewater Treatment Plant (WWTP) and downstream of lower Harvard bridge were completed during the months of June through October 1991 and July through October 1992.

The purpose of the survey was to evaluate the fish communities in the Cuyahoga River and assign a characterization of the overall fish community health. The Ohio EPA uses two indices, the modified Index of Well Being (MIwb) and the Index of Biotic Integrity (IBI) to evaluate the overall fish community health in Ohio rivers and streams (OEPA Users Manual for Biological Field Assessment of Ohio Surface Waters, 1987). Relative abundance and condition of fish, species, and trophic composition are all affected by water quality disturbances or habitat alterations. The MIwb and IBI scores are used to gauge these fish community attributes in impacted sites against those in relatively undisturbed sites.

The IBI incorporates 12 community metrics representing structural and functional attributes. The structural attributes are based upon fish community aspects such as fish numbers and diversity. Measures that incorporate fish communities' functional attributes take into consideration feeding strategies, environmental tolerances, and disease symptoms. These metrics are individually scored by comparing the data collected at a survey site with values expected at reference sites located in a similar geographic region. The maximum IBI score is 60 and the minimum is 12. The summation of the 12 metric scores provides a single value IBI score and this score determines the rating of an "exceptional," "good," "fair," or "poor" fish community.

DELT anomalies, which include deformities, eroded fins, lesions and tumors present on fishes, are also examined at each sampling site. The percent DELT anomalies is a metric used in the IBI scoring and the presence or absence of these anomalies is recorded because many anomalies are caused by environmental factors and often times indicate the presence of sublethal stresses.

The modified Index of Well Being (MIwb) incorporates four measures in terms of fish communities: numbers of individuals, biomass, and the Shannon diversity Index ($\bar{H}$) based on numbers and weight of fish. Unlike the IBI score, the MIwb score is the result of a mathematical calculation based upon the formula:

Modified Index of Well-Being

$$MIwb = 0.5 \ln N + 0.5 \ln B + \bar{H}\,(no.) + \bar{H}\,(wt.)$$

where:

N = Relative numbers of all species excluding species designated "highly tolerant"

B = Relative weights of all species excluding species designated "highly tolerant"

$\overline{H}$ (no.) = Shannon diversity index based on numbers

$\overline{H}$ (wt.) = Shannon diversity index based on weight

Shannon Diversity Index

$$\overline{H} = - \text{Summation} \left[\left(\frac{n_i}{N}\right) \log_e \left(\frac{n_i}{N}\right) \right]$$

where:

n_i = Relative numbers or weight of species

N = Total number or weight of the sample

A detailed description of the sampling and analysis method utilized in fish surveys including calculations of IBI's and MIwb's can be found in OEPA's Biological Criteria for the Protection of Aquatic Life (1987).

Appendices V-A to V-Q indicate the numbers, weight, pollution tolerances and DELT anomalies of fishes collected on the Cuyahoga River from June 1991 through October 1991 and July 1992 through October 1992. IBI and MIwb values were calculated on the Cuyahoga River for the locations upstream and downstream of Southerly WWTP's effluent and downstream of Harvard Avenue. The NEORSD's values on the river were then compared to Ohio EPA's sampling data and E.A. Science and Technology's results obtained in 1988. Additionally, an examination of the IBI and MIwb scores obtained were compared with OEPA's Compendium of Biological Results from the Ohio Rivers, Streams, and Lakes (1989) and a narrative value was then assigned to each site.

SAMPLING RESULTS & DISCUSSION

In 1991, River Mile 11.3 upstream of Southerly WWTP was sampled June 25, August 22, and September 30. A range of 67 individuals comprising 9 species to 285 individuals comprising 19 species were collected at RM 11.3 throughout these months (Appendices V-A to V-C). Of the species classified with regard to pollution tolerance by Ohio EPA, 49% of the fish collected were moderately or highly tolerant of environmental disturbances. Other species collected with other tolerance classifications were the Northern hog suckers which are moderately intolerant of pollution. The species with the most individuals collected was the common white sucker, which comprised 29 percent of the total number of fish collected. DELT anomalies entailing full body, fin and tail lesions, and eroded fins, mouth and tails, were present on greater than 3% of the fishes collected at RM. 11.3 on each of the three sampling days. The IBI and modified MIwb scoring calculated upstream of Southerly WWTP, was as follows:

Date	IBI	Rating	MIwb	Rating
6/25/91	12	Very Poor	4.0	Very Poor
8/22/91	16	Poor	5.7	Poor
9/30/91	22	Poor	6.9	Fair

In 1992, River Mile 11.3, upstream of Southerly WWTP, was sampled July 1, September 9, and October 9. A range of 114 individuals comprising 13 species to 149 individuals comprising 13 species were collected throughout these months (Appendices V-J to V-L). Of the species classified with regard to pollution tolerance by Ohio EPA, 60% of the fish collected were moderately or highly tolerant of environmental disturbances. Other species collected with other tolerance classifications were the Smallmouth bass and Northern hog sucker, which are moderately intolerant of environmental disturbances. The species with the most individuals collected was the common white sucker which comprised 35% of the total number of fish collected. DELT anomalies entailing full body, tail, and fin lesions, eroded fin, mouth, and tails were present on greater than 2.5% of the fishes collected at RM 11.3 on each of the three sampling days. The IBI and modified Iwb scoring calculated upstream of Southerly WWTP was as follows:

Date	IBI	Rating	MIwb	Rating
7/1/92	18	Poor	5.7	Poor
9/9/92	22	Poor	5.8	Poor
10/9/92	20	Poor	5.1	Poor

An examination of the 1991 and 1992 IBI and modified IWb scores obtained at RM 11.3 by NEORSD indicates the river not meeting the minimum numerical criteria for Warmwater Habitat Use Attainment. These values correlate to a "very poor" to "fair" narrative rating of biological performances as defined by Ohio EPA. The numerical criteria for an IBI and modified Iwb are scores of 40 and 8.7, respectively, for the Eastern Ontario Lake Plain.

In 1991, River Mile 10.5, downstream of Southerly WWTP was sampled June 25, August 22, and September 30. Sampling results downstream of the treatment plant produced a range of 69 individuals comprising 7 species to 121 individuals comprising 16 species (Appendices V-D to V-F). Species collected having tolerance classifications were highly or moderately tolerant of environmental disturbances with the exception of the Northern hog sucker and the Sand shiner which are moderately intolerant of pollution. Forty percent of the 329 individuals collected were Eastern gizzard shad. DELT anomalies were evident on greater than 3% of the fish collected and external DELT anomalies consisted of dorsal fin, mouth, body, and lip lesions, eroded mouth and tails. Modified Iwb and IBI scores for the electroshocking study downstream of the treatment plant are summarized below:

Date	IBI	Rating	MIwb	Rating
6/25/91	12	Very Poor	4.8	Very Poor
8/22/91	18	Poor	6.2	Poor
9/30/91	18	Poor	5.8	Poor

In 1992 River Mile 10.5, downstream of Southerly WWTP was sampled July 1, September 9, and October 9. Sampling results produced a range of 119 individuals comprising 16 species to 190 individuals comprising 13 species (Appendices V-M to V-O). Of the species classified with regard to pollution tolerance by Ohio EPA, 39% of the fish collected were moderately or highly tolerant of environmental disturbances. Other species collected having other tolerance classifications were the Northern hog sucker and Small mouth bass which are moderately intolerant of environmental disturbances. DELT anomalies consisted of body, anal fin, pectoral fin, mouth and a opercle lesions and deformed fins and mouths and were present on greater than 3% of the fishes collected at RM 10.5 on each of the three sampling days. Modified Iwb and IBI scores downstream of the treatment plant are summarized below:

Date	IBI	Rating	MIwb	Rating
7/1/92	22	Poor	6.9	Fair
9/9/92	18	Poor	6.0	Poor
10/9/92	18	Poor	6.9	Fair

An evaluation of the 1991 and 1992 IBI and MIwb scores obtained at RM 10.5 by NEORSD indicates the river not meeting the minimum numerical criteria for Warmwater Habitat Use Attainment. These values correlate to a "very poor" to "fair" narrative rating of biological performance as defined by Ohio EPA.

In 1991 fish sampling results downstream of Harvard Avenue (RM 7.1) followed the same general pattern documented upstream and downstream of Southerly WWTP. The Harvard Avenue site produced nine species each day on June 26 and August 25 and 13 species on October 11 (Appendices V-G to V-I). Eighteen percent of 390 individuals were either highly or moderately tolerant of environmental disturbances with the exception of the Northern hog sucker which is moderately intolerant of environmental disturbances. Approximately 66% of the total number of fish collected were comprised of Eastern Gizzard Shad. DELT anomalies included body and fin lesions, eroded fins and mouth, and deformed fins. These anomalies were evident on greater than 3% of the fishes collected at RM 7.1 on each of the two samping days. The modified Iwb and IBI scores are summarized as follows:

Date	IBI	Rating	MIwb	Rating
6/26/91	18	Poor	5.7	Poor
8/25/91	18	Poor	6.1	Poor
10/1/91	22	Poor	6.4	Fair

In 1992 River Mile 7.1 downstream of Harvard Avenue was sampled July 6 and October 13. Sampling results produced a range of 77 individuals comprising 7 species to 207 individuals comprising 14 species (Appendices V-P and V-Q). Of the species classified with regard to pollution tolerance by Ohio EPA, 15% of the fish collected were moderately or highly tolerant of environmental disturbances. The other species collected having other tolerance classification was the Smallmouth bass which is moderately intolerant of pollution. DELT anomalies consisted of body, tail, fin and lip lesions, a deformed eye and a mouth tumor. These anomalies were evident on 5.3% of the fishes collected at RM 7.1 on 7/6/92 and on 1.3% of the fishes collected at the same site on 10/13/92. Modified Iwb and IBI scores downstream of Harvard Avenue are summarized below:

Date	IBI	Rating	MIwb	Rating
7/6/92	22	Poor	5.9	Poor
10/13/92	18	Poor	5.8	Poor

An examination of the 1991 and 1992 IBI and modified Iwb scores obtained at RM 7.1 by NEORSD indicates the river not meeting the minimum numerical criteria for Warmwater Habitat Use Attainment. These values correlate to a "poor" to "fair" narrative rating of biological performance as defined by Ohio EPA.

Tables V-1 to V-3 indicate the quantitative fish survey of the Cuyahoga River upstream and downstream of Southerly WWTP and downstream of Harvard Avenue not attaining numerical criteria for Warmwater Habitat Use. Comparing results obtained upstream of Southerly treatment plant with results downstream of the plant indicates no significant difference, with both sites rated in the "very poor" to "fair" range. Comparing the 1991 NEORSD sampling results with results obtained in 1992 and examining individual metrics of IBI scoring criteria, increases were evident in the following:

1992 data upstream and downstream Southerly WWTP indicate a total of 25 pollution intolerant out of 1,102 fish collected in 1992, an increase from a total of 7 out of 1,173 collected in 1991. The Northern hog sucker, Smallmouth bass, and the Sandshiner comprised the pollution intolerant fishes collected in 1991. The Smallmouth bass and Northern hog sucker comprised the pollution intolerant fishes collected in 1992.

1992 data upstream and downstream of Southerly WWTP indicate an increase in numbers of pollution intolerant lithophilic spawning fish. A count of 19 Northern hog suckers out of a total of 1,102 fish collected comprised the pollution intolerant lithophilic fish. 1991 data upstream and downstream of Southerly WWTP indicated 4 out of a total of 1,173 fish collected were Northern hog suckers.

Comparing results obtained on the river upstream of Southerly WWTP, to downstream of Southerly WWTP for 1991 and 1992, average IBI scores were very similar (IBI score of 18.3 upstream versus a score of 17.6 downstream). These very similar scores indicate the treatment plant effluent is probably not adversely affecting the fish community.

However, results obtained on the river showed a decrease in the numbers of lithophilic spawning fish downstream of Southerly WWTP compared to upstream (87 lithophils downstream versus 272 lithophils upstream).

Fishes that exhibit simple spawning behavior and require clean gravel or cobble for successful reproduction are classified as lithophilic. Fishes in this classification are the most environmentally sensitive of the spawning guilds. The common white sucker and the Northern hog sucker are classified as lithophilic with the Northern hog sucker being the most environmentally sensitive of the two species. Both species of fishes were collected at sample points upstream and downstream of Southerly WWTP, but a decrease in numbers of Northern hog suckers was evident downstream of the treatment plant in 1992 (Appendices V-M to V-O).

Examining data obtained and comparing the present overall fish community upstream of Southerly WWTP to downstream of Southerly WWTP one can conclude that the Southerly WWTP effluent is not affecting the fish fauna. Fish species diversity and general pollution tolerances of fish collected is relatively the same downstream of the treatment plant compared to upstream. Since there is a direct relationship of physical habitats of a stream correlating to the presence and abundance of fish in streams (Ohio EPA, The Qualitative Habitat Evaluation Index [QHEI] Rationale, Methods, and Applications, 11/6/89), the lower numbers of lithophilic fish downstream of Southerly WWTP may be attributable to several factors.

1. The conglomeration of physical features at the Cuyahoga River sampling site consisting of lack of channel sinuosity, poor to fair channel development and poor riffle development (Appendix VI).

2. Increased amount of silt covering the substrate downstream of Southerly WWTP. Poor land use practices and habitat modifications consisting of construction/demolition material disposal sites in the area stripping most of the land of its vegetation and removing the topsoil. Without the vegetation strip along the banks of the river, erosion

of the soil increases sediment loadings entering the river thus covering the river bottom. This decreases the habitability for fish that require the clear water with bottom substrates composed of little silt.

Evaluating the overall trend from data collected by Ohio EPA and NEORSD from 1984 to 1992, both the IBI and MIwb scores illustrate an increase in the scores in years following 1984 (Figures V-A, V-B).

In summary, the quantitative fish survey on the Cuyahoga River upstream and downstream of Southerly WWTP and downstream of Harvard Avenue indicate that these sites are not attaining numerical criteria for Warmwater Habitat Use (Tables V-1 to V-3). Average IBI scores upstream and downstream of Southerly WWTP were slightly higher in 1992 but nevertheless maintain the "poor" narrative rating of biological performance as defined by Ohio EPA. However, if habitat degradation continues along the river, lower IBI scores may be obtained together with a decrease in numbers of lithophilic spawning fish, despite the fact that Southerly's effluent has no apparent adverse effect on the fish community.

Appendix V-A: Cuyahoga River Upstream of Southerly WWTP
(River Mile 11.3)
Sample Date: 6/25/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	15	0.346	-	-
Catostomus commersoni Common White Sucker	15	3.189	Highly Tolerant	Lesions: Dorsal, ventral, caudal, and anal.
Cyprinus carpio Common Carp	24	38.349	Highly Tolerant	Lesions: Dorsal, pectoral fin.
Carassius auratus Goldfish	1	0.072	Highly Tolerant	-
Notropis hudsonius Spottail Shiner	2	0.020	Moderately Tolerant	-
Notropis spilopterus Spotfin Shiner	5	0.042	-	-
Ictalurus natalis Yellow Bullhead	1	0.100	Highly Tolerant	Lesions: Mouth, and ventral.
Italurus nebulosus Brown Bullhead	2	0.350	Highly Tolerant	Lesions: Dorsal and ventral.
Morone americana White Perch	2	0.044	-	-
	67	42.512		10.4% Fish with DELT Anomalies

Appendix V-B: Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 8/22/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	33	1.567	-	Lesions: Nose, mouth, pectoral fin. Eroded mouth and tail.
Carpiodes cyprinus Quillback	1	0.004	-	-
Catostomus commersoni Common White Sucker	29	3.402	Highly Tolerant	Lesions: Body, mouth, tail, and fins. Eroded tail.
Cyprinus carpio Common Carp	15	29.816	Highly Tolerant	Lesions: Body, mouth, dorsal, tail.
Carassius auratus Goldfish	2	0.836	Highly Tolerant	Tail lesions.
Notropis spilopterus Spotfin Shiner	4	0.020	-	-
Pimephales notatus Bluntnose Minnow	2	0.054	Highly Tolerant	-
Campostoma anomalum Central Stoneroller Minnow	2	0.045	-	-
Ictalurus natalis Yellow Bullhead	2	0.445	Highly Tolerant	Eroded barbels and tail. Mouth and fin lesions.

(Continued on following page.)

Appendix V-B: (continued) Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 8/22/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Ictalurus nebulosus Brown Bullhead	1	0.164	Highly Tolerant	Fin lesions.
Morone chrysops White Bass	3	0.016	-	-
Morone americana White Perch	6	0.190	-	Tail and fin lesions.
Micropterus salmoides Largemouth Bass	1	0.010	-	-
Aplodinotus grunniens Freshwater Drum	1	0.425	Moderately Tolerant	-
	102	36.994		12.7% Fish with DELT Anomalies

Appendix V-C: Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 9/30/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	60	2.378	-	Eroded mouth.
Carpiodes cyprinus Quillback	2	0.026	-	-
Hypentelium nigricans Northern Hogsucker	1	0.020	Moderately Intolerant	-
Catostomus commersoni Common White Sucker	96	6.526	Highly Tolerant	Mouth, fin, and nose lesions. Eroded fins and mouth.
Cyprinus carpio Common Carp	13	40.104	Highly Tolerant	Eroded tail.
Rhinicthys atratulus Blacknose Dace	1	0.004	Highly Tolerant	-
Semotilus atromaculatus Creek Chub	3	0.006	Highly Tolerant	-
Notropis spilopterus Spotfin Shiner	20	0.050	-	-
Pimephales notatus Bluntnose Minnow	16	0.044	Highly Tolerant	-
Campostoma anomalum Central Stoneroller Minnow	45	0.572	-	-
Ictalurus punctatus Channel Catfish	2	0.706	-	Eroded adipose fin.

(Continued on following page.)

Appendix V-C: (continued) Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 9/30/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Ictalurus natalis Yellow Bullhead	1	0.100	Highly Tolerant	Eroded barbels.
Ictalurus nebulosus Brown Bullhead	1	0.290	Highly Tolerant	-
Morone americana White Perch	13	0.140	-	-
Micropterus salmoides Largemouth Bass	1	0.018	-	Lip lesions.
Lepomis cyanellus Green Sunfish	3	0.062	Highly Tolerant	-
Lepomis gibbosus Pumpkinseed Sunfish	2	0.104	Moderately Tolerant	-
Hybrid Sunfish	3	0.005	-	Eroded mouth.
Aplodinotus grunniens Freshwater Drum	2	1.392	Moderately Tolerant	-
	285	52.547		4.2% Fish with DELT Anomalies

Appendix V-D: Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 6/25/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	26	1.041	-	-
Catostomus commersoni Common White Sucker	12	2.407	Highly Tolerant	Caudal fin lesions.
Cyprinus carpio Common Carp	10	21.484	Highly Tolerant	-
Notropis spilopterus Spotfin Shiner	18	0.142	-	-
Ictalurus nebulosus Brown Bullhead	1	0.282	Highly Tolerant	Lip lesions.
Morone chrysops White Bass	1	0.039	-	-
Aplodinotus grunniens Fresh Water Drum	1	0.060	Moderately Tolerant	-
	69	25.455		4.3% Fish with DELT Anomalies

Appendix V-E: Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 8/22/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	74	4.453	-	Body and nose lesions, eroded mouth and tails.
Catostomus commersoni Common White Sucker	19	2.155	Highly Tolerant	Dorsal fin lesions.
Cyprinus carpio Common Carp	10	18.828	Highly Tolerant	Body, fin, and lip lesions. Eroded tail.
Semotilus atromaculatus Creek Chub	1	0.002	Highly Tolerant	-
Notropis spilopterus Spotfin Shiner	20	0.060	-	-
Notropis stramineus Sandshiner	2	0.002	Moderately Intolerant	-
Pimephales notatus Bluntnose Minnow	5	0.003	Highly Tolerant	-
Ictalurus nebulosus Brown Bullhead	1	0.342	Highly Tolerant	Fin Lesions.
Marone chrysops White Bass	1	0.082	-	-
Morone americana White Perch	4	0.130	-	Fin lesions.
Micropterus salmoides Largemouth Bass	1	0.006	-	-
Sunfish Hybrid Bluegill	1	0.001	-	-
	139	26.064		6.4% Fish with DELT Anomalies

Appendix V-F: Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 9/30/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	32	0.994	-	-
Hypentelium nigricans Northern Hogsucker	3	0.210	Moderately Intolerant	Body lesions.
Catostomus commersoni Common White Sucker	37	4.468	Highly Tolerant	Fin, mouth, eye lesions.
Cyprinus carpio Common Carp	9	22.246	Highly Tolerant	Fin lesions.
Carassius auratus Goldfish	2	0.442	Highly Tolerant	-
Semotilus atromaculatus Creek Chub	3	0.010	Highly Tolerant	-
Notropis spilopterus Spotfin Shiner	10	0.023	-	-
Pimephales notatus Bluntnose Minnow	6	0.020	Highly Tolerant	-
Campostoma anomalum Central Stoneroller Minnow	1	0.010	-	-
Ictalurus natalis Yellow Bullhead	2	0.326	Highly Tolerant	Lip lesion.

(Continued on following page.)

Appendix V-F: (continued) Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 9/30/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Ictalurus nebulosus Brown Bullhead	1	0.310	Highly Tolerant	Fin lesion.
Morone americana White Perch	6	0.081	-	-
Micropterus salmoides Largemouth Bass	2	0.036	-	-
Lepomis cyanellus Green Sunfish	5	0.138	Highly Tolerant	-
Hybrid Pumpkinseed Sunfish	1	0.028	-	-
Aplodinotus grunniens Freshwater Drum	1	0.062	Moderately Tolerant	-
	121	29.404		6.6% Fish with DELT Anomalies

Appendix V-G: Cuyahoga River Harvard Avenue (RM 7.1)
Sample Date: 6/26/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	28	3.100	-	-
Catostomus commersoni Common White Sucker	6	0.820	Highly Tolerant	-
Cyprinus carpio Common Carp	8	19.224	Highly Tolerant	Lesions: Dorsal, anal, opercle.
Carassius auratus Goldfish	2	0.068	Highly Tolerant	-
Notropis atherinoides Common Emerald Shiner	19	0.060	-	-
Notropis spilopterus Spotfin Shiner	1	0.006	-	-
Ictalurus nebulosus Brown Bullhead	2	1.172	Highly Tolerant	-
Morone chrysops White Bass	2	0.058	-	-
Lepomis gibbosus Pumpkinseed Sunfish	5	0.254	Moderately Tolerant	-
	73	24.762		5.4% Fish with DELT Anomalies

Appendix V-H: Cuyahoga River Harvard Avenue (RM 7.1)
Sample Date: 8/25/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	120	7.102	-	Body and mouth lesions, deformed anal fin, eroded mouth and tails.
Carpiodes cyprinus Quillback	1	0.804	-	-
Catostomus commersoni Common White Sucker	12	2.039	Highly Tolerant	Body and fin lesions.
Cyprinus carpio Common Carp	10	27.754	Highly Tolerant	Body, tail, and mouth lesions. Eroded tail.
Notropis atherinoides Common Emerald Shiner	9	0.032	-	-
Notropis spilopterus Spotfin Shiner	6	0.010	-	-
Morone americana White Perch	5	0.020	-	-
Lepomis gibbosus Pumpkinseed Sunfish	1	0.060	Moderately Tolerant	-
Aplodinotus grunniens Freshwater Drum	1	0.280	Moderately Tolerant	-
	165	38.101		6.6% Fish with DELT Anomalies

Appendix V-I: Cuyahoga River Harvard Avenue (RM 7.1)
Sample Date: 10/1/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Dorosoma cepedianum Eastern Gizzard Shad	110	3.786	-	Eye, mouth lesions
Ictiobus bubalus Smallmouth Buffalo	1	1.900	-	-
Hypentelium nigricans Northern Hogsucker	1	.078	Moderately Intolerant	-
Catostomus commersoni Common White Sucker	6	1.766	Highly Tolerant	Dorsal and fin lesions. Peduncle lesion.
Cyprinus carpio Common Carp	16	22.825	Highly Tolerant	Lesions: Abdominal, fin, opercle, anal.
Semotilus atromaculatus Creek Chub	1	0.001	Highly Tolerant	-
Notropis atherinoides Common Emerald Shiner	9	0.044	-	-
Notropis spilopterus Spotfin Shiner	4	0.010	-	-
Pimephales notatus Bluntnose Minnow	4	0.014	Highly Tolerant	-
Ictalurus natalis Yellow Bullhead	1	0.232	Highly Tolerant	-

(Continued on following page.)

Appendix V-I: Cuyahoga River Harvard Avenue (RM 7.1)
(continued) Sample Date: 10/1/91
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Morone americana White Perch	1	0.008	-	-
Micropterus salmoides Largemouth Bass	2	0.802	-	-
Aplodinotus grunniens Freshwater Drum	2	1.012	Moderately Tolerant	-
	152	32.478		3.9% Fish with DELT Anomalies

Appendix V-J: Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 7/1/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Cyprinus carpio Common Carp	26	46.207	Highly Tolerant	Body lesions, tail lesions.
Carassius auratus Goldfish	3	1.035	Highly Tolerant	Body lesions.
Catostomus commersoni Common White Sucker	12	1.096	Highly Tolerant	-
Pimephales notatus Bluntnose Minnow	12	0.074	Highly Tolerant	-
Dorosoma cepedianum Eastern Gizzard Shad	41	1.190	-	-
Ictalurus natalis Yellow Bullhead	6	2.580	Highly Tolerant	Lip, tail, anal, and fin lesions.
Ictalurus melas Black Bullhead	1	0.168	Moderately Tolerant	-
Micropterus salmoides Largemouth Bass	1	0.138	-	Tail lesions.
Micropterus dolomieui Smallmouth Bass	1	0.050	Moderately Intolerant	-
Lepomis cyanellus Green sunfish	1	0.072	Highly Tolerant	-

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Appendix V-J: (continued)

Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 7/1/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Notropis spilopterus Spotfin Shiner	43	0.249	-	-
Lepomis gibbosus Pumpkinseed Sunfish	1	0.024	Moderately Tolerant	-
Pomoxis nigromaculatus White Crappie	1	0.010	-	-
	149	52.893		9.3% Fish with DELT Anomalies

Appendix V-K: Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 9/9/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Cyprinus carpio Common Carp	10	16.218	Highly Tolerant	Lip lesions.
Aplodinotus grunniens Freshwater drum	2	1.152	Moderately Tolerant	-
Catostomus commersoni Common White Sucker	46	6.550	Highly Tolerant	Body lesions.
Hypentelium nigricans Northern Hog Sucker	6	0.632	Moderately Intolerant	-
Morone chrysops White Bass	1	0.130	-	-
Morone americana White Perch	2	0.098	-	-
Notropis cornutus Common Shiner	1	0.188	-	-
Notropis spilopterus Spotfin Shiner	28	0.184	-	-
Pimephales notatus Bluntnose Minnow	3	0.010	Highly Tolerant	-
Lepomis gibbosus Pumpkinseed Sunfish	3	0.040	Moderately Tolerant	-

(Continued on following page.)

Appendix V-K: (continued) Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 9/9/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Lepomis macrochirus Bluegill Sunfish	2	0.010	Moderately Tolerant	-
Dorosoma cepedianum Eastern Gizzard Shad	8	0.214	-	-
Ictalurus natalis Yellow Bullhead	2	0.500	Highly Tolerant	Lip Lesions.
	114	25.986		2.6% Fish with DELT Anomalies

Appendix V-L: Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 10/9/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Cyprinus carpio Common Carp	9	17.583	Highly Tolerant	Deformed mouth, caudal lesion.
Hypentelium nigricans Northern Hog Sucker	5	0.538	Moderately Intolerant	-
Catostomus commersoni Common White Sucker	79	11.138	Highly Tolerant	Body ventral fin lesions.
Aplodinotus grunniens Freshwater Drum	1	0.260	Moderately Tolerant	-
Dorosoma cepedianum Eastern Gizzard Shad	10	0.588	-	-
Ictalurus natalis Yellow Bullhead	4	0.586	Highly Tolerant	-
Notropis spilopterus Spotfin Shiner	8	0.052	-	-
Pimephales notatus Bluntnose Minnow	2	0.010	Highly Tolerant	-
Campostoma anomalum Central Stoneroller Minnow	1	0.032	-	-
Lepomis macrochirus Bluegill Sunfish	2	0.009	Moderately Tolerant	-

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Appendix V-L: (continued)

Cuyahoga River Upstream of Southerly WWTP (RM 11.3)
Sample Date: 10/9/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Lepomis gibbosus Pumpkinseed Sunfish	5	0.160	Moderately Tolerant	Deformed opercle.
	126	30.956		3.9% Fish with DELT Anomalies

Appendix V-M: Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 7/1/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Hypentelium nigricans Northern Hog Sucker	3	0.204	Moderately Intolerant	-
Ictalurus melas Black Bullhead	2	0.660	Moderately Tolerant	Lip lesion.
Ictalurus nebulosus Brown Bullhead	1	0.574	Highly Tolerant	-
Lepomis gibbosus Pumpkinseed Sunfish	3	0.162	Moderately Tolerant	-
Ambloplites rupestris Northern Rockbass	2	0.030	-	-
Lepomis cyanellus Green Sunfish	2	0.045	Highly Tolerant	-
Notropis spilopterus Spotfin Shiner	59	0.370	-	-
Cyprinus carpio Common Carp	12	18.825	Highly Tolerant	Body, anal, and pectoral fin lesions. Eroded tail.
Aplodinotus grunniens Freshwater Drum	1	0.300	Moderately Tolerant	Eroded fin.

(Continued on following page.)

Appendix V-M: (continued) Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 7/1/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Catostomus commersoni Common White Sucker	20	4.991	Highly Tolerant	Opercle, pectoral and dorsal fin lesions. Body lesions.
Dorosoma cepedianum Eastern Gizzard Shad	82	3.450	-	-
Micropterus dolomieui Smallmouth Bass	2	0.138	Moderately Intolerant	-
Micropterus salmoides Largemouth Bass	1	0.270	-	-
	190	30.019		5.9% Fish with DELT Anomalies

Appendix V-N: Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 9/9/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Cyprinus carpio Common Carp	25	36.756	Highly Tolerant	Deformed mouth.
Catostomus commersoni Common White Sucker	23	6.504	Highly Tolerant	Body lesion.
Micropterus dolomieui Smallmouth Bass	2	0.184	Moderately Intolerant	-
Morone chrysops White Bass	1	0.124	-	--
Aplodinotus grunniens Freshwater Drum	1	0.458	Moderately Tolerant	-
Hypentelium nigricans Northern Hog Sucker	3	0.340	Moderately Intolerant	-
Dorosoma cepedianum Eastern Gizzard Shad	8	0.278	-	-
Morone americana White Perch	2	0.046	-	-
Lepomis gibbosus Pumpkinseed Sunfish	4	0.144	Moderately Tolerant	-
Lepomis cyanellus Green Sunfish	3	0.082	Highly Tolerant	Deformed dorsal fin.

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Appendix V-N: (continued)

Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 9/9/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Lepomis macrochirus Bluegill Sunfish	2	0.062	Moderately Tolerant	Deformed mouth.
Notropis spilopterus Spotfin Shiner	34	0.168	-	-
Semotilus atromaculatus Creek Chub	1	0.002	Highly Tolerant	-
Pimephales notatus Bluntnose Minnow	1	0.002	Highly Tolerant	-
Ictalurus natalis Yellow Bullhead	5	1.460	Highly Tolerant	Mouth lesion.
Ictalurus nebulosus Brown Bullhead	4	1.122	Highly Tolerant	Mouth lesion.
	119	47.732		5.8% Fish with DELT Anomalies

Appendix V-O: Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 10/9/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Cyprinus carpio Common Carp	14	27.275	Highly Tolerant	Deformed opercle.
Aplodinotus grunniens Freshwater Drum	1	0.710	Moderately Tolerant	-
Catostomus commersoni Common White Sucker	29	5.762	Highly Tolerant	Dorsal lesions.
Hypentelium nigricans Northern Hog Sucker	2	0.288	Moderately Intolerant	-
Dorosoma cepedianum Eastern Gizzard Shad	47	9.258	-	Deformed mouth.
Lepomis gibbosus Pumpkinseed Sunfish	2	0.116	Moderately Tolerant	-
Lepomis cyanellus Green Sunfish	2	0.070	Highly Tolerant	-
Lepomis macrochirus Bluegill Sunfish	2	0.019	Moderately Tolerant	-
Notropis spilopterus Spotfin Shiner	12	0.056	-	-
Ictalurus natalis Yellow Bullhead	6	1.188	Highly Tolerant	Body and mouth lesions.

(Continued on following page.)

Appendix V-O: (continued) Cuyahoga River Downstream of Southerly WWTP (RM 10.5)
Sample Date: 10/9/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Ictalurus nebulosus Brown Bullhead	3	1.302	Highly Tolerant	Mouth lesion.
	120	46.044		6.6% Fish with DELT Anomalies

Appendix V-P: Cuyahoga River Downstream of Harvard Avenue (RM 7.1)
Sample Date: 7/6/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Cyprinus carpio Common Carp	16	47.700	Highly Tolerant	Tail, fin, lip and body lesions.
Catostomus commersoni Common White Sucker	8	1.364	Highly Tolerant	-
Ictalurus melas Black Bullhead	2	0.962	Moderately Tolerant	-
Ictalurus nebulosus Brown Bullhead	1	0.510	Highly Tolerant	Deformed eye.
Ictalurus natalis Yellow Bullhead	1	0.244	Highly Tolerant	Mouth tumor.
Micropterus salmoides Largemouth Bass	1	0.126	-	-
Dorosoma cepedianum Eastern Gizzard Shad	166	6.634	-	Body lesions.
Alosa pseudoharengus Alewife	3	0.084	-	-
Morone chrysops White Bass	1	0.065	-	-
Lepomis macrochirus Bluegill Sunfish	1	0.020	Moderately Tolerant	-

(Continued on following page.)

Appendix V-P: (continued)

Cuyahoga River Downstream of Harvard Avenue (RM 7.1)
Sample Date: 7/6/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Lepomis gibbosus Pumpkinseed Sunfish	1	0.006	Moderately Tolerant	-
Morone americana White perch	2	0.068	-	-
Micropterus dolomieui Smallmouth Bass	1	0.082	Moderately Intolerant	-
Notropis spilopterus Spotfin Shiner	3	0.026	-	-
	207	57.891		5.3% Fish with DELT Anomalies

Appendix V-Q: Cuyahoga River Downstream of Harvard Avenue (RM 7.1)
Sample Date: 10/13/92
Collection Distance: 0.5 Km

SPECIES	NUMBER	WEIGHT (kg)	POLLUTION TOLERANCE	DELT ANOMALIES
Cyprinus carpio Common Carp	3	11.1	Highly Tolerant	-
Salmo gairdneri Rainbow Trout	1	0.750	-	Body lesions.
Dorosoma cepedianum Eastern Gizzard Shad	62	11.558	-	-
Catostomus commersoni Common White Sucker	7	1.590	Highly Tolerant	-
Notemigonus crysoleucas Golden Shiner	1	0.016	Highly Tolerant	-
Notropis atherinoides Common Emerald Shiner	2	0.008	-	-
Aplodinotus grunniens Freshwater Drum	1	0.040	Moderately Tolerant	-
	77	25.062		1.3% Fish with DELT Anomalies

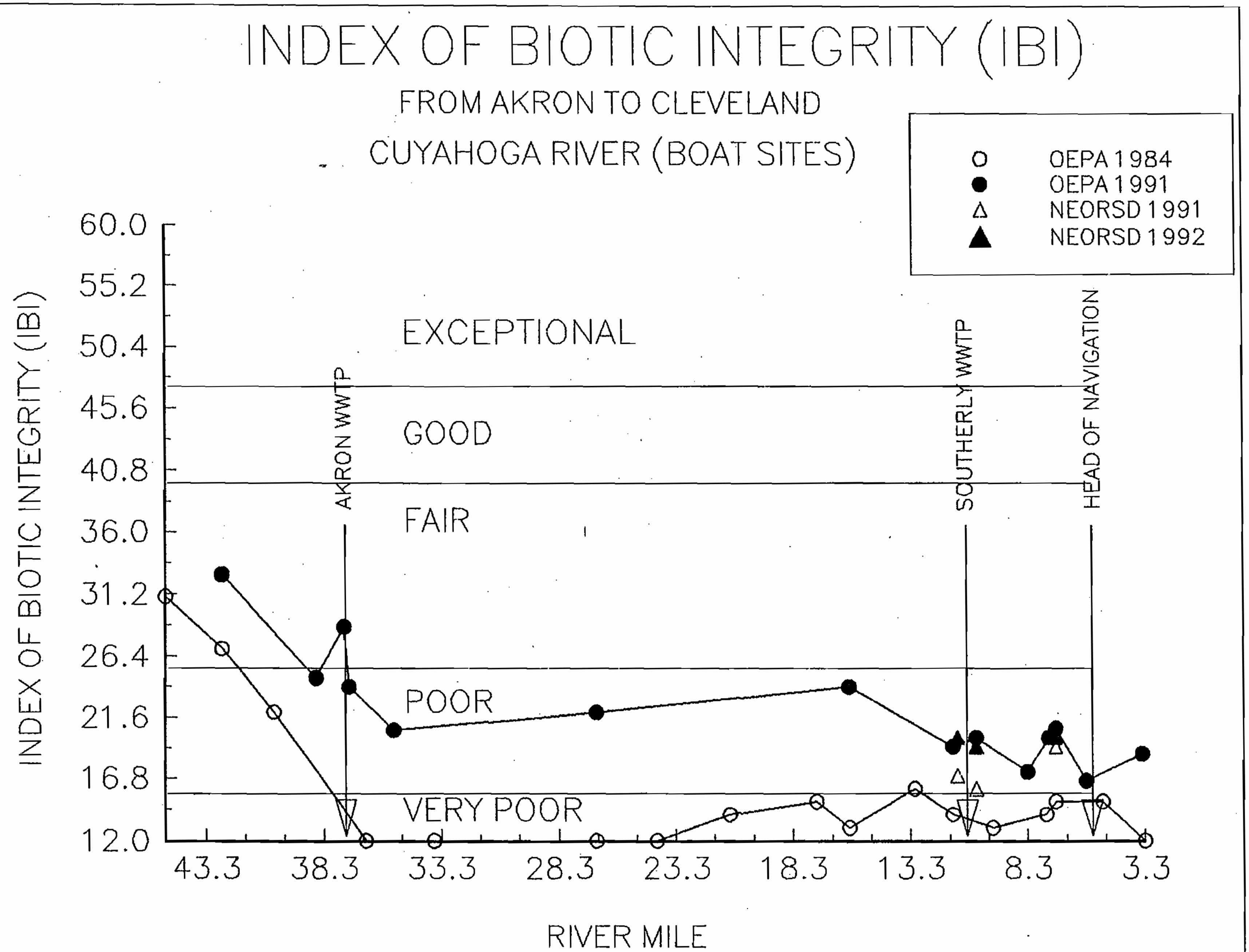
INDEX OF BIOTIC INTEGRITY (IBI)
FROM AKRON TO CLEVELAND
CUYAHOGA RIVER (BOAT SITES)
OEPA 1984
OEPA 1991
NEORSD 1991
NEORSD 1992
INDEX OF BIOTIC INTEGRITY (IBI)
60.0
55.2
50.4
45.6
40.8
36.0
31.2
26.4
21.6
16.8
12.0
EXCEPTIONAL
GOOD
FAIR
POOR
VERY POOR
AKRON WWTP
SOUTHERLY WWTP
HEAD OF NAVIGATION
43.3
38.3
33.3
28.3
23.3
18.3
13.3
8.3
3.3
RIVER MILE

Figure V-A

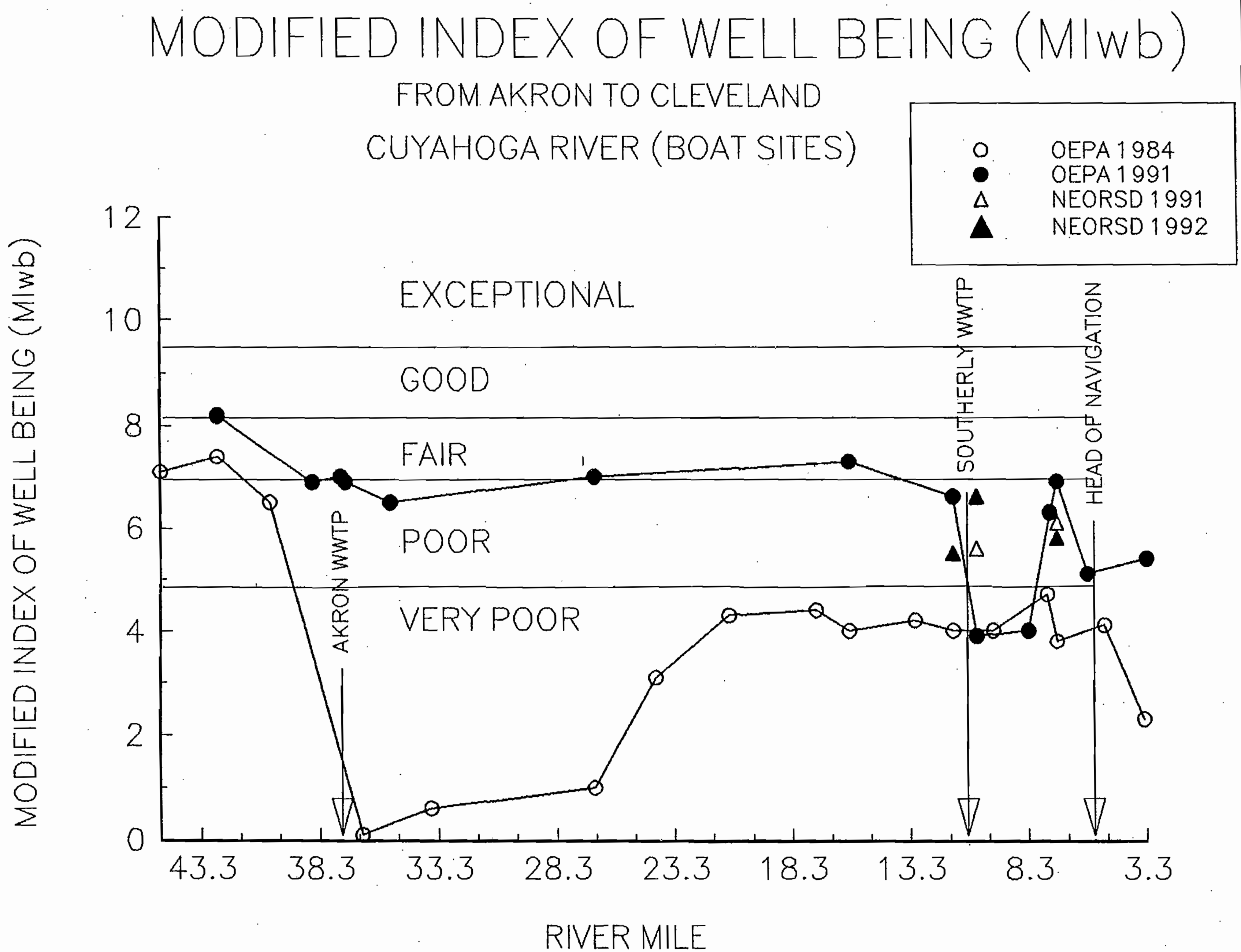
MODIFIED INDEX OF WELL BEING (MIwb)
FROM AKRON TO CLEVELAND
CUYAHOGA RIVER (BOAT SITES)
OEPA 1984
OEPA 1991
NEORSD 1991
NEORSD 1992
MODIFIED INDEX OF WELL BEING (MIwb)
0
2
4
6
8
10
12
EXCEPTIONAL
GOOD
FAIR
POOR
VERY POOR
AKRON WWTP
SOUTHERLY WWTP
HEAD OF NAVIGATION
43.3
38.3
33.3
28.3
23.3
18.3
13.3
8.3
3.3
RIVER MILE

Figure V-B

TABLE V-1

WARMWATER HABITAT ATTAINMENT STATUS OF FISH COMMUNITY
CUYAHOGA RIVER AT RM 11.3 TO 11.5
(Upstream of Southerly WWTP) 1987-1992

Agency	Date	IBI	IBI Narrative Rating	MIwb	MIwb Narrative Rating
NEORSD	7/1/92	18	Poor	5.7	Poor
NEORSD	9/9/92	22	Poor	5.8	Poor
NEORSD	10/9/92	20	Poor	5.1	Poor
NEORSD	9/30/91	22	Poor	6.9	Fair
NEORSD	8/22/91	16	Poor	5.7	Poor
NEORSD	6/25/91	12	Very Poor	4.0	Very Poor
NEORSD	9/28/90	14	Very Poor	4.6	Very Poor
NEORSD	8/3/90	14	Very Poor	4.1	Very Poor
Ohio EPA	9/12/91	20	Poor	7.0	Fair
Ohio EPA	8/13/91	18	Poor	6.8	Fair
Ohio EPA	7/17/91	20	Poor	6.0	Poor
Ohio EPA	1988	21	Poor	5.9	Poor
Ohio EPA	1987	17	Poor	4.2	Very Poor
EA Science	8/2/88	14	Very Poor	3.3	Very Poor
Battelle	1989	-	-	5.4	Poor

Minimum Value for IBI Attainment = 40

Minimum Value for MIwb Attainment = 8.7

TABLE V-2

WARMWATER HABITAT ATTAINMENT STATUS OF FISH COMMUNITY
CUYAHOGA RIVER AT RM 10.5
(Downstream of Southerly WWTP) 1987-1992

Agency	Date	IBI	IBI Narrative Rating	MIwb	MIwb Narrative Rating
NEORSD	7/1/92	22	Poor	6.9	Fair
NEORSD	9/9/92	18	Poor	6.0	Poor
NEORSD	10/9/92	18	Poor	6.9	Fair
NEORSD	9/30/91	18	Poor	5.8	Poor
NEORSD	8/22/91	18	Poor	6.2	Poor
NEORSD	6/25/91	12	Very Poor	4.8	Very Poor
NEORSD	9/28/90	14	Very Poor	4.8	Very Poor
NEORSD	8/3/90	16	Poor	4.7	Very Poor
Ohio EPA	9/12/91	22	Poor	6.0	Poor
Ohio EPA	8/13/91	18	Poor	3.3	Very Poor
Ohio EPA	7/17/91	20	Poor	2.5	Very Poor
Ohio EPA	1988	22	Poor	6.2	Very Poor
Ohio EPA	1987	19	Poor	4.8	Very Poor
EA Science	8/2/88	14	Very Poor	5.0	Poor
Battelle	1989	-	-	5.1	Poor

Minimum Value for IBI Attainment = 40

Minimum Value for MIwb Attainment = 8.7

TABLE V-3

WARMWATER HABITAT ATTAINMENT STATUS OF FISH COMMUNITY
CUYAHOGA RIVER AT RM 7.1
(Downstream of Harvard Avenue) 1987-1992

Agency	Date	IBI	IBI Narrative Rating	MIwb	MIwb Narrative Rating
NEORSD	7/6/92	22	Poor	5.9	Poor
NEORSD	10/13/92	18	Poor	5.8	Poor
NEORSD	10/1/92	22	Poor	6.4	Fair
NEORSD	8/25/91	18	Poor	6.1	Poor
NEORSD	6/26/91	18	Poor	5.7	Poor
Ohio EPA	9/18/91	26	Fair	7.4	Fair
Ohio EPA	8/15/91	20	Poor	7.0	Fair
Ohio EPA	7/18/91	16	Poor	6.2	Poor
Ohio EPA	1988	16	Poor	5.5	Poor
Ohio EPA	1987	17	Poor	4.4	Very Poor

Minimum Value for IBI Attainment = 40

Minimum Value for MIwb Attainment = 8.7

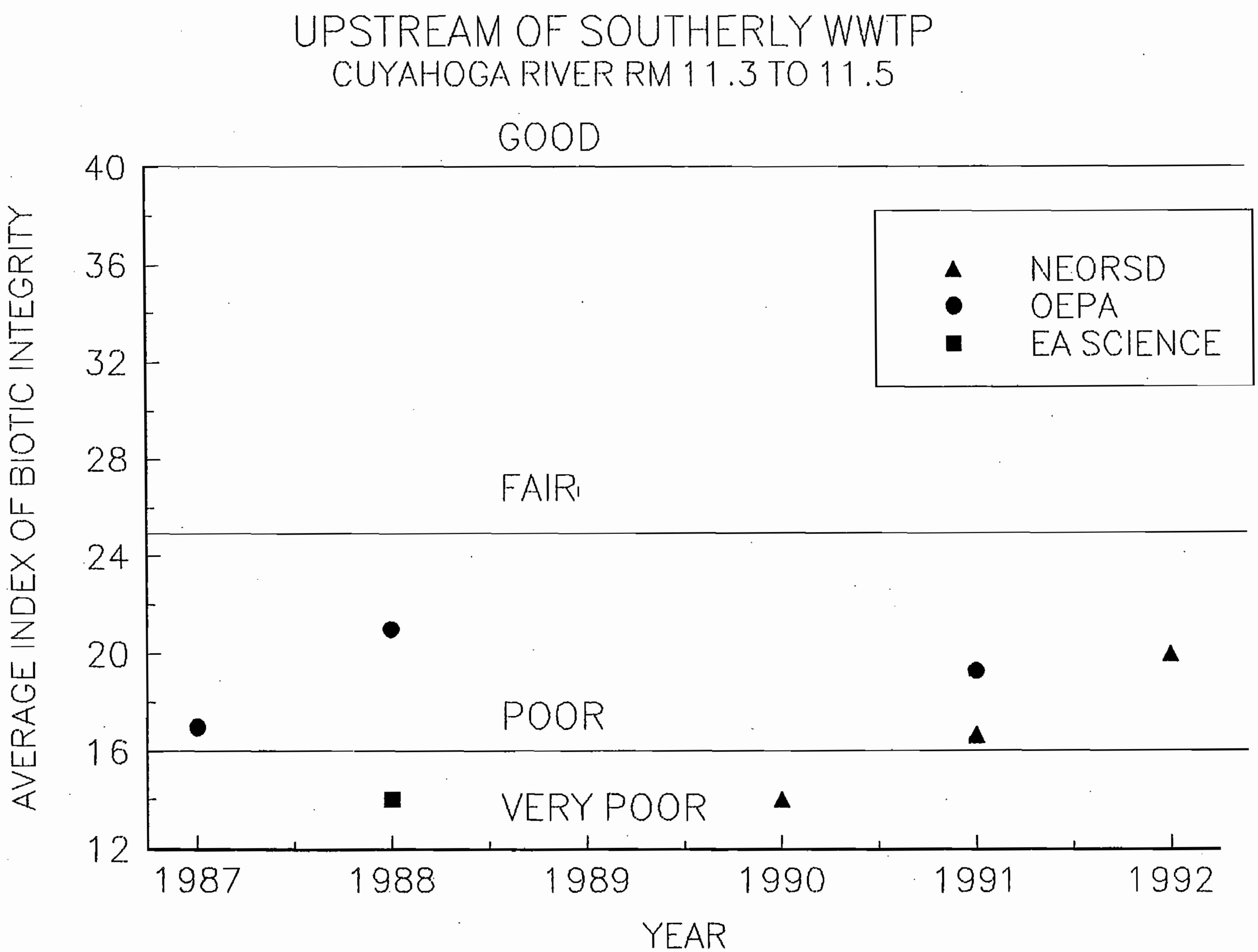
UPSTREAM OF SOUTHERLY WWTP
CUYAHOGA RIVER RM 11.3 TO 11.5
GOOD
FAIR
POOR
VERY POOR
AVERAGE INDEX OF BIOTIC INTEGRITY
40
36
32
28
24
20
16
12
1987
1988
1989
1990
1991
1992
YEAR
NEORSD
OEPA
EA SCIENCE

Figure V-C

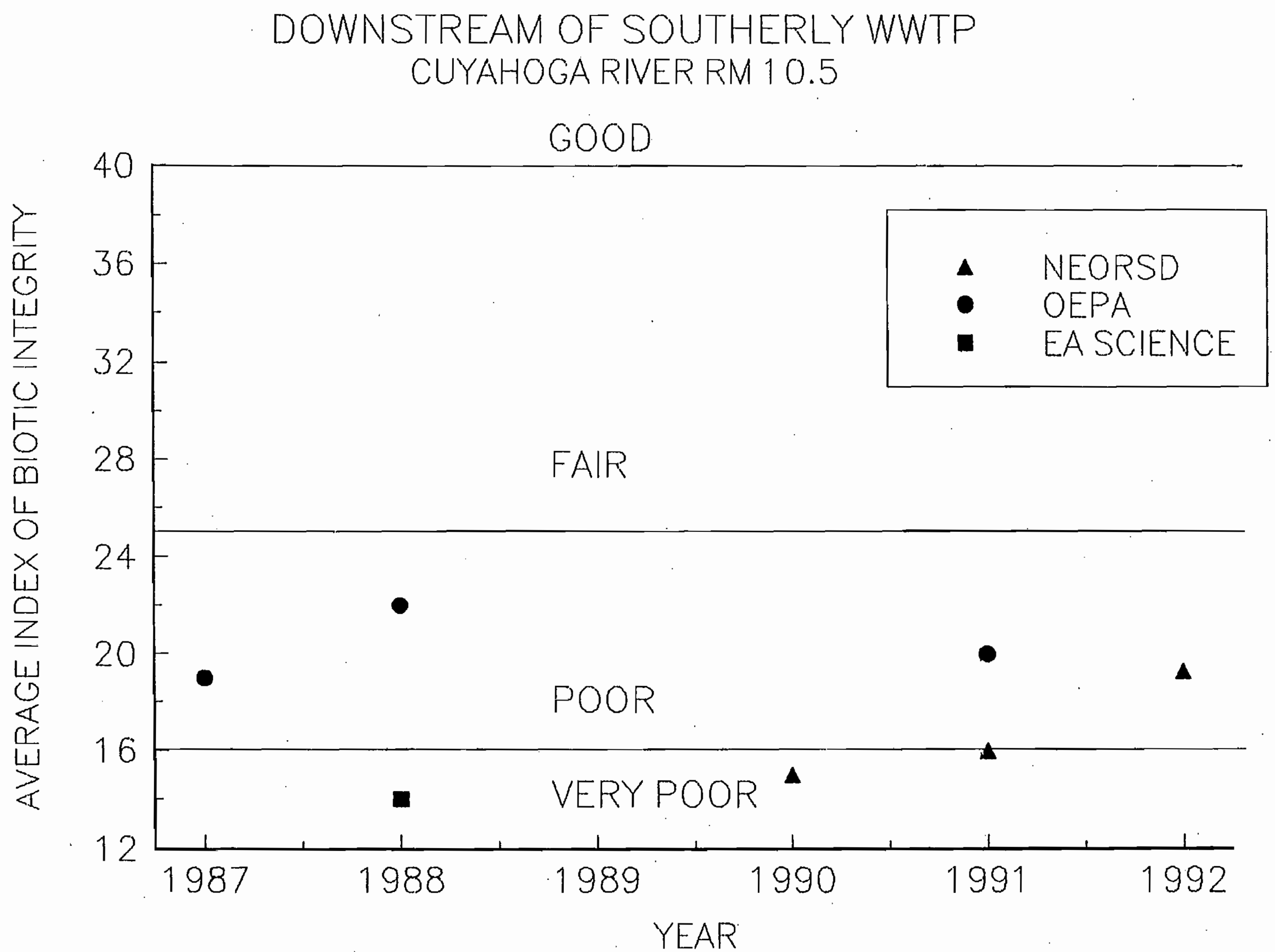
DOWNSTREAM OF SOUTHERLY WWTP
CUYAHOGA RIVER RM 10.5
GOOD
FAIR
POOR
VERY POOR
AVERAGE INDEX OF BIOTIC INTEGRITY
40
36
32
28
24
20
16
12
1987
1988
1989
1990
1991
1992
YEAR
NEORSD
OEPA
EA SCIENCE

Figure V-D

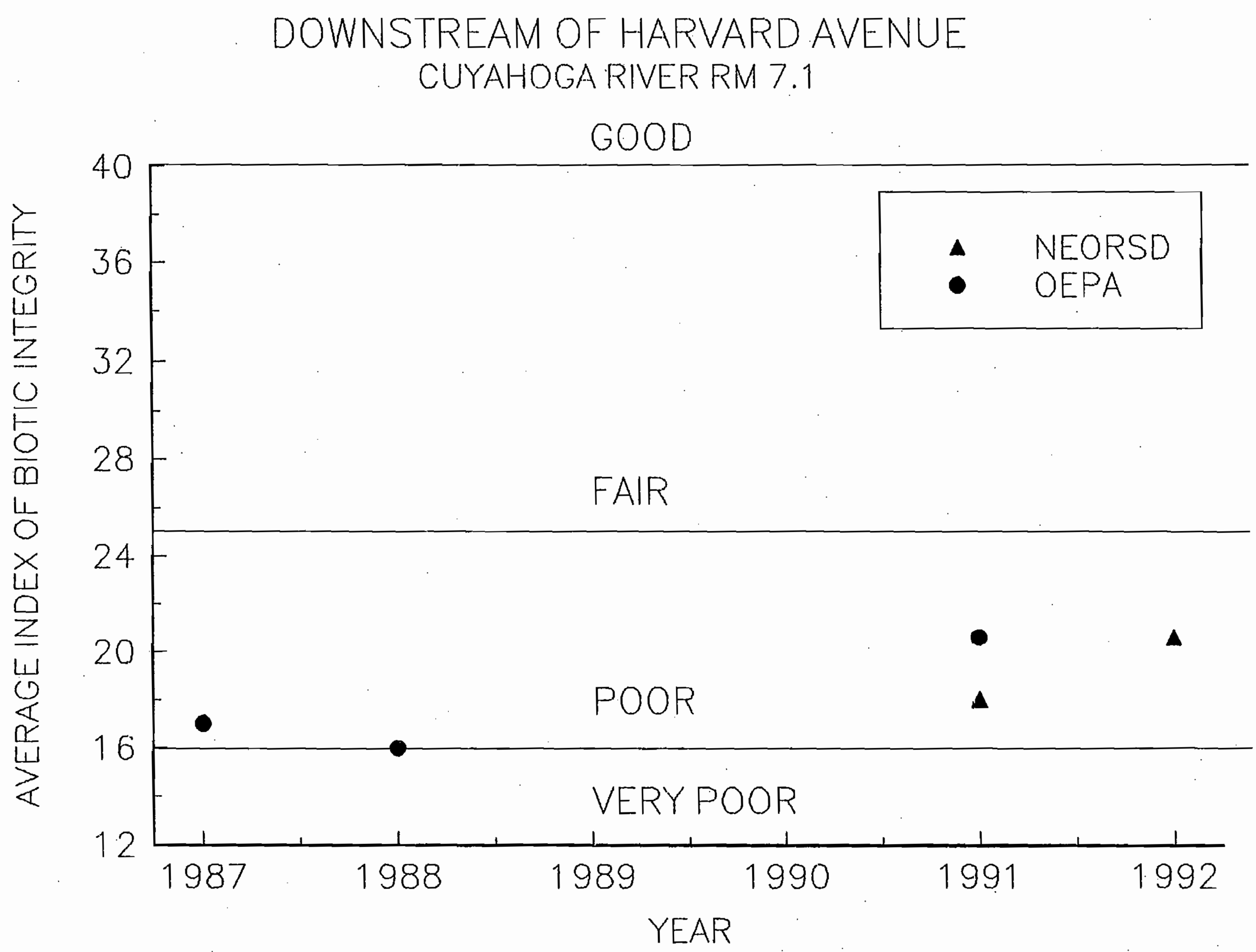
DOWNSTREAM OF HARVARD AVENUE
CUYAHOGA RIVER RM 7.1
GOOD
FAIR
POOR
VERY POOR
NEORSD
OEPA
AVERAGE INDEX OF BIOTIC INTEGRITY
40
36
32
28
24
20
16
12
1987
1988
1989
1990
1991
1992
YEAR

Figure V-E

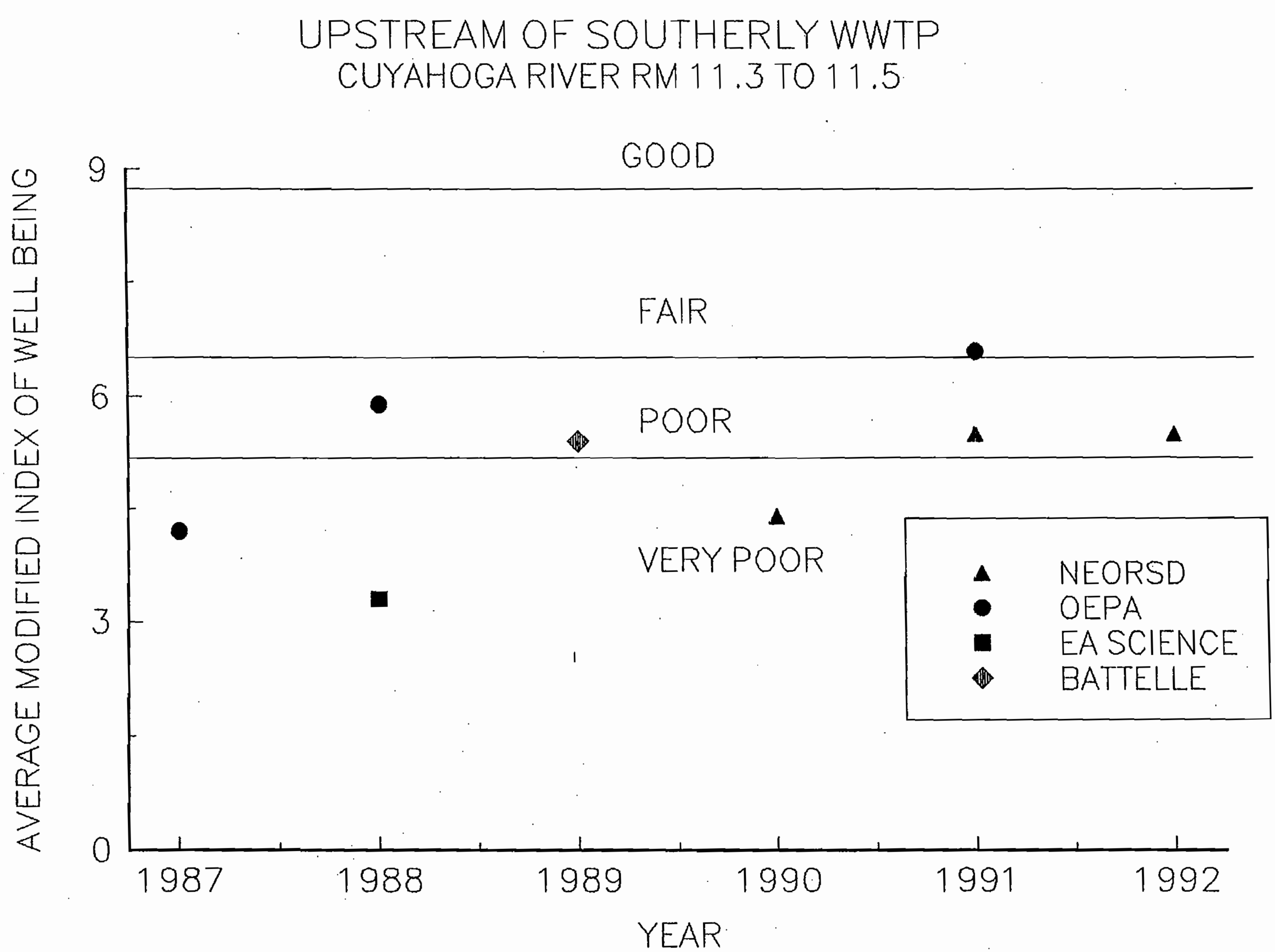
UPSTREAM OF SOUTHERLY WWTP
CUYAHOGA RIVER RM 11.3 TO 11.5
AVERAGE MODIFIED INDEX OF WELL BEING
9
6
3
0
GOOD
FAIR
POOR
VERY POOR
1987
1988
1989
1990
1991
1992
YEAR
NEORSD
OEPA
EA SCIENCE
BATTELLE

Figure V-F

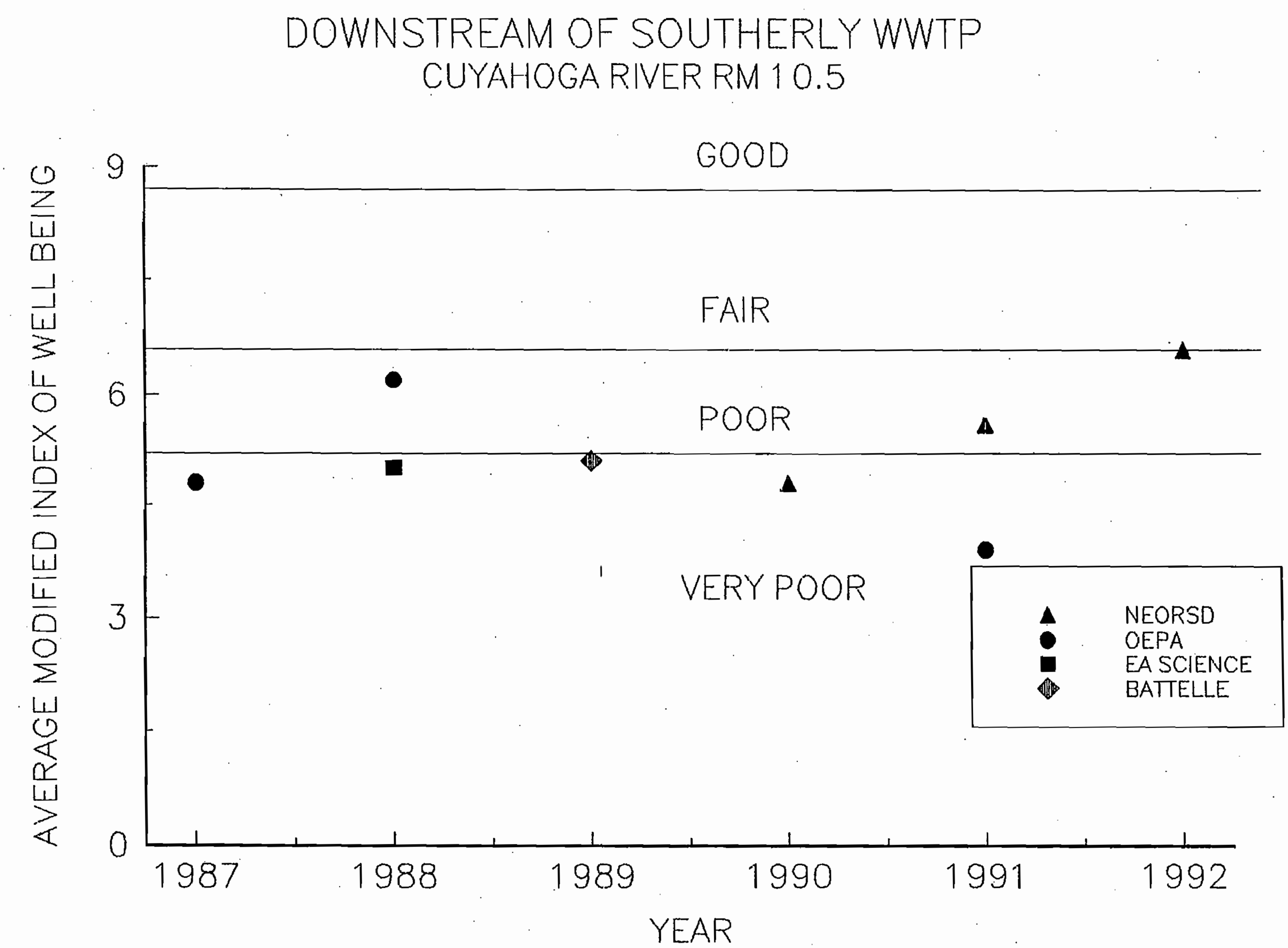
DOWNSTREAM OF SOUTHERLY WWTP
CUYAHOGA RIVER RM 10.5
AVERAGE MODIFIED INDEX OF WELL BEING
9
6
3
0
GOOD
FAIR
POOR
VERY POOR
1987
1988
1989
1990
1991
1992
YEAR
NEORSD
OEPA
EA SCIENCE
BATTELLE

Figure V-G

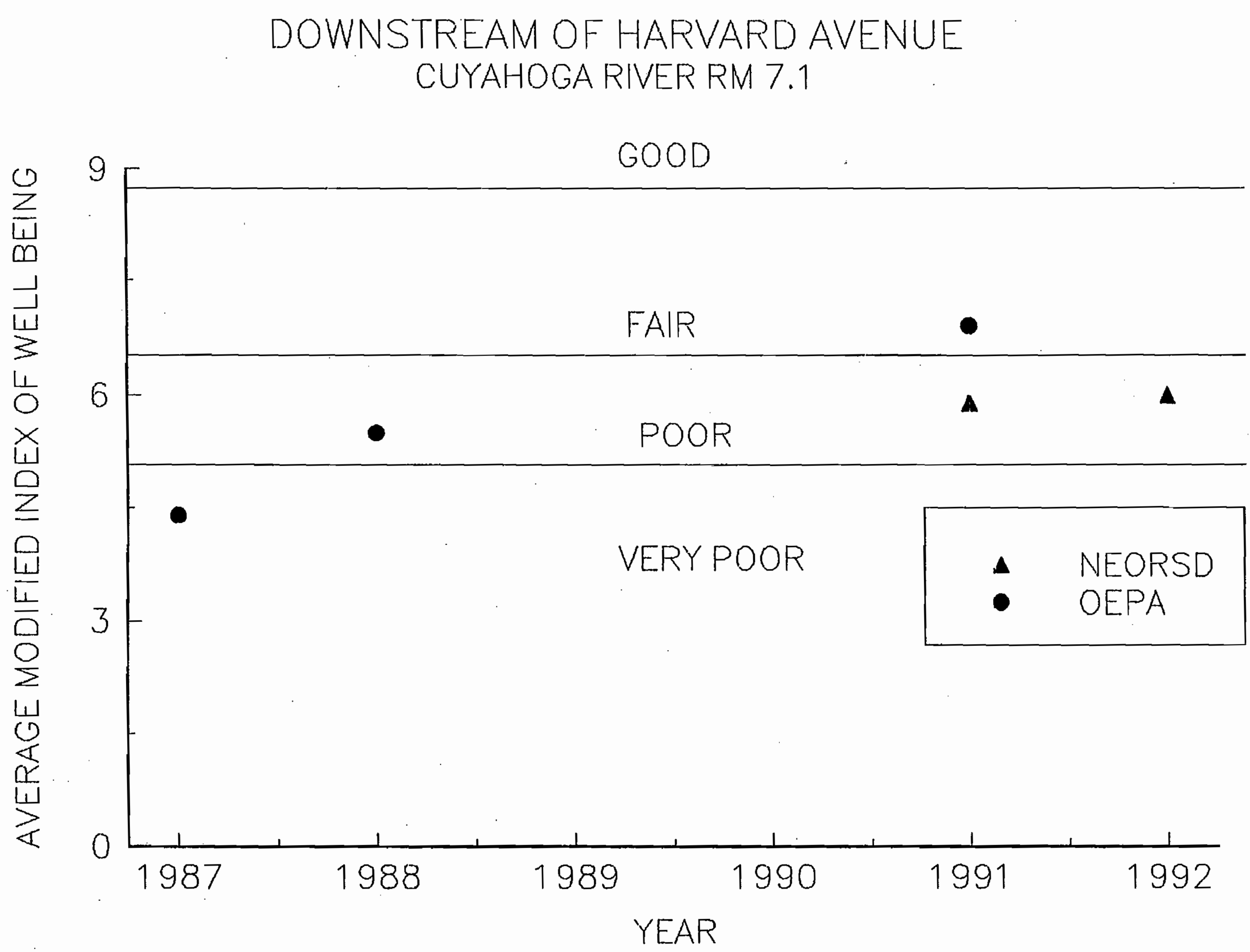
DOWNSTREAM OF HARVARD AVENUE
CUYAHOGA RIVER RM 7.1
GOOD
FAIR
POOR
VERY POOR
AVERAGE MODIFIED INDEX OF WELL BEING
9
6
3
0
1987
1988
1989
1990
1991
1992
YEAR
NEORSD
OEPA

Figure V-H

QUALITATIVE HABITAT EVALUATION INDEX SCORES
CUYAHOGA RIVER (NEORSD, 1991 – 1993)

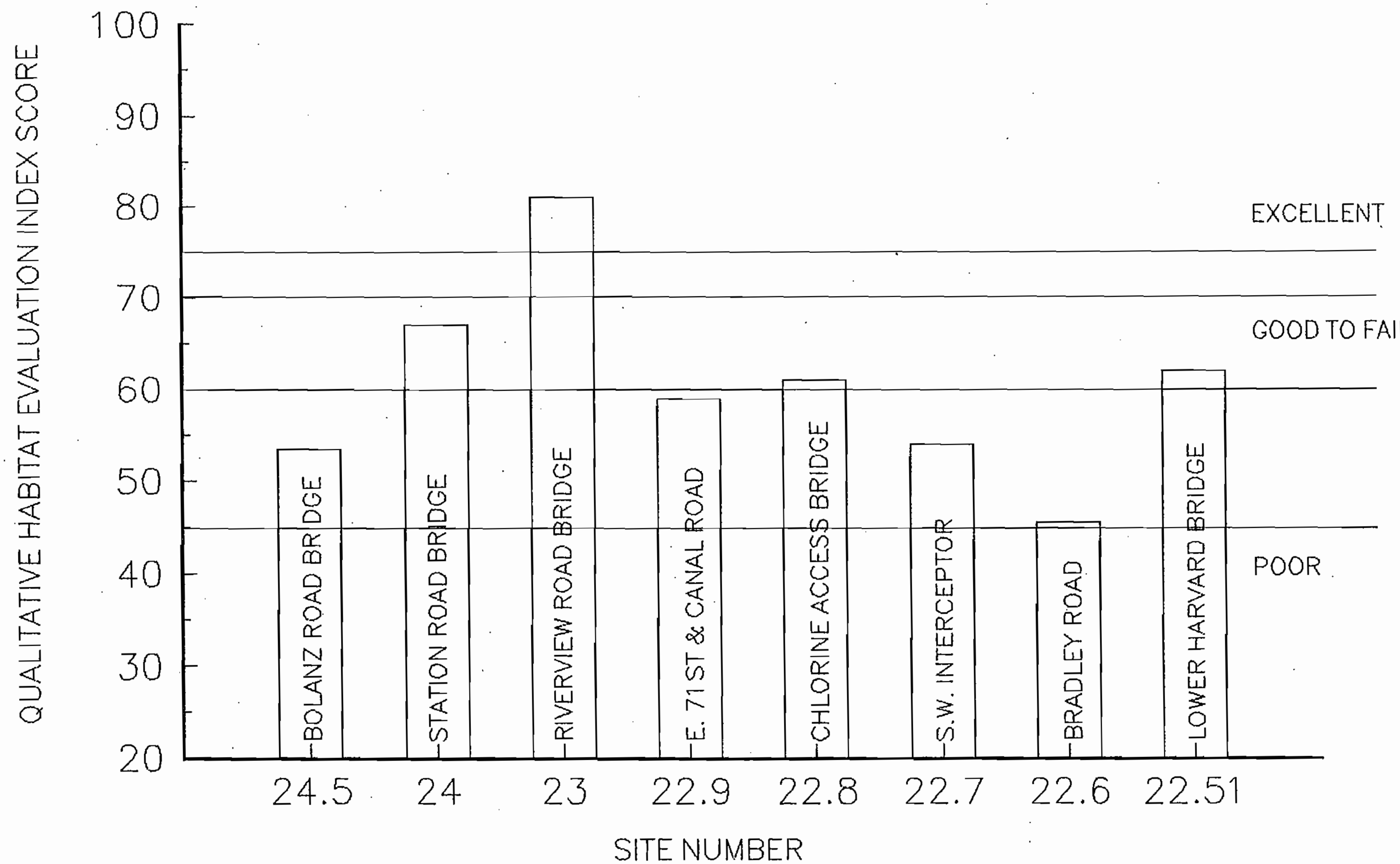

Figure V-I

APPENDIX VI

QUALITATIVE HABITAT EVALUATION INDEX
1992 SCORES

Ohio EPA Site Description Sheet

QHEI SCORE: 45

Stream EUCLID CREEK RM ____ Date 08/13/91 River Code ____
Location SITE-#0.5 DOWNSTREAM OF LAKE SHORE BLVD. Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 6.5**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER/SLABS[10] ☐☐-GRAVEL[7]
- ☐☐-BOULDER[9] ■■-SAND[6]
- ☐☐-COBBLE[8] ☐☐-BEDROCK[5]
- ☐☐-HARDPAN[4] ☐☐-DETRITUS[3] ✓
- ■■-MUCK[2] ☐☐-ARTIFIC.[0] ✓

Substrate Origin (Check all): ☐-LIMESTONE[1] ☐-RIP/RAP[0] ■-TILLS[1] ☐-HARDPAN[0] ☐-SANDSTONE[0] ☐-SHALE[-1] ☐-COAL FINES[-2]

Silt Cover (Check One or check 2 and AVERAGE): ■-SILT HEAVY[-2] ■-SILT MODERATE[-1] ☐-SILT NORMAL[0] ☐-SILT FREE[1]

Extent Of Embeddness (Check One or check 2 and AVERAGE): ■—EXTENSIVE[-2] ☐—MODERATE[-1] ☐—LOW[0] ☐—NONE[1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐—<= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

2] INSTREAM COVER — **COVER SCORE: 9**

TYPE (Check All That Apply)

- ■-UNDERCUT BANKS[1] ■-DEEP POOLS[2] ☐-OXBOWS[1]
- ■-OVERHANGING VEGETATION[1] ☐-ROOTWADS[1] ☐-AQUATIC MACROPHYTES[1]
- ■-SHALLOWS (IN SLOW WATER)[1] ☐-BOULDERS[1] ■-LOGS OR WOODY DEBRIS[1]

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) — **CHANNEL: 5**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 5**

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank):
- ☐☐-FOREST, SWAMP[3]
- ☐☐-OPEN PASTURE/ROWCROP[0]
- ■■-RESID.,PARK,NEW FIELD[1]
- ☐☐-FENCED PASTURE[1]

L R (Per Bank):
- ■■-URBAN OR INDUSTRIAL[0]
- ☐☐-SHRUB OR OLD FIELD[2]
- ☐☐-CONSERV. TILLAGE[1]
- ☐☐-MINING/CONSTRUCTION[0]

BANK EROSION:
- ■■-NONE OR LITTLE[3]
- ☐☐-MODERATE[2]
- ☐☐-HEAVY OR SEVERE[1]

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 9**

MAX DEPTH (Check 1):
- ■->1m[6]
- ☐-0.7-1m[4]
- ☐-0.4-0.7m[2]
- ☐-<0.4m[1]
- ☐—<0.2m[Pool=0]

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply):
- ☐-TORRENTIAL[-1] ☐-EDDIES[1]
- ☐-FAST[1] ☐-INTERSTITIAL[-1]
- ☐-MODERATE[1] ☐-INTERMITTENT[-2]
- ■-SLOW[1]

☐-NO POOL[0]

COMMENTS: ____

RIFFLE: 0.5

RIFFLE/RUN DEPTH:
- ☐-GENERALLY >10 cm,MAX>50[4]
- ☐-GENERALLY >10 cm,MAX<50[3]
- ■-GENERALLY 5-10 cm[1]
- ☐-GENERALLY <5 cm[Riffle=0]

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

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

☐-NO RIFFLE[0]

COMMENTS ____

GRADIENT: 10

6] Gradient (feet/mile): 13 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 76

Stream EUCLID CREEK RM ______ Date 01/08/93 River Code ______
Location SITE - #1 AT ST. CLAIR AVENUE BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present): **SUBSTRATE SCORE: 20**

TYPE / POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ___ ___ ☐☐-GRAVEL [7] ✓ ✓ Substrate Origin (Check all)
- ■■-BOULDER [9] ___ ✓ ☐☐-SAND [6] ✓ ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■■-COBBLE [8] ✓ ✓ ☐☐-BEDROCK[5] ___ ___ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ___ ___ ☐☐-DETRITUS[3] ___ ___ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ___ ___ ☐☐-ARTIFIC.[0] ___ ✓ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■- > 4 [1] ☐- <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ☐-SILT NORMAL [0] ■-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
☐-EXTENSIVE [-2] ☐-MODERATE [-1] ■-LOW [0] ☐-NONE [1]

2] INSTREAM COVER **COVER SCORE: 14**

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ■-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ☐-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 16**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 7**

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank)
- ■☐-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP [0]
- ☐☐- RESID., PARK, NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]

L R (Per Bank)
- ☐■-URBAN OR INDUSTRIAL [0]
- ☐☐-SHRUB OR OLD FIELD [2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
- ■ ■-NONE OR LITTLE [3]
- ☐ ☐-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE [1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 7**

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL [-1] ☐-EDDIES [1]
- ■-FAST [1] ☐-INTERSTITIAL [-1]
- ■-MODERATE [1] ☐-INTERMITTENT [-2]
- ■-SLOW [1]

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 6

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm, MAX>50 [4]
- ■ - GENERALLY >10 cm, MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE [0]

COMMENTS ______ **GRADIENT: 6**

6] Gradient (feet/mile): 31.8 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 66.5

Stream EUCLID CREEK RM ____ Date 01/08/93 River Code ____
Location SITE-#2 SOUTH BRANCH, HIGHLAND PICNIC AREA Crew NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 17**

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐☐-BLDER/SLABS[10] ____ ■■-GRAVEL [7] ___ ✓
- ☐☐-BOULDER [9] ✓ ☐☐-SAND [6] ✓
- ■■-COBBLE [8] ✓ ☐☐-BEDROCK[5]
- ☐☐-HARDPAN [4] ✓ ☐☐-DETRITUS[3]
- ☐☐-MUCK [2] ☐☐-ARTIFIC.[0]

Substrate Origin (Check all): ☐-LIMESTONE [1] ☐-RIP/RAP [0] ■-TILLS [1] ☐-HARDPAN [0] ☐-SANDSTONE [0] ☐-SHALE [-1] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW [0] ☐—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐— <= 4 [0]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS ____

2] INSTREAM COVER **COVER SCORE: 10**

TYPE (Check All That Apply)

- ☐-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
- ☐-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ☐-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) **CHANNEL: 14.5**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 8.5**
River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)

- ☐■-WIDE > 50m [4]
- ■☐-MODERATE 10-50 [3]
- ☐☐-NARROW 5-10m [2]
- ☐☐-VERY NARROW 1-5m [1]
- ☐☐-NONE [0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank)

- ☐■-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP [0]
- ■☐-RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]
- ☐☐-URBAN OR INDUSTRIAL [0]
- ☐☐-SHRUB OR OLD FIELD [2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ■■-NONE OR LITTLE [3]
- ☐☐-MODERATE [2]
- ☐☐-HEAVY OR SEVERE [1]

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 7**

MAX DEPTH (Check 1)

- ☐->1m [6]
- ■-0.7-1m [4]
- ☐-0.4-0.7m [2]
- ☐-< 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ■-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)

- ☐-TORRENTIAL [-1] ☐-EDDIES [1]
- ■-FAST [1] ☐-INTERSTITIAL [-1]
- ■-MODERATE [1] ☐-INTERMITTENT [-2]
- ■-SLOW [1]

☐-NO POOL [0]

COMMENTS: ____

RIFFLE: 5.5

RIFFLE/RUN DEPTH

- ☐-GENERALLY >10 cm,MAX>50 [4]
- ■-GENERALLY >10 cm,MAX<50 [3]
- ☐-GENERALLY 5-10 cm [1]
- ☐-GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ■-STABLE (e.g.,Cobble, Boulder) [2]
- ■-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1] ☐-MODERATE [0]
- ■-LOW. [1] ☐-NONE [2]

☐-NO RIFFLE [0]

COMMENTS ____ **GRADIENT: 4**

6] Gradient (feet/mile): 51.3 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 65.5

Stream EUCLID CREEK RM ____ Date 01/08/93 River Code ____
Location SITE-#3 NORTH BRANCH, HIGHLAND PICNIC AREA Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present);

SUBSTRATE SCORE: 13

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
□□-BLDER /SLABS[10]			■■-GRAVEL [7]	✓	✓
□□-BOULDER [9]		✓	□□-SAND [6]	✓	✓
□□-COBBLE [8]	✓	✓	■■-BEDROCK[5]	✓	✓
□□-HARDPAN [4]			□□-DETRITUS[3]		
□□-MUCK [2]			□□-ARTIFIC.[0]		

SUBSTRATE QUALITY
Substrate Origin (Check all)
□-LIMESTONE [1] □-RIP/RAP [0]
■-TILLS [1] □-HARDPAN [0]
□-SANDSTONE [0]
□-SHALE [-1]
□-COAL FINES [-2]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] □— <= 4 [0]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS____

Silt Cover (Check One or check 2 and *AVERAGE*)
□-SILT HEAVY [-2] □-SILT MODERATE [
■ - SILT NORMAL [0] □ - SILT FREE [1

Extent Of Embeddness (Check One or check 2 and *AVERAGE*)
□—EXTENSIVE [-2] ■—MODERATE [-
□—LOW [0] □—NONE [1]

COVER SCORE: 13

2] INSTREAM COVER

TYPE (Check *All* That Apply)
■ -UNDERCUT BANKS [1]
■ -OVERHANGING VEGETATION [1]
□ -SHALLOWS (IN SLOW WATER) [1]
□ -DEEP POOLS [2]
■ -ROOTWADS [1]
■ -BOULDERS [1]
□ -OXBOWS [1]
■ -AQUATIC MACROPHYTES [1]
■ -LOGS OR WOODY DEBRIS [1]

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

COMMENTS:____

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

CHANNEL: 15

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

COMMENTS:____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 9.5

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY
L R (Most Predominant Per Bank)
■■-FOREST, SWAMP [3]
□□-OPEN PASTURE/ ROWCROP [0]
□□- RESID.,PARK,NEW FIELD [1]
□□-FENCED PASTURE [1]

L R (Per Bank)
□□-URBAN OR INDUSTRIAL [0]
□□-SHRUB OR OLD FIELD [2]
□□-CONSERV. TILLAGE [1]
□□-MINING/CONSTRUCTION [0]

BANK EROSION
□ ■-NONE OR LITTLE [3]
■ □-MODERATE [2]
□ □-HEAVY OR SEVERE [1]

COMMENTS:____

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 8

MAX DEPTH (Check 1)
□- >1m [6]
■- 0.7-1m [4]
□- 0.4-0.7m [2]
□- < 0.4m [1]
□—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)
■-POOL WIDTH > RIFFLE WIDTH [2]
□-POOL WIDTH = RIFFLE WIDTH [1]
□-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
□-TORRENTIAL [-1]
■-FAST [1]
■-MODERATE [1]
■-SLOW [1]
□-EDDIES [1]
■-INTERSTITIAL [-1]
□-INTERMITTENT [-2]

□- NO POOL [0]

COMMENTS:____

RIFFLE: 3

RIFFLE/RUN DEPTH
□ - GENERALLY >10 cm, MAX>50 [4]
□ - GENERALLY >10 cm, MAX<50 [3]
■ - GENERALLY 5-10 cm [1]
□ - GENERALLY < 5 cm [Riffle = 0]

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

RIFFLE/RUN EMBEDDEDNESS
□-EXTENSIVE [-1] □-MODERATE [0]
■-LOW. [1] □-NONE [2]

□-NO RIFFLE [0]

COMMENTS____

GRADIENT: 4

6] Gradient (feet/mile): 83.4 %POOL:____ %RIFFLE:____ %RUN:____

Ohio EPA Site Description Sheet

QHEI SCORE: 69

Stream EUCLID CREEK RM ____ Date 01/08/93 River Code ____
Location SITE-#4 SOUTH BRANCH AT MAYFIELD ROAD Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present);

SUBSTRATE SCORE: 14

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE
☐☐-BLDER /SLABS[10]			■■-GRAVEL [7]		✓
☐☐-BOULDER [9]			☐☐-SAND [6]		✓
☐☐-COBBLE [8]		✓	■■-BEDROCK[5]	✓	✓
☐☐-HARDPAN [4]			☐☐-DETRITUS[3]		
☐☐-MUCK [2]			☐☐-ARTIFIC.[0]		

SUBSTRATE QUALITY
Substrate Origin (Check all)
☐-LIMESTONE [1] ☐-RIP/RAP [0]
■-TILLS [1] ☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1]
■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE)
☐—EXTENSIVE [-2] ☐—MODERATE [-1]
■—LOW [0] ☐—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS ____

COVER SCORE: 12

2] INSTREAM COVER

TYPE (Check All That Apply)
☐-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
■-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ____

CHANNEL: 16

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

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

COMMENTS: ____

RIPARIAN: 6.5

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)
☐☐-WIDE > 50m [4]
■■-MODERATE 10-50 [3]
☐☐-NARROW 5-10m [2]
☐☐-VERY NARROW 1-5m [1]
☐☐-NONE [0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY
L R (Most Predominant Per Bank)
☐☐-FOREST, SWAMP [3]
☐☐-OPEN PASTURE/ ROWCROP [0]
■■-RESID.,PARK,NEW FIELD [1]
☐☐-FENCED PASTURE [1]

L R (Per Bank)
☐☐-URBAN OR INDUSTRIAL [0]
☐☐-SHRUB OR OLD FIELD [2]
☐☐-CONSERV. TILLAGE [1]
☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
■ ☐-NONE OR LITTLE [3]
☐ ■-MODERATE [2]
☐ ☐-HEAVY OR SEVERE [1]

COMMENTS: ____

POOL: 10

POOL/GLIDE AND RIFFLE/RUN QUALITY

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)
☐-TORRENTIAL [-1] ☐-EDDIES [1]
☐-FAST [1] ☐-INTERSTITIAL [-1]
■-MODERATE [1] ☐-INTERMITTENT [-2]
■-SLOW [1]

☐-NO POOL [0]

COMMENTS: ____

RIFFLE: 2.5

RIFFLE/RUN DEPTH
☐-GENERALLY >10 cm,MAX>50 [4]
☐-GENERALLY >10 cm,MAX<50 [3]
■-GENERALLY 5-10 cm [1]
☐-GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE [0]

COMMENTS ____

GRADIENT: 8

5] Gradient (feet/mile): 33.4 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 64.5

Stream GREEN CREEK RM ______ Date 01/11/93 River Code ______

Location SITE -#7 SOUTH OF EUCLID AVE. AND UPPER VALLEY DRIVE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present); **SUBSTRATE SCORE: 17**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ______ ■■-GRAVEL [7] ____ ____
- ☐☐-BOULDER [9] ______ ☐☐-SAND [6] ✓ ✓
- ■■-COBBLE [8] ______ ☐☐-BEDROCK[5] ✓ ✓
- ☐☐-HARDPAN [4] ______ ☐☐-DETRITUS[3] ____ ____
- ☐☐-MUCK [2] ______ ☐☐-ARTIFIC.[0] ____ ____

Substrate Origin (Check all): ☐-LIMESTONE [1] ☐-RIP/RAP [0] ■-TILLS [1] ☐-HARDPAN [0] ☐-SANDSTONE [0] ☐-SHALE [-1] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and *AVERAGE*): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■ - SILT NORMAL [0] ☐ - SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and *AVERAGE*): ☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW [0] ☐—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐— <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

2] INSTREAM COVER — **COVER SCORE: 13**

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) — **CHANNEL: 12.5**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 7**

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 6**

MAX DEPTH (Check 1)

- ☐- >1m [6]
- ■- 0.7-1m [4]
- ☐- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ■-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL [-1] ☐-EDDIES [1]
- ☐-FAST [1] ☐-INTERSTITIAL [-1]
- ■-MODERATE [1] ☐-INTERMITTENT [-2]
- ■-SLOW [1]

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 5

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ■ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ■-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1] ☐-MODERATE [0]
- ■-LOW. [1] ☐-NONE [2]

☐-NO RIFFLE [0]

COMMENTS ______ **GRADIENT: 4**

6] Gradient (feet/mile): 102.7 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 55

Stream NINE MILE CREEK RM ______ Date 01/11/93 River Code ______

Location SITE-# 8A NORTH OF LAKE SHORE BOULEVARD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*);

SUBSTRATE SCORE: 9

TYPE — POOL RIFFLE

- ☐☐-BLDER /SLABS[10]
- ☐☐-BOULDER [9]
- ☐☐-COBBLE [8]
- ☐☐-HARDPAN [4]
- ■■-MUCK [2]
- ☐☐-GRAVEL [7]
- ■■-SAND [6]
- ☐☐-BEDROCK[5]
- ☐☐-DETRITUS[3] ✓
- ☐☐-ARTIFIC.[0]

SUBSTRATE QUALITY

Substrate Origin (Check all)

- ☐-LIMESTONE [1]
- ☐-RIP/RAP [0]
- ■-TILLS [1]
- ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and *AVERAGE*)

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

Extent Of Embeddness (Check One or check 2 and *AVERAGE*)

- ☐—EXTENSIVE [-2]
- ☐—MODERATE[-1]
- ■—LOW[0]
- ☐—NONE[1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■—<= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

2] INSTREAM COVER

COVER SCORE: 13

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ☐-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ☐-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

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

CHANNEL: 8

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: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 6

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)

- ☐☐-WIDE>50m [4]
- ☐☐-MODERATE 10-50 [3]
- ■■-NARROW 5-10m [2]
- ☐☐-VERY NARROW 1-5m [1]
- ☐☐-NONE[0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)

- ☐☐-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP[0]
- ■■- RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]

L R (Per Bank)

- ☐☐-URBAN OR INDUSTRIAL[0]
- ☐☐-SHRUB OR OLD FIELD[2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ■■-NONE OR LITTLE [3]
- ☐☐-MODERATE [2]
- ☐☐-HEAVY OR SEVERE[1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 9

MAX. DEPTH (Check 1)

- ■- >1m [6]
- ☐- 0.7-1m [4]
- ☐- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ■-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL[-1]
- ☐-FAST[1]
- ☐-MODERATE [1]
- ■-SLOW [1]
- ☐-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐- NO POOL[0]

COMMENTS: ______

RIFFLE: 0

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ☐-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1]
- ☐-MODERATE[0]
- ☐-LOW. [1]
- ☐-NONE[2]

■-NO RIFFLE[0]

COMMENTS ______

GRADIENT: 10

6] Gradient (feet/mile): 18 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 57

Stream NINE MILE CREEK RM ______ Date 01/12/93 River Code ______

Location SITE-#9 "NELA PARK" BRANCH Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*);

SUBSTRATE SCORE: 17

TYPE — POOL RIFFLE — POOL RIFFLE

- ☐☐-BLDER /SLABS[10] ______ ☐☐-GRAVEL [7] ______
- ☐☐-BOULDER [9] ______ ☐☐-SAND [6] ______
- ■■-COBBLE [8] ______ ■■-BEDROCK[5] ______
- ☐☐-HARDPAN [4] ______ ☐☐-DETRITUS[3] ______
- ☐☐-MUCK [2] ______ ☐☐-ARTIFIC.[0] ______

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐ <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

SUBSTRATE QUALITY

Substrate Origin (Check all)

- ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)

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

Extent Of Embeddness (Check One or check 2 and AVERAGE)

☐-EXTENSIVE [-2] ☐-MODERATE [-1] ☐-LOW [0] ■-NONE [1]

COMMENTS ______

COVER SCORE: 5

2] INSTREAM COVER

TYPE (Check *All* That Apply)

- ☐-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ☐-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

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

CHANNEL: 14

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

River Right Looking Downstream

RIPARIAN: 8

RIPARIAN WIDTH — L R (Per Bank)

- ☐☐-WIDE > 50m [4]
- ■■-MODERATE 10-50 [3]
- ☐☐-NARROW 5-10m [2]
- ☐☐-VERY NARROW 1-5m [1]
- ☐☐-NONE [0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)

- ☐■-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP [0]
- ■☐- RESID., PARK, NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]

L R (Per Bank)

- ☐☐-URBAN OR INDUSTRIAL [0]
- ☐☐-SHRUB OR OLD FIELD [2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ■ ■-NONE OR LITTLE [3]
- ☐ ☐-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE [1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 6

MAX DEPTH (Check 1)

- ☐- >1m [6]
- ☐- 0.7-1m [4]
- ■- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐- <0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ■-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL [-1] ☐-EDDIES [1]
- ■-FAST [1] ☐-INTERSTITIAL [-1]
- ■-MODERATE [1] ☐-INTERMITTENT [-2]
- ■-SLOW [1]

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 3

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm, MAX>50 [4]
- ☐ - GENERALLY >10 cm, MAX<50 [3]
- ■ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g., Cobble, Boulder) [2]
- ■-MOD. STABLE (e.g., Pea Gravel) [1]
- ☐-UNSTABLE (Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1] ☐-MODERATE [0]
- ■-LOW. [1] ☐-NONE [2]

☐-NO RIFFLE [0]

COMMENTS ______

GRADIENT: 4

6] Gradient (feet/mile): 201.8 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 58

Stream NINE MILE CREEK RM ____ Date 01/12/93 River Code ____

Location SITE - #10 UPSTREAM OF CULVERT, SOUTH OF BELVOIR Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all* types present):

SUBSTRATE SCORE: 19

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ____ ■■-GRAVEL [7] ____ ____
- ☐☐-BOULDER [9] ____ ☐☐-SAND [6] ✓ ____
- ■■-COBBLE [8] ____ ☐☐-BEDROCK[5] ✓ ✓
- ☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ____ ____
- ☐☐-MUCK [2] ____ ☐☐-ARTIFIC.[0] ____ ____

Substrate Origin (Check all)
☐-LIMESTONE [1] ☐-RIP/RAP [0]
■-TILLS [1] ☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and *AVERAGE*)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1]
☐-SILT NORMAL [0] ■-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and *AVERAGE*)
☐—EXTENSIVE [-2] ☐—MODERATE [-1]
☐—LOW [0] ■—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐— <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

COVER SCORE: 6

2] INSTREAM COVER

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ☐-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ____

CHANNEL: 14

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

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

COMMENTS: ____

RIPARIAN: 8

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)	EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank)	L R (Per Bank)	BANK EROSION
☐☐-WIDE > 50m [4]	■■-FOREST, SWAMP [3]	☐☐-URBAN OR INDUSTRIAL[0]	☐ ☐-NONE OR LITTLE [3]
■■-MODERATE 10-50 [3]	☐☐-OPEN PASTURE/ ROWCROP[0]	☐☐-SHRUB OR OLD FIELD[2]	■ ■-MODERATE [2]
☐☐-NARROW 5-10m [2]	☐☐- RESID.,PARK,NEW FIELD [1]	☐☐-CONSERV. TILLAGE [1]	☐ ☐-HEAVY OR SEVERE[1]
☐☐-VERY NARROW 1-5m [1]	☐☐-FENCED PASTURE [1]	☐☐-MINING/CONSTRUCTION [0]	
☐☐-NONE[0]			

COMMENTS: ____

POOL: 4

POOL/GLIDE AND RIFFLE/RUN QUALITY

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL[-1] ☐-EDDIES[1]
- ☐-FAST[1] ☐-INTERSTITIAL[-1]
- ■-MODERATE [1] ☐-INTERMITTENT[-2]
- ■-SLOW [1]

☐- NO POOL[0]

COMMENTS: ____

RIFFLE: 3

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ■ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS ____

GRADIENT: 4

6] Gradient (feet/mile): 76.3 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 70

Stream DUGWAY BROOK RM______ Date 01/19/93 River Code______

Location SITE # 12 AT LAKE SHORE BOULEVARD Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 17**

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐ ☐-BLDER /SLABS[10] ____ ____ ■ ■-GRAVEL [7] ____ ____ — Substrate Origin (Check all) — Silt Cover (Check One or check 2 and AVERAGE)
- ☐ ☐-BOULDER [9] ____ ____ ☐ ☐-SAND [6] ✓ ____ ☐-LIMESTONE [1] ☐-RIP/RAP [0] ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-
- ■ ■-COBBLE [8] ____ ____ ☐ ☐-BEDROCK[5] ____ ____ ■-TILLS [1] ☐-HARDPAN [0] ■-SILT NORMAL [0] ☐-SILT FREE [1
- ☐ ☐-HARDPAN [4] ____ ____ ☐ ☐-DETRITUS[3] ____ ____ ☐-SANDSTONE [0]
- ☐ ☐-MUCK [2] ✓ ____ ☐ ☐-ARTIFIC.[0] ____ ____ ☐-SHALE [-1] — Extent Of Embeddness (Check One or check 2 and AVERAGE)

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ <= 4 [0] ☐-COAL FINES [-2] ☐—EXTENSIVE [-2] ☐—MODERATE [-1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates) ■—LOW[0] ☐—NONE[1]

COMMENTS________

COVER SCORE: 14

2] INSTREAM COVER

TYPE (Check All That Apply) — AMOUNT (Check ONLY One or check 2 and AVERAGE)

- ■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1] ☐-EXTENSIVE > 75% [11]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1] ■-MODERATE 25-75% [7]
- ☐-SHALLOWS (IN SLOW WATER) [1] ☐-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1] ☐-SPARSE 5-25% [3]
- ☐-NEARLY ABSENT < 5% [1]

COMMENTS:________

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) **CHANNEL: 12**

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

COMMENTS:________

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 10**

River Right Looking Downstream

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

COMMENTS:________

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 9**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
■ >1m [6]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐ 0.7-1m [4]	☐-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
☐ 0.4-0.7m [2]	☐-POOL WIDTH < RIFFLE W. [0]	☐-MODERATE [1]	☐-INTERMITTENT[-2]
☐ < 0.4m [1]		■-SLOW [1]	
☐—<0.2m [Pool = 0]			

☐-NO POOL[0]

COMMENTS:________

RIFFLE: 0

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐-GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	☐-MODERATE[0]
☐-GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
☐-GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		■-NO RIFFLE[0]
☐-GENERALLY < 5 cm [Riffle = 0]			

COMMENTS________ **GRADIENT: 8**

6] Gradient (feet/mile): 23.8 %POOL:______ %RIFFLE:______ %RUN:______

Ohio EPA Site Description Sheet QHEI SCORE: 63

Stream DUGWAY BROOK RM ____ Date 01/15/93 River Code ____

Location SITE - #14 WEST BRANCH, AT LAKEVIEW CEMETERY Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); SUBSTRATE SCORE: 18

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐ ☐-BLDER /SLABS[10] ____ ____ ■ ■-GRAVEL [7] ____ ✓
- ☐ ☐-BOULDER [9] ✓ ✓ ☐ ☐-SAND [6] ✓ ✓
- ■ ■-COBBLE [8] ____ ____ ☐ ☐-BEDROCK[5] ____ ____
- ☐ ☐-HARDPAN [4] ____ ____ ☐ ☐-DETRITUS[3] ____ ____
- ☐ ☐-MUCK [2] ____ ____ ☐ ☐-ARTIFIC.[0] ____ ____

Substrate Origin (Check all): ☐-LIMESTONE [1] ☐-RIP/RAP [0] ■-TILLS [1] ☐-HARDPAN [0] ☐-SANDSTONE [0] ☐-SHALE [-1] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [- ☐ - SILT NORMAL [0] ■ - SILT FREE [1]

Extent Of Embeddedness (Check One c check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE [-1 ■—LOW [0] ☐—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ — <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

2] INSTREAM COVER COVER SCORE: 13

TYPE (Check All That Apply)

- ■ -UNDERCUT BANKS [1]
- ■ -OVERHANGING VEGETATION [1]
- ☐ -SHALLOWS (IN SLOW WATER) [1]
- ☐ -DEEP POOLS [2]
- ■ -ROOTWADS [1]
- ■ -BOULDERS [1]
- ☐ -OXBOWS [1]
- ■ -AQUATIC MACROPHYTES [1]
- ■ -LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) CHANNEL: 11.5

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) RIPARIAN: 10

"River Right Looking Downstream"

RIPARIAN WIDTH — L R (Per Bank)

- ■ ■-WIDE > 50m [4]
- ☐ ☐-MODERATE 10-50 [3]
- ☐ ☐-NARROW 5-10m [2]
- ☐ ☐-VERY NARROW 1-5m [1]
- ☐ ☐-NONE [0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank) / L R (Per Bank)

- ■ ■-FOREST, SWAMP [3]
- ☐ ☐-OPEN PASTURE/ ROWCROP [0]
- ☐ ☐- RESID.,PARK,NEW FIELD [1]
- ☐ ☐-FENCED PASTURE [1]
- ☐ ☐-URBAN OR INDUSTRIAL [0]
- ☐ ☐-SHRUB OR OLD FIELD [2]
- ☐ ☐-CONSERV. TILLAGE [1]
- ☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ■ ■-NONE OR LITTLE [3]
- ☐ ☐-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE [1]

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY POOL: 3

MAX. DEPTH (Check 1)

- ☐- >1m [6]
- ☐- 0.7-1m [4]
- ☐- 0.4-0.7m [2]
- ■- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ■-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)

- ☐-TORRENTIAL [-1]
- ☐-FAST [1]
- ☐-MODERATE [1]
- ■-SLOW [1]
- ☐-EDDIES [1]
- ☐-INTERSTITIAL [-1]
- ☐-INTERMITTENT [-2]

☐- NO POOL [0]

COMMENTS: ____

RIFFLE: 3.5

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ■ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ■-STABLE (e.g.,Cobble, Boulder) [2]
- ☐-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1]
- ■-MODERATE [0]
- ■-LOW. [1]
- ☐-NONE [2]

☐-NO RIFFLE [0]

COMMENTS ____ GRADIENT: 4

6] Gradient (feet/mile): 111.2 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 64

Stream DUGWAY BROOK RM ______ Date 01 | 15 | 93 River Code ______
Location SITE- #15 EAST BRANCH AT CUMBERLAND PARK Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present); **SUBSTRATE SCORE: 17**

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ✓ ✓ ■■-GRAVEL [7] ___ ✓ Substrate Origin (Check all) — Silt Cover (Check One or check 2 and AVERAGE)
- ☐☐-BOULDER [9] ___ ___ ☐☐-SAND [6] ___ ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0] ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-
- ■■-COBBLE [8] ___ ✓ ☐☐-BEDROCK[5] ✓ ✓ ■-TILLS [1] ☐-HARDPAN [0] ■-SILT NORMAL [0] ☐-SILT FREE [1]
- ☐☐-HARDPAN [4] ___ ___ ☐☐-DETRITUS[3] ___ ___ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ___ ___ ☐☐-ARTIFIC.[0] ___ ___ ☐-SHALE [-1] — Extent Of Embeddedness (Check One or check 2 and AVERAGE)

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ <= 4 [0] ☐-COAL FINES [-2] — ☐-EXTENSIVE [-2] ☐-MODERATE [-1]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates) — ■-LOW [0] ☐-NONE [1]
COMMENTS ______

COVER SCORE: 13

2] INSTREAM COVER

TYPE (Check *All* That Apply) — AMOUNT (Check *ONLY* One or check 2 and *AVERAGE*)

- ■-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1] ☐-EXTENSIVE > 75% [11]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1] ■-MODERATE 25-75% [7]
- ☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1] ☐-SPARSE 5-25% [3]
- ☐-NEARLY ABSENT < 5% [1]

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 13.5**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 6.5**
River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 6**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
☐- >1m [6]			
☐- 0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL [-1]	☐-EDDIES [1]
■- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST [1]	☐-INTERSTITIAL [-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT [-2]
☐- <0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 4

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐-GENERALLY >10 cm,MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	☐-MODERATE [0]
☐-GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	■-LOW. [1]	☐-NONE [2]
■-GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		
☐-GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE [0]

COMMENTS ______ **GRADIENT: 4**

6] Gradient (feet/mile): 166.9 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 56.5

Stream DOAN BROOK RM ______ Date 02/02/93 River Code ______
Location SITE #16 NORTH OF ST. CLAIR AVENUE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present);

SUBSTRATE SCORE: 15.5

TYPE	POOL RIFFLE	TYPE	POOL RIFFLE	SUBSTRATE QUALITY
☐☐-BLDER /SLABS[10]	___ ___	■■-GRAVEL [7]	___ ___	Substrate Origin (Check all)
☐☐-BOULDER [9]	✓ ✓	☐☐-SAND [6]	✓ ___	☐-LIMESTONE [1] ☐-RIP/RAP [0]
■■-COBBLE [8]	___ ___	☐☐-BEDROCK[5]	___ ___	■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]	___ ___	☐☐-DETRITUS[3]	___ ___	☐-SANDSTONE [0]
☐☐-MUCK [2]	___ ___	☐☐-ARTIFIC.[0]	✓ ___	☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ■-SILT MODERATE [-] ☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
☐—EXTENSIVE [-2] ■—MODERATE [-] ■—LOW [0] ☐—NONE [1]

COMMENTS ______

COVER SCORE: 5

2] INSTREAM COVER

TYPE (Check *All* That Apply)

☐-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
☐-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1]
☐-SHALLOWS (IN SLOW WATER) [1] ☐-BOULDERS [1] ☐-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

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

CHANNEL: 10

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 7

"River Right Looking Downstream"

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 7

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
☐- >1m [6]			
■- 0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	☐-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 2

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ■-MODERATE[0]
☐ - GENERALLY >10 cm,MAX<50 [3]	■-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1] ☐-NONE[2]
■ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]	☐-NO RIFFLE[0]
☐ - GENERALLY < 5 cm [Riffle = 0]		

COMMENTS ______

GRADIENT: 10

6] Gradient (feet/mile): 15.8 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 70.5

Stream DOAN BROOK RM ____ Date 02/02/93 River Code ____

Location SITE #17 NORTH OF CLEVELAND ART MUSEUM Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*);

SUBSTRATE SCORE: 19

TYPE POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

☐☐-BLDER /SLABS[10] ____ ☐☐-GRAVEL [7] ✓ ✓ Substrate Origin (Check all)

■■-BOULDER [9] ____ ☐☐-SAND [6] ✓ ____ ☐-LIMESTONE [1] ☐-RIP/RAP [0]

■■-COBBLE [8] ____ ☐☐-BEDROCK[5] ____ ✓ ■-TILLS [1] ☐-HARDPAN [0]

☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ____ ☐-SANDSTONE [0]

☐☐-MUCK [2] ____ ☐☐-ARTIFIC.[0] ____ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ — <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

Silt Cover (Check One or check 2 and *AVERAGE*)

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

Extent Of Embeddedness (Check One or check 2 and *AVERAGE*)

☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW[0] ☐—NONE[1]

COVER SCORE: 14

2] INSTREAM COVER

TYPE (Check *All* That Apply)

■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]

■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]

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

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

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

COMMENTS: ____

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

CHANNEL: 14

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 5.5

River Right Looking Downstream

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

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 9

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
■- >1m [6]			
☐- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐- 0.4-0.7m [2]	■-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		☐-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ____

RIFFLE: 5

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	■-MODERATE[0]
■ - GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
☐ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		
☐ - GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS ____

GRADIENT: 4

6] Gradient (feet/mile): 55.6 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 61.5

Stream DOAN BROOK RM ______ Date 02/02/93 River Code ______

Location SITE-#18 N. BRANCH AT SHAKER LAKES NATURE CENTER Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*);

SUBSTRATE SCORE: 15

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

☐☐-BLDER /SLABS[10] ______ ■■-GRAVEL [7] ______ Substrate Origin (Check all)

☐☐-BOULDER [9] ______ ■■-SAND [6] ______ ☐-LIMESTONE [1] ☐-RIP/RAP [0]

☐☐-COBBLE [8] ✓ ☐☐-BEDROCK[5] ______ ■-TILLS [1] ☐-HARDPAN [0]

☐☐-HARDPAN [4] ______ ☐☐-DETRITUS[3] ______ ☐-SANDSTONE [0]

☐☐-MUCK [2] ______ ☐☐-ARTIFIC.[0] ______ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■-<= 4 [0] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-
■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
☐-EXTENSIVE [-2] ☐-MODERATE [-
☐-LOW[0] ■-NONE[1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

COVER SCORE: 11

2] INSTREAM COVER

TYPE (Check *All* That Apply)

■-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]

■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]

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

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

COMMENTS: ______

CHANNEL: 14

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

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

COMMENTS: ______

RIPARIAN: 10

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)	EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank)	L R (Per Bank)	BANK EROSION
■■-WIDE>50m [4]	■■-FOREST, SWAMP [3]	☐☐-URBAN OR INDUSTRIAL[0]	■■-NONE OR LITTLE [3]
☐☐-MODERATE 10-50 [3]	☐☐-OPEN PASTURE/ ROWCROP[0]	☐☐-SHRUB OR OLD FIELD[2]	☐☐-MODERATE[2]
☐☐-NARROW 5-10m [2]	☐☐-RESID.,PARK,NEW FIELD [1]	☐☐-CONSERV. TILLAGE [1]	☐☐-HEAVY OR SEVERE[1]
☐☐-VERY NARROW 1-5m [1]	☐☐-FENCED PASTURE [1]	☐☐-MINING/CONSTRUCTION [0]	
☐☐-NONE[0]			

COMMENTS: ______

POOL: 5

POOL/GLIDE AND RIFFLE/RUN QUALITY

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
☐-TORRENTIAL[-1] ☐-EDDIES[1]
☐-FAST[1] ☐-INTERSTITIAL[-1]
■-MODERATE [1] ☐-INTERMITTENT[-2]
■-SLOW [1]

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 2.5

RIFFLE/RUN DEPTH
☐-GENERALLY >10 cm,MAX>50 [4]
☐-GENERALLY >10 cm,MAX<50 [3]
☐-GENERALLY 5-10 cm [1]
■-GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS ______

GRADIENT: 4

6] Gradient (feet/mile): 58 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 64

Stream DOAN BROOK RM______ Date 02/02/93 River Code______

Location SITE - # 19 S. BRANCH AT SHAKER LAKES NATURE CENTER Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present);

SUBSTRATE SCORE: 16

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ______ ■■-GRAVEL [7] ______ Substrate Origin (Check all)
- ☐☐-BOULDER [9] ______ ☐☐-SAND [6] ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■■-COBBLE [8] ______ ☐☐-BEDROCK[5] ______ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ______ ☐☐-DETRITUS[3] ______ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ______ ☐☐-ARTIFIC.[0] ______ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐ > 4 [1] ■ <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■ - SILT NORMAL [0] ☐ - SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE)
☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW [0] ☐—NONE [1]

COMMENTS______

COVER SCORE: 12

2] INSTREAM COVER

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ☐-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS:______

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

CHANNEL: 13

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

COMMENTS:______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 10

River Right Looking Downstream

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

COMMENTS:______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 6

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL[-1] ☐-EDDIES[1]
- ☐-FAST[1] ☐-INTERSTITIAL[-1]
- ■-MODERATE [1] ☐-INTERMITTENT[-2]
- ■-SLOW [1]

☐-NO POOL[0]

COMMENTS:______

RIFFLE: 3

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ■ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS______

GRADIENT: 4

6] Gradient (feet/mile): 47.6 %POOL:______ %RIFFLE:______ %RUN:______

Ohio EPA Site Description Sheet

QHEI SCORE: 62

Stream CUYAHOGA RIVER RM 7.1 Date 07/03/91 River Code ____

Location SITE -# 22.51 DOWNSTREAM of LOWER HARVARD BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all* types present);

SUBSTRATE SCORE: 14

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ____ ☐■-GRAVEL [7] ✓ ✓ — Substrate Origin (Check all)
- ☐☐-BOULDER [9] ✓ ✓ ☐☐-SAND [6] ____ ☐-LIMESTONE [1] ■-RIP/RAP [0]
- ☐■-COBBLE [8] ____ ☐☐-BEDROCK[5] ____ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ____ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ____ ☐☐-ARTIFIC.[0] ✓ ✓ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■— <= 4 [0] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ■-SILT MODERATE [- ■ - SILT NORMAL [0] ☐ - SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ■—EXTENSIVE [-2] ■—MODERATE[-1 ☐—LOW[0] ☐—NONE[1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

2] INSTREAM COVER

COVER SCORE: 10

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
- ☐-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ■-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ____

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

CHANNEL: 13

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 4.5

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)

- ☐☐-WIDE>50m [4]
- ☐☐-MODERATE 10-50 [3]
- ☐■-NARROW 5-10m [2]
- ■☐-VERY NARROW 1-5m [1]
- ☐☐-NONE[0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)

- ☐☐-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP[0]
- ☐☐- RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]

L R (Per Bank)

- ■■-URBAN OR INDUSTRIAL[0]
- ☐☐-SHRUB OR OLD FIELD[2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ■ ■-NONE OR LITTLE [3]
- ☐ ☐-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE[1]

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 9

MAX. DEPTH (Check 1)

- ■- >1m [6]
- ☐- 0.7-1m [4]
- ☐- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ■-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL[-1] ☐-EDDIES[1]
- ☐-FAST[1] ☐-INTERSTITIAL[-1]
- ■-MODERATE [1] ☐-INTERMITTENT[-2]
- ☐-SLOW [1]

☐- NO POOL[0]

COMMENTS: ____

RIFFLE: 3.5

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ■ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ■-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ■-EXTENSIVE [-1] ■-MODERATE[0]
- ☐-LOW. [1] ☐-NONE[2]

☐-NO RIFFLE[0]

COMMENTS ____

GRADIENT: 8

6] Gradient (feet/mile): .9 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet QHEI SCORE: 45.5

Stream CUYAHOGA RIVER RM 7.9 Date 02/05/93 River Code ____

Location SITE-#22.6 RIVER SMELTING Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); SUBSTRATE SCORE: 6

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ____ ☐☐-GRAVEL [7] ____ Substrate Origin (Check all)
- ☐☐-BOULDER [9] ____ ☐■-SAND [6] ____ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ☐☐-COBBLE [8] ____ ☐☐-BEDROCK[5] ____ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ____ ☐-SANDSTONE [0]
- ☐■-MUCK [2] ____ ☐☐-ARTIFIC.[0] √ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■<= 4 [0] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ■-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ■—MODERATE [-1] ☐—LOW[0] ☐—NONE[1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS____

2] INSTREAM COVER COVER SCORE: 9

TYPE (Check All That Apply)

- ☐-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ☐-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ☐-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ■-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS:____

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) CHANNEL: 13

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

COMMENTS:____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) RIPARIAN: 5.5

River Right Looking Downstream

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

COMMENTS:____

POOL/GLIDE AND RIFFLE/RUN QUALITY POOL: 8

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
■- >1m [6]			
☐- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		☐-SLOW [1]	

☐-NO POOL[0]

COMMENTS:____

RIFFLE: 0

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	☐-MODERATE[0]
☐ - GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
☐ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		
☐ - GENERALLY < 5 cm [Riffle = 0]			

■-NO RIFFLE[0]

COMMENTS____ GRADIENT: 4

6] Gradient (feet/mile): .9 %POOL:____ %RIFFLE:____ %RUN:____

Ohio EPA Site Description Sheet

QHEI SCORE: 54

Stream CUYAHOGA RIVER RM 9.7 Date 02/08/93 River Code ____
Location SITE - # 22.7 SOUTHWEST INTERCEPTOR Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*): **SUBSTRATE SCORE:** 8.5

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ____ ☐☐-GRAVEL [7] ____ ____
- ☐☐-BOULDER [9] ____ ☐■-SAND [6] ____ ____
- ☐☐-COBBLE [8] ____ ☐☐-BEDROCK[5] ____ ____
- ☐☐-HARDPAN [4] ____ ☐■-DETRITUS[3] ____ ____
- ☐☐-MUCK [2] ____ ✓ ☐☐-ARTIFIC.[0] ____ ____

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ — <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

Substrate Origin (Check all)
- ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ✓ ☐-SANDSTONE [0]
- ✓ ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)
- ■-SILT HEAVY [-2] ■-SILT MODERATE [
- ☐ - SILT NORMAL [0] ☐ - SILT FREE [

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
- ☐—EXTENSIVE [-2] ■—MODERATE [
- ☐—LOW [0] ☐—NONE [1]

COVER SCORE: 13

2] INSTREAM COVER

TYPE (Check *All* That Apply)
- ■ -UNDERCUT BANKS [1]
- ■ -OVERHANGING VEGETATION [1]
- ☐ -SHALLOWS (IN SLOW WATER) [1]
- ■ -DEEP POOLS [2]
- ■ -ROOTWADS [1]
- ☐ -BOULDERS [1]
- ☐ -OXBOWS [1]
- ☐ -AQUATIC MACROPHYTES [1]
- ■ -LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL:** 13.5

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN:** 7

"River Right Looking Downstream"

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)
- ■■-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP[0]
- ☐☐- RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]

L R (Per Bank)
- ☐☐-URBAN OR INDUSTRIAL[0]
- ☐☐-SHRUB OR OLD FIELD[2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
- ☐ ☐-NONE OR LITTLE [3]
- ☐ ☐-MODERATE [2]
- ■ ■-HEAVY OR SEVERE[1]

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL:** 8

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

MORPHOLOGY (Check 1)
- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL[-1]
- ■-FAST[1]
- ■-MODERATE [1]
- ☐-SLOW [1]
- ☐-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐- NO POOL[0]

COMMENTS: ____

RIFFLE: 0

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

■-NO RIFFLE[0]

COMMENTS ____ **GRADIENT:** 4

6] Gradient (feet/mile): .9 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 61

Stream CUYAHOGA RIVER RM 11.3 Date 02/08/93 River Code
Location SITE - # 22.8 SOUTHERLY CHLORINE ACCESS R.R. BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present); **SUBSTRATE SCORE: 14**

TYPE	POOL RIFFLE	TYPE	POOL RIFFLE	SUBSTRATE QUALITY
☐☐-BLDER/SLABS[10]	___ ___	☐■-GRAVEL [7]	___ ___	Substrate Origin (Check all)
☐☐-BOULDER [9]	___ ✓	☐■-SAND [6]	___ ___	☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐☐-COBBLE [8]	___ ___	☐☐-BEDROCK[5]	___ ___	■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]	___ ___	☐☐-DETRITUS[3]	✓ ___	☐-SANDSTONE [0]
☐☐-MUCK [2]	___ ___	☐☐-ARTIFIC.[0]	✓ ___	☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐— <= 4 [0] ☐-COAL FINES [-2]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS

Silt Cover (Check One or check 2 and AVERAGE): ■-SILT HEAVY [-2] ■-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW [0] ☐—NONE [1]

2] INSTREAM COVER — **COVER SCORE: 15**

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ☐-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ■-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS:

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) — **CHANNEL: 14**

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

COMMENTS:

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 6**
River Right Looking Downstream

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

COMMENTS:

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 8**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
■- >1m [6]			
☐- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		☐-SLOW [1]	

☐- NO POOL[0]

COMMENTS:

RIFFLE: 0

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐- GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ☐-MODERATE[0]
☐- GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1] ☐-NONE[2]
☐- GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]	■-NO RIFFLE[0]
☐- GENERALLY < 5 cm [Riffle = 0]		

COMMENTS

GRADIENT: 4

6] Gradient (feet/mile): .9 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 59

Stream CUYAHOGA RIVER RM 11.7 Date 07/03/91 River Code ______
Location SITE - # 22.9 EAST 71ST STREET AND CANAL ROAD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*);

SUBSTRATE SCORE: 11.5

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

- ☐ ☐-BLDER /SLABS[10] ______ ☐ ■-GRAVEL [7] ______
- ☐ ☐-BOULDER [9] ______ ☐ ■-SAND [6] ______
- ☐ ☐-COBBLE [8] ______ ☐ ☐-BEDROCK[5] ______
- ☐ ☐-HARDPAN [4] ✓ ✓ ☐ ☐-DETRITUS[3] ______
- ☐ ☐-MUCK [2] ______ ☐ ☐-ARTIFIC.[0] ______

Substrate Origin (Check all)
- ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)
- ☐-SILT HEAVY [-2] ■-SILT MODERATE [-1]
- ☐ - SILT NORMAL [0] ☐ - SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE)
- ■-EXTENSIVE [-2] ■-MODERATE[-1]
- ☐-LOW[0] ☐-NONE[1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■ <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

2] INSTREAM COVER

COVER SCORE: 10

TYPE (Check *All* That Apply)
- ☐ -UNDERCUT BANKS [1]
- ☐ -OVERHANGING VEGETATION [1]
- ■ -SHALLOWS (IN SLOW WATER) [1]
- ■ -DEEP POOLS [2]
- ■ -ROOTWADS [1]
- ☐ -BOULDERS [1]
- ☐ -OXBOWS [1]
- ☐ -AQUATIC MACROPHYTES [1]
- ■ -LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

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

CHANNEL: 14.5

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

COMMENTS: ______

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

RIPARIAN: 4.5

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY
L R (Most Predominant Per Bank)
- ☐ ☐-FOREST, SWAMP [3]
- ☐ ☐-OPEN PASTURE/ ROWCROP[0]
- ☐ ☐- RESID.,PARK,NEW FIELD [1]
- ☐ ☐-FENCED PASTURE [1]

L R (Per Bank)
- ■ ■-URBAN OR INDUSTRIAL[0]
- ☐ ☐-SHRUB OR OLD FIELD[2]
- ☐ ☐-CONSERV. TILLAGE [1]
- ☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION
- ■ ■-NONE OR LITTLE [3]
- ☐ ☐-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE[1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 6

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐ -TORRENTIAL[-1] ☐ -EDDIES[1]
- ■ -FAST[1] ☐ -INTERSTITIAL[-1]
- ■ -MODERATE [1] ☐ -INTERMITTENT[-2]
- ☐ -SLOW [1]

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 4.5

RIFFLE/RUN DEPTH
- ■ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS ______

GRADIENT: 8

6] Gradient (feet/mile): .9 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 81

Stream CUYAHOGA RIVER RM 16.8 Date 08/15/91 River Code ______
Location SITE #23 RIVERVIEW ROAD BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present); **SUBSTRATE SCORE: 17**

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ____ ✓ ☐■-GRAVEL [7] ____ ____
- ☐☐-BOULDER [9] ____ ✓ ☐☐-SAND [6] ____ ____
- ☐■-COBBLE [8] ____ ☐☐-BEDROCK[5] ____ ____
- ☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ____ ____
- ☐☐-MUCK [2] ____ ☐☐-ARTIFIC.[0] ____ ____

Substrate Origin (Check all): ☐-LIMESTONE [1] ☐-RIP/RAP [0] ■-TILLS [1] ☐-HARDPAN [0] ☐-SANDSTONE [0] ☐-SHALE [-1] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW [0] ☐—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐—<= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

2] INSTREAM COVER **COVER SCORE: 13**

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 14.5**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 9**

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 12**

MAX. DEPTH (Check 1)

- ■- >1m [6]
- ☐- 0.7-1m [4]
- ☐- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ■-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL[-1]
- ■-FAST[1]
- ■-MODERATE [1]
- ■-SLOW [1]
- ■-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 5.5

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ■ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ■-STABLE (e.g.,Cobble, Boulder) [2]
- ☐-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1]
- ■-MODERATE[0]
- ■-LOW. [1]
- ☐-NONE[2]

☐-NO RIFFLE[0]

COMMENTS ______ **GRADIENT: 10**

6] Gradient (feet/mile): 5.9 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 67

Stream CUYAHOGA RIVER RM 20.8 Date 01/20/93 River Code ____

Location SITE - # 24 STATION ROAD BRIDGE Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 15**

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE QUALITY
☐☐-BLDER/SLABS[10]			■■-GRAVEL [7]		✓	Substrate Origin (Check all)
☐☐-BOULDER [9]	✓	✓	☐☐-SAND [6]	✓		☐-LIMESTONE [1] ☐-RIP/RAP [0]
■■-COBBLE [8]		✓	☐☐-BEDROCK[5]			■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]			☐☐-DETRITUS[3]			☐-SANDSTONE [0]
☐☐-MUCK [2]			☐☐-ARTIFIC.[0]			☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ■-SILT MODERATE [- ☐ - SILT NORMAL [0] ☐ - SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ■—MODERATE [-1] ☐—LOW [0] ☐—NONE [1]

COMMENTS ____

COVER SCORE: 11

2] INSTREAM COVER

TYPE (Check All That Apply)

- ☐ -UNDERCUT BANKS [1] ■ -DEEP POOLS [2] ☐ -OXBOWS [1]
- ■ -OVERHANGING VEGETATION [1] ■ -ROOTWADS [1] ■ -AQUATIC MACROPHYTES [1]
- ☐ -SHALLOWS (IN SLOW WATER) [1] ■ -BOULDERS [1] ☐ -LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) **CHANNEL: 14**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 6**

River Right Looking Downstream

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

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 7**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
■- >1m [6]			
☐- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	■-POOL WIDTH < RIFFLE W. [0]	☐-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		☐-SLOW [1]	

☐- NO POOL[0]

COMMENTS: ____

RIFFLE: 4

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ■-MODERATE[0]
■ - GENERALLY >10 cm,MAX<50 [3]	■-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1] ☐-NONE[2]
☐ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]	☐-NO RIFFLE[0]
☐ - GENERALLY < 5 cm [Riffle = 0]		

COMMENTS ____ **GRADIENT: 10**

6] Gradient (feet/mile): 5.9 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 53.5

Stream CUYAHOGA RIVER RM 33.2 Date 01/20/93 River Code ______
Location SITE #24.5 BOLANZ ROAD Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present);

SUBSTRATE SCORE: 5

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ☐☐-GRAVEL [7]
- ☐☐-BOULDER [9] ■■-SAND [6]
- ☐☐-COBBLE [8] ✓ ☐☐-BEDROCK[5]
- ☐☐-HARDPAN [4] ☐☐-DETRITUS[3]
- ☐☐-MUCK [2] ☐☐-ARTIFIC.[0]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐-> 4 [1] ■-<= 4 [0]

Substrate Origin (Check all): ☐-LIMESTONE [1] ☐-RIP/RAP [0] ■-TILLS [1] ☐-HARDPAN [0] ☐-SANDSTONE [0] ☐-SHALE [-1] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ■-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE): ☐-EXTENSIVE [-2] ☐-MODERATE [-1] ■-LOW [0] ☐-NONE [1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS ______

COVER SCORE: 14

2] INSTREAM COVER

TYPE (Check All That Apply)

- ■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ______

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

CHANNEL: 12

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 5.5

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)

- ■■-WIDE >50m [4]
- ☐☐-MODERATE 10-50 [3]
- ☐☐-NARROW 5-10m [2]
- ☐☐-VERY NARROW 1-5m [1]
- ☐☐-NONE [0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank) / L R (Per Bank)

- ☐☐-FOREST, SWAMP [3] ☐☐-URBAN OR INDUSTRIAL [0]
- ■■-OPEN PASTURE/ ROWCROP [0] ☐☐-SHRUB OR OLD FIELD [2]
- ☐☐-RESID.,PARK,NEW FIELD [1] ☐☐-CONSERV. TILLAGE [1]
- ☐☐-FENCED PASTURE [1] ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ☐ ☐-NONE OR LITTLE [3]
- ☐ ■-MODERATE [2]
- ■ ☐-HEAVY OR SEVERE [1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 7

MAX DEPTH (Check 1)

- ■->1m [6]
- ☐-0.7-1m [4]
- ☐-0.4-0.7m [2]
- ☐-< 0.4m [1]
- ☐-<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ■-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)

- ☐-TORRENTIAL [-1] ☐-EDDIES [1]
- ☐-FAST [1] ☐-INTERSTITIAL [-1]
- ■-MODERATE [1] ☐-INTERMITTENT [-2]
- ☐-SLOW [1]

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 0

RIFFLE/RUN DEPTH

- ☐-GENERALLY >10 cm,MAX>50 [4]
- ☐-GENERALLY >10 cm,MAX<50 [3]
- ☐-GENERALLY 5-10 cm [1]
- ■-GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ☐-MOD. STABLE (e.g.,Pea Gravel) [1]
- ■-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1] ☐-MODERATE [0]
- ☐-LOW. [1] ☐-NONE [2]

☐-NO RIFFLE [0]

COMMENTS ______

GRADIENT: 10

6] Gradient (feet/mile): 4.7 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 59.5

Stream BIG CREEK RM ______ Date 09/19/93 River Code ______

Location SITE-#25 AT JENNINGS ROAD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all* types present);

SUBSTRATE SCORE: 18

TYPE POOL RIFFLE

- ☐ ■-BLDER /SLABS[10] ___ ✓
- ☐ ☐-BOULDER [9] ___ ___
- ☐ ■-COBBLE [8] ___ ___
- ☐ ☐-HARDPAN [4] ___ ___
- ☐ ☐-MUCK [2] ___ ✓

POOL RIFFLE

- ☐ ☐-GRAVEL [7] ___ ___
- ☐ ☐-SAND [6] ___ ___
- ☐ ☐-BEDROCK[5] ___ ___
- ☐ ☐-DETRITUS[3] ___ ___
- ☐ ☐-ARTIFIC.[0] ___ ___

SUBSTRATE QUALITY

Substrate Origin (Check all)

- ☐-LIMESTONE [1] ■-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)

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

Extent Of Embeddedness (Check One or check 2 and AVERAGE)

- ☐—EXTENSIVE [-2] ■—MODERATE [-
- ☐—LOW [0] ☐—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐ > 4 [1] ■ — <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

COVER SCORE: 7

2] INSTREAM COVER

TYPE (Check *All* That Apply)

- ☐ -UNDERCUT BANKS [1]
- ☐ -OVERHANGING VEGETATION [1]
- ■ -SHALLOWS (IN SLOW WATER) [1]
- ■ -DEEP POOLS [2]
- ☐ -ROOTWADS [1]
- ■ -BOULDERS [1]
- ☐ -OXBOWS [1]
- ■ -AQUATIC MACROPHYTES [1]
- ☐ -LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

CHANNEL: 6.5

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
- ■ - ONE SIDE CHANNEL MODIFICATIONS
- ☐ - IMPOUND.
- ☐ - ISLANDS
- ☐ - LEVEED
- ☐ - BANK SHAPING

COMMENTS: ______

RIPARIAN: 4

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)

- ☐ ☐-WIDE > 50m [4]
- ☐ ☐-MODERATE 10-50 [3]
- ☐ ☐-NARROW 5-10m [2]
- ■ ■-VERY NARROW 1-5m [1]
- ☐ ☐-NONE [0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY

L R (Most Predominant Per Bank)

- ☐ ☐-FOREST, SWAMP [3]
- ☐ ☐-OPEN PASTURE/ ROWCROP [0]
- ☐ ☐- RESID.,PARK,NEW FIELD [1]
- ☐ ☐-FENCED PASTURE [1]

L R (Per Bank)

- ■ ■-URBAN OR INDUSTRIAL [0]
- ☐ ☐-SHRUB OR OLD FIELD [2]
- ☐ ☐-CONSERV. TILLAGE [1]
- ☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ■ ■-NONE OR LITTLE [3]
- ☐ ☐-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE [1]

COMMENTS: ______

POOL: 11

POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1)

- ■ >1m [6]
- ☐ 0.7-1m [4]
- ☐ 0.4-0.7m [2]
- ☐ < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ■-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL [-1]
- ■-FAST [1]
- ☐-MODERATE [1]
- ■-SLOW [1]
- ■-EDDIES [1]
- ☐-INTERSTITIAL [-1]
- ☐-INTERMITTENT [-2]

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 5

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ■ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ■-STABLE (e.g.,Cobble, Boulder) [2]
- ☐-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1] ■-MODERATE [0]
- ☐-LOW. [1] ☐-NONE [2]

☐-NO RIFFLE [0]

COMMENTS ______

GRADIENT: 8

6] Gradient (feet/mile): 24.4 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 67

Stream BIG CREEK RM ______ Date 09|23|91 River Code ______

Location SITE-#26 E. BRANCH, UPSTREAM OF CONFLUENCE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all* types present); **SUBSTRATE SCORE: 17**

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE QUALITY
☐■-BLDER /SLABS[10]	✓	✓	☐☐-GRAVEL [7]			Substrate Origin (Check all)
☐☐-BOULDER [9]	✓	✓	☐☐-SAND [6]			☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐☐-COBBLE [8]	✓		☐■-BEDROCK[5]	✓	✓	■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]			☐☐-DETRITUS[3]			☐-SANDSTONE [0]
☐☐-MUCK [2]		✓	☐☐-ARTIFIC.[0]		✓	☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐— <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■-SILT NORMAL [0] ■-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ■—MODERATE [-1] ■—LOW [0] ☐—NONE [1]

COMMENTS ______

2] INSTREAM COVER **COVER SCORE: 8**

TYPE (Check *All* That Apply)

☐-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]
☐-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
■-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 12**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 7.5**

"River Right Looking Downstream"

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 7**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
☐->1m [6]			
☐-0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL [-1]	■-EDDIES [1]
■-0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST [1]	☐-INTERSTITIAL [-1]
☐-< 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	☐-MODERATE [1]	☐-INTERMITTENT [-2]
☐—<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 5.5

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐-GENERALLY >10 cm, MAX>50 [4]	■-STABLE (e.g., Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ■-MODERATE [0]
■-GENERALLY >10 cm, MAX<50 [3]	☐-MOD. STABLE (e.g., Pea Gravel) [1]	■-LOW. [1] ☐-NONE [2]
☐-GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel, Sand) [0]	☐-NO RIFFLE [0]
☐-GENERALLY < 5 cm [Riffle = 0]		

COMMENTS ______ **GRADIENT: 10**

6] Gradient (feet/mile): 16.0 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 62

Stream BIG CREEK RM ____ Date 01/26/93 River Code ____
Location SITE-#27 WEST BRANCH UPSTREAM of CONFLUENCE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*); **SUBSTRATE SCORE: 16.5**

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- ☐☐-BLDER/SLABS[10] ____ ☐☐-GRAVEL[7] ✓ ✓ — Substrate Origin (Check all)
- ■■-BOULDER [9] ____ ☐☐-SAND [6] ____ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■■-COBBLE [8] ____ ☐☐-BEDROCK[5] ✓ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ____ ☐☐-ARTIFIC.[0] ✓ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐—<= 4 [0] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ■-SILT MODERATE [- ☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ■—EXTENSIVE [-2] ■—MODERATE [-1 ☐—LOW [0] ☐—NONE [1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS ____

2] INSTREAM COVER — **COVER SCORE: 13**

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) — **CHANNEL: 12**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 7**
River Right Looking Downstream

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

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 3**

MAX. DEPTH (Check 1)

- ☐- >1m [6]
- ☐- 0.7-1m [4]
- ■- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ■-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL[-1] ☐-EDDIES[1]
- ☐-FAST[1] ☐-INTERSTITIAL[-1]
- ☐-MODERATE [1] ☐-INTERMITTENT[-2]
- ■-SLOW [1]

☐-NO POOL[0]

COMMENTS: ____

RIFFLE: 2.5

RIFFLE/RUN DEPTH

- ☐-GENERALLY >10 cm,MAX>50 [4]
- ☐-GENERALLY >10 cm,MAX<50 [3]
- ■-GENERALLY 5-10 cm [1]
- ☐-GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ■-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ■-EXTENSIVE [-1] ■-MODERATE[0]
- ☐-LOW. [1] ☐-NONE[2]

☐-NO RIFFLE[0]

COMMENTS ____ **GRADIENT: 8**

6] Gradient (feet/mile): 10.6 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 33.5

Stream BIG CREEK RM ______ Date 01/23/93 River Code ______

Location SITE - # 28 WEST BRANCH, UPSTREAM OF PUERTAS AVENUE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*): **SUBSTRATE SCORE: 1**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ☐☐-GRAVEL [7] — Substrate Origin (Check all) — Silt Cover (Check One or check 2 and AVERAGE)
- ☐☐-BOULDER [9] ☐☐-SAND [6] ☐-LIMESTONE [1] ☐-RIP/RAP [0] ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-
- ☐☐-COBBLE [8] ☐☐-BEDROCK[5] ■-TILLS [1] ☐-HARDPAN [0] ■-SILT NORMAL [0] ☐-SILT FREE [1]
- ☐☐-HARDPAN [4] ☐☐-DETRITUS[3] ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ■■-ARTIFIC.[0] ☐-SHALE [-1] — Extent Of Embeddedness (Check One or check 2 and AVERAGE)

TOTAL NUMBER OF SUBSTRATE TYPES: ☐-> 4 [1] ■-<= 4 [0] ☐-COAL FINES [-2] ☐—EXTENSIVE [-2] ☐—MODERATE [-1

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates) ■—LOW[0] ☐—NONE[1]

COMMENTS ______

COVER SCORE: 7

2] INSTREAM COVER

TYPE (Check *All* That Apply) — AMOUNT (Check *ONLY* One or check 2 and *AVERAGE*)

- ☐-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1] ☐-EXTENSIVE > 75% [11]
- ■-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1] ■-MODERATE 25-75% [7]
- ☐-SHALLOWS (IN SLOW WATER) [1] ☐-BOULDERS [1] ☐-LOGS OR WOODY DEBRIS [1] ■-SPARSE 5-25% [3]
- ☐-NEARLY ABSENT < 5%[1]

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 9**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 7.5**

"River Right Looking Downstream"

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 1**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
☐- >1m [6]			
☐- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	☐-MODERATE [1]	☐-INTERMITTENT[-2]
■—<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 0

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	☐-MODERATE[0]
☐ - GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
☐ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		■-NO RIFFLE[0]
☐ - GENERALLY < 5 cm [Riffle = 0]			

COMMENTS ______ **GRADIENT: 8**

6] Gradient (feet/mile): 14.6 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 52.5

Stream BIG CREEK RM ______ Date 10/17/91 River Code ______
Location SITE-#29 EAST BRANCH, AT FERNHILL PICNIC AREA Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*); **SUBSTRATE SCORE: 12.5**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐ ☐-BLDER /SLABS[10] ✓ — ☐ ☐-GRAVEL [7]
- ☐ ☐-BOULDER [9] — ☐ ■-SAND [6]
- ☐ ■-COBBLE [8] ✓ ✓ — ☐ ☐-BEDROCK[5] ✓ ✓
- ☐ ☐-HARDPAN [4] — ☐ ☐-DETRITUS[3]
- ☐ ☐-MUCK [2] — ☐ ☐-ARTIFIC.[0]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-- <= 4 [0]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS ______

Substrate Origin (Check all)
- ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ✓ ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)
■-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
■—EXTENSIVE [-2] ■—MODERATE [-1] ☐—LOW [0] ☐—NONE [1]

2] INSTREAM COVER — **COVER SCORE: 8**

TYPE (Check *All* That Apply)
- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ☐-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ☐-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) — **CHANNEL: 11.5**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 6**

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)
- ☐ ☐-FOREST, SWAMP [3]
- ☐ ☐-OPEN PASTURE/ ROWCROP [0]
- ■ ■- RESID.,PARK,NEW FIELD [1]
- ☐ ☐-FENCED PASTURE [1]

L R (Per Bank)
- ☐ ☐-URBAN OR INDUSTRIAL [0]
- ☐ ☐-SHRUB OR OLD FIELD [2]
- ☐ ☐-CONSERV. TILLAGE [1]
- ☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION
- ☐ ☐-NONE OR LITTLE [3]
- ■ ■-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE [1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 5.5**

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL [-1]
- ☐-FAST [1]
- ■-MODERATE [1]
- ■-SLOW [1]
- ☐-EDDIES [1]
- ☐-INTERSTITIAL [-1]
- ☐-INTERMITTENT [-2]

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 1

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm, MAX>50 [4]
- ☐ - GENERALLY >10 cm, MAX<50 [3]
- ■ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE [0]

COMMENTS ______ — **GRADIENT: 8**

6] Gradient (feet/mile): 22.3 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet — **QHEI SCORE: 69.5**

Stream: BIG CREEK RM ______ Date 01/27/93 River Code ______

Location: SITE-#30 STICKNEY CREEK Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*); **SUBSTRATE SCORE: 14.5**

TYPE	POOL RIFFLE	TYPE	POOL RIFFLE	SUBSTRATE QUALITY	
☐☐-BLDER /SLABS[10]		■■-GRAVEL [7]		Substrate Origin (Check all)	Silt Cover (Check One or check 2 and AVERAGE)
☐☐-BOULDER [9]	✓	☐☐-SAND [6]	✓	☐-LIMESTONE [1] ☐-RIP/RAP [0]	☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1]
☐☐-COBBLE [8]	✓	■■-BEDROCK[5]		■-TILLS [1] ☐-HARDPAN [0]	■-SILT NORMAL [0] ■-SILT FREE [1]
☐☐-HARDPAN [4]		☐☐-DETRITUS[3]		☐-SANDSTONE [0]	Extent Of Embeddness (Check One or check 2 and AVERAGE)
☐☐-MUCK [2]		☐☐-ARTIFIC.[0]		✓ ☐-SHALE [-1]	☐—EXTENSIVE [-2] ☐—MODERATE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ — <= 4 [0] ☐-COAL FINES [-2]

■—LOW[0] ☐—NONE[1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

2] INSTREAM COVER — **COVER SCORE: 12**

TYPE (Check *All* That Apply)

- ■ -UNDERCUT BANKS [1]
- ■ -OVERHANGING VEGETATION [1]
- ☐ -SHALLOWS (IN SLOW WATER) [1]
- ☐ -DEEP POOLS [2]
- ■ -ROOTWADS [1]
- ■ -BOULDERS [1]
- ☐ -OXBOWS [1]
- ■ -AQUATIC MACROPHYTES [1]
- ☐ -LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) — **CHANNEL: 17**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 10**

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 5**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
☐- >1m [6]			
☐- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
■- 0.4-0.7m [2]	■-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 1

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ■-MODERATE[0]
☐ - GENERALLY >10 cm,MAX<50 [3]	■-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1] ☐-NONE[2]
☐ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]	☐-NO RIFFLE[0]
■ - GENERALLY < 5 cm [Riffle = 0]		

COMMENTS ______ **GRADIENT: 10**

6] Gradient (feet/mile): 28 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 61

Stream MILL CREEK RM______ Date 07/03/91 River Code______
Location SITE-#31 AT CANAL ROAD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all* types present);

SUBSTRATE SCORE: 12

TYPE — POOL RIFFLE

- ☐ ☐-BLDER /SLABS[10] ______
- ☐ ☐-BOULDER [9] ______
- ☐ ☐-COBBLE [8] ___ ✓
- ☐ ☐-HARDPAN [4] ______
- ☐ ☐-MUCK [2] ______
- ☐ ■-GRAVEL [7] ___ ✓
- ☐ ■-SAND [6] ✓ ___
- ☐ ☐-BEDROCK[5] ______
- ☐ ☐-DETRITUS[3] ______
- ☐ ☐-ARTIFIC.[0] ✓ ✓

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

SUBSTRATE QUALITY

Substrate Origin (Check all)

- ☐-LIMESTONE [1]
- ■-TILLS [1]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]
- ☐-RIP/RAP [0]
- ☐-HARDPAN [0]

Silt Cover (Check One or check 2 and AVERAGE)

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

Extent Of Embeddedness (Check One or check 2 and AVERAGE)

- ■—EXTENSIVE [-2]
- ■—MODERATE [-1
- ☐—LOW [0]
- ☐—NONE [1]

COMMENTS______

2] INSTREAM COVER

COVER SCORE: 12

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ☐-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS:______

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

CHANNEL: 11.5

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:______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 5.5

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)

- ☐ ☐-WIDE>50m [4]
- ■ ■-MODERATE 10-50 [3]
- ☐ ☐-NARROW 5-10m [2]
- ☐ ☐-VERY NARROW 1-5m [1]
- ☐ ☐-NONE[0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)

- ☐ ☐-FOREST, SWAMP [3]
- ☐ ☐-OPEN PASTURE/ ROWCROP[0]
- ☐ ☐-RESID.,PARK,NEW FIELD [1]
- ☐ ☐-FENCED PASTURE [1]

L R (Per Bank)

- ■ ■-URBAN OR INDUSTRIAL[0]
- ☐ ☐-SHRUB OR OLD FIELD[2]
- ☐ ☐-CONSERV. TILLAGE [1]
- ☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ■ ☐-NONE OR LITTLE [3]
- ☐ ■-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE[1]

COMMENTS:______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 9

MAX. DEPTH (Check 1)

- ■ >1m [6]
- ☐ 0.7-1m [4]
- ☐ 0.4-0.7m [2]
- ☐ < 0.4m [1]
- ☐ <0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ■-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL[-1]
- ☐-FAST[1]
- ■-MODERATE [1]
- ☐-SLOW [1]
- ☐-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐-NO POOL[0]

COMMENTS:______

RIFFLE: 3

RIFFLE/RUN DEPTH

- ☐-GENERALLY >10 cm,MAX>50 [4]
- ■-GENERALLY >10 cm,MAX<50 [3]
- ☐-GENERALLY 5-10 cm [1]
- ☐-GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ■-MOD. STABLE (e.g.,Pea Gravel) [1]
- ■-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ■-EXTENSIVE [-1]
- ■-MODERATE[0]
- ☐-LOW. [1]
- ☐-NONE[2]

☐-NO RIFFLE[0]

COMMENTS______

GRADIENT: 8

6] Gradient (feet/mile): 29.1 %POOL:______ %RIFFLE:______ %RUN:______

Ohio EPA Site Description Sheet

QHEI SCORE: 64

Stream MILL CREEK RM______ Date 07/05/91 River Code______

Location SITE-#32 WARNER ROAD TRIBUTARY Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 17.5**

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

☐☐-BLDER /SLABS[10] ______ ☐■-GRAVEL [7] ✓ ✓ Substrate Origin (Check all)
☐☐-BOULDER [9] ______ ☐☐-SAND [6] ✓ ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐■-COBBLE [8] ✓ ✓ ☐☐-BEDROCK[5] ______ ■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4] ______ ☐☐-DETRITUS[3] ______ ☐-SANDSTONE [0]
☐☐-MUCK [2] ______ ☐☐-ARTIFIC.[0] ✓ ✓ ☐-SHALE [-1]
TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS______

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-
■-SILT NORMAL [0] ■-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE)
☐-EXTENSIVE [-2] ☐-MODERATE [-
■-LOW [0] ☐-NONE [1]

2] INSTREAM COVER **COVER SCORE: 10**

TYPE (Check All That Apply)
■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
■-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
■-SHALLOWS (IN SLOW WATER) [1] ☐-BOULDERS [1] ☐-LOGS OR WOODY DEBRIS [1]

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

COMMENTS:______

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) **CHANNEL: 12**

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

COMMENTS:______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 6.5**

River Right Looking Downstream

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

COMMENTS:______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 7**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
☐- >1m [6]			
■- 0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐-<0.2m [Pool = 0]		☐-SLOW [1]	

☐-NO POOL[0]

COMMENTS:______

RIFFLE: 2

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	■-MODERATE[0]
☐ - GENERALLY >10 cm,MAX<50 [3]	■-MOD. STABLE (e.g.,Pea Gravel) [1]	■-LOW. [1]	☐-NONE[2]
■ - GENERALLY 5-10 cm [1]	■-UNSTABLE (Gravel,Sand) [0]		
☐ - GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS______ **GRADIENT: 10**

6] Gradient (feet/mile): 29.1 %POOL:______ %RIFFLE:______ %RUN:______

Ohio EPA Site Description Sheet — **QHEI SCORE: 54.5**

Stream: MILL CREEK — RM: ____ — Date: 07/05/91 — River Code: ____

Location: SITE-#33 WOLF CREEK, AT GARFIELD PARK — Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 18**

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE QUALITY
☐☐-BLDER/SLABS[10]			☐■-GRAVEL [7]			Substrate Origin (Check all)
☐☐-BOULDER [9]	✓	✓	☐☐-SAND [6]	✓	✓	☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐■-COBBLE [8]			☐☐-BEDROCK[5]			■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]			☐☐-DETRITUS[3]			☐-SANDSTONE [0]
☐☐-MUCK [2]			☐☐-ARTIFIC.[0]	✓	✓	☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐— <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■-SILT NORMAL [0] ■-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW [0] ■—NONE [1]

2] INSTREAM COVER — **COVER SCORE: 10**

TYPE (Check All That Apply)

- ■-UNDERCUT BANKS [1]
- ☐-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ☐-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) — **CHANNEL: 10**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 5.5**

River Right Looking Downstream

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

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 4.5**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
☐- >1m [6]			
☐- 0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
■- 0.4-0.7m [2]	■-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		☐-SLOW [1]	

☐- NO POOL[0]

COMMENTS: ____

RIFFLE: 2.5

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	☐-MODERATE[0]
☐ - GENERALLY >10 cm,MAX<50 [3]	■-MOD. STABLE (e.g.,Pea Gravel) [1]	■-LOW. [1]	☐-NONE[2]
■ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		
■ - GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS ____ — **GRADIENT: 4**

6] Gradient (feet/mile): 65.7 — %POOL: ____ — %RIFFLE: ____ — %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 61.5

Stream MILL CREEK RM ______ Date 07/05/91 River Code ______
Location SITE #33.5 MAPLETOWN BRANCH Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 14.5**

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE QUALITY
☐☐-BLDER/SLABS[10]			☐■-GRAVEL [7]			Substrate Origin (Check all)
☐☐-BOULDER [9]	✓	✓	☐☐-SAND [6]	✓	✓	☐-LIMESTONE [1] ■-RIP/RAP [0]
☐■-COBBLE [8]		✓	☐☐-BEDROCK[5]			■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]			☐☐-DETRITUS[3]		✓	☐-SANDSTONE [0]
☐☐-MUCK [2]			☐☐-ARTIFIC.[0]	✓	✓	☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐—<= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ■-SILT MODERATE [-
☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
■—EXTENSIVE [-2] ■—MODERATE [-
☐—LOW [0] ☐—NONE [1]

COMMENTS ______

2] INSTREAM COVER **COVER SCORE: 13**

TYPE (Check All That Apply)

■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
■-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) **CHANNEL: 14**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 4**

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 6**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
☐- >1m [6]			
☐- 0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
■- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 2

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	■-MODERATE[0]
☐ - GENERALLY >10 cm,MAX<50 [3]	■-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
■ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		☐-NO RIFFLE[0]
☐ - GENERALLY < 5 cm [Riffle = 0]			

COMMENTS ______ **GRADIENT: 8**

6] Gradient (feet/mile): 39.4 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet — **QHEI SCORE: 51.5**

Stream MILL CREEK RM____ Date 07/05/91 River Code____

Location SITE-# 34 AT REX AND GLENBURN AVENUE Crew: NEZ RSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*): **SUBSTRATE SCORE: 51.5**

TYPE POOL RIFFLE / POOL RIFFLE / SUBSTRATE QUALITY

- O O-BLDER/SLABS[10] ____ ____ O ■-GRAVEL [7] ✓ ____ Substrate Origin (Check all)
- O O-BOULDER [9] ____ ✓ O ■-SAND [6] ✓ ____ O-LIMESTONE [1] O-RIP/RAP [0]
- O O-COBBLE [8] ✓ ✓ O O-BEDROCK[5] ____ ■-TILLS [1] O-HARDPAN [0]
- O O-HARDPAN [4] ____ ____ O O-DETRITUS[3] ____ O-SANDSTONE [0]
- O O-MUCK [2] ____ ____ O O-ARTIFIC.[0] ✓ ____ O-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] O— <= 4 [0] O-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS____

Silt Cover (Check One or check 2 and AVERAGE): O-SILT HEAVY [-2] ■-SILT MODERATE ■-SILT NORMAL [0] O-SILT FREE [

Extent Of Embeddness (Check One or check 2 and AVERAGE): ■—EXTENSIVE [-2] ■—MODERATE[- O—LOW[0] O—NONE[1]

2] INSTREAM COVER **COVER SCORE: 11**

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] O-DEEP POOLS [2] O-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] O-AQUATIC MACROPHYTES [1]
- ■-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS:____

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 13.5**

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

COMMENTS:____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 6**

River Right Looking Downstream

RIPARIAN WIDTH L R (Per Bank)	EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank)	L R (Per Bank)	BANK EROSION
O O-WIDE>50m [4]	O O-FOREST, SWAMP [3]	O O-URBAN OR INDUSTRIAL[0]	■ ■-NONE OR LITTLE [3]
O O-MODERATE 10-50 [3]	O O-OPEN PASTURE/ ROWCROP[0]	O O-SHRUB OR OLD FIELD[2]	O O-MODERATE [2]
■ ■-NARROW 5-10m [2]	■ ■- RESID.,PARK,NEW FIELD [1]	O O-CONSERV. TILLAGE [1]	O O-HEAVY OR SEVERE[1]
O O-VERY NARROW 1-5m [1]	O O-FENCED PASTURE [1]	O O-MINING/CONSTRUCTION [0]	
O O-NONE[0]			

COMMENTS:____

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 4**

MAX. DEPTH (Check 1)

- O- >1m [6]
- O- 0.7-1m [4]
- ■- 0.4-0.7m [2]
- O- < 0.4m [1]
- O—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- O-POOL WIDTH > RIFFLE WIDTH [2]
- ■-POOL WIDTH = RIFFLE WIDTH [1]
- O-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- O-TORRENTIAL[-1] O-EDDIES[1]
- O-FAST[1] O-INTERSTITIAL[-1]
- ■-MODERATE [1] O-INTERMITTENT[-2]
- O-SLOW [1]

O- NO POOL[0]

COMMENTS:____

RIFFLE: 0

RIFFLE/RUN DEPTH

- O - GENERALLY >10 cm,MAX>50 [4]
- O - GENERALLY >10 cm,MAX<50 [3]
- ■ - GENERALLY 5-10 cm [1]
- O - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- O-STABLE (e.g.,Cobble, Boulder) [2]
- O-MOD. STABLE (e.g.,Pea Gravel) [1]
- ■-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ■-EXTENSIVE [-1] O-MODERATE[0]
- O-LOW. [1] O-NONE[2]

O-NO RIFFLE[0]

COMMENTS____ **GRADIENT: 4**

6] Gradient (feet/mile): 172.3 %POOL:____ %RIFFLE:____ %RUN:____

Ohio EPA Site Description Sheet

QHEI SCORE: 66

Stream MILL CREEK RM ______ Date 07/09/91 River Code ______
Location SITE-#35 UPSTREAM OF NORTHFIELD ROAD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*);

SUBSTRATE SCORE: 17

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ______ ☐■-GRAVEL [7] ______ ✓ Substrate Origin (Check all)
- ☐☐-BOULDER [9] ✓ ✓ ☐☐-SAND [6] ✓ ___ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ☐■-COBBLE [8] ✓ ✓ ☐☐-BEDROCK[5] ___ ___ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ___ ___ ☐☐-DETRITUS[3] ___ ___ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ___ ___ ☐☐-ARTIFIC.[0] ___ ___ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [...] ■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
☐—EXTENSIVE [-2] ☐—MODERATE [-...] ■—LOW [0] ☐—NONE [1]

2] INSTREAM COVER

COVER SCORE: 16

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ■-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

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

CHANNEL: 13.5

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 5

"River Right Looking Downstream"

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 9

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL[-1] ☐-EDDIES[1]
- ☐-FAST[1] ☐-INTERSTITIAL[-1]
- ■-MODERATE [1] ☐-INTERMITTENT[-2]
- ☐-SLOW [1]

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 2.5

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ■ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS ______

GRADIENT: 4

6] Gradient (feet/mile): 53.6 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 51

Stream WEST CREEK RM ______ Date 07/11/91 River Code ______

Location SITE-#36 AT GRANGER ROAD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present):

SUBSTRATE SCORE: 11.5

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

☐☐-BLDER /SLABS[10] ___ ✓ ☐☐-GRAVEL [7] ✓ ✓ Substrate Origin (Check all)

☐☐-BOULDER [9] ___ ___ ☐■-SAND [6] ___ ___ ☐-LIMESTONE [1] ■-RIP/RAP [0]

☐■-COBBLE [8] ___ ✓ ☐☐-BEDROCK[5] ___ ___ ■-TILLS [1] ☐-HARDPAN [0]

☐☐-HARDPAN [4] ___ ___ ☐☐-DETRITUS[3] ___ ___ ☐-SANDSTONE [0]

☐☐-MUCK [2] ___ ___ ☐☐-ARTIFIC.[0] ✓ ✓ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■— <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

Silt Cover (Check One or check 2 and AVERAGE)

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

Extent Of Embeddedness (Check One or check 2 and AVERAGE)

■—EXTENSIVE [-2] ☐—MODERATE[-1] ☐—LOW[0] ☐—NONE[1]

COVER SCORE: 10

2] INSTREAM COVER

TYPE (Check *All* That Apply)

■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]

☐-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]

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

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

☐-EXTENSIVE > 75% [11]

☐-MODERATE 25-75% [7]

■-SPARSE 5-25% [3]

☐-NEARLY ABSENT < 5% [1]

COMMENTS: ______

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

CHANNEL: 8

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 3

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 9

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
■->1m [6]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐-0.7-1m [4]	☐-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐-0.4-0.7m [2]	■-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐-< 0.4m [1]		☐-SLOW [1]	
☐—<0.2m [Pool = 0]			

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 1.5

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐-GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	■-EXTENSIVE [-1]	■-MODERATE[0]
■-GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
■-GENERALLY 5-10 cm [1]	■-UNSTABLE (Gravel,Sand) [0]		
☐-GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS ______

GRADIENT: 8

6] Gradient (feet/mile): 25.8 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 56.5

Stream West Creek RM ______ Date 07/09/91 River Code ______

Location Site - #37 at Broadview Road Bridge Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present);

SUBSTRATE SCORE: 15

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE QUALITY
☐☐-BLDER /SLABS[10]	✓	✓	☐☐-GRAVEL [7]	✓	✓	Substrate Origin (Check all)
☐■-BOULDER [9]	✓	✓	☐☐-SAND [6]	✓	✓	☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐☐-COBBLE [8]	✓	✓	☐■-BEDROCK[5]			■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]			☐☐-DETRITUS[3]			☐-SANDSTONE [0]
☐☐-MUCK [2]			☐☐-ARTIFIC.[0]	✓	✓	☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
☐-EXTENSIVE [-2] ■-MODERATE [-1] ☐-LOW [0] ☐-NONE [1]

2] INSTREAM COVER

COVER SCORE: 11

TYPE (Check All That Apply)

- ☐-UNDERCUT BANKS [1]
- ☐-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ______

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

CHANNEL: 12.5

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 3

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 8

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
☐->1m [6]			
■-0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐-0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
☐-< 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐-<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 3

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐-GENERALLY >10 cm,MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ■-MODERATE[0]
☐-GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1] ☐-NONE[2]
■-GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]	☐-NO RIFFLE[0]
☐-GENERALLY < 5 cm [Riffle = 0]		

COMMENTS ______

GRADIENT: 4

6] Gradient (feet/mile): 72.4 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 59.5

Stream WEST CREEK RM ______ Date 07/09/91 River Code ______
Location SITE-#38 U.S. OF W. RIDGEWOOD DRIVE BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*): **SUBSTRATE SCORE: 13**

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ______ ☐☐-GRAVEL [7] ______
- ☐☐-BOULDER [9] ______ ☐■-SAND [6] ______
- ☐☐-COBBLE [8] ______ ☐■-BEDROCK[5] ______
- ☐☐-HARDPAN [4] ______ ☐☐-DETRITUS[3] ______
- ☐☐-MUCK [2] ______ ☐☐-ARTIFIC.[0] ______

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■— <= 4 [0]

Substrate Origin (Check all)
- ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)
- ☐-SILT HEAVY [-2] ☐-SILT MODERATE
- ■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE)
- ☐—EXTENSIVE [-2] ☐—MODERATE [-1]
- ■—LOW [0] ■—NONE [1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS ______

2] INSTREAM COVER **COVER SCORE: 9**

TYPE (Check *All* That Apply)
- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ☐-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 13.5**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 6**
"River Right Looking Downstream"

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 6**

MAX DEPTH (Check 1)
- ☐- >1m [6]
- ☐- 0.7-1m [4]
- ■- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL[-1]
- ☐-FAST[1]
- ■-MODERATE [1]
- ■-SLOW [1]
- ☐-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 2

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ■ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS ______ **GRADIENT: 10**

6] Gradient (feet/mile): 24 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 64

Stream TINKERS CREEK RM ______ Date 02/03/93 River Code ______

Location SITE - #39 OHIO CANAL VIADUCT Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*);

SUBSTRATE SCORE: 14

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

☐ ☐-BLDER /SLABS[10] ■ ■-GRAVEL [7] — Substrate Origin (Check all) — Silt Cover (Check One or check 2 and AVERAGE)

☐ ☐-BOULDER [9] ■ ■-SAND [6] ☐-LIMESTONE [1] ☐-RIP/RAP [0] ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1]

☐ ☐-COBBLE [8] ✓ ✓ ☐ ☐-BEDROCK[5] ■-TILLS [1] ☐-HARDPAN [0] ■ - SILT NORMAL [0] ☐ - SILT FREE [1]

☐ ☐-HARDPAN [4] ☐ ☐-DETRITUS[3] ☐-SANDSTONE [0]

☐ ☐-MUCK [2] ☐ ☐-ARTIFIC.[0] ☐-SHALE [-1] — Extent Of Embeddness (Check One or check 2 and AVERAGE)

TOTAL NUMBER OF SUBSTRATE TYPES: ☐ > 4 [1] ■ <= 4 [0] ☐-COAL FINES [-2] ☐—EXTENSIVE [-2] ☐—MODERATE [-1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates) ■—LOW[0] ☐—NONE[1]

COMMENTS ______

2] INSTREAM COVER

COVER SCORE: 10

TYPE (Check *All* That Apply) — AMOUNT (Check *ONLY* One or check 2 and *AVERAGE*)

■ -UNDERCUT BANKS [1] ■ -DEEP POOLS [2] ☐ -OXBOWS [1] ☐ - EXTENSIVE > 75% [11]

■ -OVERHANGING VEGETATION [1] ☐ -ROOTWADS [1] ☐ -AQUATIC MACROPHYTES [1] ■ - MODERATE 25-75% [7]

☐ -SHALLOWS (IN SLOW WATER) [1] ☐ -BOULDERS [1] ■ -LOGS OR WOODY DEBRIS [1] ■ - SPARSE 5-25% [3]

☐ - NEARLY ABSENT < 5%[1]

COMMENTS: ______

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

CHANNEL: 13

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 7

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 10

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
■ >1m [6]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐ 0.7-1m [4]	☐ -POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐ 0.4-0.7m [2]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐ < 0.4m [1]		☐-SLOW [1]	
☐—<0.2m [Pool = 0]			

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 4

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	■-MODERATE[0]
■ - GENERALLY >10 cm,MAX<50 [3]	■-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
☐ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		
☐ - GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS ______

GRADIENT: 6

6] Gradient (feet/mile): 24.7 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 69.5

Stream TINKERS CREEK RM ____ Date 07/11/91 River Code ____

Location SITE - #40 UNDER NORTHFIELD ROAD BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*);

SUBSTRATE SCORE: 11

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

■■-BLDER /SLABS[10] ✓ ✓ □□-GRAVEL [7] ✓ ✓ Substrate Origin (Check all)

□□-BOULDER [9] ___ ✓ □□-SAND [6] ✓ ✓ □-LIMESTONE [1] □-RIP/RAP [0]

□□-COBBLE [8] ___ ✓ □□-BEDROCK[5] ___ ___ ■-TILLS [1] □-HARDPAN [0]

□□-HARDPAN [4] ___ ___ □□-DETRITUS[3] ___ ✓ □-SANDSTONE [0]

□□-MUCK [2] ___ ___ □□-ARTIFIC.[0] ___ ___ □-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] □-<= 4 [0] □-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

Silt Cover (Check One or check 2 and AVERAGE)

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

Extent Of Embeddedness (Check One or check 2 and AVERAGE)

□-EXTENSIVE [-2] ■-MODERATE [-1] ■-LOW[0] □-NONE[1]

2] INSTREAM COVER

COVER SCORE: 13

TYPE (Check *All* That Apply)

■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] □-OXBOWS [1]

■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] □-AQUATIC MACROPHYTES [1]

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

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

□- EXTENSIVE > 75% [11]

■- MODERATE 25-75% [7]

■- SPARSE 5-25% [3]

□- NEARLY ABSENT < 5% [1]

COMMENTS: ____

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

CHANNEL: 17

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: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 6.5

"River Right Looking Downstream"

RIPARIAN WIDTH — L R (Per Bank)

□□-WIDE> 50m [4]

□■-MODERATE 10-50 [3]

■□-NARROW 5-10m [2]

□□-VERY NARROW 1-5m [1]

□□-NONE[0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank) — L R (Per Bank)

□□-FOREST, SWAMP [3] — □□-URBAN OR INDUSTRIAL[0]

□□-OPEN PASTURE/ ROWCROP[0] — □□-SHRUB OR OLD FIELD[2]

■■- RESID.,PARK,NEW FIELD [1] — □□-CONSERV. TILLAGE [1]

□□-FENCED PASTURE [1] — □□-MINING/CONSTRUCTION [0]

BANK EROSION

■■-NONE OR LITTLE [3]

□□-MODERATE [2]

□□-HEAVY OR SEVERE[1]

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 10

MAX. DEPTH (Check 1): □- >1m [6]; ■-0.7-1m [4]; □-0.4-0.7m [2]; □- < 0.4m [1]; □-<0.2m [Pool = 0]

MORPHOLOGY (Check 1): ■-POOL WIDTH > RIFFLE WIDTH [2]; □-POOL WIDTH = RIFFLE WIDTH [1]; □-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply): □-TORRENTIAL[-1]; ■-FAST[1]; ■-MODERATE [1]; ■-SLOW [1]; ■-EDDIES[1]; □-INTERSTITIAL[-1]; □-INTERMITTENT[-2]

□-NO POOL[0]

COMMENTS: ____

RIFFLE: 6

RIFFLE/RUN DEPTH: ■- GENERALLY >10 cm,MAX>50 [4]; ■- GENERALLY >10 cm,MAX<50 [3]; □- GENERALLY 5-10 cm [1]; □- GENERALLY < 5 cm [Riffle = 0]

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

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

□-NO RIFFLE[0]

COMMENTS ____

GRADIENT: 6

6] Gradient (feet/mile): 39.3 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 61

Stream *TINKERS CREEK* RM____ Date *07/11/91* River Code____

Location *SITE-#41 EAST OF RICHMOND ROAD* Crew: *NEORSD*

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present);

SUBSTRATE SCORE: 9.5

TYPE	POOL RIFFLE		POOL	RIFFLE	SUBSTRATE QUALITY
☐☐-BLDER /SLABS[10]	______	☐☐-GRAVEL [7]	✓	✓	Substrate Origin (Check all)
☐☐-BOULDER [9]	✓	☐☐-SAND [6]			☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐■-COBBLE [8]		☐☐-BEDROCK[5]			■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]		☐☐-DETRITUS[3]			☐-SANDSTONE [0]
☐■-MUCK [2]		☐☐-ARTIFIC.[0]	✓	✓	☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ■-SILT HEAVY [-2] ■-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE): ☐-EXTENSIVE [-2] ■-MODERATE [-1] ☐-LOW [0] ☐-NONE [1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS____

COVER SCORE: 13

2] INSTREAM COVER

TYPE (Check All That Apply)

- ■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ■-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS:____

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

CHANNEL: 14.5

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

COMMENTS:____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 3.5

River Right Looking Downstream

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

COMMENTS:____

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 10

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
■->1m [6]			
☐-0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐-0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐-< 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	☐-MODERATE [1]	☐-INTERMITTENT[-2]
☐-<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL[0]

COMMENTS:____

RIFFLE: 2.5

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐-GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	■-EXTENSIVE [-1]	■-MODERATE[0]
■-GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
☐-GENERALLY 5-10 cm [1]	■-UNSTABLE (Gravel,Sand) [0]		
☐-GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS____

GRADIENT: 8

6] Gradient (feet/mile): *10.7* %POOL:____ %RIFFLE:____ %RUN:____

Ohio EPA Site Description Sheet — **QHEI SCORE: 59.5**

Stream: TINKERS CREEK RM: ____ Date: 02/03/93 River Code: ____

Location: SITE-# 42 GLENWOOD DRIVE BRIDGE Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present): **SUBSTRATE SCORE: 13**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER/SLABS[10] ____ ■■-GRAVEL [7] ✓ ✓ — Substrate Origin (Check all)
- ☐☐-BOULDER [9] ____ ■■-SAND [6] ✓ ✓ — ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ☐☐-COBBLE [8] ✓ ✓ ☐☐-BEDROCK[5] ____ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ____ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ____ ☐☐-ARTIFIC.[0] ____ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■<= 4 [0] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ■-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW [0] ☐—NONE [1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

2] INSTREAM COVER **COVER SCORE: 11**

TYPE (Check All That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ☐-SHALLOWS (IN SLOW WATER) [1]
- ☐-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ☐-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) **CHANNEL: 15**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 6.5**

River Right Looking Downstream

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

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 8**

MAX. DEPTH (Check 1)

- ■->1m [6]
- ☐-0.7-1m [4]
- ☐-0.4-0.7m [2]
- ☐-< 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)

- ☐-TORRENTIAL [-1]
- ■-FAST [1]
- ■-MODERATE [1]
- ☐-SLOW [1]
- ☐-EDDIES [1]
- ☐-INTERSTITIAL [-1]
- ☐-INTERMITTENT [-2]

☐-NO POOL [0]

COMMENTS: ____

RIFFLE: 0

RIFFLE/RUN DEPTH

- ☐-GENERALLY >10 cm,MAX>50 [4]
- ☐-GENERALLY >10 cm,MAX<50 [3]
- ☐-GENERALLY 5-10 cm [1]
- ☐-GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ☐-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1] ☐-MODERATE [0]
- ☐-LOW. [1] ☐-NONE [2]

■-NO RIFFLE [0]

COMMENTS ____ **GRADIENT: 6**

6] Gradient (feet/mile): 3.8 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 80

Stream CHIPPEWA CREEK RM ______ Date 06/27/91 River Code ______
Location SITE #43 CHIPPEWA CREEK DRIVE FORD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*); **SUBSTRATE SCORE: 17**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ___ ___ ■■-GRAVEL [7] ___ ___
- ☐☐-BOULDER [9] ✓ ___ ☐☐-SAND [6] ✓ ___
- ■■-COBBLE [8] ___ ___ ☐☐-BEDROCK[5] ___ ___
- ☐☐-HARDPAN [4] ___ ___ ☐☐-DETRITUS[3] ___ ___
- ☐☐-MUCK [2] ___ ___ ☐☐-ARTIFIC.[0] ___ ___

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ <= 4 [0]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

Substrate Origin (Check all)
☐-LIMESTONE [1] ☐-RIP/RAP [0]
■-TILLS [1] ☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-
■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE)
☐—EXTENSIVE [-2] ☐—MODERATE [-
■—LOW [0] ☐—NONE [1]

COMMENTS ______

2] INSTREAM COVER — **COVER SCORE: 14**

TYPE (Check *All* That Apply)
- ☐-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 16**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 10**
River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank) — L R (Per Bank)
- ■■-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP [0]
- ☐☐-RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]
- ☐☐-URBAN OR INDUSTRIAL [0]
- ☐☐-SHRUB OR OLD FIELD [2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
- ■■-NONE OR LITTLE [3]
- ☐☐-MODERATE [2]
- ☐☐-HEAVY OR SEVERE [1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 9**

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL [-1]
- ☐-FAST [1]
- ■-MODERATE [1]
- ■-SLOW [1]
- ☐-EDDIES [1]
- ☐-INTERSTITIAL [-1]
- ☐-INTERMITTENT [-2]

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 4

RIFFLE/RUN DEPTH
- ☐-GENERALLY >10 cm,MAX>50 [4]
- ☐-GENERALLY >10 cm,MAX<50 [3]
- ■-GENERALLY 5-10 cm [1]
- ☐-GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE [0]

COMMENTS ______ **GRADIENT: 10**

6] Gradient (feet/mile): 29.4 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 62.5

Stream CHIPPEWA CREEK RM ______ Date 01/20/93 River Code ______

Location SITE #43.5 BRAMBLEWOOD BRANCH, U.S. OF CONFLUENCE Crew: NEDRSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all* types present);

SUBSTRATE SCORE: 16

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ______ ☐☐-GRAVEL [7] ______ ✓ Substrate Origin (Check all)
- ☐☐-BOULDER [9] ✓ ☐☐-SAND [6] ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■■-COBBLE [8] ✓ ■■-BEDROCK[5] ✓ ✓ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ______ ☐☐-DETRITUS[3] ______ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ______ ☐☐-ARTIFIC.[0] ______ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐— <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ☐-SILT MODERATE ☐-SILT NORMAL [0] ■-SILT FREE [

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE [- ■—LOW [0] ☐—NONE [1]

COMMENTS ______

COVER SCORE: 11

2] INSTREAM COVER

TYPE (Check *All* That Apply)

- ☐-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ☐-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

CHANNEL: 17

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

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

COMMENTS: ______

RIPARIAN: 7.5

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)	EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank)	L R (Per Bank)	BANK EROSION
■☐-WIDE>50m [4]	■☐-FOREST, SWAMP [3]	☐☐-URBAN OR INDUSTRIAL[0]	■ ☐-NONE OR LITTLE [3]
☐☐-MODERATE 10-50 [3]	☐☐-OPEN PASTURE/ ROWCROP[0]	☐☐-SHRUB OR OLD FIELD[2]	☐ ■-MODERATE [2]
☐■-NARROW 5-10m [2]	☐■-RESID.,PARK,NEW FIELD [1]	☐☐-CONSERV. TILLAGE [1]	☐ ☐-HEAVY OR SEVERE[1]
☐☐-VERY NARROW 1-5m [1]	☐☐-FENCED PASTURE [1]	☐☐-MINING/CONSTRUCTION [0]	
☐☐-NONE[0]			

COMMENTS: ______

POOL: 3

POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
☐->1m [6]			
☐-0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
■-0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐-< 0.4m [1]	■-POOL WIDTH < RIFFLE W. [0]	☐-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		☐-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 4

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐-GENERALLY >10 cm,MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ☐-MODERATE[0]
☐-GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	■-LOW. [1] ☐-NONE[2]
■-GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]	☐-NO RIFFLE[0]
☐-GENERALLY < 5 cm [Riffle = 0]		

COMMENTS ______

GRADIENT: 4

6] Gradient (feet/mile): 74 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 77

Stream: CHIPPEWA CREEK RM _____ Date 07/26/91 River Code _____

Location: SITE-# 44 AVERY ROAD BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*);

SUBSTRATE SCORE: 20

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE QUALITY
☐ ■-BLDER/SLABS[10]	✓	✓	☐ ☐-GRAVEL [7]	✓	✓	Substrate Origin (Check all)
☐ ☐-BOULDER [9]	✓	✓	☐ ☐-SAND [6]	✓		☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐ ■-COBBLE [8]			☐ ☐-BEDROCK[5]			■-TILLS [1] ☐-HARDPAN [0]
☐ ☐-HARDPAN [4]			☐ ☐-DETRITUS[3]			☐-SANDSTONE [0]
☐ ☐-MUCK [2]			☐ ☐-ARTIFIC.[0]			☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS _____

Silt Cover (Check One or check 2 and *AVERAGE*)
☐-SILT HEAVY [-2] ■-SILT MODERATE [-1]
☐-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and *AVERAGE*)
☐—EXTENSIVE [-2] ☐—MODERATE [-1]
■—LOW [0] ☐—NONE [1]

2] INSTREAM COVER

COVER SCORE: 15

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: _____

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

CHANNEL: 17

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

COMMENTS: _____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 6

River Right Looking Downstream

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

COMMENTS: _____

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 10

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
■- >1m [6]			
☐- 0.7-1m [4]	■-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL [-1]	☐-EDDIES [1]
☐- 0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST [1]	☐-INTERSTITIAL [-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT [-2]
☐—<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL [0]

COMMENTS: _____

RIFFLE: 5

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
☐ - GENERALLY >10 cm,MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ■-MODERATE [0]
■ - GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1] ☐-NONE [2]
☐ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]	☐-NO RIFFLE [0]
☐ - GENERALLY < 5 cm [Riffle = 0]		

COMMENTS _____

GRADIENT: 4

6] Gradient (feet/mile): 42.6 %POOL: _____ %RIFFLE: _____ %RUN: _____

Ohio EPA Site Description Sheet

QHEI SCORE: 44

Stream Burke Brook RM ______ Date 01/27/93 River Code ______
Location Site-#48.1 E. of I-77, South of Fleet Avenue Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*);

SUBSTRATE SCORE: 6

TYPE — POOL RIFFLE

- ☐☐-BLDER /SLABS[10] ________
- ☐☐-BOULDER [9] ________
- ☐☐-COBBLE [8] ____✓____
- ☐☐-HARDPAN [4] ________
- ☐☐-MUCK [2] ________
- ■■-GRAVEL [7] ____ ____
- ☐☐-SAND [6] ____ ____
- ☐☐-BEDROCK[5] ____ ____
- ☐☐-DETRITUS[3] ____ ____
- ■■-ARTIFIC.[0] ____ ____

TOTAL NUMBER OF SUBSTRATE TYPES: ☐> 4 [1] ■—<= 4 [0]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

SUBSTRATE QUALITY

Substrate Origin (Check all)

- ☐-LIMESTONE [1]
- ■-TILLS [1]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]
- ☐-RIP/RAP [0]
- ☐-HARDPAN [0]

Silt Cover (Check One or check 2 and AVERAGE)

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

Extent Of Embeddness (Check One o check 2 and AVERAGE)

- ☐—EXTENSIVE [-2]
- ☐—MODERATE [-
- ■—LOW[0]
- ☐—NONE[1]

COMMENTS________________

2] INSTREAM COVER

COVER SCORE: 8

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ☐-SHALLOWS (IN SLOW WATER) [1]
- ☐-DEEP POOLS [2]
- ☐-ROOTWADS [1]
- ☐-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS:________________

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

CHANNEL: 12

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

COMMENTS:________________

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 8

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)

- ☐☐-WIDE > 50m [4]
- ■■-MODERATE 10-50 [3]
- ☐☐-NARROW 5-10m [2]
- ☐☐-VERY NARROW 1-5m [1]
- ☐☐-NONE[0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)

- ☐■-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP[0]
- ☐■- RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]

L R (Per Bank)

- ■☐-URBAN OR INDUSTRIAL[0]
- ☐☐-SHRUB OR OLD FIELD[2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ■ ■-NONE OR LITTLE [3]
- ☐ ☐-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE[1]

COMMENTS:________________

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 4

MAX DEPTH (Check 1)

- ☐- >1m [6]
- ☐- 0.7-1m [4]
- ☐- 0.4-0.7m [2]
- ■- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ■-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL[-1]
- ☐-FAST[1]
- ■-MODERATE [1]
- ■-SLOW [1]
- ☐-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐- NO POOL[0]

COMMENTS:________________

RIFFLE: 2

RIFFLE/RUN DEPTH

- ☐- GENERALLY >10 cm,MAX>50 [4]
- ☐- GENERALLY >10 cm,MAX<50 [3]
- ☐- GENERALLY 5-10 cm [1]
- ■- GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ■-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1]
- ■-MODERATE[0]
- ■-LOW. [1]
- ☐-NONE[2]

☐-NO RIFFLE[0]

COMMENTS________________

GRADIENT: 4

6] Gradient (feet/mile): 74.1 %POOL:______ %RIFFLE:______ %RUN:______

Ohio EPA Site Description Sheet — **QHEI SCORE: 75**

Stream: ROCKY RIVER RM ____ Date 01/29/93 River Code ____

Location: SITE - # 49 E. BRANCH, NORTH OF FALLS LANE Crew: NEORSD

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 19**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ____ ☐☐-GRAVEL [7] ____ ✓ Substrate Origin (Check all)
- ■■-BOULDER [9] ____ ☐☐-SAND [6] ✓ ____ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■■-COBBLE [8] ____ ☐☐-BEDROCK[5] ✓ ____ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ____ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ____ ☐☐-ARTIFIC.[0] ____ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [■-SILT NORMAL [0] ☐-SILT FREE [

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐-EXTENSIVE [-2] ☐-MODERATE [- ■-LOW [0] ☐-NONE [1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

2] INSTREAM COVER — **COVER SCORE: 14**

TYPE (Check All That Apply)

- ■-UNDERCUT BANKS [1]   ■-DEEP POOLS [2]   ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1]   ☐-ROOTWADS [1]   ■-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1]   ■-BOULDERS [1]   ■-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) — **CHANNEL: 16.5**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 8.5**

River Right Looking Downstream

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

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 7**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
☐- >1m [6]			
■- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐-0.4-0.7m [2]	■-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐-<0.2m [Pool = 0]		☐-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ____

RIFFLE: 4

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	■-MODERATE[0]
■ - GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
■ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		
☐ - GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS ____ **GRADIENT: 6**

6] Gradient (feet/mile): 20   %POOL: ____   %RIFFLE: ____   %RUN: ____

Ohio EPA Site Description Sheet

QHEI SCORE: 73

Stream ROCKY RIVER RM ______ Date 02/04/93 River Code ______

Location SITE-#50 E. BRANCH, AT WEST BRIDGE STREET Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*): ***SUBSTRATE SCORE:* 17**

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

□□-BLDER /SLABS[10] ______ □□-GRAVEL [7] ______ ✓ Substrate Origin (Check all)

■■-BOULDER [9] ______ □□-SAND [6] ______ □-LIMESTONE [1] □-RIP/RAP [0]

■■-COBBLE [8] ______ □□-BEDROCK[5] ______ ■-TILLS [1] □-HARDPAN [0]

□□-HARDPAN [4] ______ □□-DETRITUS[3] ______ □-SANDSTONE [0]

□□-MUCK [2] ______ □□-ARTIFIC.[0] ______ □-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: □> 4 [1] ■—<= 4 [0] □-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

Silt Cover (Check One or check 2 and *AVERAGE*)

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

Extent Of Embeddedness (Check One or check 2 and *AVERAGE*)

□—EXTENSIVE [-2] □—MODERATE [-1] ■—LOW [0] □—NONE [1]

2] INSTREAM COVER ***COVER SCORE:* 15**

TYPE (Check *All* That Apply)

■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] □-OXBOWS [1]

■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1]

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

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

□-EXTENSIVE > 75% [11]

■-MODERATE 25-75% [7]

□-SPARSE 5-25% [3]

□-NEARLY ABSENT < 5% [1]

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) ***CHANNEL:* 15**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) ***RIPARIAN:* 4**

"River Right Looking Downstream"

RIPARIAN WIDTH L R (Per Bank)

□□-WIDE > 50m [4]

□□-MODERATE 10-50 [3]

■■-NARROW 5-10m [2]

□□-VERY NARROW 1-5m [1]

□□-NONE[0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank) L R (Per Bank)

□□-FOREST, SWAMP [3] ■■-URBAN OR INDUSTRIAL[0]

□□-OPEN PASTURE/ ROWCROP[0] □□-SHRUB OR OLD FIELD[2]

□□-RESID.,PARK,NEW FIELD [1] □□-CONSERV. TILLAGE [1]

□□-FENCED PASTURE [1] □□-MINING/CONSTRUCTION [0]

BANK EROSION

□ □-NONE OR LITTLE [3]

■ ■-MODERATE [2]

□ □-HEAVY OR SEVERE[1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY ***POOL:* 8**

MAX. DEPTH (Check 1)

■->1m [6]

□-0.7-1m [4]

□-0.4-0.7m [2]

□-< 0.4m [1]

□—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

□-POOL WIDTH > RIFFLE WIDTH [2]

□-POOL WIDTH = RIFFLE WIDTH [1]

■-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

□-TORRENTIAL[-1] □-EDDIES[1]

■-FAST[1] □-INTERSTITIAL[-1]

■-MODERATE [1] □-INTERMITTENT[-2]

□-SLOW [1]

□-NO POOL[0]

COMMENTS: ______

***RIFFLE:* 6**

RIFFLE/RUN DEPTH

□-GENERALLY >10 cm,MAX>50 [4]

■-GENERALLY >10 cm,MAX<50 [3]

□-GENERALLY 5-10 cm [1]

□-GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

■-STABLE (e.g.,Cobble, Boulder) [2]

□-MOD. STABLE (e.g.,Pea Gravel) [1]

□-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

□-EXTENSIVE [-1] □-MODERATE[0]

■-LOW. [1] □-NONE[2]

□-NO RIFFLE[0]

COMMENTS ______ ***GRADIENT:* 8**

6] Gradient (feet/mile): 18 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 76.25

Stream ROCKY RIVER RM ______ Date 02/04/93 River Code ______
Location SITE-#51 E. BRANCH, U.S. OF EAST ACCESS ROAD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present);

SUBSTRATE SCORE: 16

TYPE POOL RIFFLE — POOL RIFFLE

- ☐☐-BLDER /SLABS[10] ______ ☐☐-GRAVEL [7] ✓ ______
- ■■-BOULDER [9] ______ ☐☐-SAND [6] ✓ ______
- ☐☐-COBBLE [8] ______ ✓ ■■-BEDROCK[5] ______
- ☐☐-HARDPAN [4] ______ ☐☐-DETRITUS[3] ______
- ☐☐-MUCK [2] ______ ☐☐-ARTIFIC.[0] ______

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐— <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

SUBSTRATE QUALITY

Substrate Origin (Check all)
- ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)
- ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1]
- ■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One check 2 and AVERAGE)
- ☐—EXTENSIVE [-2] ☐—MODERATE [-1]
- ■—LOW [0] ☐—NONE [1]

2] INSTREAM COVER

COVER SCORE: 13

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ☐-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1]
- ☐-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

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

CHANNEL: 15.5

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 8.75

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY L R (Most Predominant Per Bank)
- ■■-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP[0]
- ☐☐- RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]

L R (Per Bank)
- ☐☐-URBAN OR INDUSTRIAL[0]
- ☐☐-SHRUB OR OLD FIELD[2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
- ☐■-NONE OR LITTLE [3]
- ■☐-MODERATE [2]
- ■☐-HEAVY OR SEVERE[1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 7

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL[-1] ☐-EDDIES[1]
- ■-FAST[1] ☐-INTERSTITIAL[-1]
- ■-MODERATE [1] ☐-INTERMITTENT[-2]
- ☐-SLOW [1]

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 6

RIFFLE/RUN DEPTH
- ☐-GENERALLY >10 cm,MAX>50 [4]
- ■-GENERALLY >10 cm,MAX<50 [3]
- ☐-GENERALLY 5-10 cm [1]
- ☐-GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS ______

GRADIENT: 10

6] Gradient (feet/mile): 6.26 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 72.5

Stream Rocky River RM ______ Date 02/05/93 River Code ______
Location Site-#52 W. Branch, North of Bagely Road Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE* BOXES; Check all types present);

SUBSTRATE SCORE: 16

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

☐☐-BLDER /SLABS[10] ____ ☐☐-GRAVEL [7] ✓ ____ Substrate Origin (Check all)
■■-BOULDER [9] ____ ☐☐-SAND [6] ✓ ____ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐☐-COBBLE [8] ✓ ✓ ■■-BEDROCK[5] ____ ■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4] ____ ☐☐-DETRITUS[3] ____ ☐-SANDSTONE [0]
☐☐-MUCK [2] ____ ☐☐-ARTIFIC.[0] ____ ☐-SHALE [-1]
TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ <= 4 [0] ☐-COAL FINES [-2]
NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)
COMMENTS ______

Silt Cover (Check One or check 2 and *AVERAGE*)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [
■ - SILT NORMAL [0] ☐ - SILT FREE [1

Extent Of Embeddedness (Check One or check 2 and *AVERAGE*)
☐—EXTENSIVE [-2] ☐—MODERATE [-
■—LOW [0] ☐—NONE [1]

COVER SCORE: 13

2] INSTREAM COVER

TYPE (Check *All* That Apply)
☐ -UNDERCUT BANKS [1] ■ -DEEP POOLS [2] ☐ -OXBOWS [1]
■ -OVERHANGING VEGETATION [1] ☐ -ROOTWADS [1] ■ -AQUATIC MACROPHYTES [1]
☐ -SHALLOWS (IN SLOW WATER) [1] ■ -BOULDERS [1] ■ -LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ______

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

CHANNEL: 16.5

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)

RIPARIAN: 8

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY
L R (Most Predominant Per Bank)
■■-FOREST, SWAMP [3]
☐☐-OPEN PASTURE/ ROWCROP [0]
■■- RESID.,PARK,NEW FIELD [1]
☐☐-FENCED PASTURE [1]

L R (Per Bank)
☐☐-URBAN OR INDUSTRIAL [0]
☐☐-SHRUB OR OLD FIELD [2]
☐☐-CONSERV. TILLAGE [1]
☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
■ ■-NONE OR LITTLE [3]
☐ ☐-MODERATE [2]
☐ ☐-HEAVY OR SEVERE [1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY

POOL: 8

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
☐-TORRENTIAL [-1] ☐-EDDIES [1]
■-FAST [1] ☐-INTERSTITIAL [-1]
■-MODERATE [1] ☐-INTERMITTENT [-2]
☐-SLOW [1]

☐- NO POOL [0]

COMMENTS: ______

RIFFLE: 5

RIFFLE/RUN DEPTH
☐ - GENERALLY >10 cm,MAX>50 [4]
■ - GENERALLY >10 cm,MAX<50 [3]
☐ - GENERALLY 5-10 cm [1]
☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE [0]

COMMENTS ______

GRADIENT: 6

6] Gradient (feet/mile): 15.4 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 79

Stream: ROCKY RIVER RM ______ Date: 02/05/93 River Code ______

Location: SITE # 52.5 UPSTREAM of HILLIARD ROAD BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*); **SUBSTRATE SCORE:** 20

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ■ ■-BLDER /SLABS[10] ___ ✓ ☐ ☐-GRAVEL [7] ✓ ___
- ☐ ☐-BOULDER [9] ___ ___ ☐ ☐-SAND [6] ✓ ___
- ☐ ■-COBBLE [8] ✓ ___ ☐ ☐-BEDROCK[5] ___ ___
- ☐ ☐-HARDPAN [4] ___ ___ ☐ ☐-DETRITUS[3] ___ ___
- ☐ ☐-MUCK [2] ___ ___ ☐ ☐-ARTIFIC.[0] ___ ___

Substrate Origin (Check all)

- ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ✓ ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)

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

Extent Of Embeddness (Check One or check 2 and AVERAGE)

- ☐—EXTENSIVE [-2] ☐—MODERATE[-
- ■—LOW[0] ☐—NONE[1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■ > 4 [1] ☐ — <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

COVER SCORE: 14

2] INSTREAM COVER

TYPE (Check *All* That Apply)

- ■ -UNDERCUT BANKS [1] ■ -DEEP POOLS [2] ☐ -OXBOWS [1]
- ■ -OVERHANGING VEGETATION [1] ☐ -ROOTWADS [1] ■ -AQUATIC MACROPHYTES [1]
- ☐ -SHALLOWS (IN SLOW WATER) [1] ■ -BOULDERS [1] ■ -LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL:** 15

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN:** 7

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL:** 8

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
■- >1m [6]			
☐- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	☐-EDDIES[1]
☐- 0.4-0.7m [2]	☐ -POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	■-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		☐-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: 5

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	■-MODERATE[0]
■ - GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
☐ - GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		
☐ - GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS ______ **GRADIENT:** 10

6] Gradient (feet/mile): 8.5 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 79.5

Stream SAGAMORE CREEK RM______ Date 02/03/93 River Code______
Location SITE - # 57 CANAL ROAD Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*): **SUBSTRATE SCORE:** 20

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ___ ___ ☐☐-GRAVEL [7] ✓ ✓ Substrate Origin (Check all)
- ■■-BOULDER [9] ___ ___ ☐☐-SAND [6] ✓ ___ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■■-COBBLE [8] ___ ___ ☐☐-BEDROCK[5] ___ ___ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ___ ___ ☐☐-DETRITUS[3] ___ ✓☐-SANDSTONE [0]
- ☐☐-MUCK [2] ___ ___ ☐☐-ARTIFIC.[0] ___ ___ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-- <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS______

Silt Cover (Check One or check 2 and *AVERAGE*)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-
☐-SILT NORMAL [0] ■-SILT FREE [1

Extent Of Embeddness (Check One or check 2 and *AVERAGE*)
☐—EXTENSIVE [-2] ☐—MODERATE [-
■—LOW [0] ☐—NONE [1]

2] INSTREAM COVER **COVER SCORE:** 17

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ☐-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ■-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS:______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL:** 16

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

COMMENTS:______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN:** 9.5

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank) — L R (Per Bank)
- ■■-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP[0]
- ☐☐- RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]
- ☐☐-URBAN OR INDUSTRIAL[0]
- ☐☐-SHRUB OR OLD FIELD[2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
- ☐ ■-NONE OR LITTLE [3]
- ■ ■-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE[1]

COMMENTS:______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL:** 9

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)
- ☐-TORRENTIAL[-1]
- ■-FAST[1]
- ■-MODERATE [1]
- ☐-SLOW [1]
- ☐-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐- NO POOL[0]

COMMENTS:______

RIFFLE: 4

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ■ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS______ **GRADIENT:** 4

6] Gradient (feet/mile): 74.1 %POOL:______ %RIFFLE:______ %RUN:______

Ohio EPA Site Description Sheet

QHEI SCORE: 76

Stream CHAGRIN RIVER RM 15.1 Date 07/07/92 River Code ____

Location SITE-#58 D.S. OF BEECH HILL/BONNIEVIEW CREEK Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all types present*); **SUBSTRATE SCORE: 15**

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ____ ____ ☐■-GRAVEL [7] ✓ ✓ Substrate Origin (Check all)
- ☐☐-BOULDER [9] ✓ ✓ ☐☐-SAND [6] ✓ ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ☐■-COBBLE [8] ____ ____ ☐☐-BEDROCK[5] ____ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ____ ____ ☐☐-DETRITUS[3] ____ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ____ ____ ☐☐-ARTIFIC.[0] ____ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■> 4 [1] ☐— <= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

Silt Cover (Check One or check 2 and *AVERAGE*)
☐-SILT HEAVY [-2] ■-SILT MODERATE [
■-SILT NORMAL [0] ☐-SILT FREE [

Extent Of Embeddness (Check One or check 2 and *AVERAGE*)
☐—EXTENSIVE [-2] ■—MODERATE [-
☐—LOW [0] ☐—NONE [1]

COVER SCORE: 15

2] INSTREAM COVER

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
- ■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1]
- ■-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 16.5**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 6**

River Right Looking Downstream

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

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 9**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
☐->1m [6]			
■-0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	■-EDDIES[1]
☐-0.4-0.7m [2]	■-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐-< 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐—<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL[0]

COMMENTS: ____

RIFFLE: 4.5

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐-GENERALLY >10 cm,MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	■-EXTENSIVE [-1]	■-MODERATE[0]
■-GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	☐-LOW. [1]	☐-NONE[2]
☐-GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel,Sand) [0]		☐-NO RIFFLE[0]
☐-GENERALLY < 5 cm [Riffle = 0]			

COMMENTS ____ **GRADIENT: 10**

6] Gradient (feet/mile): 5.8 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet — **QHEI SCORE: 78**

Stream CHAGRIN RIVER RM 17.4 Date 07/07/92 River Code ____

Location SITE-#59 MAYFIELD ROAD BRIDGE Crew: NEORSD

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check all types present); **SUBSTRATE SCORE: 18**

TYPE — POOL RIFFLE

- ☐☐-BLDER /SLABS[10] ____ ____
- ☐☐-BOULDER [9] ✓ ____
- ☐■-COBBLE [8] ____ ____
- ☐☐-HARDPAN [4] ____ ____
- ☐☐-MUCK [2] ____ ____
- ☐■-GRAVEL [7] ✓ ✓
- ☐☐-SAND [6] ✓ ✓
- ☐☐-BEDROCK[5] ____ ____
- ☐☐-DETRITUS[3] ____ ____
- ☐☐-ARTIFIC.[0] ____ ____

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

SUBSTRATE QUALITY

Substrate Origin (Check all)

- ☐-LIMESTONE [1]
- ☐-RIP/RAP [0]
- ■-TILLS [1]
- ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ☐-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and *AVERAGE*)

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

Extent Of Embeddness (Check One or check 2 and *AVERAGE*)

☐-EXTENSIVE [-2] ☐-MODERATE [-1] ■-LOW [0] ■-NONE [1]

2] INSTREAM COVER — **COVER SCORE: 13**

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) — **CHANNEL: 15.5**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 7.5**

River Right Looking Downstream

RIPARIAN WIDTH — L R (Per Bank)

- ■☐-WIDE>50m [4]
- ☐■-MODERATE 10-50 [3]
- ☐☐-NARROW 5-10m [2]
- ☐☐-VERY NARROW 1-5m [1]
- ☐☐-NONE [0]

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank) / L R (Per Bank)

- ■☐-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP [0]
- ☐■-RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]
- ☐☐-URBAN OR INDUSTRIAL [0]
- ☐☐-SHRUB OR OLD FIELD [2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION

- ☐☐-NONE OR LITTLE [3]
- ■■-MODERATE [2]
- ☐☐-HEAVY OR SEVERE [1]

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 8**

MAX. DEPTH (Check 1)

- ☐->1m [6]
- ■-0.7-1m [4]
- ☐-0.4-0.7m [2]
- ☐-< 0.4m [1]
- ☐-<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ■-POOL WIDTH = RIFFLE WIDTH [1]
- ☐-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL [-1]
- ☐-FAST [1]
- ■-MODERATE [1]
- ■-SLOW [1]
- ■-EDDIES [1]
- ☐-INTERSTITIAL [-1]
- ☐-INTERMITTENT [-2]

☐-NO POOL [0]

COMMENTS: ____

RIFFLE: 6

RIFFLE/RUN DEPTH

- ☐-GENERALLY >10 cm,MAX>50 [4]
- ■-GENERALLY >10 cm,MAX<50 [3]
- ☐-GENERALLY 5-10 cm [1]
- ☐-GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ■-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1]
- ☐-MODERATE [0]
- ☐-LOW. [1]
- ■-NONE [2]

☐-NO RIFFLE [0]

COMMENTS ____ **GRADIENT: 10**

6] Gradient (feet/mile): 7.7 %POOL: ____ %RIFFLE: ____ %RUN: ____

Ohio EPA Site Description Sheet

Stream Abram Creek   CM/RM 4.9   Date 9-15-92   **QHEI SCORE: 43**   River Code

Location AC-1 upstream of Middleburg Hts WWTP   Crew: [illegible]

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*);   **SUBSTRATE SCORE: 6**

TYPE   POOL RIFFLE   POOL RIFFLE   SUBSTRATE QUALITY

- ☐ ☐-BLDER /SLABS[10] ☐ ☐-GRAVEL [7]
- ☐ ☐-BOULDER [9] ☐ ☐-SAND [6]
- ☐ ☐-COBBLE [8] ☐ ☐-BEDROCK[5]
- ☐ ☐-HARDPAN [4] ☐ ■-DETRITUS[3] ✓
- ■ ■-MUCK [2] ✓ ☐ ☐-ARTIFIC.[0] ✓

Substrate Origin (Check all): ☐-LIMESTONE [1] ☐-RIP/RAP [0] ■-TILLS [1] ☐-HARDPAN [0] ☐-SANDSTONE [0] ☐-SHALE [-1] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ■-SILT MODERATE ☐-SILT NORMAL [0] ☐-SILT FREE

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE ☐—LOW [0] ■—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐ > 4 [1] ☐ <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS

2] INSTREAM COVER   **COVER SCORE: 13**

TYPE (Check *All* That Apply)

- ■ -UNDERCUT BANKS [1] ■ -DEEP POOLS [2] ☐ -OXBOWS [1]
- ■ -OVERHANGING VEGETATION [1] ■ -ROOTWADS [1] ☐ -AQUATIC MACROPHYTES [1]
- ☐ -SHALLOWS (IN SLOW WATER) [1] ☐ -BOULDERS [1] ■ -LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS:

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)   **CHANNEL: 7**

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

COMMENTS:

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank)   **RIPARIAN: 6**

River Right Looking Downstream

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

COMMENTS:

POOL/GLIDE AND RIFFLE/RUN QUALITY   **POOL: 5**

MAX. DEPTH (Check 1)

- ☐- >1m [6]
- ■- 0.7-1m [4]
- ☐- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ■-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL [-1] ☐-EDDIES [1]
- ☐-FAST [1] ☐-INTERSTITIAL [-1]
- ☐-MODERATE [1] ☐-INTERMITTENT [-2]
- ■-SLOW [1]

☐- NO POOL [0]

COMMENTS:

RIFFLE: 0

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ☐-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1] ☐-MODERATE [0]
- ☐-LOW. [1] ☐-NONE [2]

■-NO RIFFLE [0]

COMMENTS No Riffle   **GRADIENT: 6**

6] Gradient (feet/mile): 9   %POOL: 5   %RIFFLE: 0   %RUN: 95

Ohio EPA Site Description Sheet

QHEI SCORE: 43

Stream: Abram Creek AC-2 CM 4.6 Date 9-15-92 River Code ______

Location: Downstream of Middleburg Hts WWTP Crew: [illegible]

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Check all types present*); **SUBSTRATE SCORE:** 7

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ___ ✓ ☐☐-GRAVEL [7] ___ ___
- ☐☐-BOULDER [9] ___ ___ ☐☐-SAND [6] ___ ___
- ☐☐-COBBLE [8] ___ ___ ☐☐-BEDROCK[5] ___ ___
- ☐☐-HARDPAN [4] ___ ___ ■■-DETRITUS[3] ✓ ___
- ■■-MUCK [2] ✓ ___ ☐☐-ARTIFIC.[0] ✓ ___

TOTAL NUMBER OF SUBSTRATE TYPES: ☐ > 4 [1] ■ <= 4 [0]

Substrate Origin (Check all): ☐-LIMESTONE [1] ■-RIP/RAP [0] ■-TILLS [1] ☐-HARDPAN [0] ☐-SANDSTONE [0] ☐-SHALE [-1] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE): ☐—EXTENSIVE [-2] ☐—MODERATE [-1] ☐—LOW [0] ■—NONE [1]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS: Concrete Slabs

2] INSTREAM COVER **COVER SCORE:** 11

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ☐-BOULDERS [1]
- ☐-OXBOWS [1]
- ■-AQUATIC MACROPHYTES [1]
- ■-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL:** 7

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN:** 5

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL:** 7

MAX. DEPTH (Check 1)

- ☐- >1m [6]
- ■- 0.7-1m [4]
- ☐- 0.4-0.7m [2]
- ☐- < 0.4m [1]
- ☐—<0.2m [Pool = 0]

MORPHOLOGY (Check 1)

- ☐-POOL WIDTH > RIFFLE WIDTH [2]
- ☐-POOL WIDTH = RIFFLE WIDTH [1]
- ■-POOL WIDTH < RIFFLE W. [0]

POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)

- ☐-TORRENTIAL[-1]
- ☐-FAST[1]
- ■-MODERATE [1]
- ■-SLOW [1]
- ■-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐- NO POOL[0]

COMMENTS: ______

RIFFLE: 0

RIFFLE/RUN DEPTH

- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ☐ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

RIFFLE/RUN SUBSTRATE

- ☐-STABLE (e.g.,Cobble, Boulder) [2]
- ☐-MOD. STABLE (e.g.,Pea Gravel) [1]
- ☐-UNSTABLE (Gravel,Sand) [0]

RIFFLE/RUN EMBEDDEDNESS

- ☐-EXTENSIVE [-1] ☐-MODERATE[0]
- ☐-LOW. [1] ☐-NONE[2]

■-NO RIFFLE[0]

COMMENTS ______ **GRADIENT:** 6

6] Gradient (feet/mile): 9 %POOL: 5 %RIFFLE: 0 %RUN: 95

Ohio EPA Site Description Sheet

QHEI SCORE: 50

Stream Abram Creek CM RM 4.4 Date 9-15-92 River Code ____

Location AC-3 upstream Brook Park WWTP Crew: WK Winkel

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; Check *all* types present); **SUBSTRATE SCORE: 12**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ___ ___
- ■■-GRAVEL [7] ✓ ✓
- ☐☐-BOULDER [9] ___ ___
- ☐☐-SAND [6] ✓ ___
- ☐☐-COBBLE [8] ___ ✓
- ☐☐-BEDROCK[5] ___ ___
- ☐☐-HARDPAN [4] ___ ___
- ■■-DETRITUS[3] ___ ___
- ☐☐-MUCK [2] ___ ___
- ☐☐-ARTIFIC.[0] ✓ ___

Substrate Origin (Check all): ☐-LIMESTONE [1] ☐-RIP/RAP [0] ■-TILLS [1] ☐-HARDPAN [0] ✓☐-SANDSTONE [0] ✓☐-SHALE [-1] ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and *AVERAGE*): ☐-SILT HEAVY [-2] ☐-SILT MODERATE [- ■- SILT NORMAL [0] ☐- SILT FREE [1]

Extent Of Embeddness (Check One o check 2 and *AVERAGE*): ☐—EXTENSIVE [-2] ☐—MODERATE [-1 ■—LOW [0] ☐—NONE [1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■- > 4 [1] ☐— <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ____

2] INSTREAM COVER **COVER SCORE: 9**

TYPE (Check *All* That Apply)

- ■-UNDERCUT BANKS [1]
- ■-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ■-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ☐-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ☐-LOGS OR WOODY DEBRIS [1]

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

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

COMMENTS: ____

3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*) **CHANNEL: 8**

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

COMMENTS: ____

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 5**

River Right Looking Downstream

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

COMMENTS: ____

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 6**

MAX DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check *All* That Apply)	
☐- >1m [6]	☐-POOL WIDTH > RIFFLE WIDTH [2]	☐-TORRENTIAL[-1]	■-EDDIES[1]
☐- 0.7-1m [4]	■-POOL WIDTH = RIFFLE WIDTH [1]	☐-FAST[1]	☐-INTERSTITIAL[-1]
■- 0.4-0.7m [2]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐- < 0.4m [1]		■-SLOW [1]	
☐—<0.2m [Pool = 0]			

☐-NO POOL[0]

COMMENTS: ____

RIFFLE: 2

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐ - GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	☐-MODERATE[0]
☐ - GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	■-LOW. [1]	☐-NONE[2]
■ - GENERALLY 5-10 cm [1]	■-UNSTABLE (Gravel,Sand) [0]		
☐ - GENERALLY < 5 cm [Riffle = 0]			

☐-NO RIFFLE[0]

COMMENTS ____ **GRADIENT:** ____

6] Gradient (feet/mile): 13.2 %POOL: 5 %RIFFLE: 5 %RUN: 90

Ohio EPA Site Description Sheet

Stream Abram Creek CM/RM 4.2 Date 9/15/92 QHEI SCORE: 50 River Code

Location AC-4 Downstream Brook Park WWTP Crew: Wm Neubauer

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); SUBSTRATE SCORE: 12

TYPE POOL RIFFLE POOL RIFFLE SUBSTRATE QUALITY

☐☐-BLDER /SLABS[10] ■■-GRAVEL [7] ✓ ✓ Substrate Origin (Check all) Silt Cover (Check One or check 2 and AVERAGE)

☐☐-BOULDER [9] ☐☐-SAND [6] ✓ ☐-LIMESTONE [1] ☐-RIP/RAP [0] ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-

☐☐-COBBLE [8] ✓ ☐☐-BEDROCK[5] ■-TILLS [1] ☐-HARDPAN [0] ■-SILT NORMAL [0] ☐-SILT FREE [1

☐☐-HARDPAN [4] ■■-DETRITUS[3] ☐-SANDSTONE [0] Extent Of Embeddness (Check One or check 2 and AVERAGE)

☐☐-MUCK [2] ✓ ☐☐-ARTIFIC.[0] ✓ ☐-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2] ☐-EXTENSIVE [-2] ☐-MODERATE [-

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates) ■-LOW [0] ☐-NONE [1]

COMMENTS

2] INSTREAM COVER COVER SCORE: 9

TYPE (Check All That Apply) AMOUNT (Check ONLY One or check 2 and AVERAGE)

■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1] ☐-EXTENSIVE > 75% [11]

■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ☐-AQUATIC MACROPHYTES [1] ☐-MODERATE 25-75% [7]

☐-SHALLOWS (IN SLOW WATER) [1] ☐-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1] ■-SPARSE 5-25% [3]

☐-NEARLY ABSENT < 5% [1]

COMMENTS:

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) CHANNEL: 8

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

COMMENTS:

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) RIPARIAN: 5

River Right Looking Downstream

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

COMMENTS:

POOL/GLIDE AND RIFFLE/RUN QUALITY POOL: 6

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
☐- >1m [6]			
☐- 0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	■-TORRENTIAL[-1]	☐-EDDIES[1]
■- 0.4-0.7m [2]	■-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST[1]	☐-INTERSTITIAL[-1]
☐- < 0.4m [1]	☐-POOL WIDTH < RIFFLE W. [0]	■-MODERATE [1]	☐-INTERMITTENT[-2]
☐-<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL[0]

COMMENTS:

RIFFLE: 2

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS	
☐-GENERALLY >10 cm,MAX>50 [4]	☐-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1]	☐-MODERATE[0]
☐-GENERALLY >10 cm,MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	■-LOW. [1]	☐-NONE[2]
■-GENERALLY 5-10 cm [1]	■-UNSTABLE (Gravel,Sand) [0]		
☐-GENERALLY < 5 cm (Riffle = 0)			

☐-NO RIFFLE[0]

COMMENTS GRADIENT: 8

6] Gradient (feet/mile): 13.2 %POOL: 5 %RIFFLE: 5 %RUN: 90

Ohio EPA Site Description Sheet

QHEI SCORE: 72

Stream Abram Creek CM RM 0.04 Date 9-15-92 River Code

Location AC-5 75 ft upstream Confluence with Rocky River Crew: [illegible]

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 13**

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	SUBSTRATE QUALITY
☐☐-BLDER /SLABS[10]			☐☐-GRAVEL [7]		✓	Substrate Origin (Check all)
☐☐-BOULDER [9]	✓	✓	☐■-SAND [6]			☐-LIMESTONE [1] ☐-RIP/RAP [0]
☐☐-COBBLE [8]		✓	☐■-BEDROCK[5]			■-TILLS [1] ☐-HARDPAN [0]
☐☐-HARDPAN [4]			☐☐-DETRITUS[3]	✓		☐-SANDSTONE [0]
☐☐-MUCK [2]	✓		☐☐-ARTIFIC.[0]			■-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ■-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■-SILT NORMAL [0] ■-SILT FREE [1]

Extent Of Embeddedness (Check One or check 2 and AVERAGE)
☐-EXTENSIVE [-2] ☐-MODERATE [-1]
■-LOW [0] ■-NONE [1]

2] INSTREAM COVER **COVER SCORE: 16**

TYPE (Check All That Apply)

■-UNDERCUT BANKS [1] ■-DEEP POOLS [2] ☐-OXBOWS [1]
■-OVERHANGING VEGETATION [1] ■-ROOTWADS [1] ■-AQUATIC MACROPHYTES [1]
■-SHALLOWS (IN SLOW WATER) [1] ■-BOULDERS [1] ■-LOGS OR WOODY DEBRIS [1]

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

COMMENTS:

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) **CHANNEL: 17**

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

COMMENTS: From Confluence to 150 ft upstream creek is unstable

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 9**

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)
■■-FOREST, SWAMP [3]
☐☐-OPEN PASTURE/ ROWCROP [0]
☐☐-RESID.,PARK,NEW FIELD [1]
☐☐-FENCED PASTURE [1]

L R (Per Bank)
☐☐-URBAN OR INDUSTRIAL [0]
☐☐-SHRUB OR OLD FIELD [2]
☐☐-CONSERV. TILLAGE [1]
☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
☐ ☐-NONE OR LITTLE [3]
■ ■-MODERATE [2]
☐ ☐-HEAVY OR SEVERE [1]

COMMENTS:

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 5**

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)
☐-TORRENTIAL [-1] ☐-EDDIES [1]
■-FAST [1] ☐-INTERSTITIAL [-1]
■-MODERATE [1] ☐-INTERMITTENT [-2]
■-SLOW [1]

☐-NO POOL [0]

COMMENTS:

RIFFLE: 4

RIFFLE/RUN DEPTH
☐-GENERALLY >10 cm,MAX>50 [4]
☐-GENERALLY >10 cm,MAX<50 [3]
■-GENERALLY 5-10 cm [1]
☐-GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE [0]

COMMENTS **GRADIENT: 8**

6] Gradient (feet/mile): 37.7 %POOL: 5 %RIFFLE: 80 %RUN: 15

Ohio EPA Site Description Sheet — **QHEI SCORE: 62**

Stream: Rocky River RM: 10.6 Date: 8-15-92 River Code: ______

Location: RR-6 upstream of Abram Creek Confluence Crew: Wm Heubend

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present): **SUBSTRATE SCORE: 11.5**

TYPE — POOL RIFFLE

- ☐☐-BLDER /SLABS[10] ___ ___
- ☐☐-BOULDER [9] ✓ ✓
- ☐☐-COBBLE [8] ✓ ✓
- ☐☐-HARDPAN [4] ___ ___
- ☐☐-MUCK [2] ___ ___
- ☐■-GRAVEL [7] ✓ ✓
- ☐☐-SAND [6] ___ ___
- ☐■-BEDROCK[5] ✓ ✓
- ☐☐-DETRITUS[3] ___ ___
- ☐☐-ARTIFIC.[0] ___ ___

TOTAL NUMBER OF SUBSTRATE TYPES: ☐ > 4 [1] ■ <= 4 [0]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

SUBSTRATE QUALITY — Substrate Origin (Check all)

- ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ■-TILLS [1] ☐-HARDPAN [0]
- ☐-SANDSTONE [0]
- ■-SHALE [-1]
- ☐-COAL FINES [-2]

Silt Cover (Check One or check 2 and AVERAGE)

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

Extent Of Embeddedness (Check One or check 2 and AVERAGE)

☐—EXTENSIVE [-2] ☐—MODERATE [-1] ■—LOW [0] ☐—NONE [1]

COMMENTS ______

2] INSTREAM COVER **COVER SCORE: 6**

TYPE (Check All That Apply)

- ■-UNDERCUT BANKS [1]
- ☐-OVERHANGING VEGETATION [1]
- ☐-SHALLOWS (IN SLOW WATER) [1]
- ☐-DEEP POOLS [2]
- ■-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ☐-AQUATIC MACROPHYTES [1]
- ☐-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) **CHANNEL: 12.5**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) **RIPARIAN: 9**

River Right Looking Downstream

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

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY **POOL: 6**

MAX. DEPTH (Check 1)	MORPHOLOGY (Check 1)	POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)	
☐->1m [6]			
■-0.7-1m [4]	☐-POOL WIDTH > RIFFLE WIDTH [2]	■-TORRENTIAL [-1]	■-EDDIES [1]
☐-0.4-0.7m [2]	☐-POOL WIDTH = RIFFLE WIDTH [1]	■-FAST [1]	☐-INTERSTITIAL [-1]
☐-< 0.4m [1]	■-POOL WIDTH < RIFFLE W. [0]	☐-MODERATE [1]	☐-INTERMITTENT [-2]
☐—<0.2m [Pool = 0]		■-SLOW [1]	

☐-NO POOL [0]

COMMENTS: ______

RIFFLE: 7

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN EMBEDDEDNESS
■-GENERALLY >10 cm, MAX>50 [4]	■-STABLE (e.g.,Cobble, Boulder) [2]	☐-EXTENSIVE [-1] ■-MODERATE [0]
☐-GENERALLY >10 cm, MAX<50 [3]	☐-MOD. STABLE (e.g.,Pea Gravel) [1]	■-LOW. [1] ☐-NONE [2]
☐-GENERALLY 5-10 cm [1]	☐-UNSTABLE (Gravel, Sand) [0]	☐-NO RIFFLE [0]
☐-GENERALLY < 5 cm [Riffle = 0]		

COMMENTS ______ **GRADIENT: 10**

6] Gradient (feet/mile): 7.2 %POOL: ______ %RIFFLE: ______ %RUN: ______

Ohio EPA Site Description Sheet

QHEI SCORE: 59

Stream Rocky River RM ______ Date 8-15-92 River Code ______

Location RR-9 at Brookpark Road Bridge @ 1/4 mile dst Abram Creek Crew: [illegible]

1] SUBSTRATE (Check ONLY Two Substrate TYPE BOXES; Check all types present); **SUBSTRATE SCORE: 12.5**

TYPE — POOL RIFFLE — POOL RIFFLE — SUBSTRATE QUALITY

- ☐☐-BLDER /SLABS[10] ___ ___ ☐■-GRAVEL [7] ___ ___ Substrate Origin (Check all)
- ☐☐-BOULDER [9] ___ ✓ ☐☐-SAND [6] ✓ ___ ☐-LIMESTONE [1] ☐-RIP/RAP [0]
- ☐☐-COBBLE [8] ___ ___ ☐■-BEDROCK[5] ___ ___ ■-TILLS [1] ☐-HARDPAN [0]
- ☐☐-HARDPAN [4] ___ ___ ☐☐-DETRITUS[3] ✓ ___ ☐-SANDSTONE [0]
- ☐☐-MUCK [2] ___ ___ ☐☐-ARTIFIC.[0] ___ ___ ■-SHALE [-1]

TOTAL NUMBER OF SUBSTRATE TYPES: ☐-> 4 [1] ☐-<= 4 [0] ☐-COAL FINES [-2]

NOTE: (Ignore sludge that originates from point-sources; score is based on natural substrates)

COMMENTS ______

Silt Cover (Check One or check 2 and AVERAGE)
☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ■-SILT NORMAL [0] ☐-SILT FREE [1]

Extent Of Embeddness (Check One or check 2 and AVERAGE)
☐-EXTENSIVE [-2] ☐-MODERATE [-1] ■-LOW[0] ■-NONE[1]

2] INSTREAM COVER — **COVER SCORE: 6**

TYPE (Check All That Apply)

- ☐-UNDERCUT BANKS [1]
- ☐-OVERHANGING VEGETATION [1]
- ■-SHALLOWS (IN SLOW WATER) [1]
- ☐-DEEP POOLS [2]
- ☐-ROOTWADS [1]
- ■-BOULDERS [1]
- ☐-OXBOWS [1]
- ■-AQUATIC MACROPHYTES [1]
- ☐-LOGS OR WOODY DEBRIS [1]

AMOUNT (Check ONLY One or check 2 and AVERAGE)

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

COMMENTS: ______

3] CHANNEL MORPHOLOGY: (Check ONLY One PER Category OR check 2 and AVERAGE) — **CHANNEL: 12**

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

COMMENTS: ______

4] RIPARIAN ZONE AND BANK EROSION - (check ONE box per bank or check 2 and AVERAGE per bank) — **RIPARIAN: 5.5**

River Right Looking Downstream

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

EROSION/RUNOFF - FLOOD PLAIN QUALITY — L R (Most Predominant Per Bank)
- ☐☐-FOREST, SWAMP [3]
- ☐☐-OPEN PASTURE/ ROWCROP[0]
- ■☐- RESID.,PARK,NEW FIELD [1]
- ☐☐-FENCED PASTURE [1]

L R (Per Bank)
- ☐■-URBAN OR INDUSTRIAL[0]
- ☐☐-SHRUB OR OLD FIELD[2]
- ☐☐-CONSERV. TILLAGE [1]
- ☐☐-MINING/CONSTRUCTION [0]

BANK EROSION
- ■ ☐-NONE OR LITTLE [3]
- ☐ ■-MODERATE [2]
- ☐ ☐-HEAVY OR SEVERE[1]

COMMENTS: ______

POOL/GLIDE AND RIFFLE/RUN QUALITY — **POOL: 7**

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

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

POOL/RUN/RIFFLE CURRENT VELOCITY (Check All That Apply)
- ☐-TORRENTIAL[-1]
- ■-FAST[1]
- ■-MODERATE [1]
- ■-SLOW [1]
- ■-EDDIES[1]
- ☐-INTERSTITIAL[-1]
- ☐-INTERMITTENT[-2]

☐-NO POOL[0]

COMMENTS: ______

RIFFLE: ______

RIFFLE/RUN DEPTH
- ☐ - GENERALLY >10 cm,MAX>50 [4]
- ■ - GENERALLY >10 cm,MAX<50 [3]
- ☐ - GENERALLY 5-10 cm [1]
- ☐ - GENERALLY < 5 cm [Riffle = 0]

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

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

☐-NO RIFFLE[0]

COMMENTS ______ — **GRADIENT: 10**

6] Gradient (feet/mile): 9.96 %POOL: ______ %RIFFLE: ______ %RUN: ______

APPENDIX VII

ABRAM CREEK
1992 CHEMICAL AND BACTERIOLOGICAL DATA

(For explanation of tables, see Data Table Key in Appendix II)

NEORSD

WQIS

ABRAM CREEK (AC-1) - 08/03/92

Parameter		Value	Failure
Temperature	(degrees C)	20.4	-
Dissolved Oxygen	(mg/L)	4.8	-
BOD-5	(mg/L)	10	-
COD	(mg/L)	37	-
Suspended Solids	(mg/L)	33	-
Total Solids	(mg/L)	685	-
Dissolved Solids	(mg/L)	603	-
Specific Conductance	(umhos/cm)	900	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	1.41	-
Phosphorus	(mg/L)	0.22	-
Nitrate-N	(mg/L)	0.32	-
NO3+NO2 Total	(mg/L)	0.38	-
TKN	(mg/L)	2.87	-
Sulfates	(mg/L)	94	-
Alkalinity	(mg/L)	186	-
Hardness	(mg/L)	250	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	2.40	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	2300	PCU(2000)
pH	(s.u.)	7.2	-
E. coli	(organisms/100ml)	760	PCU(235)
Antimony	(mg/L)	<0.007	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.06	-

NEORSD

WQIS

ABRAM CREEK (AC-1) - 08/19/92

Parameter		Value	Failure
Temperature	(degrees C)	18.8	-
Dissolved Oxygen	(mg/L)	5.4	-
BOD-5	(mg/L)	12	-
COD	(mg/L)	41	-
Suspended Solids	(mg/L)	31	-
Total Solids	(mg/L)	423	-
Dissolved Solids	(mg/L)	378	-
Turbidity	(NTU)	17.0	-
Ammonia-N	(mg/L)	0.29	-
Phosphorus	(mg/L)	0.26	-
Soluble Phosphorus	(mg/L)	0.12	-
Nitrate-N	(mg/L)	0.58	-
NO3+NO2 Total	(mg/L)	0.60	-
TKN	(mg/L)	2.70	-
Chlorides	(mg/L)	126	-
Sulfates	(mg/L)	58	-
Alkalinity	(mg/L)	112	-
Hardness	(mg/L)	176	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	2.20	WHAL(1.0)*
Cadmium	(mg/L)	<0.0010	-
Lead	(mg/L)	0.004	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	58000	PCU(2000)
pH	(s.u.)	7.3	-
Arsenic	(mg/L)	0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.02	-

NEORSD

WQIS

ABRAM CREEK (AC-1) - 08/20/92

Parameter		Value	Failure
Temperature	(degrees C)	18.0	-
Dissolved Oxygen	(mg/L)	5.8	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	28	-
Suspended Solids	(mg/L)	30	-
Total Solids	(mg/L)	475	-
Dissolved Solids	(mg/L)	436	-
Specific Conductance	(umhos/cm)	620	-
Turbidity	(NTU)	14.0	-
Ammonia-N	(mg/L)	0.60	-
Phosphorus	(mg/L)	0.29	-
Soluble Phosphorus	(mg/L)	0.20	-
Nitrate-N	(mg/L)	0.01	-
NO3+NO2 Total	(mg/L)	60.01	-
TKN	(mg/L)	1.89	-
Chlorides	(mg/L)	128	-
Alkalinity	(mg/L)	132	-
Hardness	(mg/L)	184	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.020	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.06	-
Iron	(mg/L)	2.10	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.4	-
Arsenic	(mg/L)	0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Potassium	(mg/L)	6.6	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	60.00	-

NEORSD

WQIS

ABRAM CREEK (AC-1) - 08/24/92

Parameter		Value	Failure
Temperature	(degrees C)	21.5	-
Dissolved Oxygen	(mg/L)	5.0	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	46	-
Suspended Solids	(mg/L)	78	-
Total Solids	(mg/L)	629	-
Dissolved Solids	(mg/L)	502	-
Specific Conductance	(umhos/cm)	850	-
Turbidity	(NTU)	20.0	-
Ammonia-N	(mg/L)	1.01	-
Phosphorus	(mg/L)	0.43	-
Soluble Phosphorus	(mg/L)	0.16	-
Nitrate-N	(mg/L)	0.25	-
NO3+NO2 Total	(mg/L)	0.29	-
TKN	(mg/L)	2.98	-
Chlorides	(mg/L)	172	-
Sulfates	(mg/L)	82	-
Alkalinity	(mg/L)	114	-
Hardness	(mg/L)	196	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.78	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	2800	PCU(2000)
pH	(s.u.)	7.5	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	0.007	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.04	-

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ABRAM CREEK (AC-1) - 09/02/92

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	11.2	-
BOD-5	(mg/L)	4	-
COD	(mg/L)	30	-
Suspended Solids	(mg/L)	50	-
Total Solids	(mg/L)	697	-
Dissolved Solids	(mg/L)	624	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	18.0	-
Ammonia-N	(mg/L)	0.80	-
Phosphorus	(mg/L)	0.25	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	0.18	-
NO3+NO2 Total	(mg/L)	0.18	-
TKN	(mg/L)	1.80	-
Chlorides	(mg/L)	158	-
Sulfates	(mg/L)	80	-
Alkalinity	(mg/L)	160	-
Hardness	(mg/L)	241	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.020	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	2.40	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	1360	-
pH	(s.u.)	7.7	-
Arsenic	(mg/L)	0.008	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	<0.01	-

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ABRAM CREEK (AC-2) - 08/03/92

Parameter		Value	Failure
Temperature	(degrees C)	20.4	-
Dissolved Oxygen	(mg/L)	3.6	WHAL(4.0)
BOD-5	(mg/L)	11	-
COD	(mg/L)	38	-
Suspended Solids	(mg/L)	17	-
Total Solids	(mg/L)	596	-
Dissolved Solids	(mg/L)	529	-
Specific Conductance	(umhos/cm)	850	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	3.12	-
Phosphorus	(mg/L)	0.47	-
Nitrate-N	(mg/L)	1.51	-
NO3+NO2 Total	(mg/L)	2.01	-
TKN	(mg/L)	5.77	-
Sulfates	(mg/L)	90	-
Alkalinity	(mg/L)	172	-
Hardness	(mg/L)	264	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	1.80	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	8000	PCU(2000)
pH	(s.u.)	7.3	-
E. coli	(organisms/100ml)	2300	PCU(235)
Antimony	(mg/L)	<0.007	-
Thallium	(mg/L)	<0.005	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.50	-

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ABRAM CREEK (AC-2) - 08/20/92

Parameter		Value	Failure
Temperature	(degrees C)	19.3	-
Dissolved Oxygen	(mg/L)	4.5	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	32	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	492	-
Dissolved Solids	(mg/L)	441	-
Specific Conductance	(umhos/cm)	680	-
Turbidity	(NTU)	11.0	-
Ammonia-N	(mg/L)	4.59	-
Phosphorus	(mg/L)	0.44	-
Soluble Phosphorus	(mg/L)	0.22	-
Nitrate-N	(mg/L)	1.67	-
NO3+NO2 Total	(mg/L)	1.92	-
TKN	(mg/L)	4.80	-
Chlorides	(mg/L)	126	-
Sulfates	(mg/L)	93	-
Alkalinity	(mg/L)	137	-
Hardness	(mg/L)	180	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	1.30	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.4	-
Arsenic	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Potassium	(mg/L)	6.6	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.25	-

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ABRAM CREEK (AC-2) - 08/24/92

Parameter		Value	Failure
Temperature	(degrees C)	21.5	-
Dissolved Oxygen	(mg/L)	4.4	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	40	-
Total Solids	(mg/L)	566	-
Dissolved Solids	(mg/L)	484	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	12.0	-
Ammonia-N	(mg/L)	5.30	-
Phosphorus	(mg/L)	0.34	-
Soluble Phosphorus	(mg/L)	0.30	-
Nitrate-N	(mg/L)	2.76	-
NO3+NO2 Total	(mg/L)	3.40	-
TKN	(mg/L)	7.38	-
Chlorides	(mg/L)	130	-
Sulfates	(mg/L)	73	-
Alkalinity	(mg/L)	128	-
Hardness	(mg/L)	198	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.020	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.07	-
Iron	(mg/L)	1.10	WHAL(1.0)*
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	1100	-
pH	(s.u.)	7.3	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.64	-

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ABRAM CREEK (AC-2) - 09/02/92

Parameter		Value	Failure
Temperature	(degrees C)	17.0	-
Dissolved Oxygen	(mg/L)	5.2	-
BOD-5	(mg/L)	11	-
COD	(mg/L)	47	-
Suspended Solids	(mg/L)	43	-
Total Solids	(mg/L)	675	-
Dissolved Solids	(mg/L)	605	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	14.0	-
Ammonia-N	(mg/L)	4.83	-
Phosphorus	(mg/L)	0.54	-
Soluble Phosphorus	(mg/L)	0.26	-
Nitrate-N	(mg/L)	0.98	-
NO3+NO2 Total	(mg/L)	1.12	-
TKN	(mg/L)	7.29	-
Chlorides	(mg/L)	130	-
Sulfates	(mg/L)	87	-
Alkalinity	(mg/L)	162	-
Hardness	(mg/L)	216	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.040	WHAL(0.039)
Total Chromium	(mg/L)	0.020	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	2.10	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.030	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	980	-
pH	(s.u.)	7.2	-
Arsenic	(mg/L)	0.007	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	0.0100	WHAL(0.0060)
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.14	-

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ABRAM CREEK (AC-3) - 08/03/92

Parameter		Value	Failure
Temperature	(degrees C)	20.4	-
Dissolved Oxygen	(mg/L)	3.7	WHAL(4.0)
BOD-5	(mg/L)	6	-
COD	(mg/L)	33	-
Suspended Solids	(mg/L)	28	-
Total Solids	(mg/L)	640	-
Dissolved Solids	(mg/L)	576	-
Specific Conductance	(umhos/cm)	860	-
Turbidity	(NTU)	6.0	-
Ammonia-N	(mg/L)	3.24	-
Phosphorus	(mg/L)	0.34	-
Nitrate-N	(mg/L)	1.43	-
NO3+NO2 Total	(mg/L)	1.96	-
TKN	(mg/L)	5.37	-
Sulfates	(mg/L)	91	-
Alkalinity	(mg/L)	166	-
Hardness	(mg/L)	264	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.74	-
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	2700	PCU(2000)
pH	(s.u.)	7.4	-
E. coli	(organisms/100ml)	2000	PCU(235)
Antimony	(mg/L)	<0.007	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.53	-

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ABRAM CREEK (AC-3) - 08/20/92

Parameter		Value	Failure
Temperature	(degrees C)	18.8	-
Dissolved Oxygen	(mg/L)	4.5	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	26	-
Suspended Solids	(mg/L)	12	-
Total Solids	(mg/L)	483	-
Dissolved Solids	(mg/L)	456	-
Specific Conductance	(umhos/cm)	680	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	3.31	-
Phosphorus	(mg/L)	0.31	-
Soluble Phosphorus	(mg/L)	0.21	-
Nitrate-N	(mg/L)	1.63	-
NO3+NO2 Total	(mg/L)	1.92	-
TKN	(mg/L)	4.55	-
Chlorides	(mg/L)	130	-
Sulfates	(mg/L)	103	-
Alkalinity	(mg/L)	140	-
Hardness	(mg/L)	206	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.05	-
Iron	(mg/L)	1.10	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.4	-
Arsenic	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Potassium	(mg/L)	6.5	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.29	-

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ABRAM CREEK (AC-3) - 08/24/92

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	6.4	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	27	-
Suspended Solids	(mg/L)	32	-
Total Solids	(mg/L)	602	-
Dissolved Solids	(mg/L)	530	-
Specific Conductance	(umhos/cm)	875	-
Turbidity	(NTU)	11.0	-
Ammonia-N	(mg/L)	3.91	-
Phosphorus	(mg/L)	0.45	-
Soluble Phosphorus	(mg/L)	0.24	-
Nitrate-N	(mg/L)	1.97	-
NO3+NO2 Total	(mg/L)	2.42	-
TKN	(mg/L)	6.07	-
Chlorides	(mg/L)	156	-
Sulfates	(mg/L)	80	-
Alkalinity	(mg/L)	125	-
Hardness	(mg/L)	204	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.78	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	600	-
pH	(s.u.)	7.4	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	0.006	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.45	-

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ABRAM CREEK (AC-3) - 09/02/92

Parameter		Value	Failure
Temperature	(degrees C)	17.0	-
Dissolved Oxygen	(mg/L)	6.2	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	38	-
Suspended Solids	(mg/L)	41	-
Total Solids	(mg/L)	741	-
Dissolved Solids	(mg/L)	644	-
Specific Conductance	(umhos/cm)	800	-
Turbidity	(NTU)	34.0	-
Ammonia-N	(mg/L)	4.20	-
Phosphorus	(mg/L)	0.54	-
Soluble Phosphorus	(mg/L)	0.29	-
Nitrate-N	(mg/L)	0.89	-
NO3+NO2 Total	(mg/L)	1.04	-
TKN	(mg/L)	6.96	-
Chlorides	(mg/L)	144	-
Sulfates	(mg/L)	97	-
Alkalinity	(mg/L)	163	-
Hardness	(mg/L)	240	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.020	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	2.80	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	1240	-
pH	(s.u.)	7.4	-
Arsenic	(mg/L)	0.600	WHAL(0.360) AWS(0.100)*
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	0.1000	-
Nitrite-N	(mg/L)	0.15	-

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ABRAM CREEK (AC-4) - 08/03/92

Parameter		Value	Failure
Temperature	(degrees C)	20.5	-
Dissolved Oxygen	(mg/L)	5.6	-
BOD-5	(mg/L)	16	-
COD	(mg/L)	35	-
Suspended Solids	(mg/L)	32	-
Total Solids	(mg/L)	662	-
Dissolved Solids	(mg/L)	588	-
Specific Conductance	(umhos/cm)	900	-
Turbidity	(NTU)	5.0	-
Ammonia-N	(mg/L)	2.79	-
Phosphorus	(mg/L)	0.33	-
Nitrate-N	(mg/L)	3.18	-
NO3+NO2 Total	(mg/L)	3.65	-
TKN	(mg/L)	5.09	-
Sulfates	(mg/L)	96	-
Alkalinity	(mg/L)	166	-
Hardness	(mg/L)	254	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	1.20	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	398	-
pH	(s.u.)	7.3	-
E. coli	(organisms/100ml)	370	PCU(235)
Antimony	(mg/L)	<0.007	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	0.0060	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.47	-

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ABRAM CREEK (AC-4) - 08/19/92

Parameter		Value	Failure
Temperature	(degrees C)	19.0	-
Dissolved Oxygen	(mg/L)	5.3	-
BOD-5	(mg/L)	8	-
COD	(mg/L)	35	-
Suspended Solids	(mg/L)	35	-
Total Solids	(mg/L)	467	-
Dissolved Solids	(mg/L)	387	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	1.36	-
Phosphorus	(mg/L)	0.46	-
Soluble Phosphorus	(mg/L)	0.19	-
Nitrate-N	(mg/L)	2.38	-
NO3+NO2 Total	(mg/L)	2.48	-
TKN	(mg/L)	4.08	-
Chlorides	(mg/L)	116	-
Sulfates	(mg/L)	69	-
Alkalinity	(mg/L)	111	-
Hardness	(mg/L)	163	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Iron	(mg/L)	3.00	WHAL(1.0)*
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	9500	PCU(2000)
pH	(s.u.)	7.3	-
E. coli	(organisms/100ml)	5900	PCU(235)
Arsenic	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	0.0010	-
Beryllium	(mg/L)	<0.0050	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.10	-

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ABRAM CREEK (AC-4) - 08/20/92

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	5.3	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	36	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	513	-
Dissolved Solids	(mg/L)	468	-
Specific Conductance	(umhos/cm)	750	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	5.50	-
Phosphorus	(mg/L)	0.45	-
Soluble Phosphorus	(mg/L)	0.21	-
Nitrate-N	(mg/L)	5.04	-
NO3+NO2 Total	(mg/L)	5.41	-
TKN	(mg/L)	6.63	-
Chlorides	(mg/L)	134	-
Sulfates	(mg/L)	95	-
Alkalinity	(mg/L)	131	-
Hardness	(mg/L)	194	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.020	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.86	-
Cadmium	(mg/L)	0.0100	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.4	-
Arsenic	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Potassium	(mg/L)	7.1	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.37	-

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ABRAM CREEK (AC-4) - 08/24/92

Parameter		Value	Failure
Temperature	(degrees C)	21.0	-
Dissolved Oxygen	(mg/L)	7.0	-
BOD-5	(mg/L)	20	-
COD	(mg/L)	35	-
Suspended Solids	(mg/L)	18	-
Total Solids	(mg/L)	606	-
Dissolved Solids	(mg/L)	57	-
Specific Conductance	(umhos/cm)	850	-
Turbidity	(NTU)	8.8	-
Ammonia-N	(mg/L)	3.32	-
Phosphorus	(mg/L)	0.34	-
Soluble Phosphorus	(mg/L)	0.22	-
Nitrate-N	(mg/L)	4.09	-
NO3+NO2 Total	(mg/L)	4.43	-
TKN	(mg/L)	4.54	-
Chlorides	(mg/L)	156	-
Sulfates	(mg/L)	79	-
Alkalinity	(mg/L)	114	-
Hardness	(mg/L)	204	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.95	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	1340	-
pH	(s.u.)	7.4	-
Antimony	(mg/L)	<0.007	-
Arsenic	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.34	-

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ABRAM CREEK (AC-4) - 09/02/92

Parameter		Value	Failure
Temperature	(degrees C)	17.0	-
Dissolved Oxygen	(mg/L)	5.0	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	33	-
Suspended Solids	(mg/L)	39	-
Total Solids	(mg/L)	656	-
Dissolved Solids	(mg/L)	637	-
Specific Conductance	(umhos/cm)	790	-
Turbidity	(NTU)	30.0	-
Ammonia-N	(mg/L)	3.27	-
Phosphorus	(mg/L)	0.48	-
Soluble Phosphorus	(mg/L)	0.31	-
Nitrate-N	(mg/L)	4.10	-
NO3+NO2 Total	(mg/L)	4.22	-
TKN	(mg/L)	5.48	-
Chlorides	(mg/L)	142	-
Sulfates	(mg/L)	92	-
Alkalinity	(mg/L)	134	-
Hardness	(mg/L)	228	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	2.40	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	1300	-
pH	(s.u.)	7.4	-
Arsenic	(mg/L)	0.007	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.12	-

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ABRAM CREEK (AC-5) - 08/03/92

Parameter		Value	Failure
BOD-5	(mg/L)	6	-
COD	(mg/L)	<10	-
Suspended Solids	(mg/L)	8	-
Total Solids	(mg/L)	667	-
Dissolved Solids	(mg/L)	608	-
Turbidity	(NTU)	3.0	-
Ammonia-N	(mg/L)	1.02	-
Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	3.76	-
NO3+NO2 Total	(mg/L)	4.45	-
TKN	(mg/L)	2.33	-
Sulfates	(mg/L)	109	-
Alkalinity	(mg/L)	146	-
Hardness	(mg/L)	280	-
Nickel	(mg/L)	0.020	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.38	-
Cadmium	(mg/L)	0.0100	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	620	-
pH	(s.u.)	7.9	-
E. coli	(organisms/100ml)	605	PCU(235)
Antimony	(mg/L)	<0.007	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.69	-

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ABRAM CREEK (AC-5) - 08/19/92

Parameter		Value	Failure
Temperature	(degrees C)	18.5	-
Dissolved Oxygen	(mg/L)	8.3	-
BOD-5	(mg/L)	13	-
COD	(mg/L)	31	-
Suspended Solids	(mg/L)	32	-
Total Solids	(mg/L)	481	-
Dissolved Solids	(mg/L)	423	-
Turbidity	(NTU)	15.0	-
Ammonia-N	(mg/L)	1.74	-
Phosphorus	(mg/L)	0.44	-
Soluble Phosphorus	(mg/L)	0.17	-
Nitrate-N	(mg/L)	3.05	-
NO3+NO2 Total	(mg/L)	3.41	-
TKN	(mg/L)	3.65	-
Chlorides	(mg/L)	114	-
Sulfates	(mg/L)	73	-
Alkalinity	(mg/L)	111	-
Hardness	(mg/L)	178	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.13	-
Iron	(mg/L)	2.80	WHAL(1.0)*
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	5700	PCU(2000)
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	2800	PCU(235)
Arsenic	(mg/L)	0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	0.0020	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	0.0010	-
Nitrite-N	(mg/L)	0.36	-

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ABRAM CREEK (AC-5) - 08/20/92

Parameter		Value	Failure
Temperature	(degrees C)	19.9	-
Dissolved Oxygen	(mg/L)	8.1	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	14	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	506	-
Dissolved Solids	(mg/L)	464	-
Specific Conductance	(umhos/cm)	700	-
Turbidity	(NTU)	3.3	-
Ammonia-N	(mg/L)	0.44	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	4.08	-
NO3+NO2 Total	(mg/L)	4.20	-
TKN	(mg/L)	1.09	-
Chlorides	(mg/L)	126	-
Sulfates	(mg/L)	75	-
Alkalinity	(mg/L)	113	-
Hardness	(mg/L)	194	-
Nickel	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	0.33	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	7.9	-
Arsenic	(mg/L)	0.007	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Potassium	(mg/L)	4.1	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.12	-

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ABRAM CREEK (AC-5) - 09/02/92

Parameter		Value	Failure
Temperature	(degrees C)	15.0	-
Dissolved Oxygen	(mg/L)	8.8	-
BOD-5	(mg/L)	3	-
COD	(mg/L)	22	-
Suspended Solids	(mg/L)	3	-
Total Solids	(mg/L)	694	-
Dissolved Solids	(mg/L)	599	-
Specific Conductance	(umhos/cm)	750	-
Turbidity	(NTU)	3.3	-
Ammonia-N	(mg/L)	0.80	-
Phosphorus	(mg/L)	0.14	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	5.14	-
NO3+NO2 Total	(mg/L)	5.43	-
TKN	(mg/L)	1.86	-
Chlorides	(mg/L)	134	-
Sulfates	(mg/L)	103	-
Alkalinity	(mg/L)	128	-
Hardness	(mg/L)	240	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.26	-
Cadmium	(mg/L)	0.0100	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	400	-
pH	(s.u.)	7.8	-
Arsenic	(mg/L)	0.010	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.29	-

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ROCKY RIVER (RR-6) - 08/03/92

Parameter		Value	Failure
BOD-5	(mg/L)	12	-
COD	(mg/L)	20	-
Suspended Solids	(mg/L)	25	-
Total Solids	(mg/L)	405	-
Dissolved Solids	(mg/L)	328	-
Turbidity	(NTU)	18.0	-
Ammonia-N	(mg/L)	0.32	-
Phosphorus	(mg/L)	0.21	-
Nitrate-N	(mg/L)	1.34	-
NO3+NO2 Total	(mg/L)	1.45	-
TKN	(mg/L)	1.37	-
Sulfates	(mg/L)	83	-
Alkalinity	(mg/L)	138	-
Hardness	(mg/L)	204	-
Nickel	(mg/L)	0.030	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.03	-
Iron	(mg/L)	1.60	WHAL(1.0)*
Cadmium	(mg/L)	0.0100	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	570	-
pH	(s.u.)	7.8	-
E. coli	(organisms/100ml)	505	PCU(235)
Antimony	(mg/L)	<0.007	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.11	-

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ROCKY RIVER (RR-6) - 08/19/92

Parameter		Value	Failure
Temperature	(degrees C)	18.7	-
Dissolved Oxygen	(mg/L)	9.0	-
BOD-5	(mg/L)	5	-
COD	(mg/L)	17	-
Suspended Solids	(mg/L)	9	-
Total Solids	(mg/L)	420	-
Dissolved Solids	(mg/L)	378	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	0.45	-
Phosphorus	(mg/L)	0.22	-
Soluble Phosphorus	(mg/L)	0.18	-
Nitrate-N	(mg/L)	2.81	-
NO3+NO2 Total	(mg/L)	2.88	-
TKN	(mg/L)	1.96	-
Chlorides	(mg/L)	94	-
Sulfates	(mg/L)	71	-
Alkalinity	(mg/L)	142	-
Hardness	(mg/L)	218	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.08	-
Iron	(mg/L)	0.67	-
Mercury	(ug/L)	0.2	PWS(0.012)* HHSR(0.012)*
Fecal Coliform	(organisms/100ml)	88000	PCU(2000)
pH	(s.u.)	7.8	-
E. coli	(organisms/100ml)	2700	PCU(235)
Arsenic	(mg/L)	0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	0.0020	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.07	-

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ROCKY RIVER (RR-6) - 08/20/92

Parameter		Value	Failure
Temperature	(degrees C)	22.9	-
Dissolved Oxygen	(mg/L)	19.7	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	500	-
Dissolved Solids	(mg/L)	444	-
Specific Conductance	(umhos/cm)	700	-
Turbidity	(NTU)	3.3	-
Ammonia-N	(mg/L)	0.19	WHAL(*Invalid pH*)
Phosphorus	(mg/L)	0.25	-
Soluble Phosphorus	(mg/L)	0.20	-
Nitrate-N	(mg/L)	4.40	-
NO3+NO2 Total	(mg/L)	4.42	-
TKN	(mg/L)	0.55	-
Chlorides	(mg/L)	106	-
Sulfates	(mg/L)	87	-
Alkalinity	(mg/L)	138	-
Hardness	(mg/L)	214	-
Nickel	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.28	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	9.2	WHAL([6.50-9.00])
Arsenic	(mg/L)	<0.005	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Potassium	(mg/L)	4.1	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.02	-

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ROCKY RIVER (RR-6) - 09/02/92

Parameter		Value	Failure
Temperature	(degrees C)	16.0	-
Dissolved Oxygen	(mg/L)	9.5	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	25	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	583	-
Dissolved Solids	(mg/L)	501	-
Specific Conductance	(umhos/cm)	630	-
Turbidity	(NTU)	6.6	-
Ammonia-N	(mg/L)	0.06	-
Phosphorus	(mg/L)	0.22	-
Soluble Phosphorus	(mg/L)	0.20	-
Nitrate-N	(mg/L)	2.91	-
NO3+NO2 Total	(mg/L)	2.95	-
TKN	(mg/L)	2.32	-
Chlorides	(mg/L)	86	-
Sulfates	(mg/L)	90	-
Alkalinity	(mg/L)	145	-
Hardness	(mg/L)	214	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.34	-
Cadmium	(mg/L)	0.0100	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	460	-
pH	(s.u.)	7.8	-
Arsenic	(mg/L)	0.006	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.04	-

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ROCKY RIVER (RR-7) - 08/03/92

Parameter		Value	Failure
BOD-5	(mg/L)	9	-
COD	(mg/L)	17	-
Suspended Solids	(mg/L)	4	-
Total Solids	(mg/L)	657	-
Dissolved Solids	(mg/L)	590	-
Specific Conductance	(umhos/cm)	817	-
Turbidity	(NTU)	3.2	-
Ammonia-N	(mg/L)	1.20	-
Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	3.96	-
NO3+NO2 Total	(mg/L)	4.65	-
TKN	(mg/L)	3.25	-
Sulfates	(mg/L)	118	-
Alkalinity	(mg/L)	140	-
Hardness	(mg/L)	258	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.21	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	780	-
pH	(s.u.)	7.8	-
E. coli	(organisms/100ml)	675	PCU(235)
Antimony	(mg/L)	<0.007	-
Selenium	(mg/L)	<0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Nitrite-N	(mg/L)	0.69	-

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ROCKY RIVER (RR-7) - 08/19/92

Parameter		Value	Failure
Temperature	(degrees C)	18.6	-
Dissolved Oxygen	(mg/L)	8.0	-
BOD-5	(mg/L)	6	-
COD	(mg/L)	22	-
Suspended Solids	(mg/L)	10	-
Total Solids	(mg/L)	372	-
Dissolved Solids	(mg/L)	332	-
Turbidity	(NTU)	10.0	-
Ammonia-N	(mg/L)	0.57	-
Phosphorus	(mg/L)	0.18	-
Soluble Phosphorus	(mg/L)	0.13	-
Nitrate-N	(mg/L)	1.87	-
NO3+NO2 Total	(mg/L)	2.07	-
TKN	(mg/L)	2.42	-
Chlorides	(mg/L)	80	-
Sulfates	(mg/L)	68	-
Alkalinity	(mg/L)	106	-
Hardness	(mg/L)	180	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Zinc	(mg/L)	0.07	-
Iron	(mg/L)	0.92	-
Lead	(mg/L)	0.010	-
Mercury	(ug/L)	0.2	PWS(0.012)* HHSR(0.012)*
Fecal Coliform	(organisms/100ml)	41000	PCU(2000)
pH	(s.u.)	7.7	-
E. coli	(organisms/100ml)	34000	PCU(235)
Arsenic	(mg/L)	0.005	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.20	-

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ROCKY RIVER (RR-7) - 08/20/92

Parameter		Value	Failure
Temperature	(degrees C)	21.3	-
Dissolved Oxygen	(mg/L)	10.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	10	-
Suspended Solids	(mg/L)	6	-
Total Solids	(mg/L)	443	-
Dissolved Solids	(mg/L)	390	-
Specific Conductance	(umhos/cm)	600	-
Turbidity	(NTU)	5.7	-
Ammonia-N	(mg/L)	0.11	WHAL(*Invalid pH*)
Phosphorus	(mg/L)	0.10	-
Soluble Phosphorus	(mg/L)	0.08	-
Nitrate-N	(mg/L)	2.75	-
NO3+NO2 Total	(mg/L)	2.83	-
TKN	(mg/L)	2.49	-
Chlorides	(mg/L)	88	-
Sulfates	(mg/L)	85	-
Alkalinity	(mg/L)	147	-
Hardness	(mg/L)	204	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.04	-
Iron	(mg/L)	0.36	-
Mercury	(ug/L)	<0.2	-
pH	(s.u.)	9.2	WHAL([6.50-9.00])
Arsenic	(mg/L)	0.006	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Potassium	(mg/L)	3.7	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.08	-

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ROCKY RIVER (RR-7) - 09/02/92

Parameter		Value	Failure
Temperature	(degrees C)	15.0	-
Dissolved Oxygen	(mg/L)	9.0	-
BOD-5	(mg/L)	2	-
COD	(mg/L)	17	-
Suspended Solids	(mg/L)	86	-
Total Solids	(mg/L)	434	-
Dissolved Solids	(mg/L)	314	-
Specific Conductance	(umhos/cm)	710	-
Turbidity	(NTU)	9.3	-
Ammonia-N	(mg/L)	0.60	-
Phosphorus	(mg/L)	0.13	-
Soluble Phosphorus	(mg/L)	0.11	-
Nitrate-N	(mg/L)	3.60	-
NO3+NO2 Total	(mg/L)	3.79	-
TKN	(mg/L)	1.53	-
Chlorides	(mg/L)	94	-
Sulfates	(mg/L)	88	-
Alkalinity	(mg/L)	130	-
Hardness	(mg/L)	220	-
Nickel	(mg/L)	0.010	-
Copper	(mg/L)	0.010	-
Total Chromium	(mg/L)	0.010	-
Hexavalent Chromium	(mg/L)	<0.01	-
Zinc	(mg/L)	0.02	-
Iron	(mg/L)	0.58	-
Cadmium	(mg/L)	0.0100	-
Mercury	(ug/L)	<0.2	-
Fecal Coliform	(organisms/100ml)	440	-
pH	(s.u.)	7.8	-
Arsenic	(mg/L)	0.007	-
Thallium	(mg/L)	<0.007	-
Silver	(mg/L)	<0.0010	-
Beryllium	(mg/L)	<0.0005	-
Phenolics	(mg/L)	<0.05	-
Cobalt	(mg/L)	<0.0005	-
Nitrite-N	(mg/L)	0.19	-

APPENDIX VIII

1992 ABRAM CREEK BENTHIC MACROINVERTEBRATE DATA

Including scores for Hilsenhoff Biotic Index (HBI), Ephemeropteran, Plecopteran, Trichopteran (EPT) Richness, Shannon Diversity Index ($\bar{d}$) and a List of Benthic Macroinvertebrates collected and identified by the NEORSD in 1992, with HBI tolerance values and quantity.

Appendix VIII-A: 1992 Benthic Macroinvertebrate Data

Sample Location	Date	Total Taxa	$\bar{d}$	EPT Taxa	Percent EPT Composition	HBI Score /Rating	QHEI Score
Abram Creek							
*AC-1	9/15/92	15	2.1	0	0	8.46	43
*AC-2	9/17/92	19	2.6	0	0	7.96	43
AC-3	9/17/92	20	2.4	0	0	8.26/Poor	50
AC-4	9/17/92	16	2.4	0	0	8.65/Very Poor	50
AC-5	9/28/92	19	2.6	3	23.4	5.88/Fair	72
RR-6	9/25/92	32	2.7	9	57.2	5.07/Good	62
RR-7	9/25/92	18	2.5	7	54.3	4.7/Good	-
RR-9	8/12/92	32	2.7	9	60.8	4.99/Good	59

*Habitat at this location does not fully meet criteria for HBI calculation; supplemental score for temporal comparisons.

Key

$\bar{d}$ = Shannon Diversity Index = - Summation $\left(\frac{n_i}{n} \ln \frac{n_i}{n}\right)$

n_i = Total number of individuals in the taxa
n = Total number of individuals in sample

HBI = Hilsenhoff Biotic Index = Summation $\left(\frac{n_i\, a_i}{N}\right)$

n_i = Total number of indiduals in the ith taxa
a_i = Tolerance value of ith taxa
N = Total number of individuals in sample

EPT = Ephemeropteran, Plecopteran and Trichopteran

QHEI = Qualitative Habitat Evaluation Index

A = Adult
L = Larvae
P = Pupae

(Continued on following page.)

The Shannon Diversity Index measures the diversity of organisms in a stream. The index becomes higher with an increase in diversity of stream organisms. Increased diversity may be correlated to improved water quality and/or habitat quality.

The Hilsenhoff Biotic Index may be correlated to the amount of organic pollution in a stream. All other variables remaining the same, the index score becomes higher as the amount of organic pollution increases (range 0-10).

The number of EPT taxa and the EPT percent composition generally increase with improving water quality, habitat quality and/or stream size.

QHEI measures habitat quality. The index score increases as the habitat quality increases.

Further discussion of these Indices can be found in Appendices IV and X.

Appendix VIII-B: List of Benthic Macroinvertebrates
Abram Creek Site #AC-1, 9/15/92

Taxon	HBI Tolerance Value	Quantity
Coelenterata		
Hydridae		
Hydra americana	-	1
Tricladida		
Planariidae		
Dugesia tigrina	-	8
Haplotaxida		
Naididae		
Chaetogaster diastrophus	-	1
Isopoda		
Asellidae		
Asellus communis	8	12
Odonata		
Zygoptera		
Coenagrionidae		
Enallagma spp. (2 types)	*8.8	9, 2
Coleoptera		
Halipilidae		
Peltodytes sp.	-	1
Hemiptera		
Corixidae		
Sigara sp.	-	1
Diptera		
Culicidae		
Anopheles sp.	-	1
Chironomidae		
Clinotanypus sp.	8	1
Procladius sp.	9	1
Dicrotendipes nervosus Type II	8	2
Glyptotendipes sp.	10	3
Cricotopus (Isocladius) ornatus	7	1

*Approximated tolerance value

(Continued on following page.)

Appendix VIII-B: List of Benthic Macroinvertebrates
Abram Creek Site #AC-1, 9/15/92 (continued)

Taxon	HBI Tolerance Value	Quantity
Gastropoda		
Lymnaeidae		
Fossaria obrussa	-	1
Planorbidae		
Gyraulus parvus	-	1

Total Taxa = 15
Total Organisms = 46
Total EPT Taxa = 0
Total Dipteran Taxa = 6
Total Non-Dipteran Taxa = 9

Appendix VIII-C: List of Benthic Macroinvertebrates
Abram Creek Site #AC-2, 9/17/92

Taxon	HBI Tolerance Value	Quantity
Tricladida		
Planariidae		
Dugesia tigrina	-	9
Rhynchlobdellida		
Glossiphoniidae		
Helobdella stagnalis	-	1
Odonata		
Zygoptera		
Coenagrionidae		
Coenagrion/Enallagma sp. (complex)	*8.6	15
Lepidoptera		
Pyralidae		
Crambus sp.	-	1
Diptera		
Chironomidae		
Helopelopia sp.	6	1
Paratanytarsus sp.	6	1
Parachironomus hirtalatus	10	8
Phaenopsectra prob. dyari (Townes)	7	1
Dicrotendipes nervosus Type II	8	7
Polypedilum illinoense	6	10
Glyptotendipes sp.	10	6
Chironomus sp.	10	2
Corynoneura taris (Roback)	7	1
Psilometriocnemus sp.	-	1
Cricotopus bicinctus	7	13
Cricotopus (Isocladius) ornatus	7	3
Cricotopus (Isocladius) sylvestris	7	5

*Approximated tolerance value

(Continued on following page.)

Appendix VIII-C: List of Benthic Macroinvertebrates
Abram Creek Site #AC-2, 9/17/92 (continued)

Taxon	HBI Tolerance Value	Quantity
Gastropoda		
Physidae		
Physella sp.	-	4
Planorbidae		
Gyraulus parvus	-	10

Total Taxa = 19
Total Organisms = 99
Total EPT Taxa = 0
Total Dipteran Taxa = 13

Appendix VIII-D: List of Benthic Macroinvertebrates
Abram Creek Site #AC-3, 9/17/92

Taxon	HBI Tolerance Value	Quantity
Tricladida		
Planariidae		
Dugesia tigrina	-	6
Pharyngobdellida		
Erpodbellidae		
Erpobdella triannulata	-	1
Rhynchobdellida		
Glossiphoniidae		
Placobdella papillifera	-	9
Copepoda		
Cyclopidae		
Orthocyclops modestus	-	2
Amphipoda		
Gammaridae		
Crangonyx pseudogracilis complex	8	9
Odonata		
Zygoptera		
Coenagrionidae		
Coenagrion/Enallagma sp. complex	*8.6	34
Anisoptera		
Aeshnidae		
Boyeria sp.	*2	1
Diptera		
Chaoboridae		
Mochlonyx sp.	-	1
Chironomidae		
Alotanypus sp.	-	1
Natarsia sp.	8	2
Helopelopia sp.	6	1

*Approximated tolerance value

(Continued on following page.)

Appendix VIII-D: List of Benthic Macroinvertebrates
Abram Creek Site #AC-3, 9/17/92 (continued)

Taxon	HBI Tolerance Value	Quantity
Chironomidae (continued)		
Endochironomus nigricans (Johannsen)	10	2
Parachironomus abortivus (Malloch)	10	2
Polypedilum fallax group	6	1
Polypedilum illinoense	6	10
Dicrotendipes nervosus Type II (Staeger)	8	12
Diptera		
Chironomidae		
Glyptotendipes lobiferus	10	11
Chironomus sp.	10	1
Gastropoda		
Physidae		
Physella sp.	-	8
Planorbidae		
Gyraulus parvus	-	12

Total Taxa = 20
Total Organisms = 126
Total EPT Taxa = 0
Total Dipteran Taxa = 11

Appendix VIII-E: List of Benthic Macroinvertebrates
Abram Creek Site #AC-4, Downstream of Brook Park WWTP
9/17/92

Taxon	HBI Tolerance Value	Quantity
Tricladida		
Planariidae		
Dugesia tigrina	-	1
Rhynchobdellida		
Glossiphoniidae		
Placobdella papillifera	-	7
Amphipoda		
Gammaridae		
Crangonyx pseudogracilis complex	8	4
Odonata		
Zygoptera		
Coenagrionidae		
Coenagrion/Enallagma sp. complex	*8.6	15
Anisoptera		
Aeshnidae		
Aeshna sp.	5	1
Libellulidae		
Ladona sp.	-	1
Diptera		
Chironomidae		
Alotanypus sp.	-	1
Parachironomus hirtilatus	10	6
Endochironomus nigricans (Johannsen)	10	1L, 1P
Dicrotendipes nervosus (Type II)	8	13
Polypedilum illinoese	6	10
Glyptotendipes sp.	10	6
Chironomus sp.	10	15L, 2P

*Approximated Tolerance Value

(Continued on following page.)

Appendix VIII-E: List of Benthic Macroinvertebrates
Abram Creek Site #AC-4, Downstream of Brook Park WWTP
9/17/92 (continued)

Taxon	HBI Tolerance Value	Quantity
Gastropoda		
Physidae		
Physella sp.	-	3
Planorbidae		
Gyraulus parvus	-	12

Total Taxa = 16
Total Organisms = 103
Total EPT Taxa = 0
Total Dipteran Taxa = 7

Appendix VIII-F: List of Benthic Macroinvertebrates
Abram Creek Site #AC-5, Upstream of Confluence with Rocky River 9/28/92

Taxon	HBI Tolerance Value	Quantity
Tricladida		
Planariidae		
Dugesia tigrina	-	2
Oligochaeta	-	3
Amphipoda		
Gammaridae		
Crangonyx pseudogracilis complex	8	1
Trichoptera		
Hydroptilidae		
Hydroptila sp.	6	1
Hydropsychidae		
Hydropsyche betteni	6	10
Hydropsyche dicantha	2	7
Diptera		
Simuliidae		
Simulium vittatum	7	4
Tipulidae		
Tipula prob. *abdominalis*	4	3
Empididae		
Hemerodromia sp.	6	2
Chironomidae		
Conchapelopia sp.	6	3
Helopelopia sp.	6	1P
Polypedilum illinoense (Malloch)	6	7
Polypedilum fallax group	6	1
Dicrotendipes sp.	8	1
Cardiocladius obscurus (Johannsen)	5	15
Cricotopus annulator (Geotgh.)	7	6
Cricotopus bicinctus (Meig.)	7	9
Cricotopus vierriensis (Geotgh)	7	1
Eukiefferiella claripennis group	8	2

Total Taxa = 19
Total Organisms = 77
Total EPT Taxa = 3
Total Dipteran Taxa = 13

Appendix VIII-G: List of Benthic Macroinvertebrates
Rocky River Site #RR-6, 9/25/92

Taxon	HBI Tolerance Value	Quantity
Tricladida		
Planariidae		
Dugesia tigrina	-	6
Ephemeroptera		
Baetidae		
Baetis flavistriga	4	3
Heptageniidae		
Stenonema interpunctatum	7	17
Stenonema pulchellum	3	3
Stenonema tripunctatum	5	6
Odonata		
Zygoptera		
Coenagrionidae		
Argia violacea	*6.6	1
Trichoptera		
Hydroptilidae		
Hydroptila sp.	6	1
Hydropsychidae		
Symphitopsyche bifida group	6	14
Hydropsyche betteni group	6	47
Hydropsyche dicantha	2	20
Cheumatopsyche sp.	5	28
Coleoptera		
Elmidae		
Machronychus glabratus	4	1
Stenelmis crenata group (prob. *S. sexlineata* female)	5	1A
Diptera		
Simuliidae		
Simulium vittatum	7	9L, 2P
Chironomidae		
Thienemannimyia sp.	6	4
Conchapelopia sp.	6	1

(Continued on following page.)

Appendix VIII-G: List of Benthic Macroinvertebrates (Continued)
Rocky River Site #RR-6, 9/25/92

Taxon	HBI Tolerance Value	Quantity
Chironomidae (continued)		
Rheotanytarsus exiguus group	6	1L, 1P
Polypedilum convictum	6	20L, 1P
Polypedilum illinoense	6	4
Dicrotendipes neomodestus	8	1
Chironomus sp.	10	4
Cardiocladius obscurus	5	8
Nanocladius distinctus	3	1
Nanocladius minimus	3	3
Nanocladius rectinervis	3	1
Cricotopus annulator	7	3
Cricotopus triannulatus	7	1
Cricotopus bicinctus	7	22L, 3P
Cricotopus vierriensis	7	2
Rheocricotopus sp.	6	1
Gastropoda		
Ancylidae		
Ferrissia sp.	-	1

Total Taxa = 32
Total Organisms = 243
Total EPT Taxa = 9
Total Dipteran Taxa = 18

Appendix VIII-H: List of Benthic Macroinvertebrates
Rocky River Site #RR-7, 9/25/92

Taxon	HBI Tolerance Value	Quantity
Tricladida		
Planariidae		
Dugesia tigrina	-	4
Pharyngobdellida		
Erpobdellidae		
Erpobdella triannulata	-	1
Isopoda		
Asellidae		
Asellus sp.	8	1
Ephemeroptera		
Baetidae		
Baetis flavistriga	4	3
Baetis intercalaris	6	3
Heptageniidae		
Stenonema tripunctatum	5	1
Trichoptera		
Hydropsychidae		
Symphitopsyche bifida group	6	6
Hydropsyche betteni group	6	17
Hydropsyche dicantha	2	12
Cheumatopsyche sp.	5	15
Coleoptera		
Elmidae		
Stenelmis sexlineata	5	5A
Diptera		
Simuliidae		
Simulium vittatum	7	8
Chironomidae		
Conchapelopia sp.	6	1
Polypedilum convictum	6	3
Cardiocladius obscurus	5	15
Cricotopus annulator	7	4

(Continued on following page.)

Appendix VIII-H: List of Benthic Macroinvertebrates (continued)
Rocky River Site #RR-7, 9/25/92

Taxon	HBI Tolerance Value	Quantity
Chironomidae (continued)		
Cricotopus bicinctus	7	4
Cricotopus vierriensis	7	2

Total Taxa = 18
Total Organisms = 105
Total EPT Taxa = 7
Total Dipteran Taxa = 7

Appendix VIII-I: List of Benthic Macroinvertebrates
Rocky River Site #RR-9, 8/12/92

Taxon	HBI Tolerance Value	Quantity
Tricladida		
Planariidae		
Dugesia tigrina	-	1
Pharyngobdellida		
Erpobdellidae		
Erpobdella triannulata	-	1
Isopoda		
Asellidae		
Asellus communis	8	3
Amphipoda		
Gammaridae		
Crangonyx gracilis complex	8	2
Ephemeroptera		
Baetidae		
Baetis flavistriga	4	14
Baetis intercalaris	6	38
Heptageniidae		
Stenonema interpunctatum	7	8
Stenonema tripunctatum	5	1
Odonata		
Zygoptera		
Calopterygidae		
Hetaerina sp.	6	1
Trichoptera		
Hydroptilidae		
Hydroptila spp.	6	44
Hydropsychidae		
Symphitopsyche bifida group	6	18
Hydropsyche betteni group	6	7
Hydropsyche dicantha	2	35
Cheumatopsyche sp.	5	8L, 2P

(Continued on following page.)

Appendix VIII-I: List of Benthic Macroinvertebrates (continued)
Rocky River Site #RR-9, 8/12/92

Taxon	HBI Tolerance Value	Quantity
Coleoptera		
Elmidae		
Stenelmis sp.	5	1
Diptera		
Simuliidae		
Simulium vittatum	7	37
Chironomidae		
Conchapelopia sp.	6	1
Tanytarsus glabrescense group	6	1
Polypedilum convictum	6	20
Polypedilum illinoense	6	1L, 1P
Cardiocladius obscurus	5	14
Eukiefferiella claripennis group	8	1
Nanocladius minimus	3	1
Nanocladius rectinervis	3	1
Cricotopus (Isocladius) sylvestris	7	1
Cricotopus tremulus	7	4
Cricotopus annulator	7	2
Cricotopus triannulatus	7	4
Cricotopus trifascia	7	2
Cricotopus bicinctus	7	2
Cricotopus vierriensis	7	3
Cricotopus sp.	7	7P

Total Taxa = 32
Total Organisms = 288
Total EPT Taxa = 9
Total Dipteran Taxa = 17

APPENDIX IX

1992 NEORSD ABRAM CREEK
QUANTITATIVE FISH SURVEYS

ROCKY RIVER/ABRAM CREEK

Anticipating the decommissioning of the Brook Park Wastewater Treatment Plant (WWTP) and the Middleburg Heights WWTP, the Environmental Assessment Section performed electroshock fish sampling of Abram Creek and the Rocky River. These samplings were performed to characterize water quality in these streams prior to the anticipated effluent removals. Brook Park WWTP was to be decommissioned on January 6, 1993, and Middleburg Heights WWTP on December 30, 1992. Samplings were conducted in Abram Creek and Rocky River at the following locations:

Abram Creek

Creek Mile 4.2	Downstream of Brook Park WWTP
Creek Mile 4.4	Upstream of Brook Park WWTP
Creek Mile 4.9	Upstream of Middleburg Heights WWTP

NOTE: Creek Mile 4.4 represents sampling locations for both the upstream of Brook Park WWTP and the downstream of Middleburg Heights WWTP.

Rocky River

River Mile 10.0	Downstream of Abram Creek
River Mile 10.6	Upstream of Abram Creek

Fish were collected by utilizing Ohio EPA's generator powered longline electroshock equipment (Sampler Type E). Electroshocking was performed on all habitat types located within a 600 foot sampling zone at the aforementioned sampling locations. Fish collected from each sampling zone were identified to the species level, weighed, counted, examined for the presence of DELT anomalies and returned to the stream they were collected from. DELT anomalies include deformities, eroded fins, lesions and tumors. Fish specimens were collected from Abram Creek and the Rocky River on October 7, 1992 through October 20, 1992. Appendices IX-A to IX-E list the species, number of individuals, weight, pollution tolerances and percent DELT anomalies of fish collected during these samplings.

The data compiled during these samplings were used to calculate an Index of Biological Integrity (IBI) for each sampling location. A Modified Index of Well Being (MIwb) was also calculated for the Rocky River for River Miles 10.0 and 10.6. These indices are used to evaluate the overall health of fish communities in Ohio's rivers and streams. NEORSD IBI values for Abram Creek and the IBI and MIwb values for the Rocky River calculated from these samplings were compared to values calculated from Ohio EPA sampling data (Tables IX-1 and IX-2). Also a narrative value pertaining to the overall fish community health was assigned to each site based upon values presented in Ohio EPA's Compendium of Biological Results from Ohio Rivers, Streams, and Lakes, 1989. A detailed description of the sampling and analysis methods used for fish sampling, including the calculation of index values, can be found in Ohio EPA's Users Manual for Biological Field Assessment of Ohio Surface Waters, 1987.

The Abram Creek and Rocky River sample locations were electroshocked once each in 1992. Abram Creek at Creek Mile 4.2 was sampled on October 7, 1992. Sampling here produced four species comprising 199 individual specimens (Appendix IX-A). One hundred percent of the total specimens collected were classified as highly tolerant of environmental disturbances. Forty-eight percent of the total specimens were Pimephales promelas (Northern Fathead Minnow). DELT anomalies included deformed opercles and pectoral lesions on two Cyprinus carpio (Common Carp). These anomalies accounted for a one percent incidence of DELT anomalies in the total specimens. The IBI value for Creek Mile 4.2 was 16. This value correlates to a "very poor" narrative rating for the stream segment. This rating demonstrates that Abram Creek at Creek Mile 4.2 does not meet the minimum numerical criteria for a Warmwater Habitat Use Attainment.

Abram Creek at Creek Mile 4.4 was sampled on October 7, 1992. Sampling produced four species comprising seventy-five individual specimens (Appendix IX-B). One hundred percent of the total specimens collected were classified as highly tolerant of environmental disturbances. Sixty-seven percent of the total specimens were Pimephales promelas (Northern Fathead Minnows). Body lesions accounted for all DELT anomalies and were found on 2.6 percent of the total specimens. The IBI value calculated for Creek Mile 4.4 was 12. This value correlates to a "very poor" narrative rating for the stream segment. This rating demonstrates that Abram Creek at Creek Mile 4.4 does not meet the minimum numerical criteria for a Warmwater Habitat Use Attainment.

Abram Creek at Creek Mile 4.9 was sampled on October 8, 1992. Sampling produced four species comprising 131 individual specimens (Appendix IX-C). Ninety-seven percent of the total specimens collected were classified as highly tolerant of environmental disturbances. Pimephales promelas (Northern Fathead Minnow) and Lepomis cyanellus (Green Sunfish) numerically dominated this sample location and accounted for eighty-five percent of the total specimens collected. No DELT anomalies were found on the fish collected at this sample location. The IBI value calculated for Creek Mile 4.9 was 14. This value correlates to a "very poor" narrative rating for this stream segment. This rating demonstrates that Abram Creek at Creek Mile 4.9 does not meet the minimum numerical criteria for a Warmwater Habitat Use Attainment.

The Rocky River at River Mile 10.0 was sampled on October 20, 1992. Sampling produced thirteen species comprising 129 individual specimens (Appendix IX- D). The classified species collected were either highly tolerant or moderately intolerant of environmental disturbances. Seventy-three percent of the total specimens were Pimephales notatus (Bluntnose minnow). A body lesion and a lip lesion on two individual specimens were the DELT anomalies observed. These DELT anomalies were observed on 1.5 percent of the total specimens collected. The IBI value calculated at River Mile 10.0 was 12. This value correlates to a "very poor" narrative rating for this stream segment. A Modified Index of Well Being (MIwb) was also calculated for this stream segment. The MIwb value for River Mile 10.0 was 4.5. This value correlates to a "poor" narrative rating for this stream segment. These ratings demonstrate that the Rocky River at River Mile 10.0 does not meet the minimum numerical criteria for a Warmwater Habitat Use Attainment.

The Rocky River at River Mile 10.6 was sampled on October 20, 1992. Sampling produced fourteen species comprising 257 individual specimens (Appendix IX- E). Fifty-one percent of the specimens collected were moderately intolerant of environmental disturbances. The remaining classified specimens were either highly tolerant or moderately intolerant of environmental disturbances. Fifty percent of the total specimens were Notropis stramineus (Sand shiner). No DELT anomalies were found on the fish collected at this sample location. The IBI value calculated for River Mile 10.6 was 30. This value correlates to a "fair" narrative rating for the stream segment. A Modified Index of Well Being (MIwb) was also calculated for this stream segment. The MIwb value for River Mile 10.6 was 6.6. This value correlates to a "fair" narrative rating for this stream segment. These ratings demonstrate that the Rocky River at River Mile 10.6 does not meet the minimum numerical criteria for a Warmwater Habitat Use Attainment.

The IBI and MIwb values obtained for Abram Creek and the Rocky River during NEORSD's 1992 sampling were comparable to Ohio EPA's 1992 values with the exception of data collected at Rocky River Mile 10.0 (Table IX-1 and IX-2). Ohio EPA sampling of River Mile 10.0 scored higher than the NEORSD's values. The Ohio EPA scored a higher value based on the following:

1) Greater species diversity - OEPA 19 species versus NEORSD 13 species

2) More Sunfish Species - OEPA 3 species versus NEORSD 0 species

3) More Lithophilous Spawners - OEPA 30% versus NEORSD 8%

4) More Insectivore Species - OEPA 53% versus NEORSD 13%

No explanation is offered for why these differences in sampling results occurred at Rocky River Mile 10.0.

The Qualitative Habitat Evaluation Index (QHEI) was utilized on Abram Creek upstream and downstream of Brookpark Road, Middleburg Heights WWTP and Rocky River upstream and downstream of Abram Creek. This index is designed to provide a measure of habitat that corresponds to those physical factors that affect fish communities.

Evaluation of QHEI scoring incorporates physical characteristics of habitats which include substrate, instream cover, riparian characteristics, channel characteristics, pool and riffle development and stream gradient. Components of each of the above physical characteristics have been assigned scores. After evaluating each stream site, scores are added for a total score. The total score is then compared to values presented in The Use of the Qualitative Habitat Evaluation Index for Use Attainability Studies in Streams and Rivers in Ohio by Edward Rankin of the Ohio EPA. A narrative rating of habitat heterogeneity of excellent, good, fair or poor is assigned to the electrofishing sampling sites.

NEORSD's IBI and MIwb scores were lower in Rocky River downstream of Abram Creek than upstream of Abram Creek (Table IX-1). After evaluating bacteriological and chemical water quality parameters, no significant differences in these parameters were observed downstream of Abram Creek compared to upstream of Abram Creek on Rocky River. However, ammonia concentrations were slightly higher and approaching the Warmwater Habitat Criteria at the downstream site (Appendix VII, RR-7). The slightly elevated ammonia concentrations, although not exceeding the criteria, could have been stressing the fish or causing them to avoid the area.

A lower IBI score may be also correlated to a slightly lower QHEI score downstream of Abram Creek compared to upstream (Table IX-1).

The QHEI is significantly correlated with the IBI according to The Qualitative Habitat Evaluation Index [QHEI]: Rationale, Methods and Application by Ed Rankin of the Ohio EPA, 1989. Some of the metric components that scored lower and may contribute to a lower IBI score downstream of Abram Creek on the Rocky River are as follows:

ROCKY RIVER (Upstream of Abram Creek)	ROCKY RIVER (Downstream of Abram Creek)
1) More boulders and cobble in pools and riffles.	1) Sand and detritus material in pools and riffles.
2) Slight stream sinuosity.	2) Straight run/glide with little to no stream sinuosity.
3) Little/no stream bank erosion.	3) Moderate bank erosion.

These habitat components together with the sediment load Rocky River receives from Abram Creek during moderate to high flow periods may contribute to lower IBI scores. Streams with little to no sinuosity often have higher levels of suspended sediments during low and moderate flow periods than more natural streams with higher sinuosity (Karr and Schlosser, 1977). Silt is strongly associated with lower IBI scores for all electrofishing sampler types.

"Poor to very poor" value rankings for Abram Creek may be attributed to poor habitat within the creek, including the sampling zones. Evaluation of water quality data on Abram Creek upstream and downstream of Middleburg Heights and Brook Park Wastewater Treatment Plants indicate no significant levels that would have an impact on the fish community (Appendix VII, AC-1 through AC-4).

A particular physical condition observed both upstream and downstream of the Middleburg Heights WWTP is the presence of a peat material along the riparian buffer zone. The absence of quality substrates (i.e. boulders, cobble, gravel, etc.) will have a direct impact on the fish communities present in a stream segment. Quality substrates influence fish communities in a stream by providing cover for food organisms (benthic macroinvertebrates) which attract insectivore type fish. The lack of quality substrates is evident in Abram Creek.

Additional electroshock fish samplings will be performed at the sample locations in future years. These future samplings will be used to evaluate the water quality trends associated with the decommissioning of the Brook Park, Middleburg Heights WWTP and the completion of the Southwest Interceptor.

TABLE IX-1

1992 NEORSD IBI and MIwb VALUES

	Date	Creek/River Mile	IBI	MIwb	QHEI
Abram Creek	October 7, 1992	4.2	16	*	50
	October 7, 1992	4.4	12	*	50
	October 8, 1992	4.9	14	*	43
Rocky River	October 20, 1992	10.0	12	4.5	59
	October 20, 1992	10.6	30	6.6	62

TABLE IX-2

1992 OHIO EPA IBI AND MIwb SCORES

	Date	Creek/River Mile	IBI	MIwb
Abram Creek	August 26, 1992	1.9	12	*
	September 21, 1992	1.9	12	*
Rocky River	August 11, 1992	10.0	26	7.7
	August 12, 1992	11.1	30	7.2

*MIwb scores do not apply to sites with drainage areas less than 20 square miles.

Appendix IX-A: Abram Creek Downstream of Brook Park Wastewater Treatment Plant at Creek Mile 4.2

Sample Date: October 7, 1992

Distance Sampled: 0.2 Kilometers

Sample Method: Generator Longline Electroshocking

Species	Number	Weight (kg)	*Pollution Tolerance	DELT Anomalies
Cyprinus carpio Common Carp	82	48.661	Highly Tolerant	Deformed opercle and pectoral lesion.
Lepomis cyanellus Green Sunfish	13	0.074	Highly Tolerant	-
Semotilus atromaculatus Creek Chub	1	0.004	Highly Tolerant	-
Pimephales promelas Northern Fathead Minnow	95	0.171	Highly Tolerant	-
TOTAL	199	49.01		1% Fish with DELT Anomalies

*Pollution Tolerances from: Ohio Environmental Protection Agency. 1989. Biological Protection of Aquatic Life, Volume III. Columbus, Ohio.

Appendix IX-B: Abram Creek Upstream of Brook Park Wastewater Treatment Plant at Creek Mile 4.4

Sample Date: October 7, 1992

Distance Sampled: 0.2 Kilometers

Sample Method: Generator Longline Electroshocking

Species	Number	Weight (kg)	*Pollution Tolerance	DELT Anomalies
Cyprinus carpio Common Carp	20	14.388	Highly Tolerant	-
Pimephales promelas Northern Fathead Minnow	95	0.171	Highly Tolerant	Body Lesions
Lepomis cyanellus Green Sunfish	3	0.007	Highly Tolerant	-
Semotilus atromaculatus Creek Chub	2	0.006	Highly Tolerant	Body Lesion
TOTAL with	75	14.496		2.6% Fish DELT Anomalies

*Pollution Tolerances from: Ohio Environmental Protection Agency. 1989. Biological Protection of Aquatic Life, Volume III. Columbus, Ohio.

Appendix IX-C: Abram Creek Upstream of Middleburg Heights Wastewater Treatment Plant at Creek Mile 4.9

Sample Date: October 8, 1992

Distance Sampled: 0.2 Kilometers

Sample Method: Generator Longline Electroshocking

Species	Number	Weight (kg)	*Pollution Tolerance	DELT Anomalies
Cyprinus carpio Common Carp	15	14.237	Highly Tolerant	-
Pimephales promelas Northern Fathead Minnow	55	0.046	Highly Tolerant	-
Lepomis cyanellus Green Sunfish	56	0.235	Highly Tolerant	-
Semotilus atromaculatus Creek Chub	1	0.002	Highly Tolerant	-
Lepomis macrochirus Northern Bluegill Sunfish	4	0.026	Moderately Tolerant	-
TOTAL	131	14.546		0% Fish with DELT

Anomalies

*Pollution Tolerances from: Ohio Environmental Protection Agency. 1989. *Biological Protection of Aquatic Life*, Volume III. Columbus, Ohio.

Appendix IX-D: Rocky River Downstream of Abram Creek at River Mile 10.0

Sample Date: October 20, 1992

Distance Sampled: 0.2 Kilometers

Sample Method: Generator Longline Electroshocking

Species	Number	Weight (kg)	*Pollution Tolerance	DELT Anomalies
Cyprinus carpio Common Carp	3	2.530	Highly Tolerant	-
Carassius auratus Goldfish	1	0.218	Highly Tolerant	-
Catostomus commersoni Common White Sucker	9	0.444	Highly Tolerant	-
Moxostoma erythrurum Golden redhorse	1	0.218	Moderately Intolerant	-
Notropis chrysocephalus Central Striped Shiner	6	0.148	-	-
Pimephales notatus Bluntnose Minnow	94	0.450	Highly Tolerant	-
Notropis spilopterus Spotfin Shiner	8	0.023	-	-
Notropis stramineus Sand Shiner	2	0.008	Moderately Intolerant	Ventral Lesion
Ambloplites rupestris Northern Rock Bass	1	0.062	-	-
Semotilus atromaculatus Creek Chub	1	0.048	Highly Tolerant	-
Campostoma anomalum Central Stoneroller Minnow	1	0.004	-	-

(Continued on the following page.)

Appendix IX-D: (continued) Rocky River Downstream of Abram Creek at River Mile 10.0

Species	Number	Weight (kg)	*Pollution Tolerance	DELT Anomalies
Rhinicthys atratulus Blacknose Dace	1	0.002	Highly Tolerant	-
Salmo gairdneri Rainbow Trout	1	0.520	-	Lip/Mouth Lesion
TOTAL with Anomalies	129	4.675		1.5% Fish DELT

*Pollution Tolerances from: Ohio Environmental Protection Agency. 1989. Biological Protection of Aquatic Life, Volume III. Columbus, Ohio.

Appendix IX-E: Rocky River Upstream of Abram Creek at River Mile 10.6

Sample Date: October 20, 1992

Distance Sampled: 0.2 Kilometers

Sample Method: Generator Longline Electroshocking

Species	Number	Weight (kg)	*Pollution Tolerance	DELT Anomalies
Notropis stramineus Sand Shiner	128	0.474	Moderately Intolerant	-
Pimephales notatus Bluntnose Minnow	42	0.202	Highly Tolerant	-
Catostomus commersoni Common White Sucker	25	0.114	Highly Tolerant	-
Campostoma anomalum Central Stoneroller Minnow	18	0.068	-	-
Semotilus atromaculatus Creek Chub	1	0.004	Highly Tolerant	-
Etheostoma blennioides Greenside Darter	1	0.004	Moderately Intolerant	-
Notropis spilopterus Spotfin Shiner	28	0.124	-	-
Notropis cornutus Common Shiner	2	0.014	-	-
Ictalurus natalis Yellow Bullhead	5	0.606	Highly Tolerant	-
Ictalurus nebulosus Brown Bullhead	1	0.032	Highly Tolerant	-
Ambloplites rupestris Northern Rock Bass	3	0.128	-	-

(Continued on following page.)

Appendix IX-E: (continued) Rocky River Upstream of Abram Creek at River Mile 10.6

Species	Number	Weight (kg)	*Pollution Tolerance	DELT Anomalies
Cyprinus carpio Common Carp	1	0.120	Highly Tolerant	-
Lepomis macrochirus Northern Bluegill Sunfish	1	0.022	Moderately Tolerant	-
Hypentelium nigricans Northern Hog Sucker	1	0.060	Moderately Intolerant	-
TOTAL	257	1.972		0% Fish with DELT

Anomalies

*Pollution Tolerances from: Ohio Environmental Protection Agency. 1989. Biological Protection of Aquatic Life, Volume III. Columbus, Ohio.

APPENDIX X

NEORSD USE OF THE HILSENHOFF BIOTIC INDEX

Appendix X: NEORSD Use of the Hilsenhoff Biotic Index

The Hilsenhoff Biotic Index (HBI) was developed in Wisconsin by Dr. William Hilsenhoff in 1977 and revised by Dr. Hilsenhoff in 1987. The HBI can be used as an indicator of organic and nutrient pollution, which can result in lower dissolved oxygen concentrations. The HBI is an average of tolerance values for all individuals collected from a site. Benthic macroinvertebrates, specifically arthropods, are used in this assessment of stream water quality.

The HBI evaluation of water quality is accomplished using a sample of 100 to 200 arthropods collected from rock or gravel riffles. In deeper streams that have no riffles, samples from rock or gravel runs may be substituted, and in sand-bottomed streams, samples from debris that accumulates on sticks or other objects wedged into the sand in swift current may be used (Hilsenhoff, 1987). It is suggested that the stream sites to be sampled have current velocity of 0.3 m/sec (1.0 ft/sec.) or greater (Hilsenhoff, 1987). Sample collection should be performed in the spring before June 1st or between September 1st and October 15th. It has been determined that much higher biotic index values are generally reported for summer months. The use of seasonal correction factors for the summer has been suggested (Hilsenhoff, 1982, 1987). A recommended seasonal correction factor of -0.6 was used for all NEORSD summer samples (Hilsenhoff, 1988).

$$\text{HBI} = \text{Summation } \frac{n_i a_i}{N}$$

n_i = Total number of individuals in the ith taxa
a_i = Tolerance value of ith taxa
N = Total number of individuals in a sample

Tolerance values from 0 to 10 have been assigned by Dr. Hilsenhoff for 359 species (Hilsenhoff, 1987). The tolerance values increase with tolerance. For more details about tolerance values and collection methods, refer to Hilsenhoff, 1977, 1982, and 1987.

HBI values are divided into seven narrative water quality ratings: Excellent, Very Good, Good, Fair, Fairly Poor, Poor, Very Poor. The water quality ratings are based on biotic index scores, with higher scores indicating poorer water quality than lower scores (Table 1), assuming habitability of sites to be equal.

Using the HBI to evaluate water quality of streams has some advantages. The use of only arthropods helps to simplify collection, sorting and identification. Sample collection time for HBI evaluations (about 1 hour) is much less than that for artificial substrate samples (at least 6 weeks for sampler colonization and many hours of sorting). The relatively small number of arthropods required

(100-200) for an evaluation reduces processing time, compared to artificial substrate samples which may contain thousands of organisms, requiring many more hours to process. The requirement to sample only riffles or fast runs for HBI evaluation makes data more comparable between sample locations, because habitat will not be as variable.

The HBI is considered by some to be one of the most reliable indices used for rapid bioassessment today (Szcytko, 1988). HBI values are not strongly affected by stream width, unlike Ephemeropteran, Plecopteran, Trichopteran (EPT) taxa richness values. For this reason, biotic indices are more reliable than taxa richness when ratings are assigned to smaller streams (Lenat, 1993).

In 1990, the HBI was chosen by the NEORSD Environmental Assessment group as an additional method for evaluation of stream water quality. The HBI is used by NEORSD along with other methods of interpreting benthic macroinvertebrate data such as: qualitative multiple habitat sampling, EPT taxa richness, Shannon Diversity Index, and Invertebrate Community Index (as per OEPA methods using replicate Hester-Dendy artificial substrate samplers). When using invertebrates to assess water quality, a variety of biological indices and methods should be used for the most reliable assessment (Kerans, Karr and Ahlstedt, 1992).

The tolerance values provided by Dr. Hilsenhoff were developed in Wisconsin and may require some modification for Northeast Ohio. This modification may not be very significant because both regions are within the Great Lakes region and have ecologically similar streams and rivers. Site-specific tolerance values, for arthropods collected by the NEORSD, will eventually be determined for future use. Until then, the tolerance values provided by Hilsenhoff will serve as an adequate default.

Approximate tolerance values were assigned to organisms when tolerance values were not available for that species or when the taxonomic level of identification was to the genus only. The approximate tolerance value was determined by averaging the assigned tolerance values for all species within the genus. This approximate tolerance value was then used in the calculation of the HBI score. The range of tolerance values within most genera where approximate values were used was no greater than one. The use of this approximate tolerance value should not have a significant effect on the accuracy of the HBI narrative rating.

Other methods of bioassessment are currently used by NEORSD and, and as new ones become available, they also will be utilized. The "percent model affinity" described by Novak and Bode (1992) may be the next new method utilized for evaluating water quality by NEORSD. The percent model affinity method is useful for determining the impact of non-organic pollution (i.e. toxics, heavy metals, etc.), while HBI and EPT are only sensitive to organic pollution.

Some disadvantages associated with HBI stream evaluations are:

A) Selective sampling techniques. Sampling techniques which examine a specific type of habitat (i.e. riffles, swiftruns) and exclude non-arthropods (i.e. snails, worms, leeches, etc.) and other organisms endemic to pools and margins, will not provide sufficient data to characterize the entire benthic community of a stream location.

B) The HBI is only reliable in determining the impact of organic pollution on benthic fauna and was not designated to evaluate non-organic impacts.

The HBI can be modified to include non-arthropods for the bioassessment of streams. This has been accomplished in North Carolina where tolerance values have been determined for non-arthropods. These values for non-arthropods have been included in the HBI calculation for the development of the North Carolina Biotic Index (NCBI, Lenat, 1993). These NCBI tolerance values determined for non-arthropods have been utilized by the NEORSD for the evaluation of several stream locations where non-arthropods were the predominant organisms collected or no HBI tolerance values where available (e.g. Mill Creek Site #33.5 and Big Creek #27).

Table 1. Evaluation of water quality using biotic index values of samples collected in March, April, May, September, and early October

Biotic Index	Water Quality	Degree of Organic Pollution
0.00 - 3.50	Excellent	No apparent organic pollution
3.51 - 4.50	Very Good	Possible slight organic pollution
4.51 - 5.50	Good	Some organic pollution
5.51 - 6.50	Fair	Fairly significant organic pollution
6.51 - 7.50	Fairly Poor	Significant organic pollution
7.51 - 8.50	Poor	Very significant organic pollution
8.51 - 10.00	Very Poor	Severe organic pollution

Source: Hilsenhoff, 1987

Literature Cited

Hilsenhoff, W.L. 1977. Use of Arthropods to Evaluate Water Quality of Streams. Wisconsin Department Natural Resources Tech. Bull. No. 100:1-15.

Hilsenhoff, W.L. 1982. Using a Biotic Index to Evaluate Water Quality in Streams. Wisconsin Department Natural Resources Tech. Bull. No. 132:1-22.

Hilsenhoff, W.L. 1987. An Improved Biotic Index of Organic Stream Pollution. Great Lakes Entomologist 20:31-39.

Hilsenhoff, W.L. 1988. Seasonal Correction Factors for the Biotic Index. Great Lakes Entomologist 21:9-13.

Kerans, B.L., Karr, J.R., Ahlstedt, S.A. 1992. Aquatic Invertebrate Assemblages: Spatial and Temporal Differences Among Sampling Protocols. Journal of the North American Benthological Society 11(4):377-390.

Lenat, D.R. 1993. A Biotic Index for the Southeastern United States: Derivation and List of Tolerance Values, With Criteria for Assignment Water Quality Ratings. Journal of the North American Benthological Society. 12(3):279-290.

Novak, M.A. and Bode, R.W. 1992. Percent Model Affinity: A New Measure of Macroinvertebrate Community Composition. Journal of the North American Benthological Society. 11(1):80-85.

Szcytko, S.W. 1988. Investigation of New Interpretative Techniques for Assessing Biomonitoring Data and Stream Water Quality in Wisconsin Streams. Report to the Surface Water Monitoring Committee, Wisconsin Department of Natural Resources.

APPENDIX XI

CLEVELAND METROPARKS 1991-1992
STREAM SAMPLING DATA

Appendix XI: Cleveland Metroparks Stream Sampling

In 1991, the Cleveland Metroparks began collecting water samples from area streams within the park system to monitor fecal coliform levels. Sixteen sample sites were selected to include areas within the Cleveland Metroparks of interest for water quality monitoring (Table XI-I). In 1992, one additional site was selected on the Cuyahoga River at the State Route 82 bridge. The sample locations were designated Primary Contact Recreational Use by Ohio EPA with the exception of Mill Creek in Garfield Park which was Secondary Contact.

Monthly samples were collected between 6:00 a.m. and 12:20 p.m. from all sample locations by Cleveland Metroparks Department of Park Operations personnel. Samples were obtained at least 24 hours following a rain event. The Cleveland Metroparks laboratory provided bacteriological analyses of all samples and reported the results to the NEORSD.

The bacteriological data show that the fecal coliform concentrations periodically exceeded the numerical criterion for Primary Contact Recreational Use of 2,000 organisms per 100 ml at most of the sample locations (Figure XI-I). In general, the data from these creeks do not show these concentrations to constitute trends of increasing bacteria levels but single-event elevations.

Concentrations in 38 of the 275 samples (14%) exceeded Ohio EPA's numerical criterion for Primary Contact Recreational Use. NEORSD rain gauge data were reviewed to determine if fecal coliform criterion exceedances could be related to wet weather events. Of the 38 samples with concentrations exceeding the fecal coliform criterion, 22 samples had elevated concentrations attributable to wet weather (Table XI-V). Wet weather can cause sewage collection systems to become overloaded and overflow to surface waters via combined sewer overflows and/or sanitary sewer overflows. Storm water runoff from urban and agricultural areas to surface waters may also affect concentrations of fecal coliform. The fact that these samples were obtained within three days after a wet weather event may explain the elevated fecal coliform concentrations, since elevated flows probably had not yet completely subsided.
16 of the 38 exceedances remain unexplained since wet weather did not appear to be related. They may be attributable to undetected dry-weather sewer overflows, sewer leaks, septic tank discharges, or other urban/agricultural sources. However, it is unlikely that exceedances in samples collected on December 11-12, 1991 and February 3-4, 1992 were attributable to individual dry-weather sources since the Primary Contact criterion was simultaneously exceeded at numerous locations. A review of NEORSD Sewer Maintenance & Control records revealed no information that could explain these elevated levels. The

elevated concentrations on these dates could be attributable to sampling or analytical anomolies.

Sampling by Cleveland Metroparks to monitor the bacteriological conditions within area streams is an ongoing effort. Continued sampling will enable a broader bacteriological data base to be developed. It will also improve the capability to identify and respond to sewage-related water quality disruptions at these locations of high ecological importance and recreational use.

Table XI-I: Cleveland Metroparks Stream Sampling 1991-1992 Site Locations

Rocky River 1	-	East Branch, Eastland Road Ford
Rocky River 2	-	Hilliard Road Bridge
Rocky River 3	-	East Branch, Barrett Road Ford
Big Creek 1	-	East Branch, Memphis Road
Big Creek 2	-	West Branch, Memphis Road
Big Creek 3	-	John Nagy Boulevard
Mill Creek	-	Garfield Park
Wolf Creek	-	Garfield Park
Tinkers Creek 1	-	Broadway Avenue
Tinkers Creek 2	-	Richmond Road
Chippewa Creek	-	Chippewa Creek Road @ Ford
Euclid Creek 1	-	East Branch, Highland Road
Euclid Creek 2	-	West Branch, Highland Road
Chagrin River 1	-	Solon Road
Chagrin River 2	-	Wilson Mills Road
Cuyahoga River	-	State Route 82

Table XI-II: Cleveland Metroparks Stream Sampling
Fecal Coliform Concentrations
(Organisms Per 100 Milliliters)
1991

Sites	5/28	5/29	7/1	7/8	8/7	8/8	9/11	9/12	10/15	10/16	11/13	11/14	12/11	12/12
Rocky River 1	120	-	110	-	200	-	900	-	1190	-	950	-	1100	-
Rocky River 2	-	40	90	-	140	-	650	-	270	-	850	-	550	-
Rocky River 3	-	140	250	-	360	-	2100	-	2680	-	1250	-	11500	-
Big Creek 1	-	250	200	-	960	-	3200	-	7000	-	3500	-	2000	-
Big Creek 2	-	4000	350	-	500	-	800	-	6100	-	3000	-	5700	-
Big Creek 3	-	1400	125	-	1500	-	3900	-	9750	-	3500	-	11000	-
Mill Creek	-	1300	150	3200	900	-	4700	-	3300	-	2500	-	56000	-
Wolf Creek	-	680	50	1800	80	-	5500	-	4400	-	16000	-	750	-
Tinkers Creek 1	100	-	-	400	-	440	-	1600	-	625	-	1200	-	2600
Tinkers Creek 2	180	-	-	200	-	360	-	2800	-	1400	-	2500	-	900
Chippewa Creek	20	-	20	-	-	50	-	140	-	380	-	650	-	500
Euclid Creek 1	-	240	-	160	-	240	-	320	-	140	-	450	-	120
Euclid Creek 2	-	70	-	120	-	70	-	180	-	520	-	220	-	180
Chagrin River 1	180	-	-	200	-	140	-	530	-	100	-	70	-	70
Chagrin River 2	850	-	-	160	-	60	-	260	-	60	-	230	-	40
Cuyahoga River	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(Continued on following page.)

Table XI-II: (continued) Cleveland Metroparks Stream Sampling
Fecal Coliform Concentrations
(Organisms Per 100 Milliliters)
1992

Sites	2/3	2/4	3/4	4/14	5/26	5/27	6/15	6/16	7/6	7/7	8/3	8/20	9/2	10/8	12/7	12/8
Rocky River 1	850	-	490	840	220	-	260	-	360	-	370	40	250	880	360	-
Rocky River 2	3500	-	720	3100	200	-	360	-	160	-	90	970	100	440	220	-
Rocky River 3	8000	-	900	1650	450	-	460	-	320	-	480	380	220	600	510	-
Big Creek 1	250	-	780	4600	600	-	600	-	1400	-	550	700	780	780	800	-
Big Creek 2	300	-	450	330	1100	-	400	-	300	-	280	880	400	540	350	-
Big Creek 3	2500	-	780	480	450	-	600	-	300	-	500	730	440	580	610	-
Mill Creek	1250	-	900	280	2300	-	350	-	7000	-	1450	2890	1620	1750	220	-
Wolf Creek	2600	-	330	60	850	-	50	-	2000	-	280	2100	1110	800	60	-
Tinkers Creek 1	-	1550	860	180	-	350	-	510	-	450	-	250	120	990	-	170
Tinkers Creek 2	-	1750	1100	90	-	1750	-	1000	-	250	-	280	130	1250	-	270
Chippewa Creek	-	140	140	20	-	700	-	250	-	90	-	160	20	120	70	-
Euclid Creek 1	-	950	380	75	-	70	-	70	-	80	-	130	20	200	-	110
Euclid Creek 2	-	4400	500	60	-	50	-	30	-	150	-	170	30	120	-	150
Chagrin River 1	-	480	100	30	-	220	-	130	-	60	-	60	60	110	-	50
Chagrin River 2	-	90	170	10	-	80	-	130	-	90	-	100	90	140	-	90
Cuyahoga River	-	1100	660	1400	-	580	-	1080	-	680	-	300	150	690	310	-

Table XI-III: Cleveland Metroparks Stream Sampling
1991-1992 Fecal Coliform Concentrations
(Organisms Per 100 Milliliters)

Sites	N	Maximum	75th Percentile	Median	25th Percentile	Minimum	Geometric Mean
Rocky River 1	18	1,190	890	360	210	110	380
Rocky River 2	18	3,500	685	300	150	40	340
Rocky River 3	18	11,500	1,875	510	340	140	770
Big Creek 1	18	7,000	2,600	780	600	200	980
Big Creek 2	18	6,100	2,050	500	350	300	760
Big Creek 3	18	11,000	3,000	610	465	125	1,000
Mill Creek	19	56,000	2,900	1,620	625	150	1,600
Wolf Creek	19	16,000	2,300	770	70	50	640
Tinkers Creek 1	17	3,600	1,095	450	215	100	490
Tinkers Creek 2	17	2,800	1,575	900	225	90	650
Chippewa Creek	17	700	315	140	35	20	110
Euclid Creek 1	17	950	280	140	78	20	150
Euclid Creek 2	17	4,400	200	150	65	30	150
Chagrin River 1	17	530	190	100	60	30	110
Chagrin River 2	17	850	165	90	70	10	100
Cuyahoga River	10*	1,400	1,080	670	310	150	580

N = Number of times sites were sampled during 1991-1992.
* - Site sampled during 1992 only.

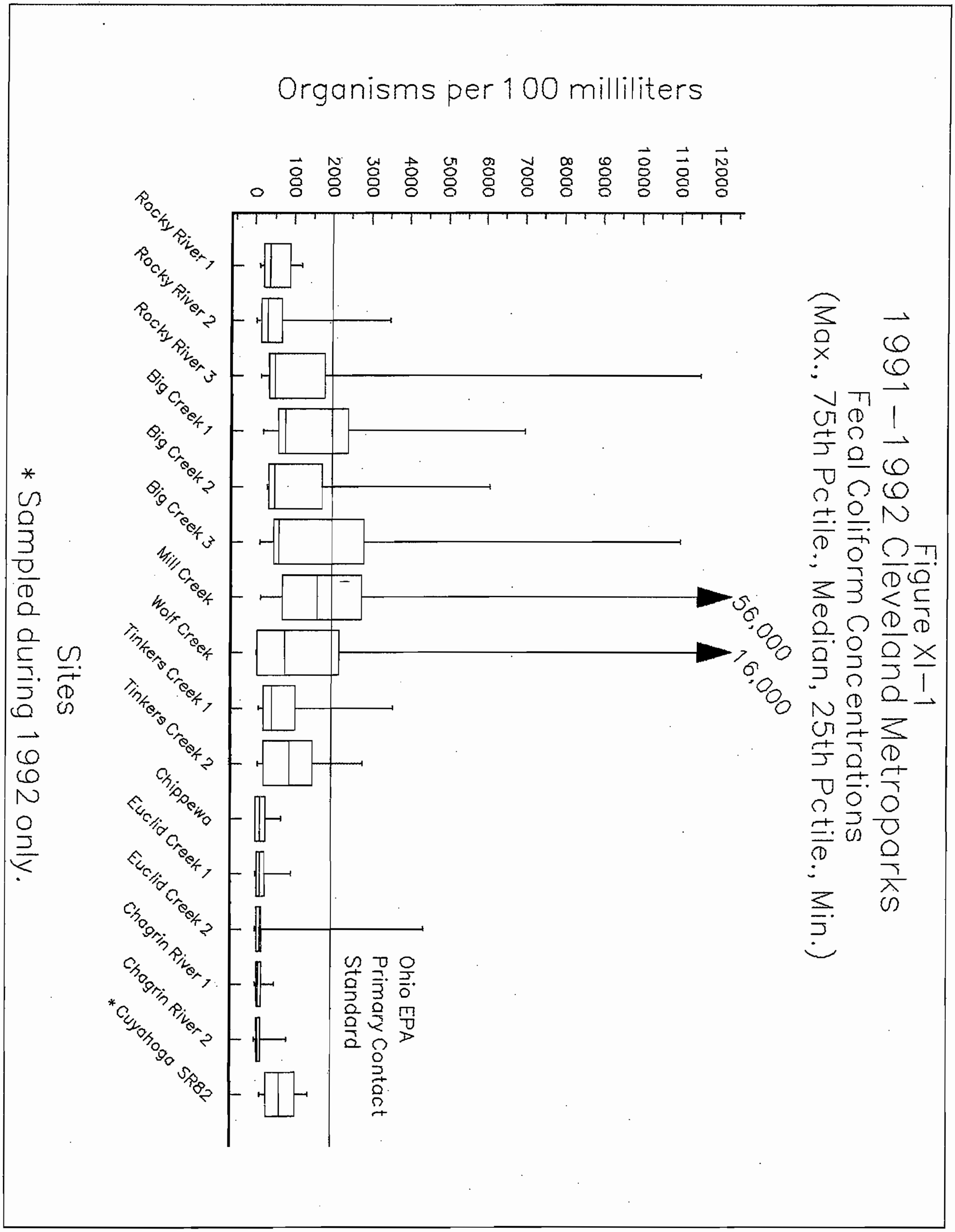

Figure XI-1
1991-1992 Cleveland Metroparks
Fecal Coliform Concentrations
(Max., 75th Pctile., Median, 25th Pctile., Min.)

Table XI-IV: NEORSD Rain Gauge Site Locations

Rain Gauge Site	Address
Easterly WWTP	1420 Lake Shore Boulevard
James Rhodes High School	5100 Biddulph Road
John Marshall High School	3952 West 140th Street
Maple Heights City Hall	5353 Lee Road
Oakwood Village Hall	24800 Broadway Avenue
Strongsville C (WWTP)	12449 Sprague Road

Table XI-V: Cleveland Metroparks Sampling Events with Fecal Coliform Criterion Exceedances Compared with Associated Rain Events Detected by NEORSD Rain Gauge Data

SAMPLING EVENTS EXCEEDING CRITERIA			ASSOCIATED RAIN EVENTS		
Sampling Date	Sampling Location	Fecal Coliform Concentrations	Rain Event Date	Rain Gauge Location	Rainfall (Inches)
5/29/91	Big Creek 2	4,000*	5/24/91	John Marshall H.S.	0.21
			5/25/91	John Marshall H.S.	0.28
			5/26/91	John Marshall H.S.	0.58
7/8/91	Mill Creek	3,200	7/4/91	Maple Heights	0.07
9/11/91	Rocky River 3	2,100*	9/10/91	Strongsville C	0.09
9/11/91	Big Creek 1	3,200*	9/10/91	James Rhodes H.S.	0.27
9/11/91	Big Creek 3	3,900*	9/10/91	James Rhodes H.S.	0.27
9/11/91	Mill Creek	4,700*	9/10/91	Maple Heights	0.88
9/11/91	Wolf Creek	5,500*	9/10/91	Maple Heights	0.88
9/12/91	Tinkers Creek 2	2,800*	9/10/91	Oakwood	0.43
10/15/91	Rocky River 3	2,680*	10/10/91	Strongsville C	0.10
			10/12/91	Strongsville C	0.26
10/15/91	Big Creek 1	7,000*	10/10/91	James Rhodes H.S.	0.22
			10/12/91	James Rhodes H.S.	0.37
10/15/91	Big Creek 2	6,100*	10/10/91	John Marshall H.S.	0.20
			10/12/91	John Marshall H.S.	0.26
			10/14/91	John Marshall H.S.	0.10
10/15/91	Big Creek 3	9,750*	10/10/91	James Rhodes H.S.	0.22
			10/12/91	James Rhodes H.S.	0.37
10/15/91	Mill Creek	3,300*	10/10/91	Maple Heights	0.24
			10/12/91	Maple Heights	0.44
10/15/91	Wolf Creek	4,400*	10/10/91	Maple Heights	0.24
			10/12/91	Maple Heights	0.44
11/13/91	Big Creek 1	3,500*	11/11/91	James Rhodes H.S.	0.56
			11/12/91	James Rhodes H.S.	0.13
11/13/91	Big Creek 2	3,000*	11/11/91	John Marshall H.S.	0.62
			11/12/91	John Marshall H.S.	0.12
11/13/91	Big Creek 3	3,500*	11/11/91	James Rhodes H.S.	0.56
			11/12/91	James Rhodes H.S.	0.13
11/13/91	Mill Creek	2,500*	11/11/91	Maple Heights	0.63
			11/12/91	Maple Heights	0.26
11/13/91	Wolf Creek	16,000*	11/11/91	Maple Heights	0.63
			11/12/91	Maple Heights	0.26
11/14/91	Tinkers Creek 2	2,500*	11/11/91	Oakwood	0.55
			11/12/91	Oakwood	0.22
12/11/91	Rocky River 3	11,500	12/2/91	Strongsville C	0.71
			12/3/91	Strongsville C	0.16

* - May be attributable to wet weather.

(Continued on following page.)

Table XI-V: (continued) Cleveland Metroparks Sampling Events with Fecal Coliform Criterion Exceedances Compared with Associated Rain Events Detected by NEORSD Rain Gauge Data

SAMPLING EVENTS EXCEEDING CRITERIA			ASSOCIATED RAIN EVENTS		
Sampling Date	Sampling Location	Fecal Coliform Concentrations	Rain Event Date	Rain Gauge Location	Rainfall (Inches)
12/11/91	Big Creek 1	2,000	12/2/91	James Rhodes H.S.	0.63
			12/3/91	James Rhodes H.S.	0.14
12/11/91	Big Creek 2	5,700	12/2/91	John Marshall H.S.	0.64
			12/3/91	John Marshall H.S.	0.23
12/11/91	Big Creek 3	11,000	12/2/91	James Rhodes H.S.	0.63
			12/3/91	James Rhodes H.S.	0.14
12/11/91	Mill Creek	56,000	12/2/91	Maple Heights	0.64
			12/3/91	Maple Heights	0.23
12/12/91	Tinkers Creek 1	2,600	12/2/91	Oakwood	0.96
			12/3/91	Oakwood	0.18
2/3/92	Rocky River 2	3,500	1/23/92	John Marshall H.S.	0.20
2/3/92	Rocky River 3	8,000	1/23/92	Strongsville C	0.14
2/3/92	Big Creek 3	2,500	1/23/92	James Rhodes H.S.	0.20
2/3/92	Wolf Creek	2,600	1/23/92	Maple Heights	0.33
2/4/92	Euclid Creek 2	4,400	1/23/92	Easterly WWTP	0.27
4/14/92	Rocky River 2	3,100	4/10/92	John Marshall H.S.	0.22
4/14/92	Big Creek 1	4,600	4/10/92	James Rhodes H.S.	0.11
5/26/92	Mill Creek	2,300*	5/23/92	Maple Heights	0.41
			5/24/92	Maple Heights	0.71
7/6/92	Mill Creek	7,000	6/18/92	Maple Heights	0.42
			6/23/92	Maple Heights	0.25
7/6/92	Wolf Creek	2,000	6/18/92	Maple Heights	0.42
			6/23/92	Maple Heights	0.25
8/20/92	Mill Creek	2,890*	8/13/92	Maple Heights	0.39
			8/15/92	Maple Heights	0.85
			8/18/92	Maple Heights	0.22
8/20/92	Wolf Creek	2,100*	8/13/92	Maple Heights	0.39
			8/15/92	Maple Heights	0.85
			8/18/92	Maple Heights	0.22

* - May be attributable to wet weather.

APPENDIX XII

ATMOSPHERIC DEPOSITION
AT 1900 GROVE COURT, CLEVELAND

Appendix XII: Atmospheric Deposition at 1900 Grove Court, Cleveland

Atmospheric deposition is the path by which surface water is contaminated by airborne pollutants. Airborne pollutants may be emitted to the atmosphere via stationary sources (e.g., coal-burning power plants, coke plants, blast furnaces, etc.) and mobile sources (e.g., automobile exhaust systems). Data and analysis on the impacts of atmospheric deposition appear to be lacking for the Cuyahoga River basin.

The NEORSD performed atmospheric deposition sampling in 1991 and 1992 at 1900 Grove Court, Cleveland (41° 29.5' N, 81° 41.9' W). The objective of the project was to obtain anecdotal information on the loadings of airborne contaminants from precipitation at this location in the Cleveland Flats. Airborne industrial, commercial, residential, and automotive emissions may be contributors to elevated atmospheric loadings to the Cuyahoga River near 1900 Grove Court. The sample site is surrounded by industrial and commercial facilities, residential communities, and roadways heavily traveled by automotive vehicles, all having potentially significant impacts on Cuyahoga River water quality.

Atmospheric deposition loadings are dependent upon many factors, including volume of precipitation, frequency of precipitation, proximity of pollutant sources, and atmospheric conditions, and are therefore highly variable between events. Furthermore, it should be noted that soil absorption/adsorption and land surface run-off characteristics are very site-specific, and therefore calculated atmospheric loadings are not necessarily representative of pollutant contributions to surface waters. Nevertheless, atmospheric contributions must be considered when assessing pollutant sources, and loading calculations can provide some perspective for the Cuyahoga River near 1900 Grove Court, Cleveland.

A glass funnel with the surface area of one square foot was inserted into the opening of a one-gallon plastic cubitainer to obtain atmospheric precipitation. The glass funnel was cleaned with nitric acid and rinsed with de-ionized water prior to precipitation sampling events. Samples were collected for analysis after and/or during each wet weather event between September 1991 and December 1992 at approximately 7:00 a.m.

The NEORSD Division Pump Station rain gauge at 2900 Division Avenue was selected to monitor precipitation duration and accumulation due to its proximity to the sampling location. The Southerly WWTP rain gauge at 6000 Canal Road and the Wade Park rain gauge at 1801 East 105th Street were used as secondary means of obtaining precipitation data when the Division Pump Station rain gauge was malfunctioning. Wind direction was obtained from the National Weather Service, and the chemical parameters were analyzed by NEORSD Analytical Services.

Table XII-1A through Table XII-1F present rain gauge data, parameters analyzed, concentrations, and dates sampled. Table XII-2 was used to calculate approximate loadings of each contaminant deposited per rain event at this location. The loadings are in pounds per square mile and are presented in Table XII-3A through Table XII-3F.

In Table XII-4, the concentrations measured in the atmospheric deposition samples are compared with Ohio EPA warmwater habitat water quality criteria. The comparison reveals that, if these concentrations had been present in warmwater habitat surface waters (with the assumed Cuyahoga River hardness), copper, zinc, iron, cadmium, lead, silver, arsenic, and pH would have all exhibited violations of water quality standards. These anecdotal data indicate that the contribution of pollutants to surface waters via atmospheric deposition must not be overlooked in identifying and characterizing the sources of water pollution.

ATMOSPHERIC PRECIPITATION CONCENTRATIONS AT 1900 GROVE COURT, CLEVELAND

Table XII - 1A

Sample Dates	09/10/91	09/16/91	09/20/91	10/05/91	05/17/92	05/23/92
Precipitation Accumulation (Inches)	0.67	0.16	0.95	1.78	0.34	0.64
Precipitation Duration (Hours)	3.42	2.42	19.60	15.65	7.16	6.83
Wind Direction	SW	SW	NW	-	NW	NW
Chlorides	-	-	-	-	-	-
Hardness	20	54	10	22	16	61
Phosphorus	-	-	-	-	-	-
Sulfates	-	-	-	-	-	-
Acidity	-	-	-	-	-	10
Phenolics	-	-	-	-	-	-
Sodium	1.7	1.3	0.33	0.42	0.97	(0.15)
Selenium (ug/L)	(1.0)	(0.001)	(1.0)	(0.002)	(0.0025)	(0.0025)
Potassium	3.24	1.70	0.26	0.47	(0.005)	(0.15)
Thallium	-	-	-	-	-	-
pH (S.U.)	4.0	7.3	5.7	7.2	6.4	9.0
Nickel	0.04	0.01	(0.005)	0.01	0.01	0.01
Copper	0.28	0.015	0.01	0.018	0.02	0.01
Total Chromium	0.01	0.01	0.01	0.02	0.01	0.01
Hexavalent Chromium	-	-	-	(0.005)	(0.005)	-
Zinc	0.19	0.12	0.07	0.16	0.27	0.13
Iron	0.19	2.3	0.46	2.7	1.7	2.6
Cadmium	(0.005)	(0.005)	(0.005)	(0.005)	0.001	0.001
Lead	0.05	0.06	0.04	0.09	0.05	0.04
Mercury (ug/L)	-	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Silver	(0.005)	(0.005)	(0.005)	(0.005)	(0.001)	(0.00025)
Antimony	(0.005)	(0.005)	(0.005)	(0.005)	(0.0035)	(0.0015)
Arsenic	1.0	0.0056	3.0	(0.0025)	(0.0025)	(0.0025)
Beryllium	-	-	-	-	-	-
Cobalt	0.01	(0.005)	(0.005)	(0.005)	0.001	(0.005)
Magnesium	0.67	1.9	0.60	2.0	1.8	1.6
Manganese	0.05	0.16	0.04	0.22	0.17	0.21

All concentrations are in mg/L except where noted otherwise.

( ) - Concentrations less than detection are expressed as one-half the method detection limit for averaging.

All precipitation data is from Division Pump Station rain gauge except where noted otherwise.

ATMOSPHERIC PRECIPITATION CONCENTRATIONS AT 1900 GROVE COURT, CLEVELAND

Table XII - 1B

Sample Dates	05/29/92	05/30/92*	06/04/92	06/18/92	06/19/92	06/22/92
Precipitation Accumulation (Inches)	0.34	0.11	0.32	0.79	0.79	0.17
Precipitation Duration (Hours)	5.58	1.45	14.33	4.42	4.42	0.58
Wind Direction	N	-	SE	-	SW	-
Chlorides	-	-	-	-	-	-
Hardness	60	44	-	68	-	-
Phosphorus	-	-	-	-	-	-
Sulfates	-	-	-	-	-	-
Acidity	-	-	-	65	-	-
Phenolics	-	-	-	-	-	-
Sodium	1.3	0.92	7.7	0.94	0.36	0.46
Selenium (ug/L)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)
Potassium	0.17	0.17	4.1	(0.15)	(0.005)	0.07
Thallium	-	-	-	-	-	-
pH (S.U.)	5.9	6.1	7.9	7.7	6.3	4.9
Nickel	0.01	0.01	0.04	0.09	0.001	0.005
Copper	0.02	0.01	0.12	0.03	0.003	0.006
Total Chromium	0.01	(0.005)	0.08	0.02	0.003	0.003
Hexavalent Chromium	(0.005)	(0.005)	-	(0.005)	(0.005)	-
Zinc	0.17	0.16	0.88	0.02	0.05	0.04
Iron	2.2	1.4	18.0	4.8	0.54	0.40
Cadmium	0.001	0.001	0.02	0.002	(0.00025)	0.002
Lead	0.04	0.028	0.39	0.07	0.14	0.010
Mercury (ug/L)	(0.1)	(0.1)	-	(0.1)	-	-
Silver	(0.00025)	(0.00025)	-	0.0005	(0.00025)	(0.00025)
Antimony	(0.0035)	(0.0035)	0.03	(0.0035)	0.008	(0.0035)
Arsenic	(0.0025)	(0.0025)	-	0.004	0.005	(0.0025)
Beryllium	-	-	-	-	-	-
Cobalt	0.001	0.001	(0.005)	0.002	(0.00025)	(0.00025)
Magnesium	1.9	1.0	14.3	3.2	0.24	0.30
Manganese	0.17	0.15	1.6	0.37	0.03	0.02

All concentrations are in mg/L except where noted otherwise.

( ) - Concentrations less than detection are expressed as one-half the method detection limit for averaging.

All precipitation data is from Division Pump Station rain gauge except where noted otherwise.

* Southerly WWTP rain gauge

ATMOSPHERIC PRECIPITATION CONCENTRATIONS AT 1900 GROVE COURT CLEVELAND

Table XII - 1C

Sample Dates	06/24/92*	07/06/92	07/11/92**	07/12/92**	07/15/92	07/19/92
Precipitation Accumulation (Inches)	0.21	0.36	0.56	0.49	0.40	0.87
Precipitation Duration (Hours)	0.42	1.33	5.5	7.58	2.83	7.66
Wind Direction	-	SW	-	-	SW	SW
Chlorides	-	-	-	-	-	-
Hardness	28	-	-	-	-	-
Phosphorus	-	-	-	-	-	-
Sulfates	-	-	-	-	-	-
Acidity	-	-	-	-	-	-
Phenolics	-	-	-	-	-	-
Sodium	0.07	0.23	0.03	0.03	0.04	0.65
Selenium (ug/L)	(0.0035)	(0.0025)	(0.0035)	(0.0035)	(0.0035)	(0.0025)
Potassium	1.0	(0.5)	2.9	2.9	1.0	(0.5)
Thallium	-	-	-	-	-	-
pH (S.U.)	6.5	6.2	7.3	6.2	6.1	5.8
Nickel	0.03	0.004	0.008	0.007	0.032	0.008
Copper	0.01	0.009	0.01	0.006	0.008	0.01
Total Chromium	0.01	0.005	0.010	0.003	0.004	0.002
Hexavalent Chromium	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Zinc	0.10	0.04	0.14	0.03	0.12	0.02
Iron	2.8	0.14	1.0	0.26	0.48	0.08
Cadmium	0.001	(0.00025)	0.02	0.001	0.001	(0.0005)
Lead	0.03	0.015	0.028	0.010	0.012	0.006
Mercury (ug/L)	0.3	(0.1)	-	-	(0.1)	(0.1)
Silver	(0.0005)	(0.00025)	0.001	0.008	0.001	0.001
Antimony	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)
Arsenic	0.002	0.005	0.010	(0.0045)	0.008	(0.0025)
Beryllium	-	-	-	-	-	-
Cobalt	0.001	(0.00025)	(0.00025)	(0.00025)	(0.0025)	(0.00025)
Magnesium	1.4	0.17	1.4	0.32	0.4	(0.005)
Manganese	0.25	0.01	0.12	0.02	0.04	(0.005)

All concentrations are in mg/L except where noted otherwise.

( ) - Concentrations less than detection are expressed as one-half the method detection limit for averaging.

All precipitation data is from Division Pump Station rain gauge except where noted otherwise.

* Southerly WWTP rain gauge ** Wade Park rain gauge

ATMOSPHERIC PRECIPITATION CONCENTRATIONS AT 1900 GROVE COURT, CLEVELAND

Table XII - 1D

Sample Dates	07/24/92	07/26/92#	07/30/92	07/31/92	08/08/92	08/11/92
Precipitation Accumulation (Inches)	0.86	0.0	0.58	0.23	0.07	0.66
Precipitation Duration (Hours)	3.75	0.0	3.62	1.17	0.75	1.25
Wind Direction	NE	-	-	NE	SW	NW
Chlorides	2.0	-	-	-	-	-
Hardness	-	-	-	-	-	-
Phosphorus	-	-	-	-	-	-
Sulfates	4.89	-	-	-	-	-
Acidity	-	-	20.0	20.0	-	2.5
Phenolics	-	-	-	-	-	-
Sodium	0.05	0.04	0.02	0.04	0.12	-
Selenium (ug/L)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)	(0.0025)
Potassium	0.07	(0.02)	(0.5)	(0.5)	(0.5)	(0.5)
Thallium	-	-	-	-	(0.0035)	(0.0035)
pH (S.U.)	6.8	5.9	5.4	4.5	7.1	7.0
Nickel	0.005	0.002	0.004	0.003	0.01	0.03
Copper	0.02	0.010	0.006	0.004	0.01	0.01
Total Chromium	0.005	0.003	0.002	-	0.01	-
Hexavalent Chromium	(0.005)	(0.005)	(0.005)	(0.005)	-	(0.005)
Zinc	0.09	0.04	0.04	0.05	0.06	0.07
Iron	0.96	0.48	0.31	0.19	0.41	0.64
Cadmium	0.001	(0.0005)	(0.00025)	(0.00025)	0.001	(0.005)
Lead	0.051	0.021	0.010	0.015	0.03	0.008
Mercury (ug/L)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	-
Silver	(0.0005)	(0.0005)	(0.00025)	0.001	(0.0005)	(0.0005)
Antimony	(0.0035)	(0.004)	(0.0035)	(0.0035)	(0.0035)	(0.0035)
Arsenic	(0.0025)	(0.0025)	(0.003)	(0.0025)	(0.0025)	(0.0025)
Beryllium	-	-	-	-	(0.00025)	(0.00025)
Cobalt	(0.0015)	(0.0015)	(0.00025)	(0.00025)	(0.00025)	0.001
Magnesium	1.1	0.36	0.33	0.36	1.1	0.04
Manganese	0.08	0.14	0.01	0.03	0.05	0.43

All concentrations are in mg/L except where noted otherwise.

( ) - Concentrations less than detection are expressed as one-half the method detection limit for averaging.

All precipitation data is from Division Pump Station rain gauge except where noted otherwise.

- Rain gauge malfunction

ATMOSPHERIC PRECIPITATION CONCENTRATIONS AT 1900 GROVE COURT, CLEVELAND

Table XII - 1E

Sample Dates	08/14/92	08/15/92	08/24/92#	08/27/92	08/28/92	08/30/92
Precipitation Accumulation (Inches)	0.26	0.93	0.0	0.56	0.28	0.32
Precipitation Duration (Hours)	2.42	12.25	0.0	1.30	7.95	0.50
Wind Direction	NW	-	-	SW	-	NW
Chlorides	-	-	-	1.0	2.0	-
Hardness	-	-	-	-	-	-
Phosphorus	-	-	-	-	(0.05)	-
Sulfates	-	-	-	-	4.0	-
Acidity	-	-	-	5.0	5.0	2.5
Phenolics	-	-	-	-	-	-
Sodium	(0.015)	(0.015)	2.1	0.17	0.50	-
Selenium (UG/l)	(0.0025)	(0.0025)	(0.0025)	0.005	(0.0025)	(0.0025)
Potassium	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)
Thallium	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)
pH (S.U.)	6.9	6.2	7.7	5.4	4.7	6.0
Nickel	0.002	(0.0005)	0.02	0.002	0.002	0.002
Copper	0.007	0.004	0.04	0.003	0.01	0.01
Total Chromium	0.004	0.002	0.04	0.004	0.003	0.004
Hexavalent Chromium	(0.005)	(0.005)	-	(0.005)	(0.005)	(0.005)
Zinc	0.03	0.02	0.28	0.05	0.06	0.09
Iron	0.25	0.08	6.5	0.32	0.06	0.19
Cadmium	0.001	(0.0005)	0.01	(0.0005)	(0.0005)	(0.0005)
Lead	0.006	(0.0015)	0.06	0.004	(0.0015)	0.004
Mercury (ug/L)	(0.1)	-	-	(0.1)	(0.1)	(0.1)
Silver	(0.0005)	(0.0005)	-	0.001	(0.005)	0.002
Antimony	(0.0035)	(0.0035)	(0.0035)	(0.0035)	0.007	(0.0035)
Arsenic	(0.0025)	(0.0025)	0.005	0.007	0.005	(0.0025)
Beryllium	(0.00025)	(0.00025)	0.001	(0.0025)	(0.00025)	(0.00025)
Cobalt	(0.00025)	(0.00025)	0.001	(0.00025)	(0.00025)	(0.00025)
Magnesium	0.46	0.33	8.7	0.27	0.09	0.17
Manganese	0.03	0.02	1.2	0.04	0.01	0.01

All concentrations are in mg/L except where noted otherwise.

( ) - Concentrations less than detection are expressed as one-half the method detection limit for averaging.

All precipitation data is from Division Pump Station rain gauge except where noted otherwise.

- Rain gauge malfunction.

ATMOSPHERIC PRECIPITATION CONCENTRATIONS AT 1900 GROVE COURT, CLEVELAND

Table XII - 1F

Sample Dates	09/03/92	09/10/92#	09/21/92	11/14/92	11/20/92	12/30/92
Precipitation Accumulation (Inches)	0.32	0.0	0.07	0.54	0.49	0.79
Precipitation Duration (Hours)	11.75	0.0	2.17	7.87	6.08	12.25
Wind Direction	-	-	SW	-	-	-
Chlorides	-	-	-	14.0	10.0	-
Hardness	-	-	-	-	-	-
Phosphorus	-	-	-	(0.005)	(0.005)	-
Sulfates	-	-	-	8.0	10.0	-
Acidity	5.0	10.0	-	5.0	5.0	-
Phenolics	-	-	-	-	-	-
Sodium	0.49	0.33	-	1.7	2.9	50.6
Selenium (ug/L)	0.009	0.005	-	(0.0025)	(0.0025)	0.0025
Potassium	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	9.2
Thallium	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	-
pH (S.U.)	4.8	6.7	7.1	7.5	7.1	7.7
Nickel	0.002	0.002	(0.0005)	(0.01)	(0.001)	-
Copper	0.007	0.004	(0.0015)	0.01	0.01	0.14
Total Chromium	0.004	0.005	0.004	(0.005)	(0.005)	0.04
Hexavalent Chromium	(0.005)	(0.005)	-	(0.005)	(0.005)	-
Zinc	0.06	0.03	0.01	0.03	0.03	0.45
Iron	0.81	0.34	0.17	0.41	0.29	11.1
Cadmium	0.001	0.001	(0.0005)	(0.005)	(0.005)	0.01
Lead	0.008	(0.0015)	(0.0013)	(0.015)	(0.015)	0.32
Mercury (ug/L)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	-
Silver	0.002	(0.0005)	-	(0.005)	(0.005)	-
Antimony	(0.0035)	(0.0035)	(0.0035)	(0.0035)	(0.0035)	-
Arsenic	0.006	0.005	0.006	(0.0025)	(0.0025)	-
Beryllium	(0.00025)	(0.00025)	(0.00025)	(0.00025)	(0.00025)	-
Cobalt	(0.00025)	(0.00025)	-	0.001	0.001	0.002
Magnesium	0.73	0.39	0.35	2.2	0.95	8.5
Manganese	0.08	0.02	0.04	0.05	0.06	-

All concentrations are in mg/L except where noted otherwise.

( ) - Concentrations less than detection are expressed as on-half the method detection limit for averaging.

All precipitation data is from Division Pump Station rain gauge except where noted otherwise.

Rain gauge malfunction.

Table XII-2.

Calculation for Loadings per Rain Event

$$\frac{mg}{L} \times \frac{in}{event} \times \left(\frac{1\ lb}{454{,}000\ mg} \times \frac{7.48\ gal}{ft^3} \times \frac{1\ ft^3}{1{,}728\ in^3} \times \frac{4.0 \times 10^9\ in^2}{mile^2} \times \frac{3.78\ L}{gal.}\right)$$

$$= \frac{mg}{L} \times \frac{in}{event} \times \left(\frac{144\ lb \times L}{mg \times in \times mile^2}\right) = lbs/mile^2/event$$

$\frac{mg}{L}$ = Concentration of Parameter

$\frac{in}{event}$ = Accumulation of Precipitation

LOADINGS (LBS/SQ.MI./EVENT) FROM PRECIPITATION AT 1900 GROVE COURT, CLEVELAND

Table XII - 3A

Sample Dates	09/10/91	09/16/91	09/20/91	10/05/91	05/17/92	05/23/92
Chlorides	-	-	-	-	-	-
Hardness	1900	1200	1400	5600	780	5600
Phosphorus	-	-	-	-	-	-
Sulfates	-	-	-	-	-	-
Acidity	-	-	-	-	-	920
Phenolics	-	-	-	-	-	-
Sodium	160	30	45	110	47	0.01
Selenium	0.10	0.00002	0.14	0.0005	0.00012	0.00023
Potassium	310	39	36	120	0.2	14
Thallium	-	-	-	-	-	-
Nickel	4.0	0.2	0.7	2	0.5	0.9
Copper	27	0.34	1	5.0	1	0.9
Total Chromium	1	0.2	1	5	0.4	0.9
Hexavalent Chromium	-	-	-	1	0.24	-
Zinc	18	2.8	10	41	13	12
Iron	18	53	63	690	83	240
Cadmium	0.5	0.1	0.7	1	0.05	0.09
Lead	5	1	5	20	2	4
Mercury	-	0.002	0.01	0.02	0.005	0.01
Silver	0.5	0.1	0.7	1	0.05	0.023
Antimony	0.5	0.1	0.7	1	0.17	0.14
Arsenic	96	0.13	410	0.64	0.12	0.23
Beryllium	-	-	-	-	-	-
Cobalt	1	0.1	0.7	1	0.05	0.5
Magnesium	65	44	82	510	88	150
Manganese	5	3.7	5	56	8.3	19

LOADINGS (LBS/SQ.MI./EVENT) FROM PRECIPITATION AT 1900 GROVE COURT, CLEVELAND

Table XII - 3B

Sample Dates	05/29/92	05/30/92	06/04/92	06/18/92	06/19/92	06/22/92
Chlorides	-	-	-	-	-	-
Hardness	2900	700	-	7700	-	-
Phosphorus	-	-	-	-	-	-
Sulfates	-	-	-	-	-	-
Acidity	-	-	-	7400	-	-
Phenolics	-	-	-	-	-	-
Sodium	64	14	350	110	41	11
Selenium	0.00012	0.000040	0.00012	0.00028	0.00028	0.000061
Potassium	8.3	2.7	190	17	0.57	2
Thallium	-	-	-	-	-	-
Nickel	0.5	0.2	2	10	0.1	0.1
Copper	1	0.2	5.5	3	0.3	0.1
Total Chromium	0.5	0.08	4	2	0.3	0.07
Hexavalent Chromium	0.2	0.08	-	0.6	0.6	-
Zinc	8.3	2.5	40	2	6	1
Iron	110	22	830	550	61	9.8
Cadmium	0.05	0.02	0.9	0.2	0.028	0.05
Lead	2	0.44	18	8	16	0.24
Mercury	0.005	0.002	-	0.01	-	-
Silver	0.012	0.0040	-	0.06	0.028	0.0061
Antimony	0.17	0.055	1	0.40	0.9	0.086
Arsenic	0.12	0.040	-	0.4	0.6	0.061
Beryllium	-	-	-	-	-	-
Cobalt	0.05	0.02	0.2	0.2	0.028	0.0061
Magnesium	93	16	660	360	27	7.3
Manganese	8.3	2.4	74	42	3	0.50

LOADINGS (LBS/SQ.MI./EVENT) FROM PRECIPITATION AT 1900 GROVE COURT, CLEVELAND

Table XII - 3C

Sample Dates	06/24/92	07/06/92	07/11/92	07/12/92	07/15/92	07/19/92
Chlorides	-	-	-	-	-	-
Hardness	850	-	-	-	-	-
Phosphorus	-	-	-	-	-	-
Sulfates	-	-	-	-	-	-
Acidity	-	-	-	-	-	-
Phenolics	-	-	-	-	-	-
Sodium	2	12	2	2	2	81
Selenium	0.00010	0.00013	0.00028	0.00025	0.00020	0.00031
Potassium	30	20	230	200	60	60
Thallium	-	-	-	-	-	-
Nickel	0.9	0.2	0.6	0.5	1.8	1
Copper	0.3	0.5	0.8	0.4	0.5	1
Total Chromium	0.3	0.2	0.81	0.2	0.2	0.2
Hexavalent Chromium	0.2	0.2	0.4	0.4	0.3	0.6
Zinc	3.0	2	11	2	6.9	2
Iron	85	7.2	81	18	28	10
Cadmium	0.03	0.013	2	0.07	0.06	0.06
Lead	0.9	0.78	2.2	0.70	0.69	0.8
Mercury	0.009	0.005	-	-	0.006	0.01
Silver	0.02	0.013	0.08	0.6	0.06	0.1
Antimony	0.10	0.18	0.28	0.25	0.20	0.44
Arsenic	0.06	0.2	0.81	0.32	0.5	0.31
Beryllium	-	-	-	-	-	-
Cobalt	0.03	0.013	0.020	0.02	0.14	0.031
Magnesium	42	8.8	110	22	20	0.6
Manganese	8	0.5	9.7	1	2	0.6

LOADINGS (LBS/SQ.MI./EVENT) FROM PRECIPITATION AT 1900 GROVE COURT, CLEVELAND

Table XII - 3D

Sample Dates	07/24/92	07/26/92	07/30/92	07/31/92	08/08/92	08/09/92
Chlorides	250	-	-	-	-	-
Hardness	-	-	-	-	-	-
Phosphorus	-	-	-	-	-	-
Sulfates	600	-	-	-	-	-
Acidity	-	-	1700	660	-	240
Phenolics	-	-	-	-	-	-
Sodium	6.2	M	1.7	1.3	1	-
Selenium	0.00031	M	0.00021	0.000083	0.00002	0.00024
Potassium	9	M	40	20	5	50
Thallium	-	-	-	-	0.04	0.33
Nickel	0.6	M	0.3	0.1	0.1	3
Copper	2	M	0.5	0.1	0.1	0.1
Total Chromium	0.6	M	0.2	-	0.1	-
Hexavalent Chromium	0.6	M	0.4	0.2	-	0.5
Zinc	10	M	3	2	0.6	7
Iron	120	M	26	6.3	4	61
Cadmium	0.1	M	0.021	0.0083	0.01	0.5
Lead	6.3	M	0.84	0.50	0.3	0.8
Mercury	0.01	M	0.008	0.003	0.001	-
Silver	0.06	M	0.021	0.03	0.005	0.05
Antimony	0.43	M	0.29	0.12	0.04	0.33
Arsenic	0.31	M	0.25	0.083	0.02	0.24
Beryllium	-	-	-	-	0.002	0.024
Cobalt	0.18	M	0.021	0.0083	0.002	0.1
Magnesium	140	M	28	12	10	4
Manganese	10	M	0.8	1	0.5	41

M - Rain Gauge Malfunction

LOADINGS (LBS/SQ.MI./EVENT) FROM PRECIPITATION AT 1900 GROVE COURT, CLEVELAND

Table XII - 3E

Sample Dates	08/14/92	08/15/92	08/24/92	08/27/92	08/28/92	08/30/92
Chlorides	-	-	-	81	81	-
Hardness	-	-	-	-	-	-
Phosphorus	-	-	-	-	2	-
Sulfates	-	-	-	-	160	-
Acidity	-	-	-	400	200	120
Phenolics	-	-	-	-	-	-
Sodium	0.56	2.0	M	14	20	-
Selenium	0.000094	0.00033	M	0.0004	0.00010	0.00012
Potassium	20	70	M	40	20	20
Thallium	0.13	0.47	M	0.28	0.14	0.16
Nickel	0.07	0.07	M	0.2	0.08	0.09
Copper	0.3	0.5	M	0.2	0.4	0.5
Total Chromium	0.1	0.3	M	0.3	0.1	0.2
Hexavalent Chromium	0.2	0.7	-	0.4	0.2	0.2
Zinc	1	3	M	4	2	4
Iron	9.4	10	M	26	2	8.8
Cadmium	0.04	0.07	M	0.04	0.02	0.02
Lead	0.2	0.20	M	0.3	0.060	0.2
Mercury	0.004	-	-	0.008	0.004	0.005
Silver	0.02	0.07	-	0.08	0.2	0.09
Antimony	0.13	0.47	M	0.28	0.3	0.16
Arsenic	0.094	0.33	M	0.6	0.2	0.12
Beryllium	0.0094	0.033	M	0.20	0.010	0.012
Cobalt	0.0094	0.033	M	0.020	0.010	0.012
Magnesium	17	44	M	22	4	7.8
Manganese	1	3	M	3	0.4	0.5

M - Rain Gauge Malfunction

LOADINGS (LBS/SQ.MI./EVENT) FROM PRECIPITATION AT 1900 GROVE COURT, CLEVELAND

Table XII - 3F

Sample Dates	09/03/92	09/10/92	09/21/92	11/14/92	11/20/92	12/30/92	09/10/91 to 12/30/92 AVERAGE
Chlorides	-	-	-	1100	700	-	440
Hardness	-	-	-	-	-	-	2900
Phosphorus	-	-	-	0.4	0.4	-	0.9
Sulfates	-	-	-	620	700	-	520
Acidity	230	M	-	390	350	-	1100
Phenolics	-	-	-	-	-	-	-
Sodium	22	M	-	130	200	5800	200
Selenium	0.0004	M	-	-	0.0018	0.0028	0.008
Potassium	20	M	5	40	40	1000	80
Thallium	0.16	M	0.04	0.27	0.25	-	0.2
Nickel	0.09	M	0.005	0.8	0.07	-	1
Copper	0.3	M	0.02	0.8	0.7	16	2
Total Chromium	0.2	M	0.04	0.4	0.4	4	0.8
Hexavalent Chromium	0.2	M	-	0.4	0.4	-	0.4
Zinc	3	M	0.1	2	2	51	8
Iron	37	M	2	32	20	1300	100
Cadmium	0.05	M	0.005	0.4	0.4	1	0.3
Lead	0.4	M	0.01	1.2	1.0	36	4
Mercury	0.005	M	0.001	0.008	0.007	-	0.006
Silver	0.09	M	-	0.4	0.4	-	0.2
Antimony	0.16	M	0.04	0.27	0.25	-	0.3
Arsenic	0.3	M	0.06	0.19	0.18	-	20
Beryllium	0.012	M	0.002	0.019	0.018	-	0.03
Cobalt	0.012	M	-	0.08	0.07	0.2	0.2
Magnesium	34	M	4	170	67	970	100
Manganese	4	M	0.4	4	4	-	10

M - Rain Gauge Malfunction

Table XII-4.

Atmospheric Precipitation Average Concentrations Compared with
Ohio EPA Outside Mixing Zone Warmwater Habitat Water Quality Criteria

Parameter	Average Concentration*	Concentration Range	30-Day Ave. WWH WQC**	Maximum WWH WQC**
Chlorides	5.8	1.0-14.0	-	-
Hardness	38	10-68	-	-
Phosphorus	<0.1	<0.1	-	-
Sulfates	7.0	4.0-10.0	-	-
Acidity	13.0	2.5-65	-	-
Sodium	2.3	<0.03-50.6	-	-
Selenium (ug/L)	0.06	<0.002 - 1.0	5.0	20
Potassium	1.0	<0.01-9.2	-	-
Thallium	<0.007	<0.007	0.016	0.071
pH (S.U.)	-	**4.0**-9.0	-	6.5-9.0
Nickel	0.01	<0.001-0.9	0.34	3.0
Copper	0.02	<0.003-**0.04**	0.024	0.038
Total Chromium	<0.01	0.002-0.08	0.39	3.4
Hex. Chromium	<0.01	<0.01	0.011	0.015
Zinc	0.1	0.01-**0.88**	0.20	0.22
Iron	**2**	0.06-18	1.0	-
Cadmium	**0.003**	<0.0005-0.01	0.0025	0.013
Lead	**0.05**	<0.0026-**0.39**	0.018	0.35
Mercury (ug/L)	<0.2	<0.2-0.3	0.012	1.1
Silver	**0.002**	<0.0005-**0.008**	0.0013	0.0060
Antimony	0.005	<0.003-0.03	0.19	0.65
Arsenic	0.1	0.002-**3.0**	0.19	0.36
Beryllium	0.0005	<0.0005-0.001	0.079	1.8
Cobalt	0.002	<0.0005-0.01	-	-
Magnesium	1.7	<0.01-14.3	-	-
Manganese	0.2	<0.01-1.6	-	-

All concentrations are in mg/L except where noted otherwise.

*Concentrations below detection assumed to be one-half the method detection limit for averaging.

**Based on Cuyahoga River hardness of 215 mg/L.

Concentrations in **bold** exceed Warmwater Habitat water quality criteria.

APPENDIX XIII

BLAST FURNACE SLAG LEACHATE

Appendix XIII: Blast Furnace Slag Leachate

Blast furnace slag is a non-metallic material produced during the molten stage of iron production in a blast furnace. Slag usually consists of alumina and silica, which come from the iron ore, combined with calcium and magnesium oxides from the flux stone. Blast furnace slag also contains calcium sulfide, iron oxide and manganese oxide. The exact quantities vary with the source of the iron ore and flux stone (NSA Bulletin 188-1). The molten slag can be cooled by various methods to produce three distinct types of slag: granulated, expanded and air cooled.

Granulated slag is cooled rapidly with water to produce a glassy granular slag. This type of slag can be crushed or screened for a variety of uses including: highway base/subbase, soil conditioning, lightweight concrete blocks, pipe backfill, floor fill, etc.

Expanded slag is formed when controlled quantities of water are added rapidly to increase the vesicular nature of the slag. This type of slag has a more porous appearance than the other types. Expanded slag is used in various lightweight masonry products, floor fill, etc.

Air cooled slag is produced when the molten slag is allowed to air cool in a pit. It is then crushed and screened for various sized rocks. This type of slag has more diverse uses than the other two types. Air cooled slag is used as a trickling filter bed medium, septic tank absorption beds, roofing, bituminous pavement, skid resistant surfaces, masonry products, slope protection, backfill, railroad ballast, slag wool insulation, highway base/subbase, french drains, pipe backfill, concrete aggregate, etc. Further investigation into the potential problems associated with each type of slag and which type creates the most problems is warranted.

Slag has been used extensively as pipe backfill because it becomes highly alkaline when exposed to water (pH 9 to 11 standard units), which prevents acidic conditions that can cause cast iron and steel pipes to corrode.

Many of the crushed slags used in pipe backfill, french drains and highway base/subbase, tend to leach out a greenish-yellow discharge with a strong sulfur odor.

NEORSD personnel obtained several samples of slag leachate from slag that was soaked in buckets of water for at least 24 hours. Chemical analyses of these slag leachate samples revealed elevated concentrations of BOD, COD, chlorides, sulfates, total solids, dissolved solids, hardness, calcium, iron, pH, and alkalinity, and high specific conductance (Table XIII-A). Also noted was a greenish-yellow color and a strong sulfur odor. These results were then compared to samples collected from various discharges during investigations of malodorous discharges to area streams. (See Burke Brook Site #48.1 and Rocky River at Puritas Road.) The chemical analyses of the malodorous discharges had elevated concentrations of the same chemical parameters measured in the slag leachate samples. The results suggest that these discharges investigated by NEORSD personnel probably contained slag leachate. Also noted in all of the malodorous discharge investigations were a similar greenish-yellow color and sulfur odors.

Blast furnace slag is typically stock piled outdoors to be cured before use. Curing of slag usually involves the rinsing or soaking by water to reduce the amount of sulfides, fine material, greenish-yellow color and odor associated with uncured slag. Before slag is used in highway construction it typically goes through a testing procedure to ensure minimal leachate problems. These testing procedures may not be adequate to ensure that all slag used will not cause leachate problems. Also, these test procedures may not be followed uniformly or required for every application of slag.

Further sampling and investigation into slag leachate and the impact it has on the aquatic environment is warranted. Future quantitative chemical analyses of various slag samples will be conducted.

Table XIII-A contains chemical data from a sample of slag soaked in distilled water for 24 hours and 48 hours. Included is data of mixed rubble (i.e. slag, concrete, brick, etc.) soaked for 24 hours in distilled water. The sample of slag was enough to fill a 3.5 gallon bucket halfway with water added to completely submerse the slag. The data in Table XIII-A is for comparison with water samples collected in the field when slag leachate is suspected to be present.

Table XIII-A: Slag Leachate

	24 Hour Soak	48 Hour Soak	Mixed Rubble 24 Hours
BOD	380	330	230
COD	585	356	630
Suspended Solids	128	1,210	5,730
Total Solids	3,720	2,160	5,970
Dissolved Solids	1,790	530	912
Sp. Cond. (umhos/cm)	2,260	7,440	1,317
Ammonia	0.14	<0.01	<0.01
Phosphorus	1.02	1.18	3.65
Soluble P	-	0.06	0.38
Nitrates	<0.01	0.04	0.23
Nitrites	0.15	0.05	0.02
TKN	4.70	1.75	6.47
Chlorides	700	214	330
Sulfates	321	144	257
Alkalinity	293	343	678
Hardness	897	818	1,060
Nickel	0.07	0.10	0.21
Copper	0.06	0.08	0.62
Chromium (Total)	0.11	0.14	0.28
Chromium (Hexavelent)	<0.01	<0.01	<0.01
Zinc	0.21	0.24	1.00
Iron	12.0	17.4	100
Cadmium	0.03	0.04	0.07
Lead	0.19	0.35	1.30
Mercury (ug/L)	0.2	0.1	0.4
pH (Standard Units)	9.7	9.9	10.2
Manganese	4.80	6.30	3.20
Calcium	272	214	357
Sulfides	-	14.1	7.52
Phenolics	-	0.23	0.12

All parameters in mg/L unless otherwise noted.

APPENDIX XIV

SUMMARY OF CUYAHOGA RIVER REMEDIAL ACTION PLAN
1989-1992 FISH TISSUE COLLECTION
AND ANALYSIS

CUYAHOGA RIVER
RAP
Remedial Action Plan
A Turn For The Better

NEWS RELEASE

Date:	March 17, 1994	
Contact:	Steve Tuckerman - OEPA	(216) 963-1105
	Keith Linn - NEORSD	(216) 641-6000
	Mary Beth Binns - CRCPO	(216) 241-2414 Ext. 253
Release:	Immediately	

Cuyahoga RAP Identifies Pollutants in Fish from Cuyahoga River and Lake Erie

Research recently completed by the community-based Cuyahoga River Remedial Action Plan (RAP) identified the levels of contaminants found in fish on the Cuyahoga River and Cleveland lakefront. During the three-year research, which began in 1989, 370 fish were collected and tested for 130 pollutants. Of those 130 pollutants, 27 were detected.

The research, which cost more than $375,000, drew financial and technical resources from the City of Akron, Cuyahoga County Board of Health, Cuyahoga River Community Planning Organization, Cuyahoga Valley National Recreation Area, Northeast Ohio Regional Sewer District, Ohio Department of Health, Ohio Department of Natural Resources, Ohio EPA, and U.S. Fish and Wildlife Service.

The chairman of the Cuyahoga RAP, Greg Studen, said, "everyone wants to know if the fish are safe to eat. We had no current data to address this, and we knew the research would be a big job. But the RAP has been very successful coordinating multi-party efforts."

The most notable pollutants detected were PCB (polychlorinated biphenyls) mixtures. PCBs are the contaminant which poses the most significant risk to human health in the Great Lakes region. The Ohio Department of Health, the agency responsible for issuing fish consumption advisories, has reviewed the data, and, based on the levels of PCBs in fish, is issuing an advisory for the Cuyahoga River.

Steve Tuckerman, from the Ohio EPA, and Keith Linn, from the Northeast Ohio Regional Sewer District, co-chaired the Cuyahoga RAP fish tissue research team. "Frankly, I thought we'd find higher levels in the fish," said Tuckerman. "But when compared to PCB levels in fish from other bodies of water around the county, levels in Cuyahoga River fish don't stick out like a sore thumb. Considering that twenty years ago you would have had difficulty finding any fish in the river from Akron to Cleveland, we've come a long way."

The RAP process is a long range plan to restore and enhance the Cuyahoga River. The Cuyahoga RAP has identified the sources of the river's problems and is investigating actions to resolve them.

Enclosure

Cuyahoga River Remedial Action Plan
668 Euclid Avenue, 4th Floor, Atrium Office Plaza, Cleveland, Ohio 44114-3000
(216) 241-2414, Extension 250

CUYAHOGA RIVER REMEDIAL ACTION PLAN
HIGHLIGHTS
of the Fish Tissue Research

The Cuyahoga River Remedial Action Plan has just completed three years of research on the levels of contaminants found in the flesh of Cuyahoga River and Lake Erie fish. The research was undertaken to address a significant unknown in the Cuyahoga RAP planning process.

The research was a major collaborative effort. Under the direction of the Cuyahoga RAP, the Cuyahoga River Community Planning Organization (CRCPO) served as the fiscal agent for this project. Resources for the collection and analysis of the samples and the interpretation of the results were supplied by the City of Akron, Cuyahoga County Board of Health, Cuyahoga Valley National Recreation Area (CVNRA), Northeast Ohio Regional Sewer District (NEORSD), Ohio Department of Natural Resources (ODNR), Ohio Environmental Protection Agency (Ohio EPA), and U. S. Fish and Wildlife Service (USF&WS). This voluntary effort was a large undertaking that consumed approximately 1500 person hours in sample collection and an approximately equal number of hours in meetings and data analysis. The cost of chemical analysis totaled $189,242.50 with wages, equipment, supplies and data analysis costs nearly equalling that of chemical analysis.

Analyses were performed on composite samples of fish fillets to assess the most probable risk to human health from contaminants found in the flesh. The data have been reviewed by the Ohio Department of Health (ODH) to set fish consumption guidelines for the Cuyahoga River. ODH is the state agency with authority to establish fish consumption advisories. The research will also serve as a baseline for comparison for future analyses of chemical contaminants in fish fillets.

Fish were collected from five sites in the Cuyahoga River between Akron and Cleveland, and from three sites in Lake Erie along the Cleveland shoreline. These eight sites are in the "Area of Concern (AOC)", as defined by the Cuyahoga RAP process. Levels of contaminants found in AOC fish were contrasted to levels in fish taken from waters elsewhere in Northeast Ohio that are less impacted by industrial and urban development. These "reference sites" include one site on the upper Cuyahoga River in Shalersville (Geauga Co.), one site on the Chagrin River, and two sites on Lake Erie - one at Lakewood and one at Eastlake. Results of analysis on RAP samples were also compared to a recent national study on levels of fish contamination.

Three hundred and seventy fish were collected during 1989, 1990 and 1992, yielding 95 composite samples to be analyzed. Though not all species were found at each site, species collected include Common Carp, White Sucker, Golden Redhorse, Yellow Bullhead, Brown Bullhead, Rock Bass, Pumpkinseed, Bluegill, Smallmouth Bass, Largemouth Bass, Black Crappie, Yellow Perch, Walleye, and Freshwater Drum. The composite samples were tested for 130 of contaminants of greatest concern.

Of the 130 pollutants for which the fish samples were analyzed, 27 contaminants were detected. These contaminants included 3 polychlorinated biphenyl (PCB) mixtures, 11 pesticide compounds, 7 volatile organic compounds, and 6 heavy metals. Of those contaminants found, PCBs are recognized as the contaminant posing the most significant risk to human health in the Great Lakes Region. PCBs at varying levels were detected in 77 composite samples, including samples from the reference sites. The research found that levels of PCBs in river and lake AOC fish are significantly higher than those in fish taken from the river reference sites. Contaminant levels in fish from lake reference sites were similar to river AOC levels.

The Cuyahoga RAP data were compared with results published in a National Study of Chemical Residues in Fish (USEPA 1992). This comparison revealed that, generally, concentrations of contaminants detected in fish collected from the AOC were similar to levels in fish collected at over 100 urban, agricultural, and industrial areas across the nation.

(continued...)

The production of PCBs began in the United States in 1929. PCBs were used as a dielectric fluid in capacitors and transformers, a plasticizer in plastic and rubber products, a lubricant in hydraulic and vacuum fluids, an ink carrier and solvent in the manufacturing process for carbonless copying paper, and a sealer for gaskets and furnaces. In 1977, U.S. EPA banned the production-based discharge of PCBs. In 1979, U.S. EPA banned PCB manufacture, processing, and distribution in commerce. In 1982, a phase-out of the use of PCBs in electrical equipment was begun and it continues into the present. PCB levels in fish throughout the Great Lakes have declined since the late 1970's.

Despite the bans and phase-outs, PCBs persist in the environment because they are relatively insoluble in water and resistant to biological degradation. Although they may be below detectable levels in ambient water or sediments, PCBs are nevertheless detected in fish tissue due to their high potential for bioaccumulation.

Both the Cuyahoga RAP research and the National Study frequently detected pesticides. Like PCBs, uses of many of the pesticide compounds detected (e.g., DDT and its degradation products, DDE and DDD) have been banned in the United States. And like PCBs, these compounds continue to be detected in fish tissue on a widespread basis because they are relatively insoluble in water, highly bioaccumulative, and resistant to biological degradation. Additionally, their persistence has been attributed to environmental recycling and to atmospheric transport from other countries, where they continue to be produced and used in large quantities.

Methoxychlor, heptachlor epoxide, and endrin were three pesticide compounds found in AOC fish at levels generally higher than national levels. Where a national standard or guideline has been set for these contaminants, AOC fish did not exceed these levels. Other pesticide compounds in AOC fish are generally lower than national levels.

Mercury was detected in all of the RAP samples, AOC and reference sites alike. It was also detected in nearly 95 percent of the fish analyzed for the National Study. Yet, the samples from the Cuyahoga RAP reference sites as well as the national study reference sites had mercury concentrations generally slightly higher than mercury concentrations in the samples from the Cuyahoga AOC and the National Study impacted sites. This may be explained by the fact that the predominant sources of mercury in surface waters are not point source discharges directly to water, but natural or atmospheric sources. Mercury occurs naturally in more than 25 different minerals found in the earth's crust, while fossil fuel combustion has been identified as one of the most significant anthropogenic sources of mercury in the environment.

The Cuyahoga RAP is overseen by a 33-member Coordinating Committee (CCC). Members were appointed in 1988 by the Director of Ohio EPA to develop a Remedial Action Plan for the Cuyahoga River. CCC members represent local industries, local civic and environmental organizations, and local, regional, state and federal agencies. A list of CCC members is enclosed.

Remedial Action Plans (RAPs) are mandated by the Great Lakes Water Quality Agreement of 1986 between Canada and the United States to restore seriously degraded areas and points of persistent toxic pollution. The Cuyahoga River is one of 43 such points, designated as "Areas of Concern." RAPs require the evaluation of 15 or so beneficial uses of the water resource. Safe consumption of fish by humans is one such beneficial use to be addressed in each RAP area. Other beneficial uses include the health of fish and wildlife populations, and recreational access and safety from contact with contaminated water.

For a more complete summary of the current conditions in the Cuyahoga River and the impaired beneficial uses, or to get involved in the process to restore beneficial uses, call 241-2414, extension 253.

APPENDIX XV

OUTLINE OF GEOLOGIC EVENTS IN NORTHEAST OHIO AND THEIR RELATION TO THE CUYAHOGA RIVER WATERSHED

The Southern Great Lakes Region has traditionally been viewed as an area of less geologic interest than the mountainous regions found to the east and west or the exposed shield rocks to the north. In truth, the region contains a wide range of geologic features. Precambrian Time (prior to 600 million years before present (M b.p.) activities, besides affecting geologic history in their own time, have influenced the succession of geologic events in subsequent eras. The regional history during the Paleozoic Era (600 M - 230 M b.p.) built on these events to provide the region with a varied array of bedrock landforms. Activities during the Cenozoic Era (65 M b.p. - present) have worked to reveal and add to these previous landforms. The region encompasses parts of Michigan, Ohio, and Pennsylvania and includes all of Cuyahoga County and the Cuyahoga River watershed.

The geologic history of the region can be traced to approximately 1,000 million years before present time (M b.p.). During this period of Precambrian Time, a mountain range similar to the younger Appalachian System ran through the Southern Great Lakes Region. By the end of Precambrian Time (600 M b.p.) this mountainous system had eroded to an almost featureless plain.(1) This plain became the "basement rocks" that underlie the region.

Much of the Paleozoic Era of the region involved a series of successive advances and retreats of shallow seaways as the midcontinent rose and fell relative to sea level. A recession began in the late Precambrian Time and reached its lowest level at the end of the Cambrian Period (600 M - 500 M b.p.). This was followed by uplifting during the early Ordovician Period (500 M - 435 M b.p.). A new recession began in the Middle Ordovician to Middle Silurian (435 M - 400 M b.p.) periods. During the Later Silurian Period the gradually retreating continental seas were cut off from the open seas. A water equilibrium developed in this landlocked sea between evaporation and recharge with large deposits of limestone, gypsum and halite (salt) being precipitated. These precipitates formed the salt beds that are presently mined in Detroit and Cleveland. All the sedimentary rocks associated with these early Paleozoic events are unexposed to the surface in Northeastern Ohio.

The exposed bedrocks in the Cleveland area are classified as belonging to the Devonian (400 M - 350 M b.p.), Mississippian (350 M - 310 M b.p.), and Pennsylvanian (310 M - 280 M b.p.) periods. During these periods more sediments were deposited, eroded and overlain. The Mississippian and Pennsylvanian Periods are also collectively known as the Carboniferous Period. It was during this extended period that the great coal seams found throughout Ohio

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(1) Southern Great Lakes. 1977, Kendall/Hunt Publishing Company.

Figure XV-1 Geologic Time

ERA	PERIOD		AGE OF BOUNDARY (MILLION YEARS)
CENO-ZOIC	QUATERNARY		
			1.5
	TERTIARY		
			65
MESOZOIC	CRETACEOUS		
			135
	JURASSIC		
			190
	TRIASSIC		
			230
PALEOZOIC	PERMIAN		
			280
	CARBON-IFEROUS	PENNSYLVANIAN	
			310
		MISSISSIPPIAN	
			350
	DEVONIAN		
			400
	SILURIAN		
			435
	ORDOVICIAN		
			500
	CAMBRIAN		
			600
PRECAMBRIAN			

Taken from Guide to the Geology of Northeastern Ohio, P.O. Banks and R. M. Feldmann (1970). Adapted from Kulp (1961).

began in swamp forests that dominated the region. After the Pennsylvanian Period the marine seas never encroached back upon Ohio.

Glacial activity during the Pleistocene Epoch (1.5 M - 0.5 M b.p.) of the Quatenary Period (1.5 M b.p. - present) has played an obvious role in shaping the modern landscape and defining the major geomorphic regions. Boundaries between these regions are also dictated by the geographic extent of Paleozoic bedrocks that are overlain by the Pleistocene glacial deposits. A third factor, the nature and distribution of geologic landforms (i.e., faults, arches, or escarpments), also played a significant role in determining the regional distribution of glacial rock. This indirectly determined the distribution of later Pleistocene sediments.(1)

The eastern half of Ohio is contained in the Appalachian Plateau Province. This province is characterized by landforms with moderately high relief. The province is also characterized by deeply disected valleys. Two sections make up the province: the glaciated southern New York section and the unglaciated Kanawa section. A low relief escarpment (Portage Escarpment) was produced at their intersection by glacial sediment heaped upon Mississippian and Pennsylvanian-age sedimentary rocks. Locally this escarpment produces the "Heights" areas which are actually the foothills to the Allegheny Mountains. This escarpment is relatively subdued in eastern Ohio. The same ridge reaches more than 300 feet in Western New York.(1)

Landforms lying to the west and north of this escarpment are contained in the eastern part of the Central Lowlands Province. This province stretches throughout much of the northern midcontinent. The area containing Greater Cleveland is further defined as lying in the East Lake or the Till Plains sections. The East Lake section is an extremely flat landform. Any preglacial relief has been obscured by ancient Lake Erie sedimentation deposits. The Till Plains section is characterized by an open low relief topography composed of ground moraine and terminal moraine deposits from the last glacial period.

Several glacial periods are known to have occurred in Ohio during the "Ice Age" of the Quatenary period. The last, called the Wisconsin Stage, is thought to have occurred some 20,000 years ago.(2) The entire Cleveland region was subjected to glaciation at least four times during this last "Ice Age." When the ice flows traveled over both plateau and lowlands and melted, they left deposits of varying thickness of ground-up rocks, boulders, pebbles,

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(1) Southern Great Lakes. 1977, Kendall/Hunt Publishing Company.

(2) The Geology of the Cleveland Region, 1940, Cleveland Museum of Natural History

sand and clay. When the ice began retreating, due to climatic warming, they began melting faster than they advanced. This caused great bays of water to occupy the lowlands in the northwest corner of Ohio and proceeded the formation of Lake Erie.

This part of the Southern Great Lakes region was covered for long periods of time by the waters of these glacial lakes caught between the watershed and the ice front. Numerous ridge deposits of sand and gravel representing beach lines formed along the shores of these lakes. The levels of these lakes were at first relatively high, but as lower outlets were uncovered by the retreating ice, the lake levels correspondingly lowered until the present Great Lakes basins were reached.

As the last ice sheet retreated from the old Cuyahoga River Valley it laid down a thick deposit of heavy clay containing boulders and pebbles of various sizes. This material completely filled up the old river channel and much of the valley as well. When the glacial lakes continued to fall, the new Cuyahoga River began cutting its present channel down to corresponding levels and spreading out at its mouth a good amount of materials consisting of muds, sands and gravels. These materials were laid down in broad sheets over the previous glacial deposits of boulder clay. This continuing process was responsible for building up the relatively flat platform upon which Cleveland is largely built. These boulder clays are still the dominant factor in the normally elevated total solids loadings found in the Cuyahoga River.

These elevated loadings have a direct effect on the nature of the ecosystems found in the Cuyahoga River. The increased bed load limits the habitats that can be used by macroinvertebrates and nesting fish. The increased suspended solids load affects the amount of light penetration into the water. This may indirectly affect populations of biota in the river. Thirdly, an increase in dissolved load directly affects the water chemistry of the system. So we can conclude that the Cuyahoga River is a prisoner of its past. Any improvements to the ecosystem will always be limited by the geomorphologic characteristics of the watershed.