Toxics Substances Control Program

Pittsburgh to Wheeling Field Survey

ORSANCO

OHIO RIVER VALLEY WATER SANITATION COMMISSION
AN INTERSTATE AGENCY
ESTABLISHED JUNE 30, 1948

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RESULTS OF JANUARY 1989 FIELD SURVEY
PITTSBURGH - WHEELING SEGMENT
OHIO RIVER

TOXIC SUBSTANCES CONTROL PROGRAM

Ohio River Valley Water Sanitation Commission
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I. BACKGROUND

The Ohio River Valley Water Sanitation Commission, ORSANCO, is conducting investigations of segments of the Ohio River, as part of its Toxic Substances Control Program. The segment investigations involve the following activities:

- Analyze historic data
- Recommend field survey
- Carry out field survey and analyze results
- Recommend follow-up work
- Analyze follow-up data
- Determine needs for additional work/recommend control program

The segment of the Ohio River from Pittsburgh, Pennsylvania to Wheeling, West Virginia is the scope of this report. A report evaluating historic data and recommending a field survey was completed in September 1988. The field survey took place in January 1989; this report presents an analysis of those data and recommends additional data collection.

Analyses of historic data showed long term water quality problems. Parameters of concern identified in 1988 included: arsenic, chloroform, copper, cyanide, lead, mercury, nickel, phenolics, and zinc in the water column, and chlordane and polychlorinated biphenyls (PCBs) in fish tissue. Contributions of these pollutants come from both point and nonpoint sources. The analyses also suggested that many of the parameters of concern were temperature dependent. The relationship between temperature and pollutant concentration shows that as temperature decreases, pollutant concentration increases. Recommendations of the September 1988 report included: (1) sampling for volatile organic chemicals, phenolics and cyanide at low flow/low temperature conditions and (2) collection of sediment samples. Collection of water column samples occurred in January 1989. The sediment sampling has yet to be scheduled.

Parameters of Concern

Table 1 shows the parameters of concern for the Pittsburgh-Wheeling segment of the Ohio River. The table shows those pollutants identified in three separate reports. All three reports used similar methods for analysis. Table 1 suggests improving water quality conditions since the publication of The Presence of Toxic Substances in the Ohio River in 1986. Application of the Seasonal Kendall Test for trends shows copper, lead, phenolics, and zinc with a significant ($p. < 0.1$) trend with a negative slope for the 1977 -1987 period.

TABLE I

PITTSBURGH - WHEELING SEGMENT
TOXIC SUBSTANCES CONTROL PROGRAM

Parameters of Concern	Published Date
The Presence of Toxic Substances in the Ohio River	*1986*
Metals: Arsenic, Chromium, *Copper, *Lead, Mercury, Nickel, *Zinc Organics: Benzene, Chloroform, Chlordane, Cyanide, 1,1-Dichloroethylene, 1,2-Dichloropropane, Dibromochloromethane, *Phenolics, Polychlorinated Biphenyls (PCBs), Tetrachloroethylene, 1,1,1-Trichloroethylene	
Pittsburgh - Wheeling Recommendation Report	*1988*
Metals: Arsenic, *Copper, *Lead, Mercury, Nickel, *Zinc Organics: Chloroform, Chlordane, Cyanide, Polychlorinated Biphenyls (PCBs), *Phenolics	
Assessment of Water Quality Conditions: Water Years 1988-1989	*1990*
Metals: *Copper, *Lead, Nickel Organics: Bromodichloromethane, Chloroform, Chlordane, Dibromodichloromethane, Polychlorinated Biphenyls (PCBs)	

**These parameters have a significant decreasing trend for 1977-1987*

Inventory of Facilities

One hundred twenty six facilities discharge to the Ohio River in the study segment. These include 92 industrial discharges and 34 municipal waste water treatment plants (WWTPs). Table 2 is a summary of those discharges. Fifty- six of the facilities are in Pennsylvania, 38 in Ohio, and 32 are in West Virginia. Appendix 1 contains a complete listing of these facilities.

TABLE 2

SUMMARY OF DISCHARGES TO THE OHIO RIVER
MILE POINT 0 - 85

Municipal WWTPs flow > 5.0 MGD	2
Municipal WWTPs flow < 5.0 MGD	32
Chemical Manufacturing Facilities	9
Steels/Metals	26
Manufacturing	21
Power Stations	10
Bulk Terminals	26
Total Permitted Facilities	**126**

Many (17) of the communities along the study segment have combined sewer systems transporting both waste water and storm water runoff. These systems overload during periods of heavy rainfall. This results in inadequate treatment of waste water and direct discharge of untreated sewage into the Ohio River. Table 3 lists those communities with combined sewer systems.

Another concern is the transport of toxic substances from contaminated ground water to the surface water. The heavy concentration and the type of industry along the study segment increase this concern for the Pittsburgh-Wheeling segment. The Commission inventoried sites that potentially have contaminated the ground water. For the study segment there are 49 such sites, with 24 sites judged to have severe contamination. The types of contamination identified include metals, organics, and other inorganics. There is a need to obtain additional data to characterize this problem.

TABLE 3

COMMUNITIES WITH COMBINED SEWER SYSTEMS

Mile Point	Municipality
0.0	Pittsburgh, Pennsylvania
4.0	Bellevue, Pennsylvania
5.0	Avalon, Pennsylvania
6.5	Emsworth, Pennsylvania
11.8	Sewickley, Pennsylvania
13.9	Leetsdale, Pennsylvania
15.9	Ambridge, Pennsylvania
20.0	Aliquippa, Pennsylvania
25.0	Rochester, Pennsylvania
43.3	Chester, West Virginia
45.7	Newell, West Virginia
56.7	New Cumberland, West Virginia
59.1	Toronto, West Virginia
63.0	Weirton, West Virginia
68.0	Steubenville, Ohio
71.0	Mingo Junction, Ohio
74.7	Wellsburg, West Virginia

There are 36 public water supplies along the Ohio River in the Pittsburgh-Wheeling segment. Eight of these facilities, serving over 760,000 people, use the Ohio River as their raw water supply. Twenty-eight of these utilities use ground water pumped from the alluvial aquifer adjacent to the Ohio River. These 28 utilities serve over 200,000 people. Appendix 1 contains a complete listing of all the public water supplies in the study area.

II. SURVEY DESIGN

Objective

The objective of the January 1989 field survey was to characterize the presence of cyanide, phenolics, and volatile organic chemicals (VOCs) in the Ohio River and major tributaries under low

temperature/low flow conditions. Low temperature/low flow conditions were identified as the best conditions for determining the effect of point source and constant loading nonpoint sources of cyanide, phenolics and VOCs (i.e., ground water infiltration) on Ohio River water quality. Low water temperature inhibits volatilization and transformation of pollutants. Low flow decreases the amount of dilution by the receiving stream.

Sampling Locations

Sampling locations were selected to isolate clusters of dischargers. For this study there were 13 clusters on the Ohio River. Many of the sampling sites were located perpendicular to public water supply intakes to assess water quality at the point of withdrawal. Five tributary stations provided data on inputs of toxic substances from the tributaries. Table 4 lists the sampling stations and shows the number of discharges between stations on the Ohio River. Appendix 1 includes sampling stations with the discharge list.

TABLE 4

IN STREAM SAMPLING LOCATIONS

River Mile	River	Location	Discharges	
			IW	MW
7.4*	Allegheny	Pittsburgh Waterworks		
0.8*	Allegheny	9th Street Bridge		
19.7*	Monongahela	Peter's Creek Confluence		
4.5*	Monongahela	Hays Mine (West Penn Water)		
0.8*	Monongahela	Smithfield Bridge		
0.7	Ohio	West End Bridge		
4.5	Ohio	West View Water Authority	3	1
9.0	Ohio	Neville Island	11	1
12.5	Ohio	Sewickley Bridge	3	3
25.3	Ohio	Monoca-Rochester Bridge	9	7
4.5*	Beaver	Beaver Falls		
31.5	Ohio	Montgomery Locks & Dam	5	3
40.2	Ohio	East Liverpool, OH Waterworks	8	2
50.0	Ohio	Yellow Creek Light and Daymark	10	3
59.0	Ohio	Toronto Waterworks	4	4
65.2	Ohio	Steubenville, OH WW & Weirton, WV WW	9	1
69.9	Ohio	Follansbee, WV	7	2
72.6	Ohio	Brilliant, OH WW & Wellsville, WV WW	8	1
86.8	Ohio	Wheeling, WV Waterworks	15	6
		Total Number of Discharges	92	34

IW - Industrial Waste Water Discharges
MW - Municipal Waste Water Discharges
** - Miles from Confluence With the Ohio River*
@ - Number of Discharges Between Sampling Locations

Analytes

In addition to phenolics, cyanide and volatile organic chemicals several field parameters and conventional water quality parameters were measured. These included: dissolved oxygen, conductivity, hardness, pH, temperature and total suspended solids. These parameters would show any lateral or vertical variability in water quality. Table 5 lists all the parameters for which samples were analyzed including a listing of the specific volatile organic chemicals.

TABLE 5

WATER QUALITY PARAMETERS

Field Parameters

Temperature
Dissolved Oxygen
Conductivity
pH

Measured at one meter from bottom, one meter from top and mid-depth at the left quarter point, mid-channel and the right quarter point.

Laboratory Analysis

Total Suspended Solids
Hardness
Phenolics
Cyanide
Volatile Organic Chemicals - including:

	Detection Limits		Detection Limits
Benzene	0.2	1,2-Dichloropropane	0.2
Bromobenzene	0.2	1,3-Dichloropropane	0.2
Bromochloromethane	0.2	2,2-Dichloropropane	0.2
Bromodichloromethane	0.2	1,1-Dichloropropane	0.2
Bromoform	0.2	Ethylbenzene	0.2
n-Butylbenzene	0.2	Hexachlorobutadiene	0.2
sec-Butylbenzene	0.2	Isopropylbenzene	0.2
tert-Butylbenzene	0.2	4-Isopropyltoluene	1.8
Carbon Tetrachloride	0.2	Methylene Chloride	1.0
Chlorobenzene	0.2	Naphthalene	0.2
Chloroform	0.2	n-Propylbenzene	0.2
2-Chlorotoluene	0.2	Styrene (Ethenylbenzene)	0.2
4-Chlorotoluene	0.2	1,1,1,2-Tetrachloroethane	0.2
Dibromochloromethane	0.2	1,1,2,2-Tetrachloroethane	0.2
1,2-Dibromo-3-chloropropane	0.2	Tetrachloroethene	0.2
1,2-Dibromomethane	0.2	Toluene	0.2
Dibromomethane	0.2	1,2,3-Trichlorobenzene	0.2
1,2-Dichlorobenzene	0.2	1,2,4-Trichlorobenzene	0.2
1,3-Dichlorobenzene	0.2	1,1,1-Trichloroethane	0.2
1,4-Dichlorobenzene	0.2	Trichloroethene	0.2
1,1-Dichloroethane	0.2	1,2,3-Trichloropropane	0.2
1,2-Dichloroethane	0.2	1,2,4-Trimethylbenzene	0.2
1,1-Dichloroethene	0.2	1,3,5-Trimethylbenzene	0.2
cis-1,2-Dichloroethene	0.2	1,2-Xylene	0.2
trans-1,2-Dichloroethene	0.2	1,3-Xylene & 1,4-Xylene	0.2

Depth composite samples taken at the left quarter point, mid-channel and right quarter point.

Participants

The field work was accomplished thanks to many different organizations. Three federal agencies and four state agencies participated in the field work. These agencies provided personnel, equipment and invaluable information on the upper Ohio River. Table 6 lists the agencies which participated.

TABLE 6

AGENCIES PARTICIPATING IN THE JANUARY 1989 PITTSBURGH-WHEELING FIELD SURVEY

State Participants
Pennsylvania Department of Environmental Resources
Pennsylvania Fish Commission
Ohio Environmental Protection Agency
West Virginia Department of Natural Resource
Federal Participants
United States Army Corps of Engineers
United States Coast Guard
United States Environmental Protection Agency

Quality Assurance/Quality Control

The QA/QC plan developed for the survey is included as Appendix 2. Each participating agency reviewed and approved the QA/QC plan before the field work. The Ohio EPA Laboratory performed all the laboratory analyses, except for phenolics. The WV DNR laboratory provided the phenolics analyses.

III. SURVEY RESULTS

Overall

The data collected show a profile of water quality conditions present at low temperature, and stable flow conditions. Cyanide was present at all stations except at the Pittsburgh Waterworks station on the Allegheny River. Phenolics were present at all stations except the Hays Mine Station on the Monongahela River. Of the 50 volatile organic chemicals analyzed for, ten were detected.

The water temperature ranged from 2 °C to 5 °C. Dissolved oxygen levels were at saturation; conductivity ranged from a high of 440 μmhos/cm in the Beaver River to less than 200 μmhos/cm in the Ohio River at Wheeling. At most locations the pH was near neutral (7.0) conditions. Exceptions were the locations up and downstream of the confluence of the Beaver River. These locations had reported values below the

minimum stream criterion of 6.0. Additional field work done the following day showed pH to be within the criteria limits (6.0-9.0).

Phenolics

The phenolics concentration (5.0 μg/l) exceeded the stream criterion at two locations: left bank of the Monongahela at MP 19.7 and left bank of the Ohio River at MP 69.9.

Cyanide

Ninety five percent (95%) of all total cyanide results exceeded the chronic criterion for free cyanide (5 μg/l). Two samples (left bank at MP 19.7 on the Monongahela River and the left bank at MP 69.9 on the Ohio River) exceeded the acute criterion (22 μg/l). Since the cyanide analysis was for total cyanide, these data only indicate a potential problem.

Benzene

Benzene levels exceeded the 10^{-6} cancer risk level criterion (0.6 μg/l) in 7 samples. Six of these samples were taken at Monongahela River stations; the seventh was taken at the left bank of the Ohio at MP 69.9.

Other Volatile Organics

Nine other volatile organics were detected in the Ohio River and major tributaries. These were:

Chloroform
Ethylbenzene
Naphthalene
Tetrachloroethane
Toluene
1,1,1-Trichloroethane
1,2,4-Trimethylbenzene
1,2-Xylene
1,3-Xylene & 1,4-Xylene

Instream concentration of these compounds were reported at near the detection level at various stations.

Assessment by Objective

The objective of the field survey was to characterize the presence of phenolics, cyanide, and volatile organic chemicals in the Ohio River and major tributaries under low flow/low temperature conditions. Sampling locations separated the discharges into 13 clusters in order to delineate the impact of these discharges. Table 7 shows the sampling location and the key pollutants for each location.

TABLE 7

INSTREAM SAMPLING LOCATIONS AND KEY PARAMETERS

River Mile	River	Location	Discharges@		Key Parameters
			IW	MW	
7.4*	Allegheny	Pittsburgh Waterworks			
0.8*	Allegheny	9th Street Bridge			Ethyl Benzene, Toluene, Xylenes
19.7*	Monongahela	Peter's Creek Confluence			Phenolics, Cyanide, Benzene, Ethyl Benzene, Naphthalene, Toluene, Trimethylbenzene, Xylenes
4.5*	Monongahela	Hays Mine(W Penn Water)			Cyanide(v), Benzene, Toluene, Xylenes
0.8*	Monongahela	Smithfield Bridge			Cyanide, Benzene
0.7	Ohio	West End Bridge			Cyanide, Benzene
4.5	Ohio	West View Water Authority	3	1	Cyanide, Benzene
9.0	Ohio	Neville Island	11	1	Cyanide (^), Benzene
12.5	Ohio	Sewickley Bridge	3	3	Cyanide(v)
25.3	Ohio	Monoca-Rochester Bridge	9	7	Cyanide, pH
4.5*	Beaver	Beaver Falls			
31.5	Ohio	Montgomery L&D	5	3	Cyanide(v), pH, Tetrachloroethane
40.2	Ohio	East Liverpool OH Waterworks	8	2	Cyanide, Tetrachloroethane
50.0	Ohio	Yellow Creek Lt & Daymark	10	3	Cyanide
59.0	Ohio	Toronto Waterworks	4	4	Cyanide
65.2	Ohio	Steubenville OH WW & Weirton WV WW	9	1	Cyanide
69.9	Ohio	Follansbee, WV	7	2	Cyanide(^), Phenolics (^), Benzene(^),
72.6	Ohio	Brilliant, OH WW & Wellsville, WV WW	8	1	Naphthalene(^), Toluene, Xylenes Cyanide
86.8	Ohio	Wheeling, WV WW	15	6	Cyanide
Total Number of Discharges:			**92**	**34**	

IW - Industrial Waste Water Discharges
MW - Municipal Wastewater Discharges
* - Miles from Confluence with the Ohio River
@ - Number of Discharges Between Sampling Locations
(^) - Concentration Increased from Upstream
(v) - Concentration Decreased from Upstream

The goal of sampling at low flow/low temperature conditions was met. Flow was between the long term average monthly flow and the minimum monthly flow for January. Table 8 shows the flow conditions on January 24, 1989 as compared to the long term average monthly flow and the minimum monthly average flow for January.

TABLE 8

FLOW CONDITIONS

Flow Station	Flow 01/24/89	LTA Flow	Min. Avg. Flow
Monongahela	9.6	12.5	3.8
Allegheny	11.3	23.0	6.6
Ohio (MP 15.2)	22.1	39.1	10.3
Beaver	1.8	4.4	1.1
Ohio (MP 40.2)	24.7	45.7	11.7

All values in 1,000 cubic feet per second.
LTA- Long Term Average Flow for January (1963 - 1986).
Min. Avg. Flow - Minimum Average Monthly (January for the period of record.

The field data were analyzed to determine variability in the water column by depth and by lateral position. A blocked, one factor analysis of variance was done for each field parameter at each station. This method analyzes for statistical differences for one factor (lateral position) and by block (depth). A summary of the analysis is shown in Table 9.

TABLE 9

LATERAL VARIATION IN FIELD DATA

RIVER MILE	RIVER	LOCATION	DISCHARGES@		FIELD PARAMETERS			
			IW	MW	TEMP	pH	COND	DO
7.4*	Allegheny	Pittsburgh Waterworks			N	N	Y	N-d
0.8*	Allegheny	9th Street Bridge			Y	N	Y	N
19.7*	Monongahela	Peter's Creek Confluence			Y	N	Y	N
4.5*	Monongahela	Hays Mine (West Penn Water)			Y	N	Y	N
0.8*	Monongahela	Smithfield Bridge			Y	N	Y	N
0.7	Ohio	West End Bridge			Y	N	N	Y
4.5	Ohio	West View Water Authority	3	1	Y	N	Y	Y
9.0	Ohio	Neville Island	11	1	Y	N	Y	N
12.5	Ohio	Sewickley Bridge	3	3	N	Y	Y	N
25.3	Ohio	Monoca-Rochester Bridge	9	7	N	Y	Y-d	N
31.5	Ohio	Montgomery Locks & Dam	5	3	N	N	N	N
40.2	Ohio	East Liverpool, OH WW	8	2	N	N	Y	N
50.0	Ohio	Yellow Creek Light & Daymark	10	3	N	N	Y	Y
59.0	Ohio	Toronto Waterworks	4	4	Y	N	Y	N
65.2	Ohio	Steubenville, OH Waterworks & Weirton, WV Waterworks	9	1	N	N	N	N
69.9	Ohio	Follansbee, WV	7	2	Y	N	N	N
72.6	Ohio	Brilliant, OH Waterworks & Wellsville, WV Waterworks	8	1	N	N	N	N
86.8	Ohio	Wheeling, WV Waterworks	15	6	N	N	N	N
		Total Number of Discharges:	92	34				

IW - Industrial Wastewater Discharges
MW - Municipal Wastewater Discharges
** - Miles from Confluence With the Ohio River*
Y - Significant Lateral Variation (5% Confidence Level)
N - Lateral Variation Not Significant (5% Confidence Level)
-d - Significant Variation With depth (5% Confidence Level)

Table 9 shows the significant variation (5% confidence level) at each station for each parameter. The analysis indicates that lateral position is more likely to show variation than depth in the water column. Conductivity at the Monoca-Rochester Bridge station and DO at the Pittsburgh Waterworks station were the only parameters to show significant variation due to depth.

Variation across the river suggests an input to the river that has not completely mixed. Temperature variation indicates a thermal load, conductivity indicates a dissolved solids load (i.e., metals), pH indicates an acid/caustic load, and DO variation indicates a load with a large oxygen demand. Overall the following conclusions can be made:

Based on the ANOVA:

- It appears that thermal loads have the greatest effect on the Monongahela, Allegheny and upper 10 miles of the Ohio River.

- A significant acidic load impacts water quality upstream of the Sewickley bridge and the Monoca-Rochester Bridge.
- Significant variations in conductivity are observed at most stations in the study segment. This suggests incomplete mixing at the flow conditions of January 24, 1989.
- There is a significant oxygen demanding load affecting the left bank of the Ohio River from mile 4.5 to at least 9.0 and the right bank at the Yellow Creek station (MP 50).

The most widely detected toxic substances were benzene, cyanide and phenolics. Figures 1 through 6 show the spatial distribution.

Benzene

Figure 1 displays the distribution of benzene in the Ohio River on January 24, 1989. The graph suggests a significant input from the Monongahela River. The effect of the input appears to last up to Neville Island (MP 9.0). It appears that the hydraulic conditions inhibited mixing of the Allegheny and Monongahela River, as indicated by nondetections on the right bank of the Ohio in the upper 9.0 miles. There may be a large input of benzene upstream of mile point 69.9 and downstream of mile point 65.2.

Figure 2 shows an estimate of the instream load of benzene. Calculation of estimated loads uses the flowing load associated with each quarter point sample. Summation of the quarter point loads provide the total load at that point of the river. Table 10 shows the instream concentration, stream flow and estimated loads. For each sample, the load calculated assumed the sample represented 1/3 of the stream flow. The Allegheny River samples are not included because all samples were below the detection level.

Figure 2 and Table 10 suggest that the primary source of benzene in the upper 60 miles of the Ohio River is the Monongahela River. The major source of benzene to the Monongahela River is the USX Clairton Works (MP 20). Extensive site investigations have been conducted at the site. USX is working towards action to control the migration of benzene and phenolics contaminated ground water to the Monongahela River.

It appears there is another source of benzene between mile point 65.2 and 69.9 of the Ohio River. Outfall sampling conducted by Koppers and Wheeling Pittsburgh Steel show benzene levels in their discharges below the detection limit of 5.0 ppb. Documentation of ground water contamination in the Follansbee area suggests ground water may be contributing benzene to the Ohio River.

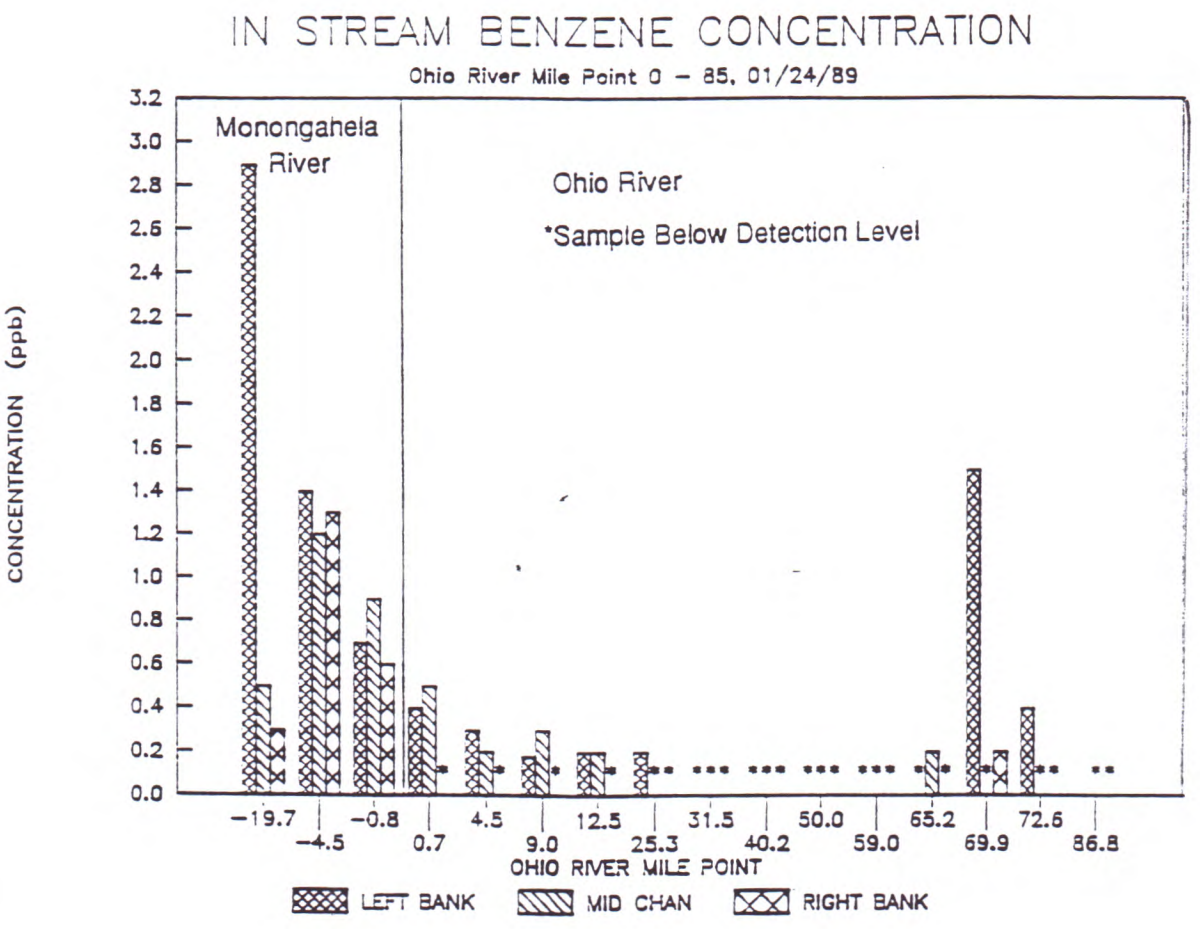


Figure 1

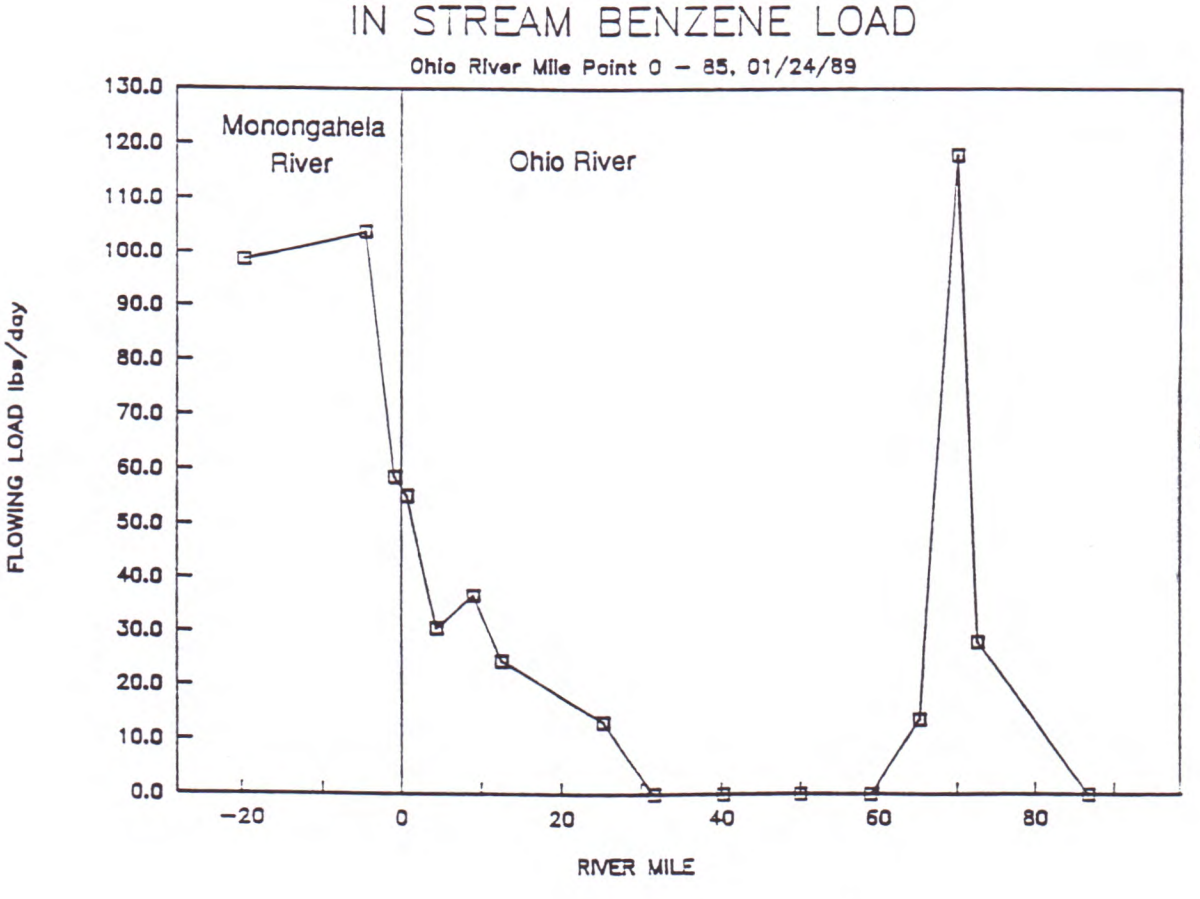


Figure 2

Table 10
Flowing Loads – Benzene

River mile	Flow cfs	Benzene Conc. (µg/l) left	mid	right	Benzene Load (lbs/day) left	mid	right	Total Load	Change
mon 19.7	9600	2.9	0.5	0.3	77	13	8	99	
mon 4.5	9600	1.4	1.2	1.3	37	32	35	104	5
mon 0.8	9600	0.7	0.9	0.6	19	24	16	59	–45
0.7	22100	0.4	0.5	BDL	25	31	<12	55	–3
4.5	22100	0.3	0.2	BDL	18	12	<12	31	–25
9.0	22100	0.3	0.3	BDL	18	18	<12	37	6
12.5	22100	0.2	0.2	BDL	12	12	<12	25	–12
25.3	23900	0.2	BDL	BDL	13	<13	<13	13	–11
31.5	24000	BDL	BDL	BDL	<13	<13	<13	0	–13
40.2	24700	BDL	BDL	BDL	<14	<14	<14	0	0
50.0	24800	BDL	BDL	BDL	<14	<14	<14	0	0
59.0	24900	BDL	BDL	BDL	<14	<14	<14	0	0
65.2	25000	BDL	0.2	BDL	<14	14	<14	14	14
69.9	25000	1.5	BDL	0.2	104	<14	14	118	104
72.6	25450	0.4	BDL	BDL	28	<14	<14	28	–90
86.8	25900	BDL	BDL	BDL	<14	<14	<14	0	–28

Detection Limit 0.2 µg/l

BDL – Below Detection Limit mon – Monongahela River

Cyanide

Figure 3 displays the distribution of cyanide in the Ohio River on January 24, 1989. The graph suggests a large input from the Monongahela River and large inputs upstream of mile points 9.0, 25.3, and 69.9.

Figure 4 shows an estimate of flowing loads on January 24, 1989. Loads were estimated as described above in the benzene discussion. Table 11 shows the instream concentration, stream flow and estimated loads. The Allegheny samples were not included because the levels were below the detection level.

Figure 4 and Table 11 suggest at least 4 significant inputs of cyanide to the upper 80 miles of the Ohio River. These include the Monongahela River, industrial discharges on Neville Island, LTV Steel, Aliquippa, and industrial discharges in the Follansbee, WV area.

As part of the segment investigation ORSANCO requested Ohio River dischargers to sample their outfalls on the day of the survey and submit the data to ORSANCO. There were many responses and some of the data are useful to delineate sources. Table 12 shows the results from several of these discharges. The quantities reported, however, do not account for the increases observed in stream.

TABLE 12

DISCHARGE OF CYANIDE FROM SELECTED DISCHARGES

Discharger	Mile Point	Cyanide Load
Shenango Iron & Coke	8.0	11.2 lbs/day
Wheeling-Pittsburgh Steel Coke	68.8	1.4 lbs/day
Koppers Industries	69.3	1.5 lbs/day

For the Neville Island sampling station there are 10 other industrial discharges, three of which may be contributing to the cyanide load in the river. Contaminated ground water from Neville Island may be contributing to the problem.

Several discharges may be contributing to the cyanide load upstream of the Monoca-Rochester location. The most significant of these discharges is LTV Steel in Aliquippa.

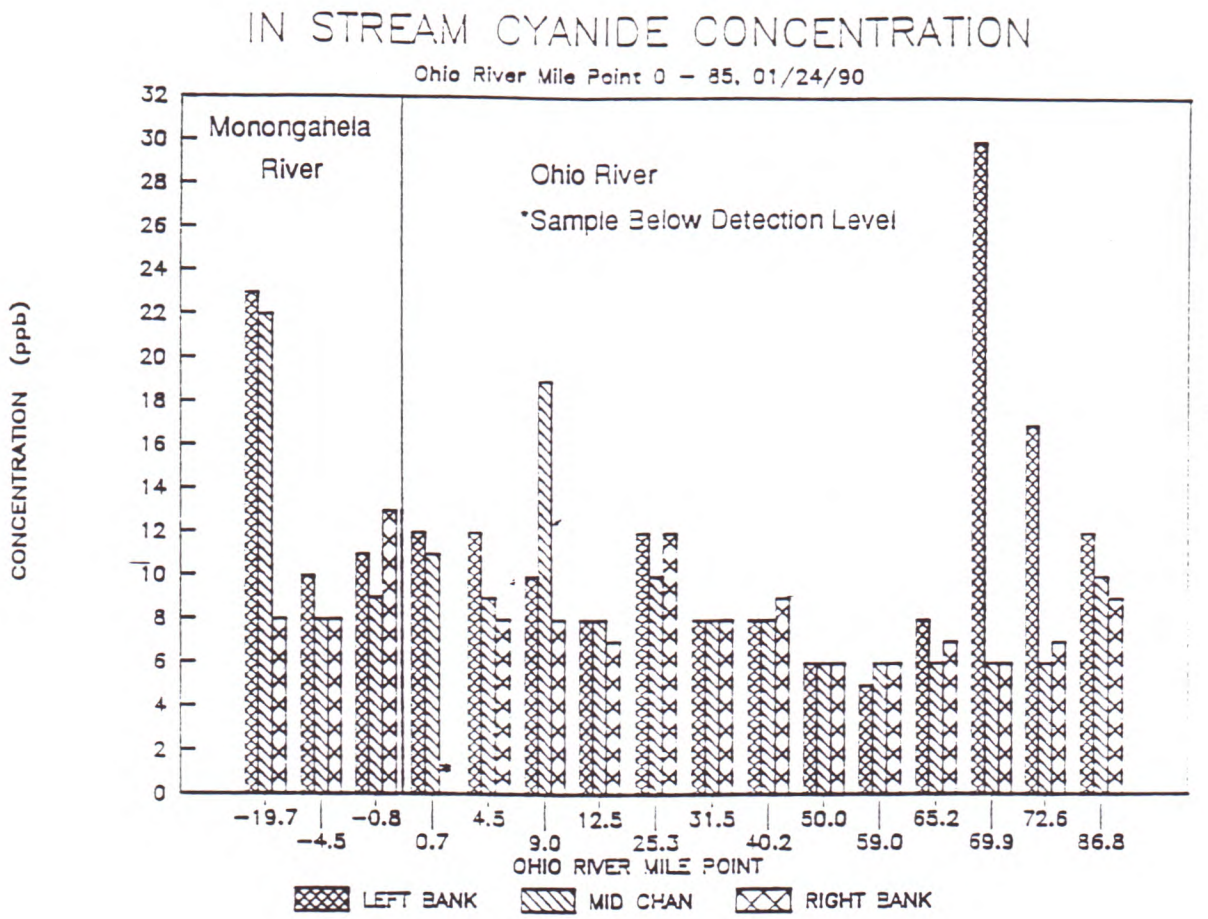


Figure 3

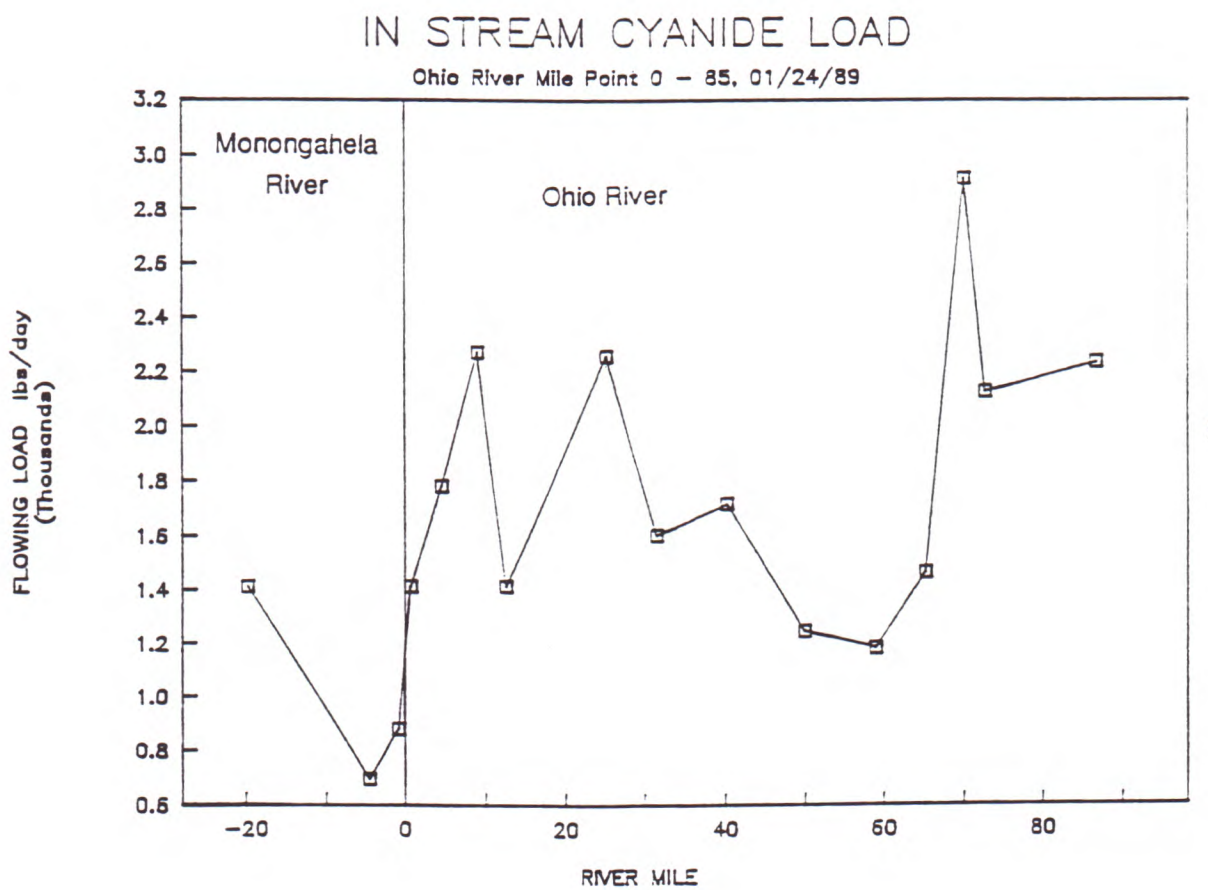


Figure 4

Table 11
Flowing Loads – Cyanide

River mile	Flow cfs	Cyanide Conc. (μg/l) left	mid	right	Cyanide Load (lbs/day) left	mid	right	Total Load	Change
mon 19.7	9600	23	22	8	613	586	213	1413	
mon 4.5	9600	10	8	8	267	213	213	693	–720
mon 0.8	9600	11	9	13	293	240	347	880	187
0.7	22100	12	11	BDL	736	675	<306	1411	532
4.5	22100	12	9	8	736	552	491	1780	368
9.0	22100	10	19	8	614	1166	491	2270	491
12.5	22100	8	8	7	491	491	430	1411	–859
25.3	23900	12	10	12	796	664	796	2256	845
31.5	24000	8	8	8	533	533	533	1599	–657
40.2	24700	8	8	9	549	549	617	1715	115
50.0	24800	6	6	6	413	413	413	1240	–475
59.0	24900	5	6	6	346	415	415	1175	–64
65.2	25000	8	6	7	555	417	486	1458	282
69.9	25000	30	6	6	2083	417	417	2916	1458
72.6	25450	17	6	7	1201	424	495	2120	–796
86.8	25900	12	10	9	863	719	647	2229	109

Detection Limit 5 μg/l

BDL – Below Detection Limit mon – Monongahela River

In the Follansbee area data were available for only two dischargers. There are seven other industrial discharges, three of which may be significant sources of cyanide. Contaminated ground water may also be contributing cyanide. Several of the industrial sites directly upstream of the Follansbee monitoring location have documented contaminated ground water under their sites.

Phenolics

Figure 5 displays the distribution of phenolics in the upper Ohio River on January 24, 1989. The graph suggests a significant input of phenolics upstream of the Follansbee (mp 69.9) sampling location.

Figure 6 and Table 13 show estimated instream loads during the survey. These show that the only noteworthy input is in the reach of the Ohio River from mp 65.2 to 69.9. Discharge sampling results do not account for this change. Loadings from other point sources and the input from contaminated ground water in this reach may account for the difference.

IV. CONCLUSIONS

Data collected on January 24, 1989 at 19 locations in the upper 85 miles of the Ohio River and near the mouths of major tributaries show several areas that are contributing benzene, phenolics and cyanide to the Ohio River. The locations of significant sources include:

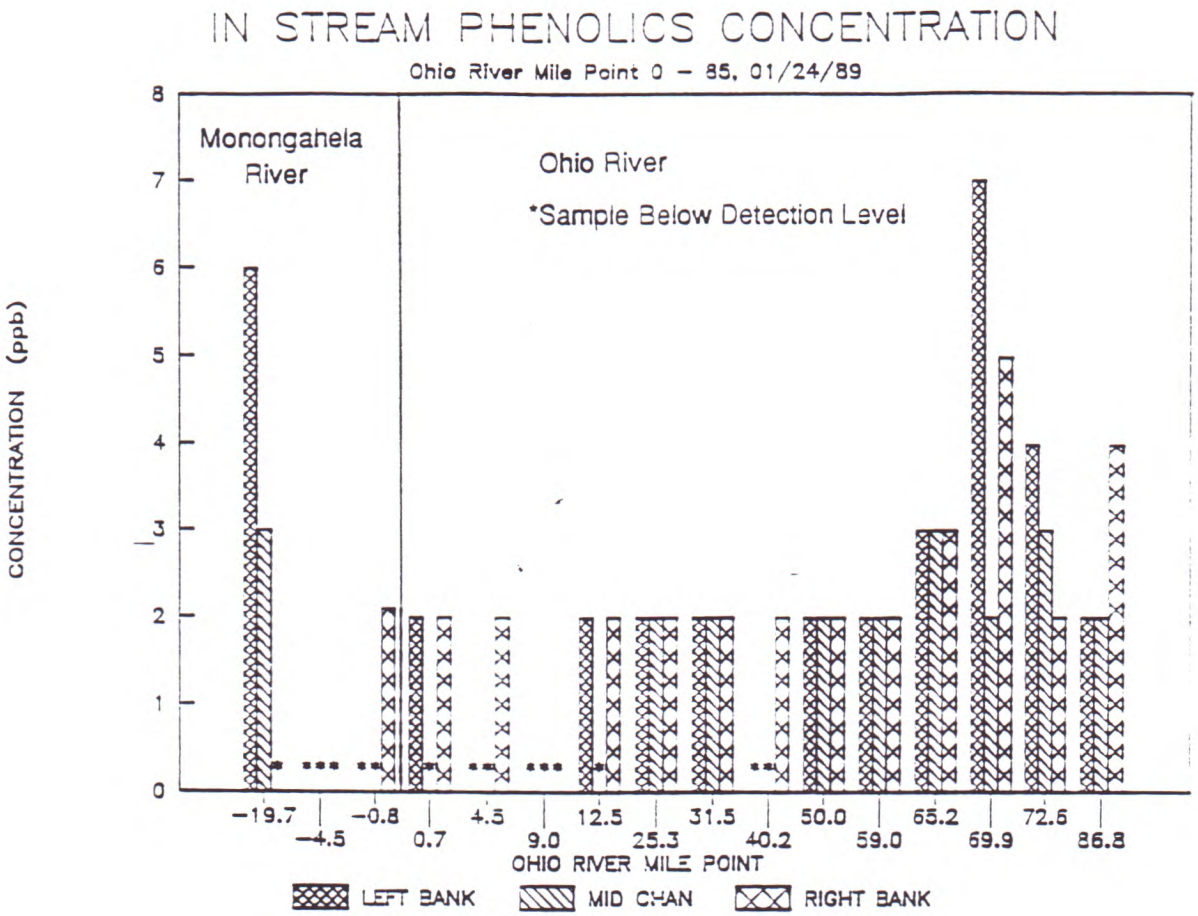
- The Monongahela River
- The reach of the Ohio River from mile point 4.5 to 9.0
- The reach of the Ohio River from mile point 12.5 to 25.3
- The reach of the Ohio River from mile point 65.2 to 69.9

Additional discharge and stream sampling is necessary to delineate specific sources. The Pennsylvania Department of Environmental Resources (PA DER) is doing intensive survey work on the Monongahela River to define needs for waste load allocations for discharges to the Monongahela River.

V. FOLLOW-UP ACTIONS

Actions Underway

In 1989 ORSANCO entered into a contract with the PA DER to apply a toxic screening model to waterbodies in the upper Ohio River Basin. As part of the arrangement ORSANCO would apply the model to the upper 200 miles of the Ohio River to determine the applicability of the method for ORSANCO's programs. Preliminary results show problems in the areas identified in the field study as well as additional problem areas.



Figure

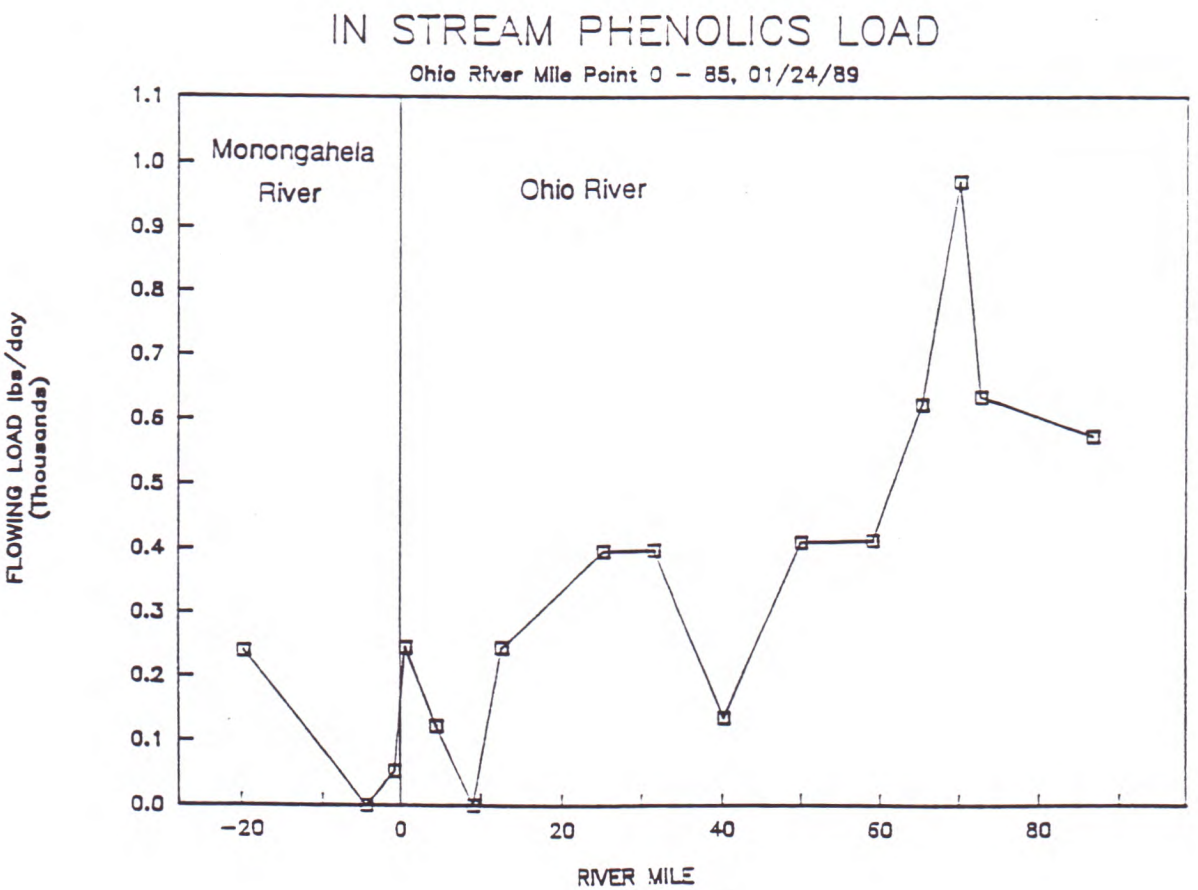


Figure 6

Table 13
Flowing Loads – Phenolics

River mile	Flow cfs	Phenolics Conc. (μg/l) left	mid	right	Phenolics Load (lbs/day) left	mid	right	Total Load	Change
mon 19.7	9600	6	3	BDL	160	80	<53	240	
mon 4.5	9600	BDL	BDL	BDL	<53	<53	<53	0	-240
mon 0.8	9600	BDL	BDL	2	<53	<53	53	53	53
0.7	22100	2	BDL	2	123	<123	123	245	192
4.5	22100	BDL	BDL	2	<123	<123	123	123	-123
9.0	22100	BDL	BDL	BDL	<123	<123	<123	0	-123
12.5	22100	2	BDL	2	123	<123	123	245	245
25.3	23900	2	2	2	133	133	133	398	153
31.5	24000	2	2	2	133	133	133	400	2
40.2	24700	BDL	BDL	2	<137	<137	137	137	-263
50.0	24800	2	2	2	138	138	138	413	276
59.0	24900	2	2	2	138	138	138	415	2
65.2	25000	3	3	3	208	208	208	625	210
69.9	25000	7	2	5	486	139	347	972	347
72.6	25450	4	3	2	283	212	141	636	-336
86.8	25900	2	2	4	144	144	288	575	-61

Detection Limit 2 μg/l

BDL – Below Detection Limit mon – Monongahela River

The following discharges were identified as contributing loads of toxic substances which may cause violations of stream criteria at low flow conditions. Design flow for protection of aquatic life is the Q_{7-10} and for non-threshold human health (carcinogens) criteria is the harmonic mean flow.

Facility	M.P.	Parameter
ALCOSAN	3.2	Free Cyanide
U.S.S. Wheel and Axle	4.0	Carbon Tetrachloride
Shenango Iron and Coke	8.0	Copper, Free Cyanide
Duquesne Light	15.3	Mercury
Hussey Metals	15.4	Copper
LTV Steel	17.0	Beryllium, Cadmium, Copper, Lead, Mercury, Silver, Zinc, Free Cyanide, Phenolics, Benzene, 1,1-Dichloroethylene
St. Joseph Resources	28.5	Beryllium
Pennsylvania Power	33.7	Beryllium, Mercury
Duquesne Light	34.9	Copper, Zinc
Weirton Steel	62.5	Lead, Zinc, Free Cyanide
Wheeling-Pittsburgh Steel, Yorkville	83.7	Chromium, Lead, Zinc

Of the toxic substances detected in the January 24, 1989 survey, benzene was not identified as a problem in the screening. Cyanide was identified in four discharges, the location of which correspond to increases observed in the January 24, 1989 data. Phenolics were identified as a potential problem in one discharge. This discharge does not correspond to an observed instream problem. The screening, using the PA DER WQAT, does indicate the need to sample for metals at low flow conditions.

The West Virginia Department of Natural Resources (WV DNR) is working with Weirton Steel (MP 62.5) towards bringing that facility into compliance with its discharge permit. The WV DNR is also working with Koppers Industries INC (MP 69.3) to control migration of contaminated ground water at that site.

ORSANCO maintains a list of Ohio River discharges experiencing compliance problems. Of the 15 dischargers tracked for compliance problems, 4 are in the study area. These facilities all have programs in place to achieve compliance.

Remaining Actions

In September, 1988 it was recommended that a two phase field study be conducted to evaluate the distribution of toxic substances in the upper 85 miles of the Ohio River. The recommendation included cold weather water column sampling, described in this report, and collection and analysis of sediment samples.

The collection of sediment samples should be carried out to delineate sources of PCBs and pesticides. Sediment sampling could also be used to determine relative contribution of metals by nonpoint sources from tributaries.

The results of the cold weather survey suggest the need for additional water column sampling in selected reaches of the Ohio River. The following reaches should be included, at a minimum:

- From mile point 4.5 to 9.0
- From mile point 12.5 to 25.3
- From mile point 62.5 to 69.9

Additional instream sampling should be done in conjunction with discharge sampling to provide data for mass balance calculations. The design of any additional field work should consider both the results of this survey and the results from the toxics screening done using the PA DER methods.

There is a need to investigate the interaction of ground water and surface water. The data indicates contaminated ground water may be providing a significant loading to the Ohio River in the Neville Island area and the Follansbee, West Virginia area.

As part of the Commission's Toxic Substances Control Program there is a commitment to perform transport modeling at a site to estimate the loadings to the Ohio River. Preliminary investigations show both sites to have sufficient data.

APPENDIX 1

Ohio River Discharges
Pittsburgh, PA - Wheeling, WV
Mile Point 0 - 85

River Mile	Corporation	Plant Name	State	Permit Number	In Stream Sampling Locations
2.5	DUQUESNE LIGHT COMPANY	BRUNOT ISLAND POWER STATION	PA	PA0031933	
2.9	PITT OIL COMPANY, INC.		PA	PA0036391	
3.1	ALLEGHENY COUNTY SANITARY AUTHORITY	ALCOSAN WWTP	PA	PA0025984	
4.0	UNITED STATES STEEL CORPORATION	WHEEL AND AXLE PLANT	PA	PA0094528	
					4.5 | West View Water Authority
4.5	UNITED STATES STEEL CORPORATION	HOMESTEAD WORKS	PA	PA0004481	
5.1	MARQUETTE COMPANY	MARQUETTE CEMENT PLANT	PA	PA0091774	
5.3	CALGON CARBON CORPORATION	NEVILLE ISLAND PLANT	PA	PA0091227	
6.4	EXXON COMPANY, U.S.A.	NEVILLE ISLAND TERMINAL	PA	PA0041602	
6.6	NEVILLE CHEMICAL COMPANY		PA	PA0004979	
6.7	DRAVO CORPORATION	ENGINEERING WORKS DIVISION	PA	PA0001538	
6.8	ARISTECH CHEMICAL CORPORATION	NEVILLE ISLAND PLANT	PA	PA0003832	
7.0	TAPCO, INC.	TAPCO PROCESSING PLANT	PA	PA0094722	
7.6	DEPARTMENT OF PUBLIC WELFARE	DIXMONT STATE HOSPITAL WWTP	PA	PA0030538	
7.7	VULCAN MATERIALS COMPANY	METALLICS DIVISION	PA	PA0002861	
8.0	SHENANGO, INC.	SHENANGO COKE AND IRON DIVISION	PA	PA0002437	
8.1	SHENANGO, INC.	NEVILLE ISLAND FOUNDRY DIVISION	PA	PA0002445	
					9.0 | Neville Island
9.5	MOON TOWNSHIP MUNICIPAL AUTHORITY	MONTOUR RUN WWTP	PA	PA0028801	
10.2	CORAOPOLIS MUNICIPAL SANITARY AUTHORITY	CORAOPOLIS WWTP	PA	PA0026352	
10.7	BORON OIL COMPANY	CORAOPOLIS TERMINAL	PA	PA0003816	
10.8	PITTSBURGH FORGINGS COMPANY	METALS FABRICATION PLANT	PA	PA0000779	
10.9	TEXACO, INC.	CORAOPOLIS SALES TERMINAL	PA	PA0002984	
12.3	BOROUGH OF SEWICKLEY	SEWICKLEY WWTP	PA	PA0020681	12.5 | Sewickley Bridge
14.2	MUNICIPAL AUTHORITY OF THE BOROUGH OF LEETSDALE	LEETSDALE WWTP	PA	PA0024589	
14.6	BETHLEHEM STEEL CORPORATION	LEETSDALE WORKS	PA	PA0002950	
15.2	DUQUESNE LIGHT COMPANY	PHILIPS POWER STATION	PA	PA0001619	
15.8	CRESCENT-SOUTH HEIGHTS MUNICIPAL AUTHORITY	CRESCENT-SOUTH HEIGHTS WWTP	PA	PA0023159	
16.0	THE BABCOCK AND WILCOX COMPANY	AMBRIDGE WORKS	PA	PA0006335	
16.1	UNITED STATES STEEL CORPORATION	USS FABRICATION WORKS	PA	PA0004090	
17.0	LTV STEEL COMPANY, INC.	ALIQUIPPA WORKS	PA	PA0006114	
17.5	BOROUGH OF AMBRIDGE MUNICIPAL AUTHORITY	AMBRIDGE BOROUGH WWTP	PA	PA0027146	
17.5	H. H. ROBERTSON COMPANY	AMBRIDGE DIVISION FACILITY	PA	PA0003000	
20.3	MUNICIPAL AUTHORITY OF THE BOROUGH OF BADEN	BADEN WWTP	PA	PA0028410	
20.6	MUNICIPAL WATER AUTHORITY OF ALIQUIPPA	ALIQUIPPA WWTP	PA	PA0025968	
21.6	CONWAY BOROUGH MUNICIPAL AUTHORITY	CONWAY BOROUGH WWTP	PA	PA0036609	

Ohio River Discharges
Pittsburgh, PA - Wheeling, WV
Mile Point 0 - 85

River Mile	Corporation	Plant Name	State	Permit Number	In Stream Sampling Locat
23.1	TELEDYNE VASCO COLONIAL PLANT		PA	PA0002585	
23.9	AMPCO PITTSBURGH CORPORATION	COLONA DIVISION PLANT	PA	PA0005819	
24.0	ASHLAND PETROLEUM COMPANY	FREEDOM REFINERY	PA	PA0001295	
24.2	SUPERIOR DRAWN STEEL COMPANY	MONACA PLANT	PA	PA0034665	
25.3	ROCHESTER AREA JOINT SEWER AUTHORITY	ROCHESTER AREA WWTP	PA	PA0026140	25.3 | Monoca-Rochester Brid
25.6	MONACA BOROUGH MUNICIPAL AUTHORITY	MONACA WWTP	PA	PA0020125	
25.6	TELEDYNE PITTSBURGH TOOL STEEL		PA	PA0002046	
26.2	BEAVER BOROUGH MUNICIPAL AUTHORITY	BEAVER BOROUGH WWTP	PA	PA0024694	
28.0	VANPORT TOWNSHIP MUNICIPAL AUTHORITY	VANPORT-BRIGHTON WWTP	PA	PA0023698	
28.2	ASHLAND PETROLEUM COMPANY	VANPORT TERMINAL	PA	PA0000523	
28.5	ST. JOE RESOURCES COMPANY	SMELTING DIVISION	PA	PA0002208	
29.4	WESTINGHOUSE ELECTRIC CORPORATION	WESTINGHOUSE BEAVER PLANT	PA	PA0001236	
29.7	ARCO CHEMICAL COMPANY	BEAVER VALLEY PLANT	PA	PA0006254	31.5 | Montgomery Locks & Da
33.7	PENNSYLVANIA POWER COMPANY	BRUCE MANSFIELD PLANT	PA	PA0027481	
33.8	SHIPPINGPORT SAND AND GRAVEL COMPANY	GEORGETOWN PLANT	PA	PA0002488	
34.5	DEPARTMENT OF ENERGY	SHIPPINGPORT ATOMIC POWER STATION	PA	PA0001589	
34.9	DUQUESNE LIGHT COMPANY	BEAVER VALLEY POWER STATION	PA	PA0025615	
35.0	DUQUESNE LIGHT COMPANY	BEAVER VALLEY UNIT NO.2	PA	PA0027707	
35.2	ASHLAND PETROLEUM COMPANY	MIDLAND TERMINAL	PA	PA0204013	
36.3	J&L SPECIALTY PRODUCTS CORPORATION	MIDLAND WORKS	PA	PA0005754	
36.4	LTV STEEL COMPANY	MIDLAND WORKS	PA	PA0097870	
37.3	MUNICIPAL AUTHORITY OF THE BOROUGH OF MIDLAND	MIDLAND BOROUGH WWTP	PA	PA0023701	
40.1	THE HALL CHINA COMPANY	WWTP	OH	OH0011410	40.2 | East Liverpool, OH Wate
42.2	TAYLOR, SMITH AND TAYLOR COMPANY		WV	WV0004685	
42.4	THE COLETEX CORPORATION		WV	WV0005223	
43.3	CITY OF CHESTER	CHESTER WWTP	WV	WV0021768	
44.6	CITY OF EAST LIVERPOOL	EAST LIVERPOOL WWTP	OH	OH0024970	
45.1	SHIPPINGPOST SAND AND GRAVEL COMPANY	IRON CITY PLANT	WV	WV0041653	
45.3	THE OHIO BRASS COMPANY		WV	WV0004561	
45.5	THE HOMER LAUGHLIN CHINA COMPANY		WV	WV0004570	
45.5	GLOBE REFRACTORIES, INC.		WV	WV0004774	
45.7	THE NEWELL COMPANY		WV	WV0027502	
47.4	QUAKER STATE OIL REFINING CORPORATION	CONGO PLANT	WV	WV0004626	
47.6	CITY OF WELLSVILLES	WELLSVILLE WWTP	OH	OH0028045	
48.6	ASHLAND PETROLEUM COMPANY	WELSVILLE TERMINAL	OH	OH0029068	

Ohio River Discharges
Pittsburgh, PA - Wheeling, WV
Mile Point 0 - 85

River Mile	Corporation	Plant Name	State	Permit Number	In Stream Sampling Locations
49.2	STERLING CHINA COMPANY		OH	OH0012327	50.0 | Yellow Creek Light and Dayma
50.5	McCOURT MINING COMPANY		OH	OH0094170	
53.9	OHIO EDISON COMPANY	W.H. SAMMIS PLANT	OH	OH0011525	
54.9	VILLAGE OF STRATTON	STRATTON WWTP NO.1	OH	OH0022225	
55.0	VILLAGE OF STRATTON	STRATTON WWTP NO.2	OH	OH0059374	
55.0	B. AND S. RESOURCES, INC.		OH	OH0099350	
55.6	VILLAGE OF EMPIRE	EMPIRE WWTP	OH	OH0050539	
57.5	OHIO EDISON COMPANY	TORONTO PLANT	OH	OH0011568	
57.6	CITY OF NEW CUMBERLAND	NEW CUMBERLAND WWTP	WV	WV0025119	59.0 | Toronto Waterworks
59.1	CITY OF TORONTO	TORONTO WTP	OH	OH0059234	
59.2	VALLEY CONVERTING COMPANTY, INC.		OH	OH0011738	
60.1	CITY OF TORONTO	TORONTO WWTP	OH	OH0020214	
60.5	TITANIUM METALS CORPORATION	TORONTO PLANT	OH	OH0010910	
61.5	INTERNATIONAL MILL SERVICES, INC.		WV	WV0070084	
62.4	AIR PRODUCTS AND CHEMICALS, INC.		WV	WV0004391	
62.5	WEIRTON STEEL CORPORATION		WV	WV0003336	
64.1	BARIUM AND CHEMICALS, INC.		OH	OH0011886	
64.9	PETROLEUM FUEL AND TERMINAL COMPANY		WV	WV0071129	
65.2	CITY OF WEIRTON	WEIRTON WTP	WV	WV0070971	65.2 | Stuebenville & Weirton, WW
65.8	SIGNODE SUPPLY CORPORATION		WV	WV0003425	
66.0	WEIRTON ICE AND COAL SUPPLY COMPANY		WV	WV0091367	
66.2	CITY OF WEIRTON	WEIRTON WWTP	WV	WV0023108	
68.0	CITY OF STEUBENVILLE	STEUBENVILLE WWTP	OH	OH0027511	
68.6	WEIRTON STEEL CORPORATION	STEUBENVILLE PLANT	OH	OH0010774	
68.7	WHEELING PITTSBURGH STEEL CORPORATION	STEUBENVILLE NORTH PLANT	OH	OH0011347	
68.8	WHEELING PITTSBURGH STEEL CORPORATION	STEUBENVILLE EAST COKE PLANT	WV	WV0004499	
69.3	KOPPERS COMPANY, INC.	FOLLANSBEE PLANT	WV	WV0004588	
69.7	WHEELING PITTSBURGH STEEL CORPORATION	STUEBENVILLE EAST SINTER PLANT	WV	WV0023281	69.9 | Follansbee, WV
70.0	WEST VIRGINIA ENERGY, INC.	LOADING DOCK	WV	WV1007238	
70.3	WHEELING - NISSHIN		WV	WV0004502	
70.6	CITY OF FOLLANSBEE	FOLLANSBEE WWTP	WV	WV0020273	
70.7	WHEELING - PITTSBURGH STEEL CORPORATION	STEUBENVILLE SOUTH PLANT	OH	OH0011355	
71.1	VILLAGE OF MINGO JUNCTION	MINGO JUNCTION WTP	OH	OH0029904	
72.5	STARVAGGI INDUSTRIES, INC.	WELLSBURG DOCK AND STOCKPILE FACILITY	WV	WV1002554	72.6 | Brilliant & Wellsville, WW
73.0	EAGLE MANUFACTURING COMPANY		WV	WV0071196	
73.6	GENPAK CORPORATION		WV	WV0070289	
73.8	S. GEORGE COMPANY		WV	WV0005118	
74.4	BANNER FIBERBOARD COMPANY		WV	WV0004430	

Ohio River Discharges
Pittsburgh, PA - Wheeling, WV
Mile Point 0 - 85

River Mile	Corporation	Plant Name	State	Permit Number	In Stream Sampling Locati
74.5	VILLAGE OF BRILLIANT	BRILLIANT WTP	OH	OH0099333	
74.7	CITY OF WELLSBURG	WELLSBURG WWTP	WV	WV0026832	
76.0	VILLAGE OF BRILLIANT	BRILLIANT WWTP	OH	OH0021270	
76.3	OHIO POWER COMPANY	TIDD PLANT	OH	OH0012602	
76.5	CARDINAL OPERATING COMPANY	CARDINAL PLANT	OH	OH0012581	
77.7	W. B. COAL COMPANY		OH	OH0096164	
78.3	BROOKE COUNTY PUBLIC SERVICE DIST., VILLAGE OF BEECH BOTTOM	BEECH BOTTOM WWTP	WV	WV0084182	
79.4	WHEELING PITTSBURGH STEEL CORPORATION	BEECH BOTTOM PLANT	WV	WV0004511	
80.0	WINDSOR POWER HOUSE COAL COMPANY		WV	WV0065790	
80.7	VILLAGE OF TILTONSVILLE	TILTONSVILLE WWTP	OH	OH0090891	
80.9	OHIO COAL AND CONSTRUCTION CORPORATION		OH	OH0089028	
81.0	OHIO COAL AND CONSTRUCTION CORPORATION	WARRENTON PREPARATION AND LOADING FACILITY	OH	OH0076597	
81.0	OHIO COAL AND CONSTRUCTION CORPORATION		OH	OH0098973	
81.6	VILLAGE OF RAYLAND	RAYLAND WWTP	OH	OH0048003	
81.8	TRI-STATE ASPHALT CORPORATION	WARRENTON TERMINAL	OH	OH0012343	
83.0	VILLAGE OF TILTONSVILLE	TILTONSVILLE WTP	OH	OH0041611	
83.1	VILLAGE OF TILTONSVILLE	TILTONSVILLE WWTP	OH	OH0020435	
83.6	YORKVILLE WATERWORKS	YORKVILLE WTP	OH	OH0030767	
83.7	WHEELING PITTSBURGH STEEL CORPORATION	YORKVILLE PLANT	OH	OH0011371	
85.0	MARIETTA COAL COMPANY		OH	OH0088587	86.8 Wheeling, WV Waterwor

APPENDIX 2

APPENDIX 2

Public Water Supplies
Along the Ohio River

River Mile	PWS	State	Type*	Avg. Prod. MGD
2.9	STATE CORRECTIONAL	PA	GW	0.4
4.5	WEST VIEW WATER	PA	SW	20.0
8.6	ROBINSON TOWNSHIP	PA	SW	1.5
10.0	BOR. OF CORAOPOLIS	PA	GW	1.0
11.1	SEWICKLEY BOROUGH	PA	GW	0.8
11.8	MOON TWP	PA	GW	3.2
13.0	EDGEWORTH BOROUGH	PA	GW	0.8
15.5	CRESWELL HEIGHTS	PA	GW	1.0
16.5	AMBRIDGE WATER AUTH.	PA	GW	3.9
19.0	ALIQUIPPA WATER AUTH.	PA	GW	3.3
25.3	BOROUGH OF MONACA	PA	GW	0.9
26.0	BEAVER BOROUGH MWA	PA	GW	1.0
28.0	VANPORT MWA	PA	GW	1.3
29.0	CENTER TWP MA	PA	GW	1.2
33.0	INDUSTRY BOROUGH	PA	SW	0.2
34.5	SHIPPINGPORT BOROUGH	PA	GW	0.01
36.2	MIDLAND	PA	SW	3.3
40.2	EAST LIVERPOOL	OH	SW	3.0
42.1	CHESTER WATER WORKS	WV	GW	0.5
45.0	THE NEWELL COMPANY	WV	GW	0.8
54.5	STRATTON	OH	GW	0.1
56.6	NEW CUMBERLAND	WV	GW	0.5
59.1	TORONTO	OH	SW	0.7
65.1	WEIRTON WATER WORKS	WV	GW,SW	3.1
65.2	STEUBENVILLE	OH	SW	6.5
70.4	FOLLANSBEE WATER	WV	GW	0.4
70.5	HOOVERSON HEIGHTS	WV	GW	0.4
71.1	MINGO JUNCTION	OH	GW	1.4
74.0	WELLSBURG WW	WV	GW	0.6
74.2	BRILLIANT	OH	GW	0.3
78.0	BEECH BOTTOM	WV	GW	0.09
78.0	HAMMOND PSD	WV	GW	0.3
82.3	TILTONSVILLE	OH	GW	0.6
83.3	YORKVILLE	OH	GW	0.1
86.8	WHEELING	WV	SW	8.0

*GW = Ground Water
SW = Surface Water

APPENDIX 3

TOXIC SUBSTANCES CONTROL PROJECT

QUALITY ASSURANCE PROJECT PLAN

PITTSBURGH TO WHEELING TOXICS SURVEY

Signatures:

Project Coordinator, ORSANCO _____
Paul McConocha

QA Officer, ORSANCO _____
Louise Ahles-Kedziora

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Project Coordinator, PA DER _____
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Scott McPhiliamy

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Mike Koryak

Ohio River Valley Water Sanitation Commission
49 E. Fourth Street, Suite 815
Cincinnati, OH 45202

December 29, 1988

1. Project Name: Pittsburgh to Wheeling Toxics Survey

2. Project Initiation: January, 1989

3. Project Objective:

To provide data on certain chemical and physical parameters for water quality assessments under the Commission's Toxic Substances Control Program for the Ohio River from mile 0.0 to 85.0 (Pittsburgh, Pennsylvania to Wheeling, West Virginia).

4. Project Description:

This sampling project is designed to further characterize volatile organic compounds (VOCs), phenolics and cyanide during cold weather conditions in the Ohio River water column from Pittsburgh to Wheeling. The data collected from this field survey will be combined with existing data to confirm the presence and sources of these toxic substances in the Ohio River.

5. Sampling Design and Rationale:

Review of Commission ambient monitoring data indicate that as water column temperature decreases, certain pollutant concentrations significantly increase. Comparisons of water quality data to the Commission's stream criteria also indicate that certain in-stream exceedances are most prevalent during the winter months. Transect locations and parameters were selected with these considerations in mind. Specifically, transect locations are upstream and downstream of industrial centers, in high water use areas, and at or near the point of confluence of major tributaries.

Evaluations of topographic maps indicate that most NPDES dischargers can be grouped into 14 clusters. The main stem transects are located upstream and downstream of these clusters with a special emphasis being place on municipal water utility intake locations. Whenever practical, a transect location was identified perpendicular to a municipal water utility in order to assess the quality of raw water at the point of intake. This approach further assesses the impacts of point sources on

ambient water quality at municipal water utilities, a possible route of toxic exposure to humans. Each monitoring location is identified in detail in Appendix 1.

In-stream Sampling Transect Sites

Mile Point	River	ID#	Transect Location
7.4*	Allegheny	WA1	Pittsburgh Waterworks
0.8*	Allegheny	WA2	9th Street Bridge
4.5*	Monongahela	WM1	Hays Mine (West Penn Water)
0.8*	Monongahela	WM2	Smithfield St. Bridge
0.7	Ohio	WO1	West End Bridge
4.5	Ohio	WO2	West View Water Authority
9.0	Ohio	WO3	Lower Neville Island
12.5	Ohio	WO4	Sewickley Bridge
25.3	Ohio	WO5	Monaca-Rochester Bridge
31.5	Ohio	WO6	Montgomery Locks (upstream)
40.2	Ohio	WO7	East Liverpool Waterworks
50.0	Ohio	WO8	Yellow Creek Light & Daymark
59.0	Ohio	WO9	Toronto Waterworks
65.2	Ohio	WO10	Steubenville/Weirton Waterworks
69.9	Ohio	WO11	Follansbee
74.0	Ohio	WO12	Brilliant-Wellsburg
86.8	Ohio	WO13	Wheeling Waterworks

*Miles from the Ohio River Confluence.

6. Monitoring Parameters and Frequency:

The ambient water quality samples will be vertically composited grab samples collected at stream quarter points. All ambient water samples will be analyzed for purgeable halogenated organic compounds, purgeable aromatic compounds, phenolics, cyanide, temperature, pH, conductivity, hardness and total suspended solids. The intensive survey will be completed in January 1989.

PARAMETER TABLE:

Compound	Number of Samples	Sample Matrix	Analytical Methods	Sample Preserv.	Holding Time
Temp	51	Water	STD Method 212	none	Field Test
pH	51	"	EPA 150.1	none	Field Test
Sp. Cond.	51	"	EPA 120.1	none	Field Test
Susp. Solids	51	"	OEPA Method 022	Cool 4°C	7 days

PARAMETER TABLE: (cont.)

Compound	Number of Samples	Sample Matrix	Analytical Methods	Sample Preservation	Holding Time
Hardness	51	Water	OEPA Method 030	Fix pH<2, HNO_3	6 months
Cyanide	51	"	OEPA Method 010	Fix pH>12, NaOH	14 days
Phenolics	51	"	OEPA Method 018	Fix pH<2, H_2SO_4	28 days

Compound	Number of Samples	Analytical Methods	Sample Preservation	Holding Time
Bromochloromethane	51	OEPA 003A	Cool 4°C	14 days
Bromodichloromethane	"	"	pH <2 - HCl*	"
Bromoform	"	"	"	"
Carbon Tetrachloride	"	"	"	"
Chloroform	"	"	"	"
Dibromochloromethane	"	"	"	"
1,1-Dichloroethane	"	"	"	"
1,2-Dichloroethane	"	"	"	"
1,1-Dichloroethylene	"	"	"	"
1,2-Dichloropropane	"	"	"	"
Methylene Chloride	"	"	"	"
Tetrachloroethylene	"	"	"	"
1,1,1 Trichloroethane	"	"	"	"
Trichloroethylene	"	"	"	"
Trichlorofluoromethane	"	"	"	"
Benzene	"	"	"	"
Chlorobenzene	"	"	"	"
Ethylbenzene	"	"	"	"
1,2-Dichlorobenzene	"	"	"	"
1,3-Dichlorobenzene	"	"	"	"
1,4-Dichlorobenzene	"	"	"	"
Toluene	"	"	"	"

EPA Method 502.2 - Volatile Organic Compounds in water by Purge and Trap Capillary Column Gas Chromatography with Photoionization and Electrolytic Conductivity Detector in Series (Sept. 1986); OEPA Method 003A.

*Contingent upon results of an OEPA preservative study currently in progress.

7. Project Organization and Responsibility:

The field survey is a cooperative effort between Ohio Environmental Protection Agency (OEPA), Pennsylvania Department of Environmental Resources (PA DER), West Virginia Department of

Natural Resources (WV DNR), U.S. Environmental Protection Agency (U.S. EPA - Wheeling Field Office), U.S. Corps of Engineers (U.S. COE - Pittsburgh District) and Ohio River Valley Water Sanitation Commission (ORSANCO). ORSANCO will provide field personnel, all sample containers, preservatives, shipping materials, field data sheets and one fully rigged sampling boat. Participating agencies will provide field personnel, appropriate sampling gear and necessary sampling boats to complement existing resources. All laboratory analyses will be the responsibility of ORSANCO with OEPA Water Quality Laboratory identified as the contract laboratory.

8. Quality Assurance Objectives

Data quality requirements are parameter specific and shall conform to those stated in U.S. EPA approved analytical methods. Accuracy and precision criteria for each analyte can be found in Method 502.2 GC (VOCs), OEPA QA Manual, and Methods for Chemical Analysis of Water and Wastes, EPA 600/4-74-020 (inorganics). All sampling and analysis procedures will be performed as outlined in this QA plan to ensure sample validity and representativeness and minimize sample loss and contamination problems. Twenty-two volatile organics will be analyzed in grab samples of river water using purge and trap gas chromatography with photoionization and electrolytic conductivity detectors. The analytical method employed is approved by U.S. EPA for analysis of treated drinking water and raw source water (Method 502.2). The compounds include halogenated methanes, ethanes, ethylenes, propanes, benzene and its derivatives. Realistic laboratory detection limits for these parameters range from 0.2µg/l to 0.3µg/l.

PARAMETER	TARGET DETECTION LIMIT*
Temperature	1°C
pH	0.1 s.u.
Sp. Cond.	10µ
Susp. Solids	5 mg/L
Hardness	1 mg/L
Cyanide	5 µg/L
Phenolics	2 µg/L

METHOD DETECTION LIMIT, UG/L*

PARAMETER	HECD/PID
Bromochloromethane	Not Established
Bromodichloromethane	0.1
Bromoform	0.1
Carbon Tetrachloride	Not Established
Chloroform	0.1
Dibromochloromethane	0.1
1,1 Dichloroethane	0.2
1,2 Dichloroethane	0.1
1,1 Dichloroethylene	0.1
1,2 Dichloropropane	0.1
Methylene Chloride	1.8
Tetrachloroethylene	0.1
1,1,1 Trichloroethane	0.1
Trichloroethylene	0.1
Trichlorofluoromethane	Not Established
Benzene	0.1
Chlorobenzene	0.1
Ethylbenzene	0.1
1,2 Dichlorobenzene	0.3
1,3 Dichlorobenzene	0.2
1,4 Dichlorobenzene	0.2
Toluene	0.1

HECD = Hall Electrolytic Conductivity Detector
PID = Photoionization Detector
* OEPA QA Manual

9. Internal Quality Control Checks and Frequency

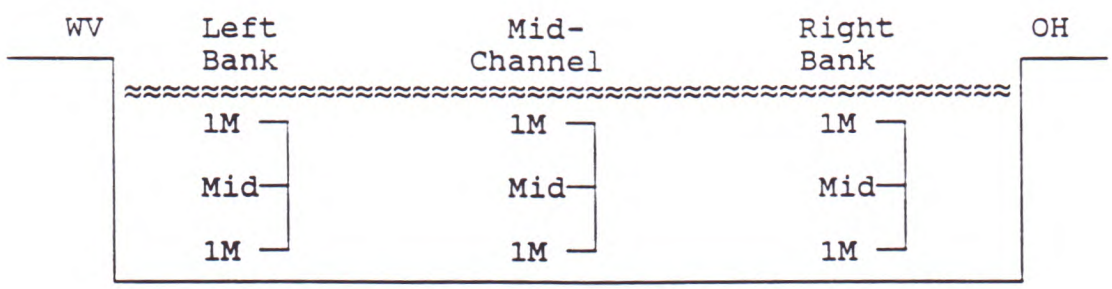
Quality control checks in the field will consist of field blanks and duplicate samples. All VOC samples will be collected in duplicate and analyzed at a frequency of 10%. One field blank and one duplicate per inorganic parameter will be analyzed for every 16 samples collected. Sampling sites for collection of blanks and duplicates will be selected randomly in the field and sample bottles labeled "field blanks" or "duplicate." Single lot reagent grade water will be provided for preparing all field blanks.

Laboratories providing analysis in this project have an approved quality assurance program in place and are certified in water/waste water analysis. Routine quality control in the laboratory should include the following:

1) daily reagent blank analysis;
2) daily calibration standard analysis;
3) analysis of field blanks and duplicates; and
4) weekly low level spike analysis.

10. Sampling Procedures

At all times sampling crews are to observe strict safety precautions including personal flotation devices (life vests), appropriate cold weather attire, marine radios, etc. At lock and dam locations, the samples will be collected immediately upstream of the lock and dam, perpendicular to the river bank by boat. At all other sampling locations, the samples will be collected perpendicular to the identified landmark by boat. At each sampling site three vertically composited grab samples will be taken, one each from the three quarter points (right quarterpoint, midstream and left quarterpoint). Depths of one meter from the surface, mid-depth and one meter from the bottom will be composited for each of the quarter points (see diagram). If required, preservative is then added to the sample container. Stainless-steel, brass or teflon Kemmerer samplers will be utilized to collect the samples.



River Cross Section

Cleaned labeled sample bottles will be provided as follows:

Volatile Organics	40 ml. glass - teflon septa
Phenolics	8 oz. glass - polyethylene
Cyanide	1 qt. plastic
Suspended Solids	1 qt. plastic
Hardness	1 qt. plastic

Bottle labels will specify analyte, date, time, river, river mile point, location description including sample number, preservative, and collector's name and agency. A field sample report will also be prepared for each sampling point. Each state will use the OEPA form (Appendix 2).

Field Parameters - ORSANCO and each participating agency will provide their own field instruments (YSI, Hydro-Lab, etc.) for the on-site tests. Field measurements for temperature (°C), conductivity and pH will be recorded at each quarter point at one meter intervals. The completed sample report (see Appendix 3) will accompany the samples to the laboratory, and be returned with the results to ORSANCO.

Volatile Organics - Samples must be collected in 40 ml septum vials from each depth (one meter from the surface, mid-depth and one meter from the bottom) for each quarter point. **OEPA laboratories will composite VOC samples in the laboratory.** Fill the sample vial just to overflowing in such a manner that no air bubbles pass through the sample as the bottle is being filled. Seal the bottle so that no air bubbles are entrapped in it. Maintain the hermetic seal on the sample vial until the time of analysis. Duplicates will be collected and submitted at all times and field blank samples will be submitted at a frequency of 10%. All samples have a limited holding time. All samples must be iced or refrigerated a 4°C from the time of collection to the time of analysis. Given the time of year, take care that **samples do not freeze.**

Phenolics - Samples must be collected in 8 oz. glass containers with polyethylene caps. Samples will be vertically composited in the field. Samples are preserved in the field by adding 1 ml 1:1 H_2SO_4. Samples will be stored at 4°C and submitted to the laboratory as soon as possible.

Total Cyanide - Samples will be collected in one quart polyethylene cubitainers. Samples will be vertically composited in the field and preserved by adding 4 NaOH pellets per sample to achieve a pH greater than 12 S.U. Samples will be stored at 4°C from the time of collection to the time of analysis.

Total Suspended Solids - Samples will be collected in one quart polyethylene cubitainers. Samples will be vertically composited in the field. Samples will be stored at 4°C from the time of collection to the time of analysis. No preservation is required.

Total Hardness - Samples will be collected in one quart polyethylene cubitainers. Samples will be vertically composited in the field and preserved by adding 2 ml 1:1 HNO_3 per sample to achieve a pH less than 2 S.U. Samples will be stored at 4°C from the time of collection to the time of analysis.

11. Sample Custody

All pertinent information will be documented on field sample reports and sample bottle labels at the time of collection. The sample collector attests to the validity of the sample by signature on the bottle and log sheet. The log sheets are submitted with the samples to the laboratory and can be used to report the test results to ORSANCO. An OEPA chain of custody form (Appendix 4) will be used for the samples. ORSANCO will be responsible for transporting the water samples to the laboratory.

12. Calibration Procedures and Preventive Maintenance

Field instrumentation to measure pH, temperature, and conductivity should be calibrated prior to sampling according to the manufacture's directions. A copy of the calibration procedures will be submitted to ORSANCO. Calibration of laboratory instruments should conform to U.S. EPA protocol for the specific method used. Field personnel will record field calibration results and submit a copy of this log to ORSANCO.

Documentation of equipment maintenance, calibration and repairs is an integral part of a laboratory's quality assurance program. Each laboratory participating in this study is responsible for this element.

13. Analytical Procedures

See Section 6, Monitoring Parameters and Frequency.

14. Data Reduction, Validation and Reporting

Documentation of test results, review of calculations, and data reporting will be conducted by each laboratory according to standard operating procedures. The data will be reviewed for completeness and consistency and entered into ORSANCO's toxics

data base which has been established to manage all data collected on this Ohio River segment. Copies of the data on either floppy disk and/or paper will be made available to all participants.

15. Data Usage

The physical\chemical data generated by this sampling Project is used to:

- assess general water quality conditions and identify problem areas,
- evaluate point, non-point and tributary impacts to the Ohio River,
- identify specific sources of toxic substances in the study area, and
- support water quality management decisions.

Basic statistical tests and simple conservative water quality modeling will be performed on the data to characterize water quality. These values will be compared to the Commission's stream criteria and combined with other monitoring data for Toxic Substances Control Program assessments.

16. Corrective Action

In the field, spare sampling containers will be available in case of sample loss or contamination. State personnel are responsible for sample collection devices and test equipment supplies. In the event of unfavorable weather conditions or major conflicts with personnel scheduling, and alternative sampling date will be established.

Corrective action in the laboratory should follow established analytical operating procedures and any action taken reported to ORSANCO's project coordinator.

17. Quality Assurance Reports

A status report will be prepared by ORSANCO to review progress and discuss any quality assurance problems following the field sampling effort. An estimation of analytical precision and

accuracy should be included in the test results reported by the laboratory. The final project report will include a summary of quality control objectives achieved during the project.

TRANSECT DESCRIPTIONS

In-stream Sampling Transect Sites

Mile Point	River	Lab ID#	Transect Location
7.4*	Allegheny	WA1R	Pittsburgh Waterwork
7.4*	Allegheny	WA1M	Pittsburgh Waterwork
7.4*	Allegheny	WA1L	Pittsburgh Waterwork
0.8*	Allegheny	WA2R	9th Street Bridge
0.8*	Allegheny	WA2M	9th Street Bridge
0.8*	Allegheny	WA2L	9th Street Bridge
4.5*	Monongahela	WM1R	Hays Mine (West Penn Water)
4.5*	Monongahela	WM1M	Hays Mine (West Penn Water)
4.5*	Monongahela	WM1L	Hays Mine (West Penn Water)
0.8*	Monongahela	WM2R	Smithfield St. Bridge
0.8*	Monongahela	WM2M	Smithfield St. Bridge
0.8*	Monongahela	WM2L	Smithfield St. Bridge
0.7	Ohio	WO1R	West End Bridge
0.7	Ohio	WO1M	West End Bridge
0.7	Ohio	WO1L	West End Bridge
4.5	Ohio	WO2R	West View Water Authority
4.5	Ohio	WO2M	West View Water Authority
4.5	Ohio	WO2L	West View Water Authority
9.0	Ohio	WO3R	Lower Neville Island (Main Chan.)
9.0	Ohio	WO3M	Lower Neville Island (Main Chan.)
9.0	Ohio	WO3L	Lower Neville Island (Back Chan.)
12.5	Ohio	WO4R	Sewickley Bridge
12.5	Ohio	WO4M	Sewickley Bridge
12.5	Ohio	WO4L	Sewickley Bridge
25.3	Ohio	WO5R	Monaca-Rochester Bridge
25.3	Ohio	WO5M	Monaca-Rochester Bridge
25.3	Ohio	WO5L	Monaca-Rochester Bridge
21.5	Ohio	WO6R	Montgomery Locks (upstream)
21.5	Ohio	WO6M	Montgomery Locks (upstream)
21.5	Ohio	WO6L	Montgomery Locks (upstream)
40.2	Ohio	WO7R	East Liverpool Waterworks
40.2	Ohio	WO7M	East Liverpool Waterworks
40.2	Ohio	WO7L	East Liverpool Waterworks
50.0	Ohio	WO8R	Yellow Creek Light & Daymark
50.0	Ohio	WO8M	Yellow Creek Light & Daymark
50.0	Ohio	WO8L	Yellow Creek Light & Daymark

*Miles from the Ohio River Confluence.

In-stream Sampling Transect SitesCont.

Mile Point	River	Lab ID#	Transect Location
59.0	Ohio	WO9R	Toronto Waterworks
59.0	Ohio	WO9M	Toronto Waterworks
59.0	Ohio	WO9L	Toronto Waterworks
65.2	Ohio	WO10R	Steubenville/Weirton Waterworks
65.2	Ohio	WO10M	Steubenville/Weirton Waterworks
65.2	Ohio	WO10L	Steubenville/Weirton Waterworks
69.9	Ohio	WO11R	Follansbee
69.9	Ohio	WO11M	Follansbee
69.9	Ohio	WO11L	Follansbee
72.6	Ohio	WO12R	Brilliant-Wellsburg
72.6	Ohio	WO12M	Brilliant-Wellsburg
72.6	Ohio	WO12L	Brilliant-Wellsburg
86.8	Ohio	WO13R	Wheeling Waterworks
86.8	Ohio	WO13M	Wheeling Waterworks
86.8	Ohio	WO13L	Wheeling Waterworks

TOTAL GRAB SAMPLES=51

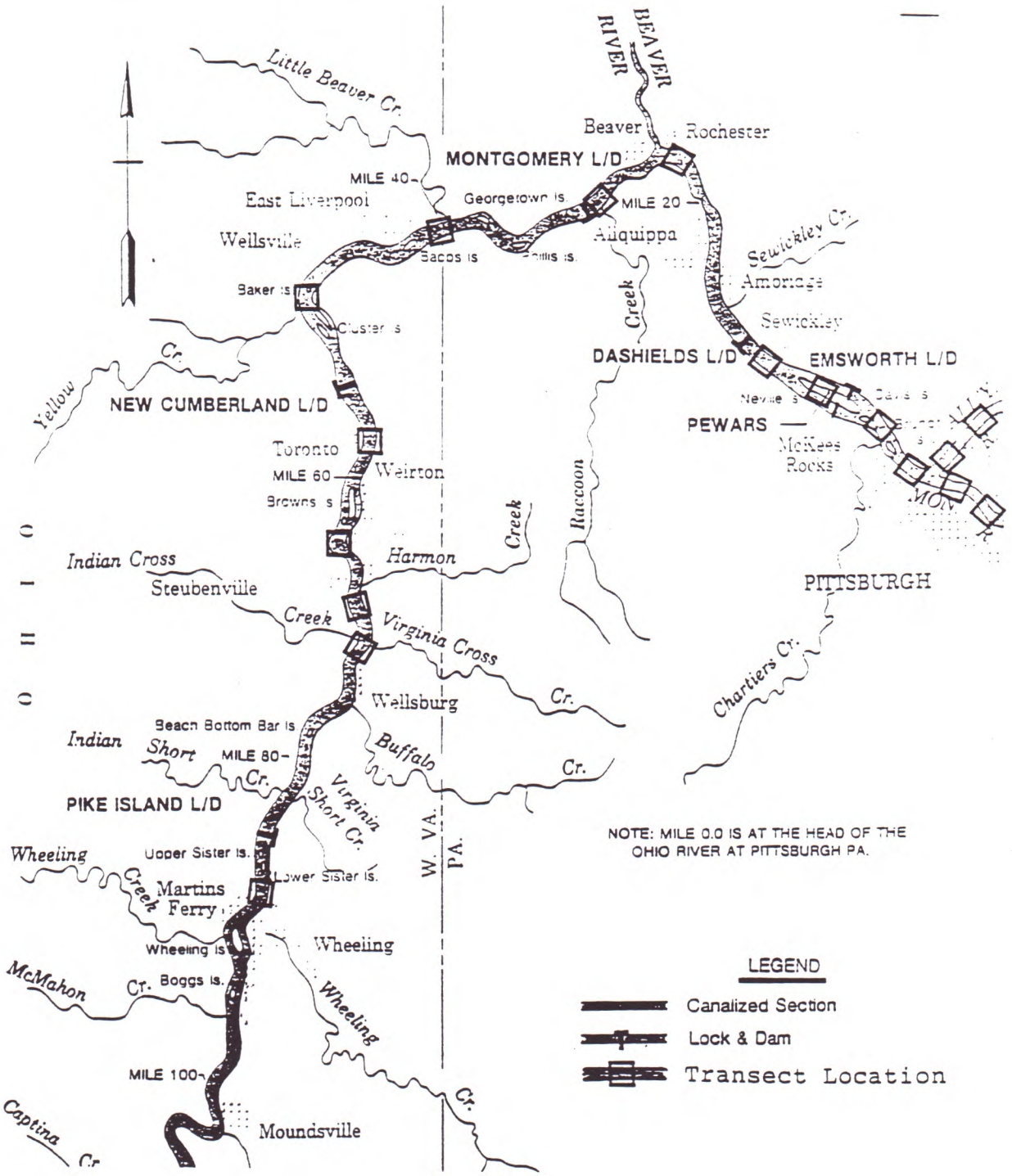
Lab ID Key:
First Letter -
W=Water Matrix

Second Letter -
A=Allegheny River
M=Monongahela River
O=Ohio River

Numbers -
##=Sequence Number (upstream to downstream)

Third Letter -
R=Right Quarter Point
M=Mid Channel
L=Left Quarter Point

PITTSBURGH TO WHEELING TOXICS SURVEY
TRANSECT LOCATIONS:



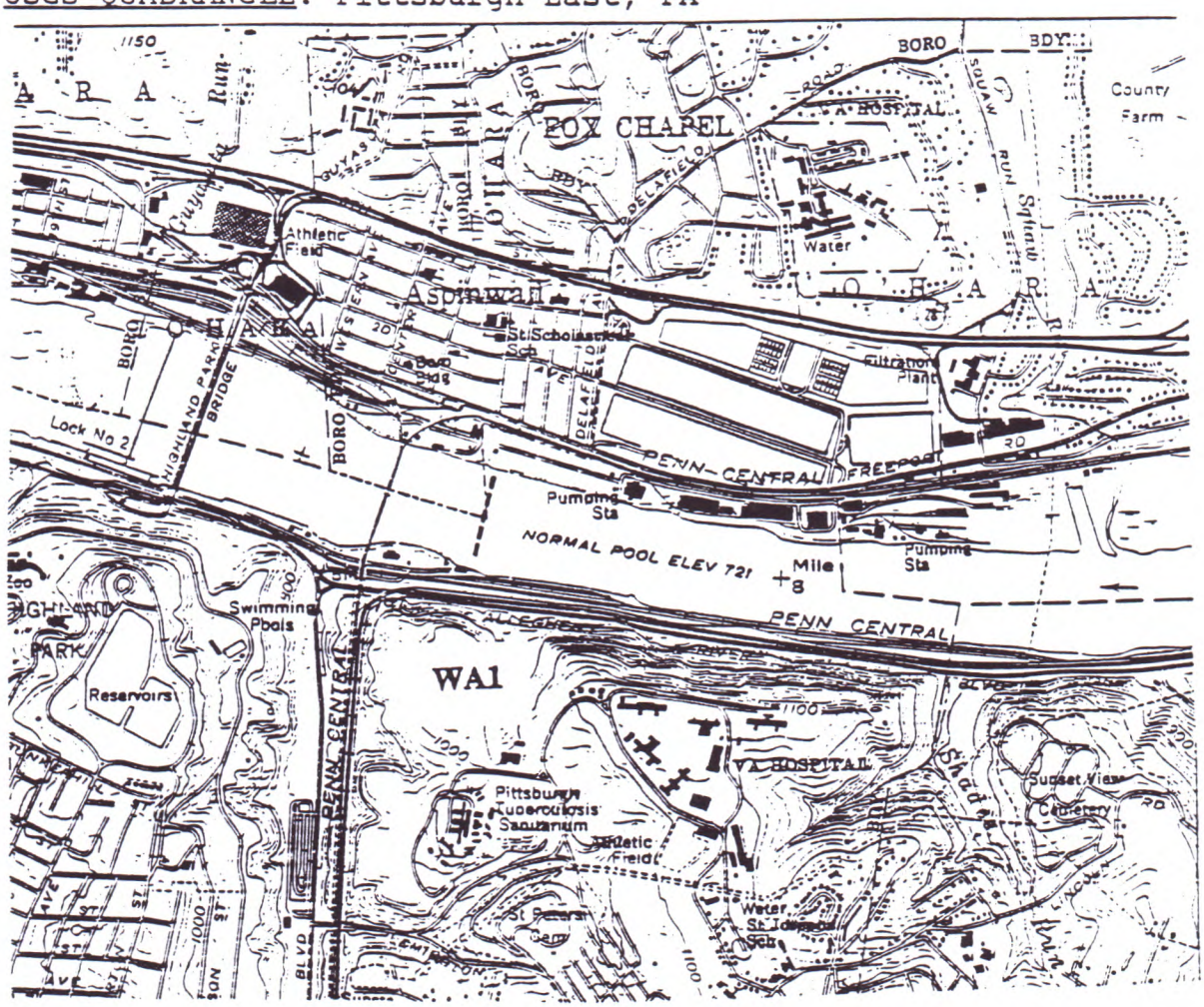
STATION: WA1 - Pittsburgh Waterworks

RIVER: Allegheny

LOCATION: Located on the Allegheny River 7.4 miles upstream of the Pittsburgh Point perpendicular to the City of Pittsburgh water supply intakes (0.2 miles upstream of the Penn Central Railroad Bridge or 0.5 miles upstream of Allegheny Lock and Dam No. 2).

REMARKS: This transect is intended to be a control for the Allegheny River basin. The Ohio River data will be compared to this baseline sample. In addition, this site can also serve as a QA/QC cross-section for the Pittsburgh ODS and manual monitoring station.

USGS QUADRANGLE: Pittsburgh East, PA



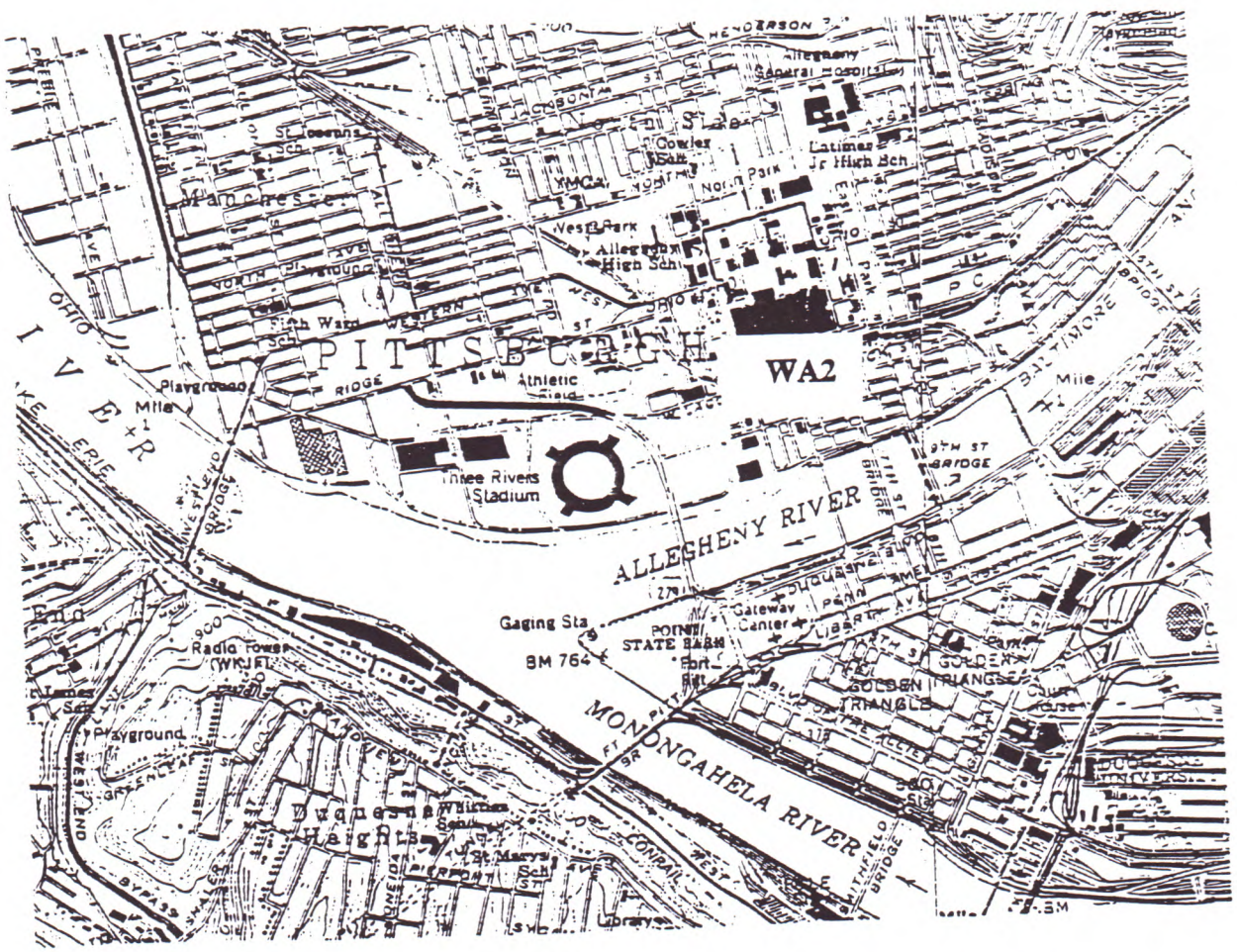
STATION: WA2 - 9th Street Bridge

RIVER: Allegheny

LOCATION: Located on the Allegheny River 0.8 miles upstream of the Pittsburgh Point under the 9th Street Bridge.

REMARKS: This transect is intended to be quantify any urban runoff and/or point source impacts on water quality from the City of Pittsburgh area.

USGS QUADRANGLE: Pittsburgh East, PA



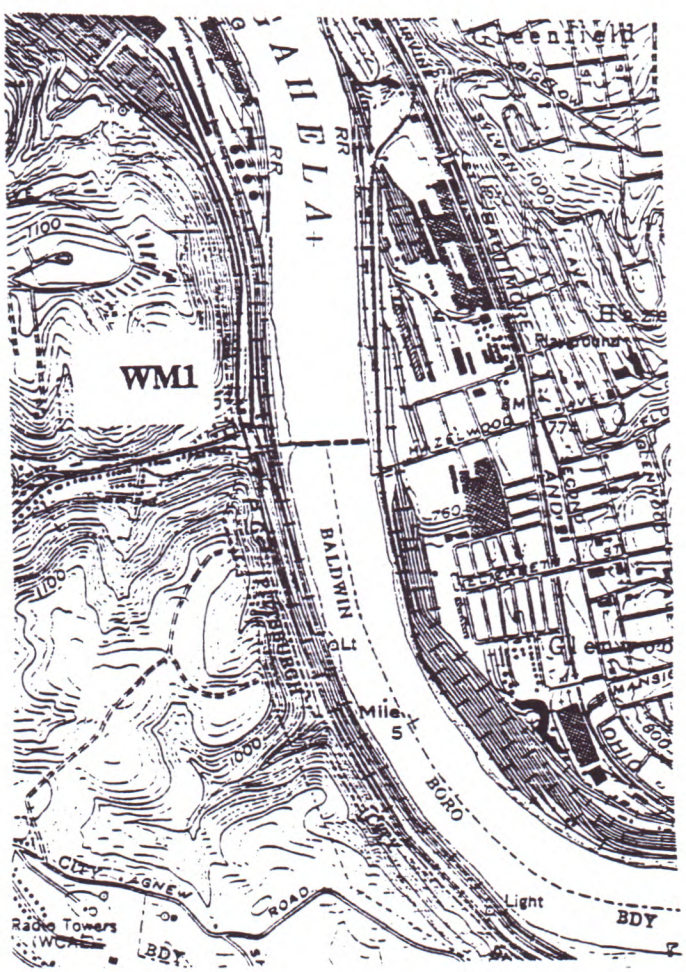
STATION: WM1 - Hays Mine (West Penn Water)

RIVER: Monongahela

LOCATION: Located on the Monongahela River 4.5 miles upstream of the Pittsburgh Point perpendicular to the Western Pennsylvania Water Company Becks Run water treatment plant (0.1 miles downstream of the first areal power crossing).

REMARKS: This transect is intended to be a control for the Monongahela River basin. The Ohio River data will be compared to this baseline sample. In addition, this site can also serve as a QA/QC cross-section for the West Penn Water ODS and manual monitoring station.

USGS QUADRANGLE: Pittsburgh East, PA



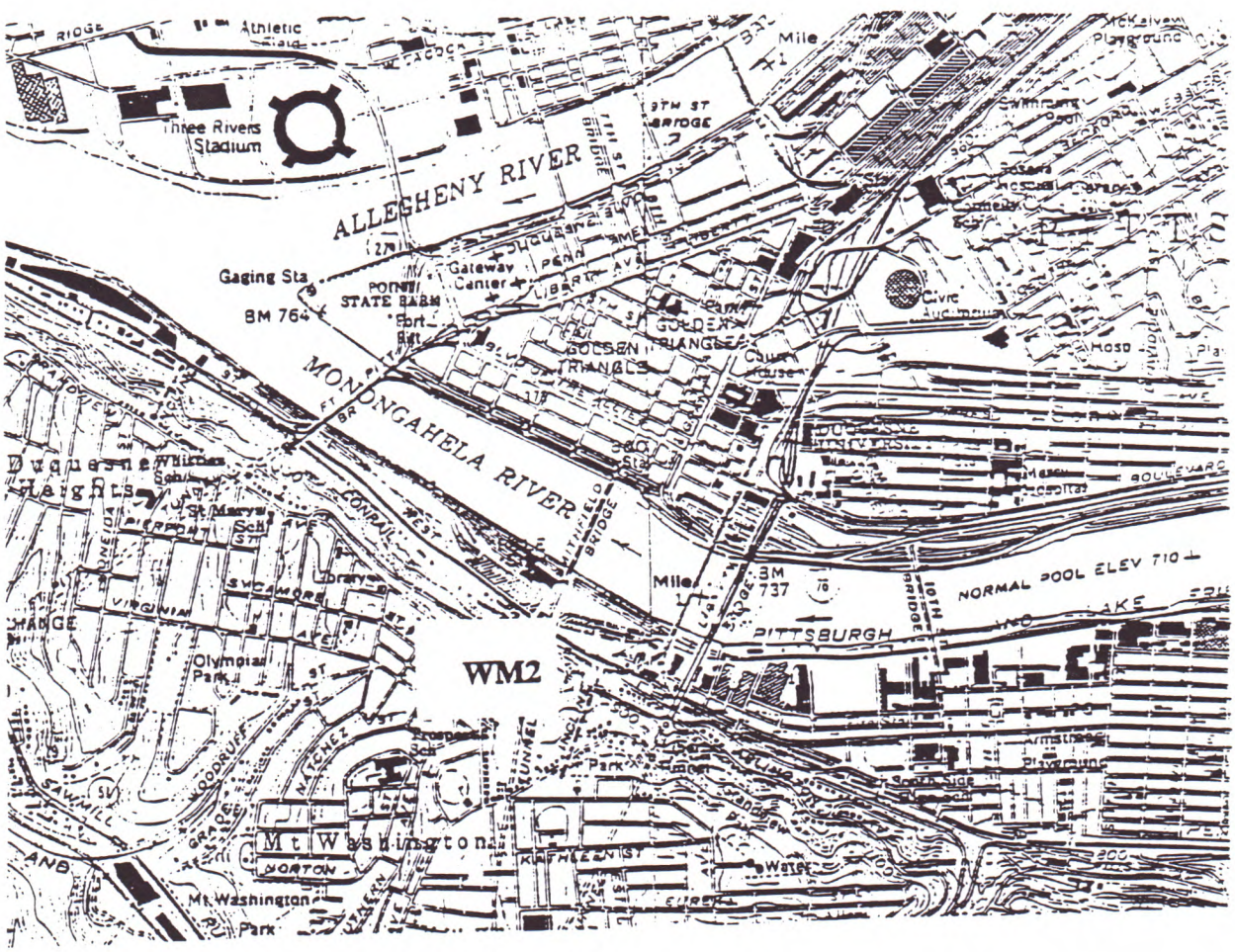
STATION: WM2 - Smithfield Street Bridge

RIVER: Monongahela

LOCATION: Located on the Monongahela River 0.7 miles upstream of the Pittsburgh Point under the Smithfield Street Highway Bridge (this is the second bridge upstream of the Pittsburgh Point).

REMARKS: This transect is intended to be quantify any urban runoff and/or point source impacts on water quality from the City of Pittsburgh area.

USGS QUADRANGLE: Pittsburgh East, PA



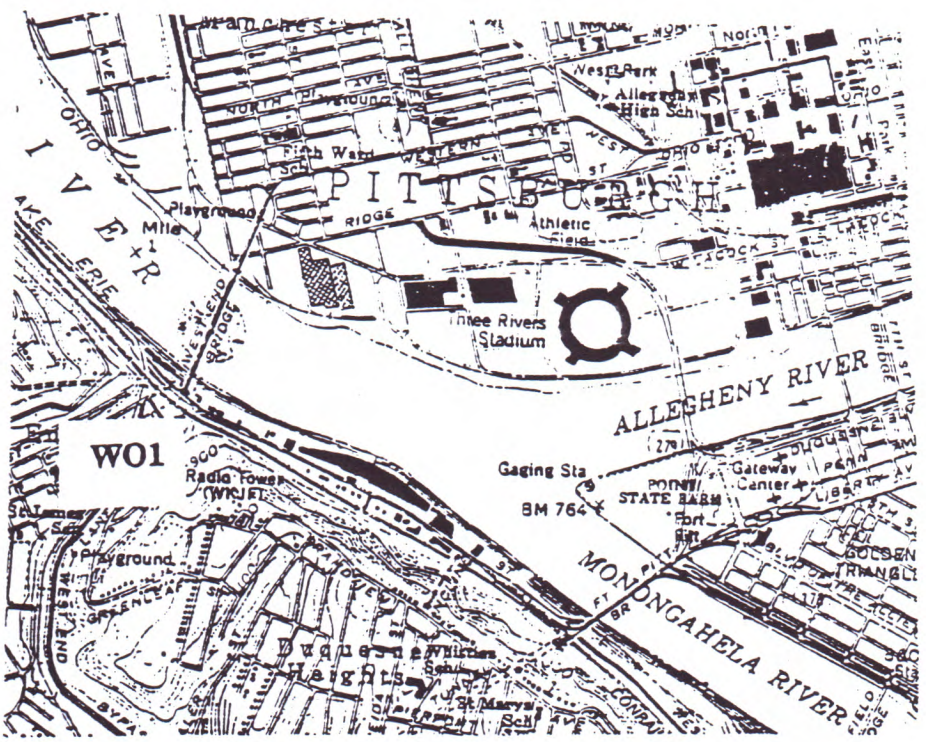
STATION: WO1 - West End Bridge

RIVER: Ohio

LOCATION: Located on the Ohio River 0.7 miles downstream of the Pittsburgh Point underneath the West End Bridge.

REMARKS: This transect is intended to be a control for the Ohio River main stem. All of the Ohio River data will be compared to this baseline station.

USGS QUADRANGLE: Pittsburgh West, PA



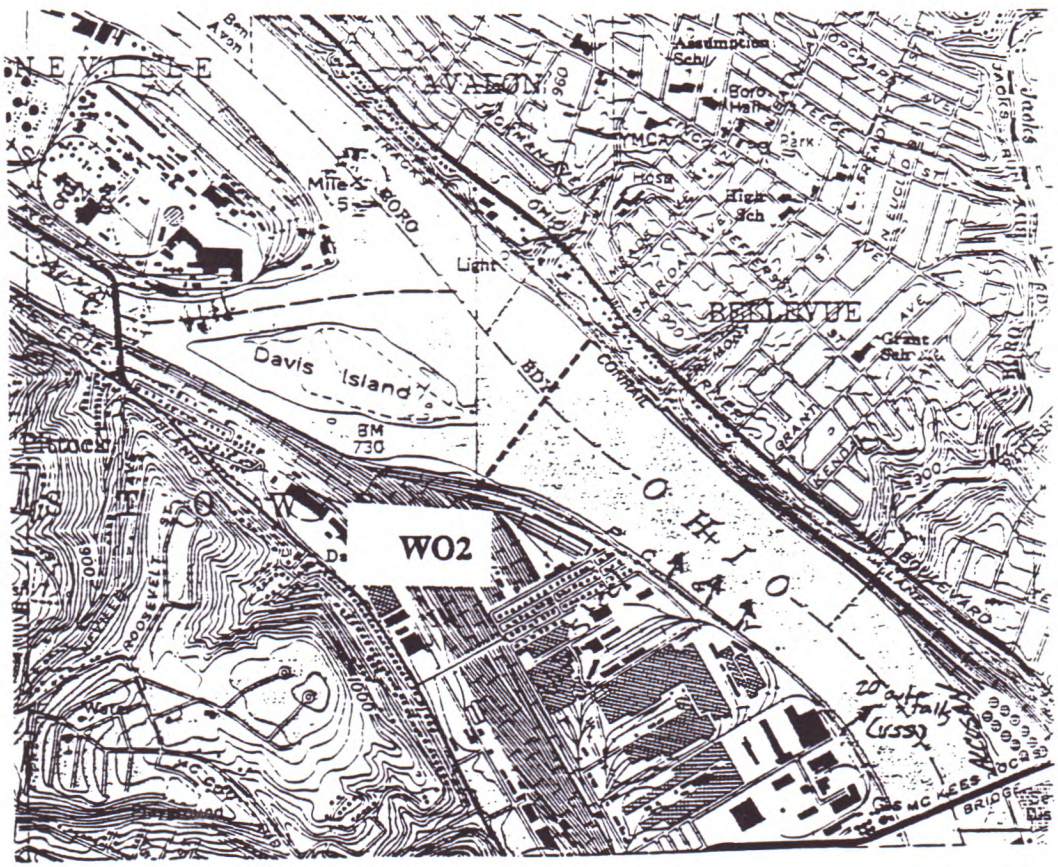
STATION: WO2 - West View Water Authority

RIVER: Ohio

LOCATION: Located on the Ohio River 4.5 miles downstream of the Pittsburgh Point (just upstream of Davis Island).

REMARKS: This transect is intended to gather further information on ALCOSAN (M.P. 3.1) and USX (M.P. 4.0), two 304(l) list candidates. In addition, this site can also serve as a QA/QC cross-section for the West View CDS Monitoring Station (this station has historically seen low detection levels for chloroform and other organics).

USGS QUADRANGLE: Pittsburgh West, PA



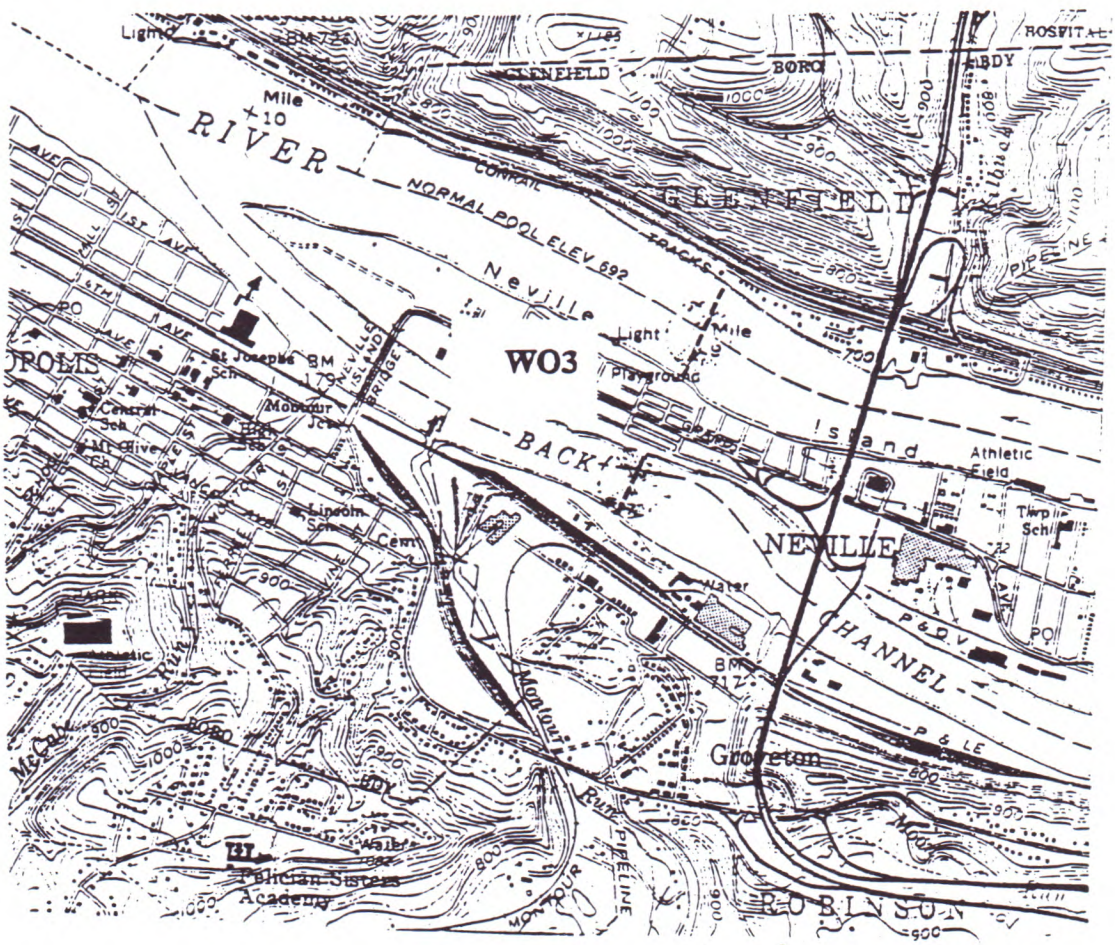
STATION: WO3 - Lower Neville Island

RIVER: Ohio

LOCATION: Located on the Ohio River 9.0 miles downstream of the Pittsburgh Point (just upstream of the Old Lock 2 Light and Daymark).

REMARKS: This transect is intended to gather further information on Shenango, Inc. (M.P. 8.0), a 304(1) list candidate, and Neville Chemical (M.P. 6.8) a suspected ground water contamination site. Note that two samples are recommended for the main channel (right bank and center) and that one sample be taken from the back channel (left bank).

USGS QUADRANGLE: Ambridge, PA



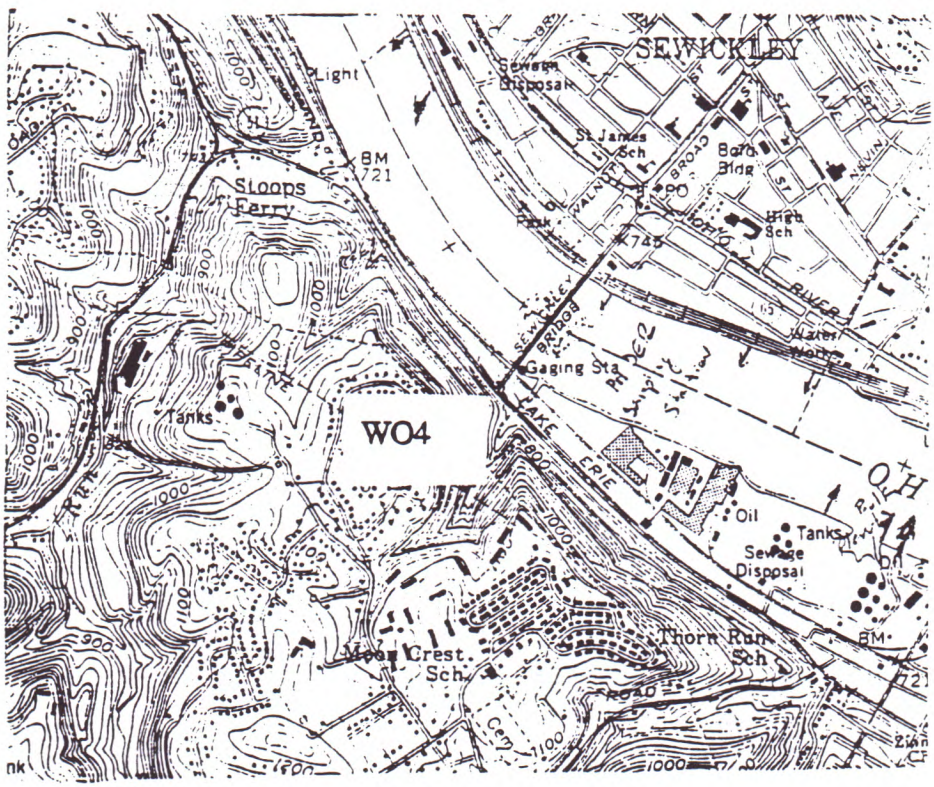
STATION: WO4 - Sewickley Bridge

RIVER: Ohio

LOCATION: Located on the Ohio River 12.5 miles downstream of the Pittsburgh Point (0.3 miles downstream of the G. Zerr Light and Daymark or 0.7 mile downstream of the Sewickley Bridge).

REMARKS: This transect is intended to gather further information on several municipal wastewater treatment plants and to determine if there are any water quality impacts from a proposed Superfund National Priority List site on the downstream tip of Neville Island.

USGS QUADRANGLE: Ambridge, PA



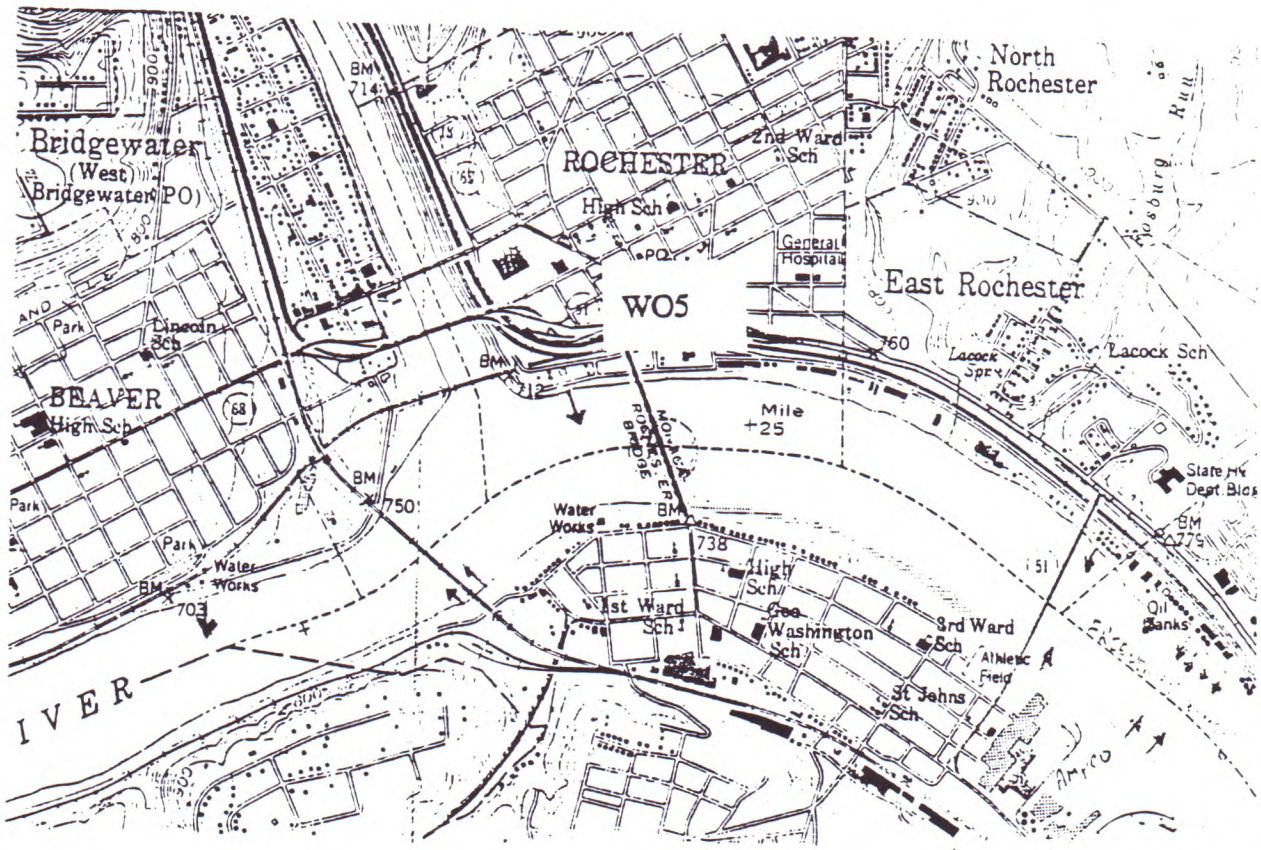
STATION: WO5 - Monaca-Rochester Bridge

RIVER: Ohio

LOCATION: Located on the Ohio River 25.3 miles downstream of the Pittsburgh Point under the Monaca-Rochester Bridge which is perpendicular to the Monaca Water Works Company (0.2 miles upstream of the Beaver River confluence).

REMARKS: This transect is intended to gather further information on several municipal wastewater treatment plants, the Ashland Freedom Refinery (a TSDF with possible ground water contamination).

USGS QUADRANGLE: Beaver, PA



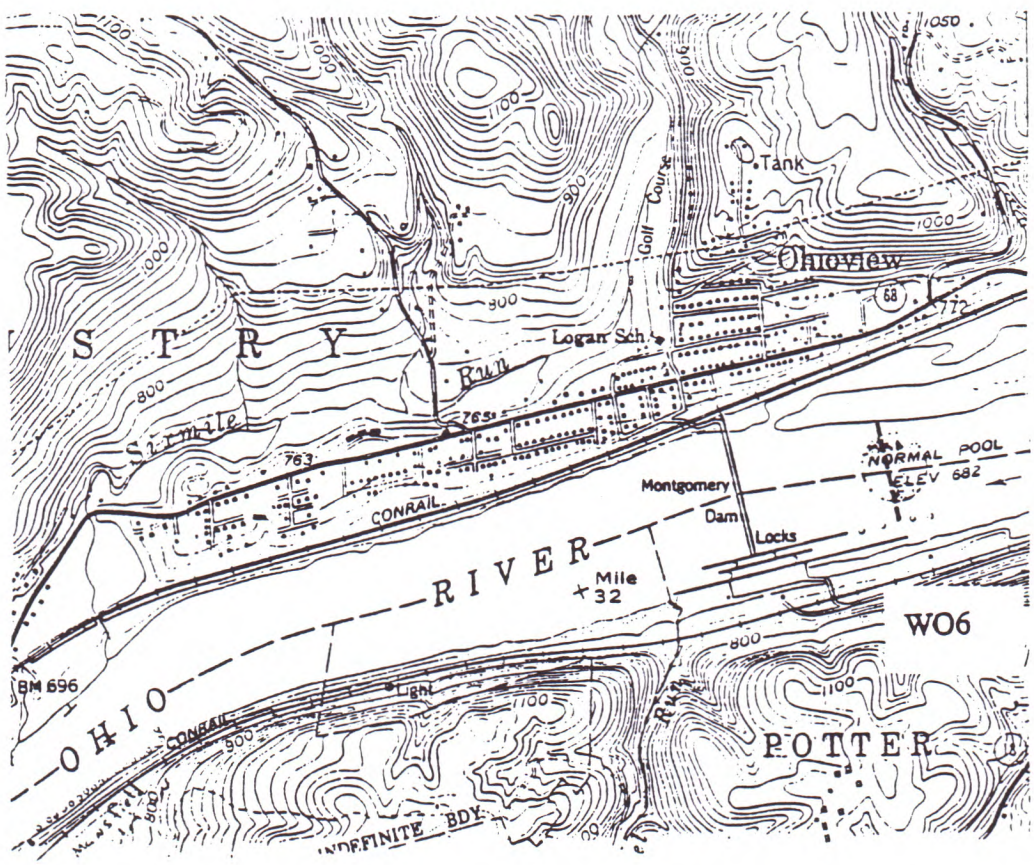
STATION: WO6 - Montgomery Locks

RIVER: Ohio

LOCATION: Located on the Ohio River 31.5 miles downstream of the Pittsburgh Point, 0.5 miles upstream of Montgomery Locks and Dam.

REMARKS: This transect is intended to gather further information on several municipal wastewater treatment plants; St. Joe Resources (M.P. 28.5) and ARCO Chemical (M.P. 29.7), two 304(l) short list candidates.

USGS QUADRANGLE: Midland, PA



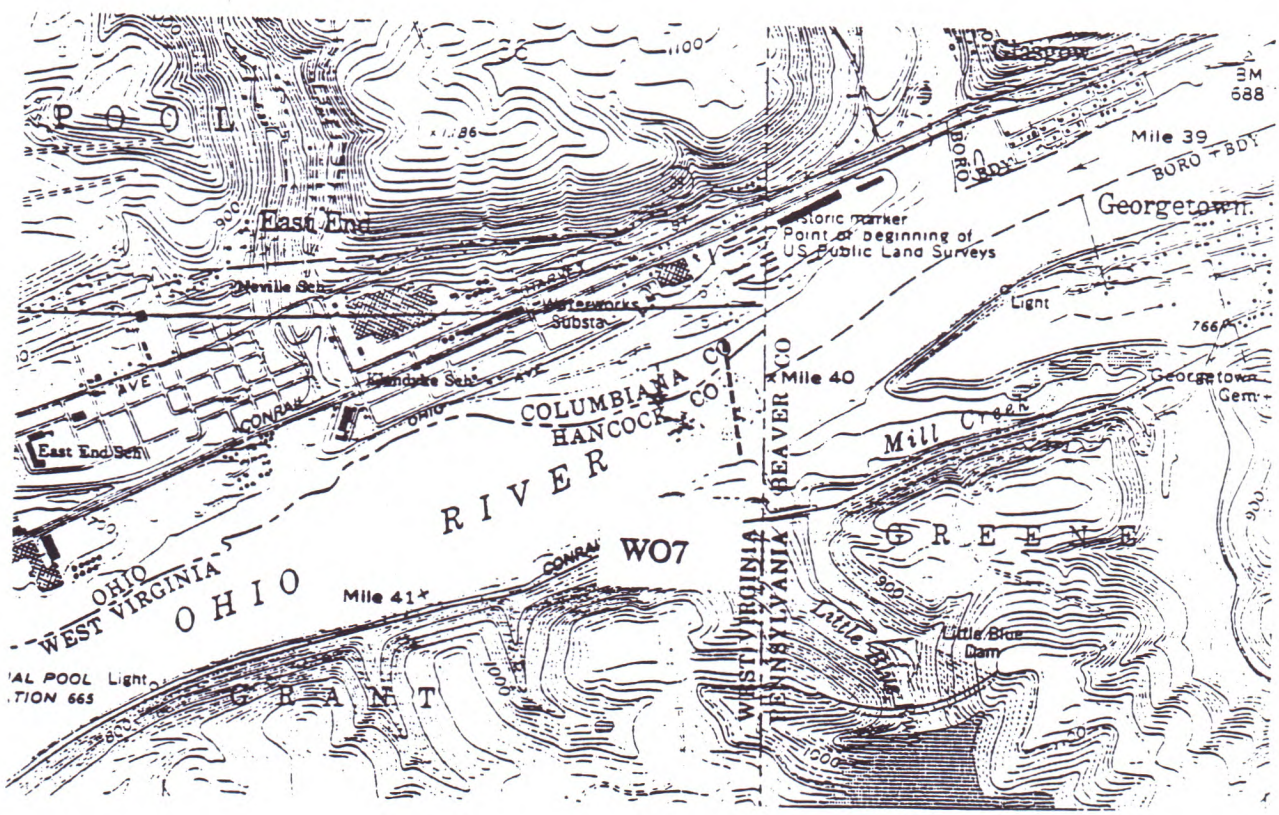
STATION: WO7 - East Liverpool Waterworks

RIVER: Ohio

LOCATION: Located on the Ohio River 40.2 miles downstream of the Pittsburgh Point, 0.2 miles downstream of the Pennsylvania state line (just upstream of power areal crossing).

REMARKS: This transect is intended to gather further information on several municipal wastewater treatment plants; Duquesne Light Co. (M.P. 28.5) and J.& L. Specialty Steel (M.P. 36.3), two 304(1) short list candidates. In addition, this site can also serve as a QA/QC cross-section for the East Liverpool ODS and Manual monitoring station.

USGS QUADRANGLE: East Liverpool North, OH-WV



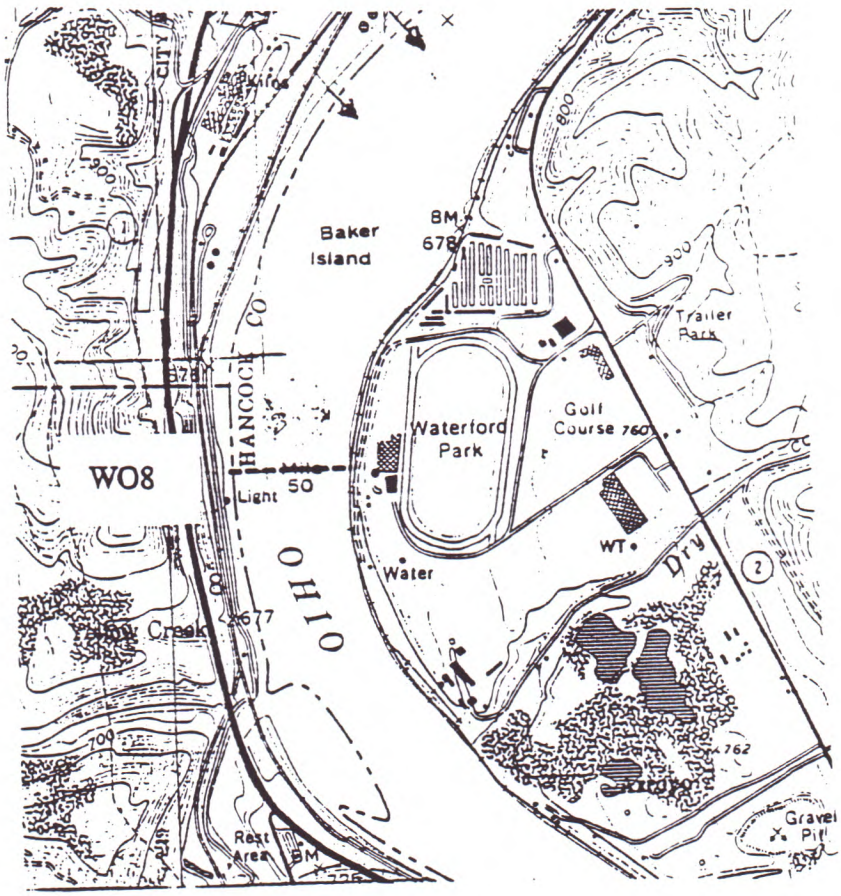
STATION: WO8 - Yellow Creek Light and Daymark

RIVER: Ohio

LOCATION: Located on the Ohio River 50.0 miles downstream of the Pittsburgh Point perpendicular to the Yellow Creek Light and Daymark.

REMARKS: This transect is intended to gather further information on Wellsville Wastewater Treatment Plant (M.P. 47.3), East Liverpool Wastewater Treatment Plant (M.P. 44.6) and Quakerstate Congo Refinery (M.P. 45.2), the latter two are 304(1) short list candidates.

USGS QUADRANGLE: Wellsville, OH-WV



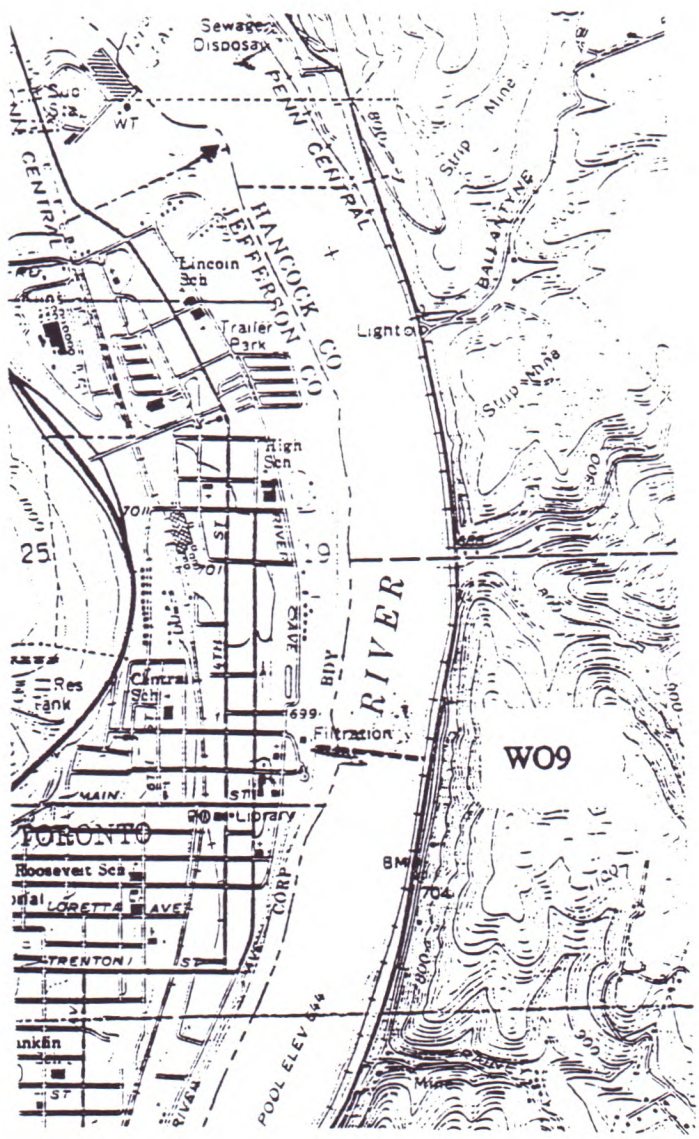
STATION: WO9 - Toronto Waterworks

RIVER: Ohio

LOCATION: Located on the Ohio River 59.0 miles downstream of the Pittsburgh Point, perpendicular to the Toronto, Ohio, waterworks.

REMARKS: This transect is intended to gather further information on Ohio Edison Sammis Plant (M.P. 53.9), a 304(1) short list candidate.

USGS QUADRANGLE: Weirton, WV-OH



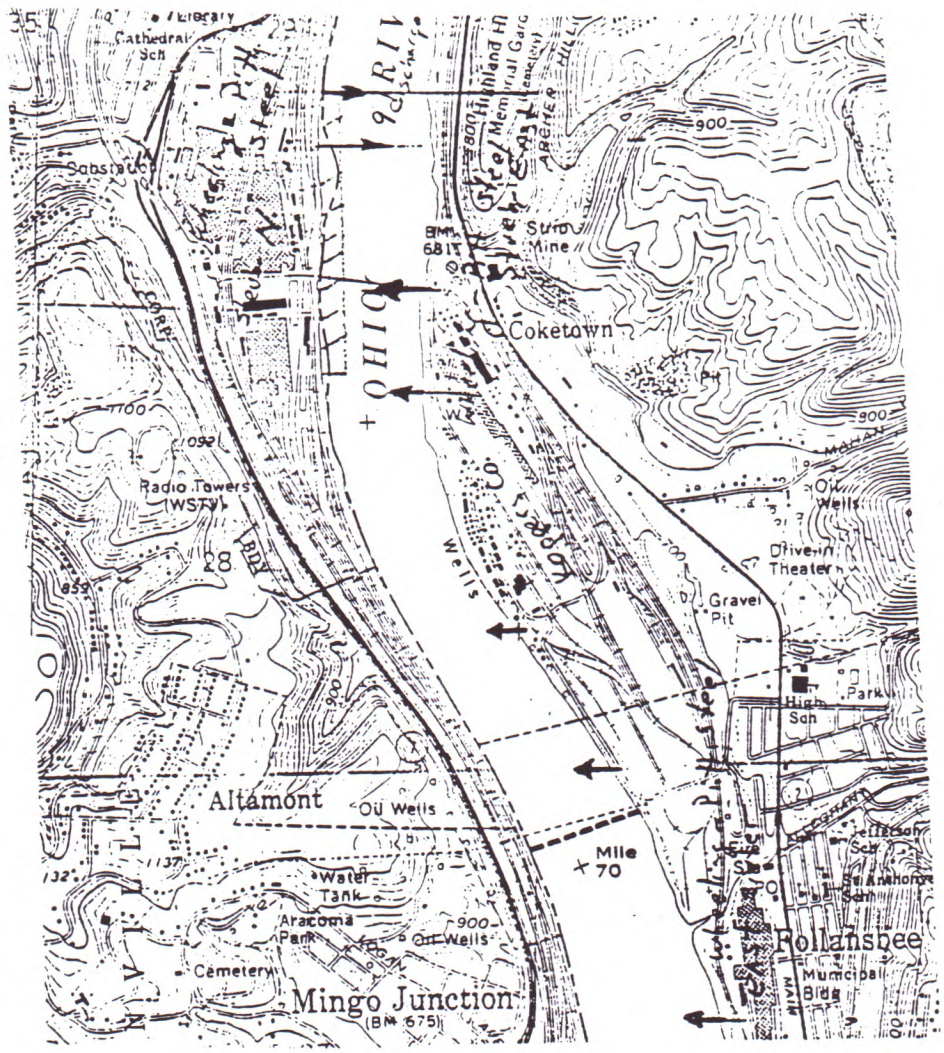
STATION: WO11 - Follansbee

RIVER: Ohio

LOCATION: Located on the Ohio River 69.9 miles downstream of the Pittsburgh Point, perpendicular to the town of Follansbee, West Virginia.

REMARKS: This transect is intended to gather further information on Wheeling Pittsburgh Steel Corporation (M.Ps. 68.6 & 68.8) and Koppers Company, Inc., two 304(l) short list candidate and ground water contamination sites.

USGS QUADRANGLE: Steubenville East, OH-WV



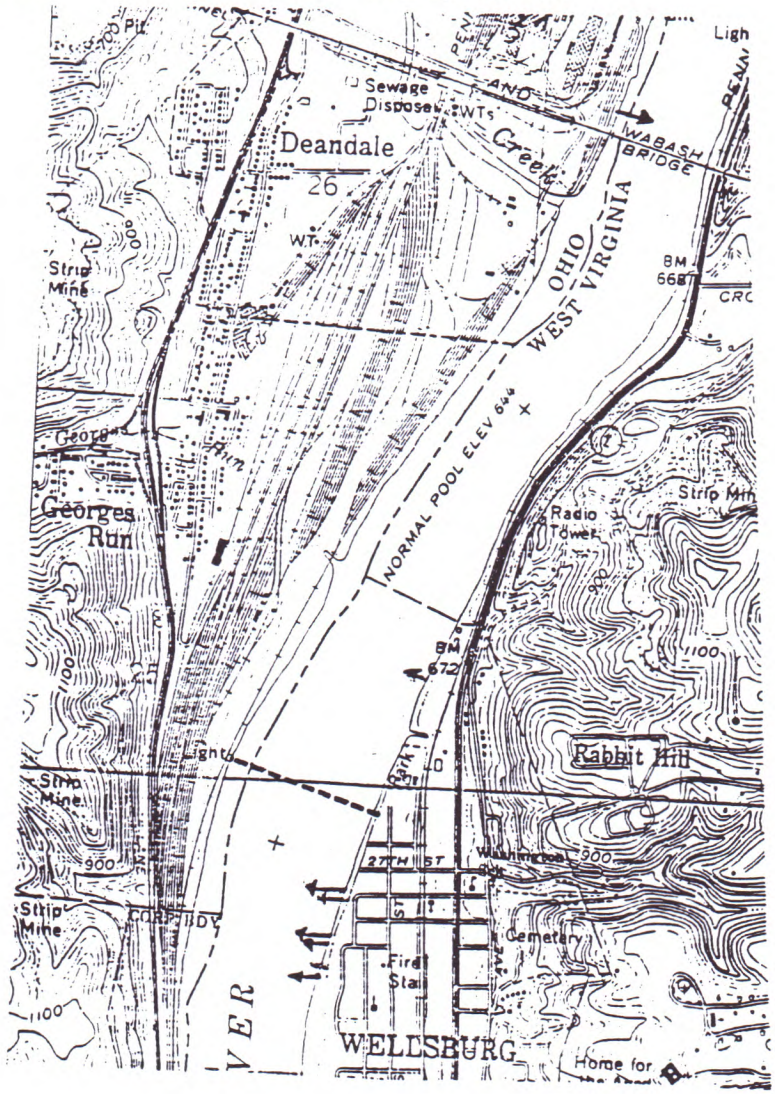
STATION: WO12 - Brilliant-Wellsburg

RIVER: Ohio

LOCATION: Located on the Ohio River 72.8 miles downstream of the Pittsburgh Point, perpendicular to the Cox Ripple Light and Daymark.

REMARKS: This transect is intended to gather further information on Wheeling Pittsburgh Steel Corporation (M.Ps. 68.6 & 68.8) and Koppers Company, Inc., two 304(1) short list candidate and ground water contamination sites.

USGS QUADRANGLE: Steubenville East, OH-WV



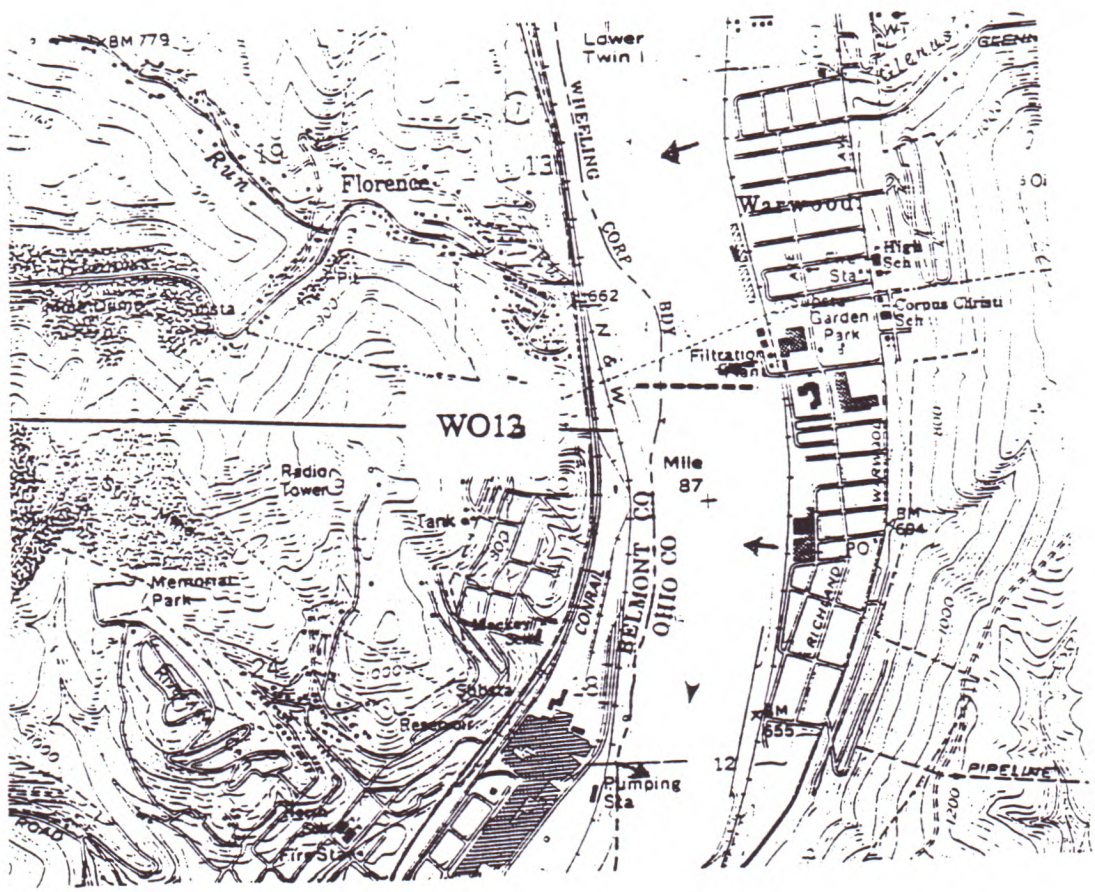
STATION: WO13 - Wheeling Waterworks

RIVER: Ohio

LOCATION: Located on the Ohio River 86.8 miles downstream of the Pittsburgh Point, perpendicular to the Wheeling Waterworks (underneath an areal power crossing).

REMARKS: This transect is intended to gather further information on Wheeling Pittsburgh Steel Corporation (M.P. 70.7), a 304(1) short list candidate and ground water contamination site. In addition, this site can also serve as a QA/QC cross-section for the Wheeling CDS and manual monitoring stations.

USGS QUADRANGLE: Wheeling, WV-OH



OEPA FIELD DATA FORM

OhioEPA

WATER QUALITY LABORATORY CHEMICAL REPORT FORM

Station ID# _____

Received _ _ _ _ _ _ Date Approved _ _ _ _ _ _ Approved by: _____ Lab Number _____

Station _____

Sample Use: ☐ Monthly ☐ Litigation ☐ WQM ☐ Complaint ☐ B-WQ Survey ☐ Compliance

Sample Type: ☐ Grab ☐ Composite ☐☐☐☐☐ S(
☐ Sediment

Sample Collected by _____

Date & Time of Sample Begin Y Y M M D D ☐☐☐☐☐☐ H H M M ☐☐☐☐
End ☐☐☐☐☐☐ ☐☐☐☐

Report Analysis to _____

☐ CO ☐ NEDO ☐ NWDO ☐ SEDO ☐ SWDO ☐ CDO ☐ WQM

Frequency & Duration of Composite Sample _____

FIELD MEASUREMENTS	PARAMETER	STORET CODE	RESULTS	DATE ANALYZED	ANALYST	SEDIMENT mg/kg
	☐ Chlorine, Total Resd., mg/l	P50060.				
	☐ Conductivity, umhos/cm	P94.				
	☐ Dissolved Oxygen, mg/l	P299.				
	☐ Flow, CFS	P61				
	☐ pH, SU	P400.				
	☐ Temperature, Water, °C	P10.				
	☐ Gage Height, ft.	P65.				
	☐					

LABORATORY MEASUREMENTS	PARAMETER	STORET CODE	RESULTS	DATE ANALYZED	ANALYST	SEDIMENT mg/kg
	☐ Arsenic, Total As, ug/l	P1002.				
	☐ Cadmium, Total Cd, ug/l	P1027.				
	☐ Calcium, Total Ca, mg/l	P916.				
	☐ Chromium, Diss. Hex Cr, ug/l	P1220.				
	☐ Chromium, Total Cr, ug/l	P1034.				
	☐ Copper, Total Cu, ug/l	P1042.				
	☐ Iron, Total Fe, ug/l	P1045.				
	☐ Lead, Total Pb, ug/l	P1051.				
	☐ Magnesium, Total Mg, mg/l	P927.				
	☐ Manganese, Total Mn, ug/l	P1055.				
	☐ Mercury, Total, Hg, ug/l	P71900.				
	☐ Nickel, Total Ni, ug/l	P1067.				
	☐ Potassium, Total K, mg/l	P937.				
	☐ Selenium, Total Se, ug/l	P1147.				
	☐ Sodium, Total Na, mg/l	P929.				
	☐ Zinc, Total, ug/l	P1092.				
	☐ Hardness, Total $CaCO_3$, mg/l	P900.				
	☐					
	☐					
	☐					

LABORATORY MEASUREMENTS	PARAMETER	STORET CODE	RESULTS	DATE ANALYZED	ANALYST	SEDIMENT mg/kg
	☐ Acidity, Total $CaCO_3$, mg/l	P70508.				
	☐ Alkalinity, Total $CaCO_3$, mg/l	P410.				
	☐ BOD, 5-day, mg/l	P310.				
	☐ cBOD, 5-day, mg/l	P80082.				
	☐ BOD, 20-day, mg/l	P324.				
	☐ cBOD, 20 day, mg/l	P80087				
	☐ Carbon, Total Org, mg/l	P680.				
	☐ COD, mg/l	P335.				
	☐ Chloride, Cl, mg/l	P940.				
	☐ Conductivity at 25° C, umhos/cm	P95.				
	☐ Cyanide, Total, ug/l	P720.				
	☐ Nitrate-Nitrite, as N, mg/l	P630.				
	☐ Nitrite, as N, mg/l	P615.				
	☐ Nitrogen, Ammonia as N, mg/l	P610.				
	☐ Nitrogen, Total Kjeldahl, mg/l	P625.				
	☐ Oil and Grease, mg/l	P556.				
	☐ pH, SU	P403.				
	☐ Phenolics, ug/l	P32730.				
	☐ Phosphorus, Total, mg/l	P665.				
	☐ Residue, Total, mg/l	P500.				
	☐ Residue, Total Flt, mg/l	P70300.				
	☐ Residue, Total Nflt, mg/l	P530.				
	☐ Sulfate, SO_4, mg/l	P945.				
	☐ Nitrate (WQM use only)	P620.				
	☐ Fecal Coliform, MF, #/100 ml	P31616.				
	☐ Total Coliform, MF, #/100 ml	P31501.				
	☐					
	☐					
	☐					

PRESERVATIVES

☐ NaOH ☐ H_2SO_4, nutrients ☐ Other
☐ HNO_3 ☐ H_2SO_4, phenolics ☐ Filtered
☐ N/P ☐ H_2SO_4, oil and grease

Comments:

DISTRIBUTION:
WHITE-LAB
GREEN-PERMITS
CANARY-STORET
PINK-DISTRICT

Ohio EPA Division of Water Quality Monitoring and Assessment

Analytical Chemistry Laboratory Sample Submission and Chain of Custody Report

Date Received (Year / Month / Day) _____

Collected by _____

Ohio EPA Districts ☐ NEDO ☐ SWDO ☐ CO ☐ SEDO ☐ NWDO ☐ COU

Date of grab sample _____

Laboratory Number(s) _____

Beginning and End Date of Composite Sample _____

Station(s) _____

Sample Type(s) ☐ Compliance ☐ Ambient ☐ Water Quality Survey ☐ Complaint ☐ Legal Action

Additional Information _____

Condition of Container of Transfer: _____ Locked or Tamper Proof _____ Unlocked or Not Tamper Proof

Number of Samples (Containers/Sites/Parameters) _____

MILITARY TIME

	Year	Month	Day	Hour	Minute
Received from					
Received by					
Received from					
Received by					
Received from					
Received by					
Received from					
Received by					

EPA 4705

Distribution
White — Originator
Canary — Laboratc

FIELD MEASUREMENT DATA FORM

OHIO RIVER VALLEY WATER SANITATION COMMISSION
TOXIC SUBSTANCES CONTROL PROGRAM

FIELD MEASUREMENTS DATA SHEET

STATION ID#_____

LOCATION_____

RIVER_____

QUARTER POINT: (CIRCLE ONE)

RIGHT MID-CHANNEL LEFT

TIME_____A.M./P.M. DATE_____

FIELD INSTRUMENT MODEL_____

SAMPLE COLLECTED BY_____

_____

DEPTH FROM SURFACE	TEMP (^{o}C)	Ph s.u.	CONDUCTIVITY (umhos/cm)
SURFACE	_____	_____	_____
MID-DEPTH	_____	_____	_____
BOTTOM	_____	_____	_____

APPENDIX 4

APPENDIX 4

FIELD DATA FROM 0-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

LAB ID	RIVER mile point	FIELD DATE	TEMP degC sur	TEMP degC mid	TEMP degC bot	pH s.u. sur	pH s.u. mid	pH s.u. bot	COND umhos /cm sur	COND umhos /cm mid	COND umhos /cm bot	D.O. mg/l sur	D.O. mg/l mid	D.O. mg/l bot	Quarter Point
** ALLEGHENY RIVER															
* STATION: PITTSBURGH WATERWORKS															
WA1R	7.4	01/24/89	1.7	1.8	1.9	7.0	6.9	7.0	260	260	259	14.2	14.5	14.7	R
WA1M	7.4	01/24/89	1.7	1.7	1.6	7.0	6.9	6.9	239	239	239	14.2	14.2	14.7	M
WA1L	7.4	01/24/89	1.5	1.5	1.5	7.0	7.0	7.0	245	245	245	14.0	14.1	14.7	L
* STATION: 9th STREET BRIDGE															
WA2R	0.8	01/24/89	1.9	1.9	1.9	7.1	7.0	7.1	259	259	260	15.3	15.6	15.6	R
WA2M	0.8	01/24/89	1.8	1.8	1.8	7.1	7.0	6.9	246	252	249	15.3	15.6	15.9	M
WA2L	0.8	01/24/89	1.6	1.7	1.6	7.0	6.8	6.8	246	248	248	15.2	15.4	15.9	L
** MONONGAHELA RIVER															
* STATION: PETER'S CREEK CONFLUENCE															
WM1R	19.7	01/25/89	4.5	4.5	4.4	7.1	7.1	7.0	204	205	205	13.0	13.0	13.2	R
WM1M	19.7	01/25/89	4.7	4.7	4.8	6.9	7.0	7.1	219	203	203	12.7	12.3	12.8	M
WM1L	19.7	01/25/89	5.4	5.5	5.5	7.1	7.0	7.0	260	262	262	12.0	12.1	12.6	L
* STATION: HAYS MINE (WEST PENN WATER)															
WM2R	4.5	01/24/89	2.8	2.8	3.0	6.9	6.8	6.8	251	252	255	13.1	13.4	13.5	R
WM2M	4.5	01/24/89	2.6	2.6	2.6	7.0	6.9	6.9	249	249	251	13.2	13.6	13.7	M
WM2L	4.5	01/24/89	2.5	2.5	2.5	7.0	7.0	6.6	248	249	250	13.9	14.3	13.9	L
* STATION: SMITHFIELD STREET BRIDGE															
WM3R	0.8	01/24/89	3.6	3.6	3.5	6.8	6.5	6.6	259	259	262	13.3	13.4	13.3	R
WM3M	0.8	01/24/89	2.9	2.8	2.7	6.9	6.8	6.9	263	264	264	13.8	14.4	14.5	M
WM3L	0.8	01/24/89	3.0	3.0	3.0	6.9	6.8	6.9	258	259	258	13.5	13.4	13.8	L
** OHIO RIVER															
* STATION: WEST END BRIDGE															
WO1R	0.7	01/24/89	1.8	1.7	1.7	6.9	6.8	6.7	251	252	254	15.6	15.4	16.2	R
WO1M	0.7	01/24/89	2.6	2.7	2.9	7.0	6.9	6.9	250	254	256	13.5	13.5	13.7	M
WO1L	0.7	01/24/89	3.3	3.3	3.3	6.9	6.9	7.0	251	252	251	12.8	12.9	13.2	L
* STATION: WEST VIEW WATER AUTHORITY															
WO2R	4.5	01/24/89	2.5	2.5	2.5	6.9	6.9	6.8	269	271	274	14.3	14.2	14.0	R
WO2M	4.5	01/24/89	2.7	2.7	2.7	6.9	7.0	6.8	252	252	253	13.9	13.9	13.6	M
WO2L	4.5	01/24/89	3.3	3.2	3.1	6.7	7.0	6.8	268	268	269	13.5	13.1	12.8	L
* STATION: LOWER NEVILLE ISLAND (MAIN CHANNEL)															
WO3R	9.0	01/24/89	2.5	2.5	2.5	6.9	6.9	6.7	270	270	269	14.3	14.0	14.0	R
WO3M	9.0	01/24/89	2.8	2.8	2.7	7.0	7.1	6.9	260	259	259	13.8	13.8	13.6	M
* STATION: LOWER NEVILLE ISLAND (BACK CHANNEL)															
WO3L	9.0	01/24/89	2.9	2.8	2.7	7.0	7.0	7.0	268	269	269	13.9	13.6	13.4	L

FIELD DATA FROM O-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

LAB ID	RIVER mile point	FIELD DATE	TEMP degC sur	TEMP degC mid	TEMP degC bot	pH s.u. sur	pH s.u. mid	pH s.u. bot	COND umhos /cm sur	COND umhos /cm mid	COND umhos /cm bot	D.O. mg/l sur	D.O. mg/l mid	D.O. mg/l bot	Quarter Point
* STATION: SEWICKLEY BRIDGE															
WO4R	12.5	01/24/89	2.7	2.6	2.5	6.3	6.4	6.4	272	274	274	14.1	14.0	14.0	R
WO4M	12.5	01/24/89	2.6	2.6	2.6	6.7	6.7	6.7	267	266	268	14.0	13.9	13.7	M
WO4L	12.5	01/24/89	2.6	2.6	2.6	6.7	6.8	6.7	270	273	275	13.9	13.7	13.6	L
* STATION: MONACA-ROCHESTER BRIDGE															
WO5R	25.3	01/24/89	2.8	2.8	2.8	4.9	4.7	4.5	271	270	268	14.3	14.2	14.3	R
WO5M	25.3	01/24/89	2.8	2.8	2.8	6.2	6.2	6.2	268	265	263	14.4	14.4	14.4	M
WO5L	25.3	01/24/89	2.9	2.9	2.9	5.8	5.7	5.7	272	269	268	14.3	14.4	14.2	L
** BEAVER RIVER															
* STATION: BEAVER FALLS															
WB1M	4.5	01/24/89	3.1	3.2	3.3	6.9	7.1	7.4	438	439	440	13.1	13.1	13.1	M
** OHIO RIVER															
* STATION: MONTGOMERY LOCKS (UPSTREAM)															
WO6R	31.5	01/24/89	2.6	2.6	2.6	6.0	5.9	6.0	292	285	282	14.0	14.0	14.0	R
WO6M	31.5	01/24/89	2.6	2.7	2.6	5.3	5.0	6.5	288	288	262	14.2	14.1	13.8	M
WO6L	31.5	01/24/89	2.8	2.8	2.9	5.8	5.7	5.2	274	269	262	14.2	14.1	14.0	L
* STATION: EAST LIVERPOOL WATERWORKS															
WO7R	40.2	01/24/89	2.5	2.5	2.5	6.6	7.0	6.8	280	284	283	14.7	14.9	14.8	R
WO7M	40.2	01/24/89	2.5	2.5	2.5	7.0	7.0	7.0	280	282	283	15.0	15.0	14.8	M
WO7L	40.2	01/24/89	2.7	2.7	2.7	7.1	7.1	7.0	277	278	279	16.0	15.7	15.2	L
* STATION: YELLOW CREEK LIGHT & DAYMARK															
WO8R	50.0	01/24/89	2.5	2.5	2.5	6.9	7.1	7.1	281	281	283	14.2	14.7	14.6	R
WO8M	50.0	01/24/89	2.6	2.6	2.6	7.1	7.1	7.0	278	279	281	16.3	16.0	15.6	M
WO8L	50.0	01/24/89	2.7	2.6	2.6	7.2	7.2	7.2	274	276	276	15.7	15.6	15.4	L
* STATION: TORONTO WATERWORKS															
WO9R	59.0	01/24/89	4.9	4.8	4.9	7.2	7.2	7.2	274	274	274	15.3	14.8	14.5	R
WO9M	59.0	01/24/89	4.3	4.1	4.1	7.2	7.2	7.2	272	272	272	15.5	15.1	15.1	M
WO9L	59.0	01/24/89	3.5	3.4	3.4	7.3	7.2	7.1	269	269	270	13.5	14.7	14.3	L
* STATION: STEUBENVILLE-WEIRTON WATERWORKS															
WO10R	65.2	01/24/89	4.4	4.3	4.4	6.6	7.1	7.1	283	282	286	13.4	12.5	14.0	R
WO10M	65.2	01/24/89	4.2	4.1	4.2	7.0	7.1	7.0	281	281	282	13.5	12.9	13.6	M
WO10L	65.2	01/24/89	4.1	3.9	3.7	7.1	7.0	7.0	289	289	304	13.9	13.4	13.8	L
* STATION: FOLLANSBEE															
WO11R	69.9	01/24/89	4.6	4.6	4.8	6.5	6.3	6.3	283	283	290	13.7	13.5	14.1	R
WO11M	69.9	01/24/89	4.3	4.2	4.2	6.9	6.2	6.8	281	281	286	12.8	13.2	14.1	M
WO11L	69.9	01/24/89	4.4	4.4	4.5	7.0	6.9	6.7	304	297	345	13.1	13.8	14.1	L

FIELD DATA FROM 0-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

LAB ID	RIVER mile point	FIELD DATE	TEMP degC sur	TEMP degC mid	TEMP degC bot	pH s.u. sur	pH s.u. mid	pH s.u. bot	COND umhos /cm sur	COND umhos /cm mid	COND umhos /cm bot	D.O. mg/l sur	D.O. mg/l mid	D.O. mg/l bot	Quarter Point
* STATION: BRILLIANT-WELLSBURG															
WO12R	72.6	01/24/89	4.7	4.9	5.1	6.7	6.5	6.1	293	294	314	13.3	12.8	13.5	R
WO12M	72.6	01/24/89	4.3	4.3	4.5	6.7	6.5	5.8	280	279	283	13.0	13.3	13.2	M
WO12L	72.6	01/24/89	4.5	4.3	4.3	7.0	7.1	7.1	291	286	288	13.8	12.6	13.2	L
* STATION: WHEELING WATERWORKS															
WO13R	86.8	01/24/89	4.9	4.9	4.9	6.9	6.8	6.6	170	170	171	11.9	11.9	12.2	R
WO13M	86.8	01/24/89	5.0	5.0	4.9	6.8	6.8	6.9	170	171	171	11.9	11.9	11.9	M
WO13L	86.8	01/24/89	4.9	4.8	4.8	6.8	6.8	6.8	170	170	171	11.6	11.6	11.8	L

LABORATORY ANALYSIS DATA FROM O-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

RIVER mile point	LAB ID	COLLECTION DATE	PHENOL Tot ug/l	CYANIDE Tot ug/l	TOTAL SUSPENDED SOLIDS mg/l	HARDNESS CaCO3 Total mg/l	Calcium mg/l	Magnesium mg/l	Quarter Point
** ALLEGHENY RIVER									
* STATION: PITTSBURGH WATERWORKS									
7.4	WA1R	01/24/89	2	<5	7	82	23	6	R
7.4	WA1M	01/24/89	<2	<5	<5	80	22	6	M
7.4	WA1L	01/24/89	<2	<5	<5	82	23	6	L
* STATION: 9th STREET BRIDGE									
0.8	WA2R	01/24/89	2	<5	<5	82	23	6	R
0.8	WA2M	01/24/89	<2	<5	<5	82	23	6	M
0.8	WA2L	01/24/89	<2	8	<5	77	22	6	L
** MONONGAHELA RIVER									
* STATION: PETER'S CREEK CONFLUENCE									
19.7	WM1R	01/25/89	<2	8	5	73	21	5	R
19.7	WM1M	01/25/89	3	22	5	73	21	5	M
19.7	WM1L	01/25/89	6	23	11	90	26	6	L
19.7	WM1B BLANK	01/25/89	<2	5	<5	<7	<1	<1	M
* STATION: HAYS MINE (WEST PENN WATER)									
4.5	WM2R	01/24/89	<2	8	31	82	23	6	R
4.5	WM2M	01/24/89	<2	8	9	82	23	6	M
4.5	WM2L	01/24/89	<2	10	5	82	23	6	L
4.5	WM2B BLANK	01/24/89	<2	<5	<5	<7	<1	<1	M
* STATION: SMITHFIELD STREET BRIDGE									
0.8	WM3R	01/24/89	2	13	32	84	24	6	R
0.8	WM3M	01/24/89	<2	9	5	85	24	6	M
0.8	WM3L	01/24/89	<2	11	5	85	24	6	L
** OHIO RIVER									
* STATION: WEST END BRIDGE									
0.7	WO1R	01/24/89	2	<5	<5	82	23	6	R
0.7	WO1M	01/24/89	<2	11	<5	85	24	6	M
0.7	WO1L	01/24/89	2	12	7	85	24	6	L
* STATION: WEST VIEW WATER AUTHORITY									
4.5	WO2R	01/24/89	2	8	<5	85	24	6	R
4.5	WO2M	01/24/89	<2	9	<5	85	24	6	M
4.5	WO2L	01/24/89	<2	12	<5	87	25	6	L
* STATION: LOWER NEVILLE ISLAND (MAIN CHANNEL)									
9.0	WO3R	01/24/89	<2	8	5	85	24	6	R
9.0	WO3M	01/24/89	<2	19	<5	85	24	6	M

VOLATILE ORGANICS DATA FOR O-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

VOC: ug/l

LAB ID	FIELD	DATE	BENZENE	CHLORO-FORM	ETHYL-BENZENE	NAP-THALENE	TETRA-CHLORO-ETHENE	TOLUENE	1,1,1 TRI-CHLORO-ETHANE	1,2,4 TRI-METHYL-BENZENE	1,2 XYLENE	1,3 XYLENE & 1,4 XYLENE
* STATION: LOWER NEVILLE ISLAND (BACK CHANNEL)												
WO3L		01/24/89	0.3	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
* STATION: SEWICKLEY BRIDGE												
WO4R		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO4M		01/24/89	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO4L		01/24/89	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO4B	BLANK	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
* STATION: MONACA-ROCHESTER BRIDGE												
WO5R		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO5M		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO5L		01/24/89	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO5B	BLANK	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
** BEAVER RIVER												
* STATION: BEAVER FALLS												
WB1M		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
** OHIO RIVER												
* STATION: MONTGOMERY LOCKS (UPSTREAM)												
WO6R		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO6M		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO6L		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
* STATION: EAST LIVERPOOL WATERWORKS												
WO7R		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.3	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO7M		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.4	0.0 U	0.0 U	0.0 U	0.0 U	0.2
WO7L		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.3	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
* STATION: YELLOW CREEK LIGHT & DAYMARK												
WO8R		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO8M		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO8L		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO8B	BLANK	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
* STATION: TORONTO WATERWORKS												
WO9R		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO9M		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO9L		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
* STATION: STEUBENVILLE-WEIRTON WATERWORKS												
WO10R		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
WO10M		01/24/89	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.3	0.0 U	0.3	0.0 U	0.3
WO10L		01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U

VOLATILE ORGANICS DATA FOR 0-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

VOC: ug/l

3	FIELD DATE	BENZENE	CHLORO-FORM	ETHYL-BENZENE	NAP-THALENE	TETRA-CHLORO-ETHENE	TOLUENE	1,1,1 TRI-CHLORO-ETHANE	1,2,4 TRI-METHYL-BENZENE	1,2 XYLENE	1,3 XYLENE & 1,4 XYLENE
10B BLANK	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
STATION: FOLLANSBEE											
1R	01/24/89	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.2	0.0 U	0.0 U	0.0 U	0.3
1M	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.2	0.0 U	0.0 U	0.0 U	0.3
1L	01/24/89	1.5	0.0 U	0.0 U	3.9	0.0 U	0.4	0.0 U	0.0 U	0.0 U	0.3
TATION: BRILLIANT-WELLSBURG											
2R	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.2
2M	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
2L	01/24/89	0.4	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
TATION: WHEELING WATERWORKS											
3R	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
3M	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
3L	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
3B BLANK	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U

LABORATORY ANALYSIS DATA FROM O-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

RIVER mile point	LAB ID	COLLECTION DATE	PHENOL TOT ug/l	CYANIDE TOT ug/l	TOTAL SUSPENDED SOLIDS mg/l	HARDNESS CaCO3 Total mg/l	Calcium mg/l	Magnesium mg/l	Quarter Point
* STATION: LOWER NEVILLE ISLAND (BACK CHANNEL)									
9.0	WO3L	01/24/89	<2	10	<5	87	25	6	L
* STATION: SEWICKLEY BRIDGE									
12.5	WO4R	01/24/89	2	7	5	85	24	6	R
12.5	WO4M	01/24/89	<2	8	6	85	24	6	M
12.5	WO4D DUPL.	01/24/89	2	10	5	85	24	6	M
12.5	WO4L	01/24/89	2	8	<5	87	25	6	L
12.5	WO4B BLANK	01/24/89	<2	6	<5	<7	<1	<1	M
* STATION: MONACA-ROCHESTER BRIDGE									
25.3	WO5R	01/24/89	2	12	<5	85	24	6	R
25.3	WO5M	01/24/89	2	10	5	87	25	6	M
25.3	WO5L	01/24/89	2	12	5	91	25	7	L
25.3	WO5B BLANK	01/24/89	<2	<5	<5	<7	<1	<1	M
** BEAVER RIVER									
* STATION: BEAVER FALLS									
4.5	WB1M	01/24/89	4	<5	<5	146	42	10	M
** OHIO RIVER									
* STATION: MONTGOMERY LOCKS (UPSTREAM)									
31.5	WO6R	01/24/89	2	8	<5	96	27	7	R
31.5	WO6M	01/24/89	2	8	5	96	27	7	M
31.5	WO6L	01/24/89	2	8	7	94	26	7	L
* STATION: EAST LIVERPOOL WATERWORKS									
40.2	WO7R	01/24/89	2	9	5	99	28	7	R
40.2	WO7M	01/24/89	<2	8	5	96	27	7	M
40.2	WO7L	01/24/89	<2	8	6	96	27	7	L
* STATION: YELLOW CREEK LIGHT & DAYMARK									
50.0	WO8R	01/24/89	2	6	5	96	27	7	R
50.0	WO8M	01/24/89	2	6	<5	90	26	6	M
50.0	WO8D DUPL.	01/24/89	2	5	<5	90	26	6	M
50.0	WO8L	01/24/89	2	6	6	87	25	6	L
50.0	WO8B BLANK	01/24/89	<2	<5	<5	<7	<1	<1	M
* STATION: TORONTO WATERWORKS									
59.0	WO9R	01/24/89	2	6	5	90	26	6	R
59.0	WO9M	01/24/89	2	6	6	90	26	6	M
59.0	WO9L	01/24/89	2	5	5	90	26	6	L
* STATION: STEUBENVILLE-WEIRTON WATERWORKS									
65.2	WO10R	01/24/89	3	7	7	90	26	6	R

LABORATORY ANALYSIS DATA FROM 0-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

RIVER mile point	LAB ID	COLLECTION DATE	PHENOL TOT ug/l	CYANIDE TOT ug/l	TOTAL SUSPENDED SOLIDS mg/l	HARDNESS CaCO3 Total mg/l	Calcium mg/l	Magnesium mg/l	Quarter Point
65.2	WO10M	01/24/89	3	6	5	90	26	6	M
65.2	WO10L	01/24/89	3	8	7	90	26	6	L
65.2	WO10B BLANK	01/24/89	<2	<5	<5	<7	<1	<1	M
* STATION: FOLLANSBEE									
69.9	WO11R	01/24/89	5	6	6	90	26	6	R
69.9	WO11M	01/24/89	2	6	8	85	24	6	M
69.9	WO11L	01/24/89	7	30	9	90	26	6	L
* STATION: BRILLIANT-WELLSBURG									
72.6	WO12R	01/24/89	2	7	7	96	27	7	R
72.6	WO12M	01/24/89	3	6	8	91	25	7	M
72.6	WO12L	01/24/89	4	17	<5	94	26	7	L
* STATION: WHEELING WATERWORKS									
86.8	WO13R	01/24/89	4	9	5	94	26	7	R
86.8	WO13M	01/24/89	2	10	5	91	25	7	M
86.8	WO13L	01/24/89	2	12	5	94	26	7	L
86.8	WO13B BLANK	01/24/89	<2	<5	<5	<7	<1	<1	M

VOLATILE ORGANICS DATA FOR 0-85 TOXICS SURVEY
ORSANCO -- JANUARY, 1989

VOC: ug/l

B	FIELD DATE	BENZENE	CHLORO-FORM	ETHYL-BENZENE	NAP-THALENE	TETRA-CHLORO-ETHENE	TOLUENE	1,1,1 TRI-CHLORO-ETHANE	1,2,4 TRI-METHYL-BENZENE	1,2 XYLENE	1,3 XYLENE & 1,4 XYLENE
ALLEGHENY RIVER											
STATION: PITTSBURGH WATERWORKS											
1R	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
1M	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
1L	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
STATION: 9th STREET BRIDGE											
2R	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
2M	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
2L	01/24/89	0.0 U	0.0 U	0.2	0.0 U	0.0 U	0.4	0.0 U	0.4	0.4	0.7
MONONGAHELA RIVER											
STATION: PETER'S CREEK CONFLUENCE											
R	01/25/89	0.3	0.0 U	0.0 U	0.0 U	0.0 U	1.2	0.0 U	0.2	0.2	0.3
M	01/25/89	0.5	0.0 U	0.0 U	0.0 U	0.0 U	0.5	0.0 U	0.2	0.0 U	0.2
L	01/25/89	2.9	0.0 U	0.2	4.3	0.0 U	1.8	0.0 U	0.3	0.4	0.6
B BLANK	01/25/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.8	0.0 U	0.2	0.0 U	0.3
TATION: HAYS MINE (WEST PENN WATER)											
R	01/24/89	1.3	0.0 U	0.0 U	0.0 U	0.0 U	0.3	0.0 U	0.2	0.0 U	0.3
M	01/24/89	1.2	0.0 U	0.0 U	0.0 U	0.0 U	0.2	0.0 U	0.0 U	0.0 U	0.0 U
L	01/24/89	1.4	0.0 U	0.0 U	0.0 U	0.0 U	0.2	0.0 U	0.0 U	0.0 U	0.0 U
B BLANK	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
TATION: SMITHFIELD STREET BRIDGE											
R	01/24/89	0.6	0.0 U	0.0 U	0.0 U	0.0 U	0.3	0.0 U	0.0 U	0.0 U	0.2
M	01/24/89	0.9	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.2
L	01/24/89	0.7	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.2
OHIO RIVER											
TATION: WEST END BRIDGE											
R	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.3	0.0 U	0.0 U	0.0 U
M	01/24/89	0.5	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.3	0.0 U	0.0 U	0.0 U
L	01/24/89	0.4	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
TATION: WEST VIEW WATER AUTHORITY											
R	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
M	01/24/89	0.2	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
L	01/24/89	0.3	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U
'ATION: LOWER NEVILLE ISLAND (MAIN CHANNEL)											
R	01/24/89	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.3	0.0 U	0.0 U	0.0 U
M	01/24/89	0.3	0.3	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U	0.0 U