Preface

This study is the outgrowth of a proposal by Republc Steel Corporation to employ a new approach in evaluating the benefits that might result by passage from BPT (Best Practicable Control Technology Currently Available) to BAT (Best Available Technology Economically Achievable). (See Appendix IV.)

The suggested approach was to assume that the water quality goals of fishable and swimmable waters were achieved regardless of any technological or site specific constraints and to develop the benefits which would then result. This approach eliminates the need for very complex, time consuming, and costly water quality analysis and modelling projections and provides a screening technique to determine if further detailed study should be undertaken; if the simplified approach determines benefits clearly unfavorable in view of the costs anticipated, the need for the more complex review is eliminated.

Republic Steel discussed this approach with U.S. EPA in the summer of 1981 and it was agreed that an initial study should be undertaken by an independent contractor to parallel the U.S. EPA study of the Mahoning River so that the two studies could be compared. A protocol for the study was developed in cooperation with U.S. EPA with an additional provision that the benefit estimate be an "upper bound" estimate and "reflect the maximum possible level of benefits." It was on this basis that the present study was prepared.

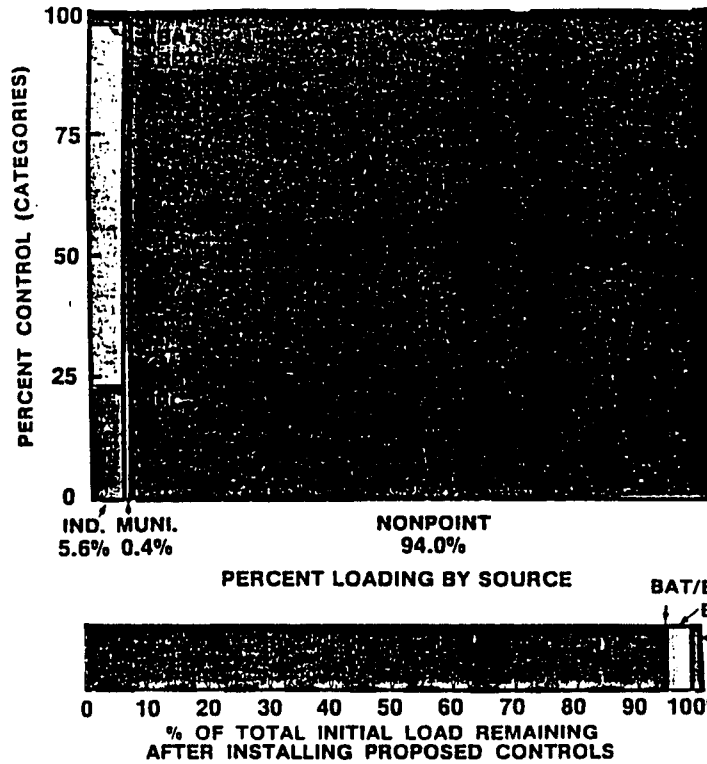
The rationale behind the upper bound approach is to start out with some hard numbers that have a strong empirical basis which can provide a ceiling on the benefits estimates and then lower this upper bound as our empirical knowledge permits. The reason this upper bound approach has been chosen instead of a more customary best estimate "approach" is that at our current state of empirical knowledge any best estimate is subject to a wide and often unknown margin of error. To place the gross upper bound benefit calculated in this study in proper perspective, it is necessary to understand the implications of the assumptions made concerning non-point sources (NPS) and sewerage treatment plant STP sources of pollution. This study assumes that STP will attain secondary treatment (ST) and non-point sources will be brought under control at the same time as BAT is achieved. This, at present, appears to be an unrealistic assumption.

The consequences of violating this assumption are indicated in Figures i and ii for total suspended solids (TSS) and biological oxygen demand (BOD), respectively. If the mid-seventies is taken as a base period, the implementation of BPT by industrial point sources and secondary treatment by municipal sewerage treatment plants will only reduce the total loading of TSS by 5.5 per cent. Passage to BAT and best practical wastewater treatment technology (BPWTT) will only reduce TSS by an additional 0.2 per cent (see Appendix V) as shown in Figure i. Non-point sources if not controlled will continue to provide 94.1 per cent of the base period loading.

A similar story is told for biological oxygen demand (BOD). The implementation of BPT and ST will reduce the base period loading

Figure i

MAHONING RIVER SUSPENDED SOLIDS LOADING DISCHARGE SUMMARY *



*TOTAL AREAS REPRESENT 2,582 MILLION LBS./YEAR SUSPENDED SOLIDS

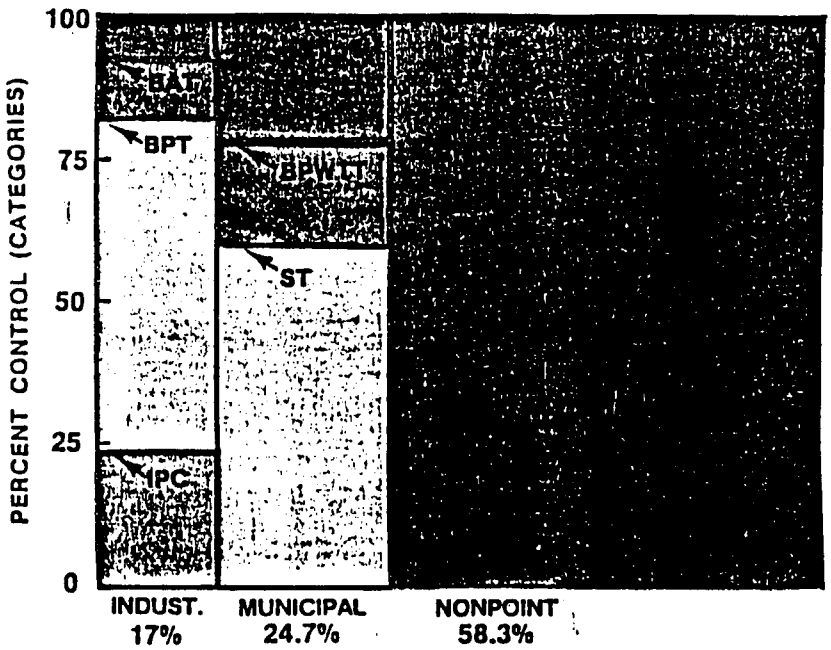
KEY: BPT - BEST PRACTICAL CONTROL TECHNOLOGY
BAT - BEST AVAILABLE CONTROL TECHNOLOGY
ST - SECONDARY TREATMENT
BPWTT - BEST PRACTICAL WASTEWATER TREATMENT TECHNOLOGY
IPC - INDUSTRIAL PLANT CLOSINGS

INFORMATION SOURCES:

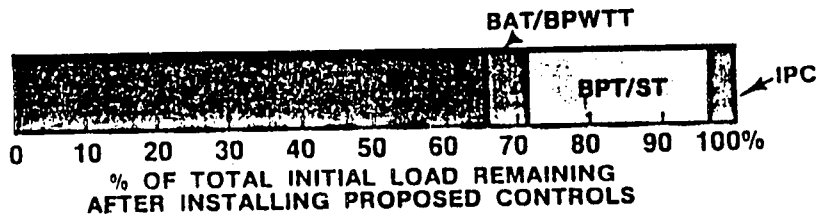
1. MAHONING RIVER - WASTE LOAD ALLOCATION STUDY, USEPA, MAY 1977.
2. MAHONING RIVER - WASTE LOAD ALLOCATION STUDY, USEPA, NOV. 1980.
3. THE NATIONAL RESIDUAL DISCHARGE INVENTORY, R.A. LUKEN ET AL, JAN. 1976.
4. PRELIMINARY REPORT ON FEASIBILITY STUDY ON THE REMOVAL OF BANK AND RIVER BOTTOM SEDIMENTS IN THE MAHONING RIVER, HAVENS & EMERSON, JUNE, 1976.

Figure ii

MAHONING RIVER
BOD
LOADING DISCHARGE SUMMARY*



PERCENT LOADING BY SOURCE



* TOTAL AREAS REPRESENT 72.5 MILLION LBS./YEAR BOD

KEY: BPT - BEST PRACTICAL CONTROL TECHNOLOGY
BAT - BEST AVAILABLE CONTROL TECHNOLOGY
ST - SECONDARY TREATMENT
BPWTT - BEST PRACTICAL WASTEWATER TREATMENT TECHNOLOGY
IPC - INDUSTRIAL PLANT CLOSINGS (IND)

INFORMATION SOURCES:

1. MAHONING RIVER - WASTE LOAD ALLOCATION STUDY, USEPA, MAY 1977.

2. MAHONING RIVER - WASTE LOAD ALLOCATION STUDY, USEPA, NOV. 1980.

3. THE NATIONAL RESIDUAL DISCHARGE INVENTORY, R.A. LUKEN ET AL, JAN. 1976.

by 28.8 per cent. The passage to BAT and BPWTT will reduce the base period loading by an additional 6.1 per cent as shown in Figure ii; non-point sources will still contribute 58.3 per cent of the base period BOD loading. If the municipal STP's do not attain ST and non-point sources of pollution are not brought under control, BAT will reduce the base period BOD loading by only 30.5 per cent and a large part of the benefits ascribed to BAT in this study will not be realized. This point is discussed in greater detail in Appendix V.

The small water quality improvement that has occurred with the closure in the past three years of five of the eight steel plants operating on the Mahoning River(resulting in a 22 per cent reduction in the industrial TSS and BOD loadings but only a 1 per cent reduction in the total TSS loading and 4 per cent reduction in the total BOD loadings) suggests that the attainment of BAT by the remaining industrial users may result in only small improvements in present water quality, unless substantial progress is made with NPS and STP sources of pollution, with near zero additional economic and social benefits.

In addition, as Havens and Emerson (1976) pointed out, low water flow and maximum temperature conditions play an important role in the attainment of the TSS and BOD Water Quality Standard. Increased minimum flows and/or lower maximum temperatures could achieve substantial water quality improvement even at current permit conditions for the other standards.

The remainder of this study assumes that STP and NPS will be brought under control at the same time as industrial users achieve BAT on the Mahoning River.

The upper bound limit in this study was initially calculated under extreme assumptions such as capacity utilization and zero travel time for all users to the newly created water recreational opportunities, so that in fact it was not a least upper bound but a gross upper bound. A second estimate was made with more realistic assumptions concerning travel times and the value of leisure to recreational users but retaining the assumption of capacity utilization of the new recreational opportunities. While this is called a "best estimate" it still has the character of an upper bound estimate since it retains the capacity utilization assumption but makes less extreme assumptions about travel times and the value of leisure.

The author acknowledges the cooperation of the U.S. EPA and Ohio EPA in providing information employed in this study.

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APPENDICES

I. INTRODUCTION AND SUMMARY

This study undertakes the task to determine the social and economic benefits resulting from the improvement in water quality on the Mahoning River, Warren, Ohio, to its confluence with the Beaver River at New Castle, Pennsylvania, that will be brought about by the passage from Best Practical Control Technology Currently Available (BPT) to Best Available Control Technology Economically Achievable (BAT).

The method of computing the social and economic benefits was first to establish an upper bound on the benefits by making assumptions that would maximize benefits resulting from the implementation of BAT. The question of whether the attainment of Ohio and Pennsylvania Water Quality Standards by the implementation of BAT, for all discharges, is technically feasible is still not a settled matter. Nevertheless, the value of the potential benefits was calculated on the assumption that the implementation of BAT would achieve the Ohio and Pennsylvania Water Quality Standards without exception. It was assumed that non-point sources of water pollution would not prevent the attainment of the Water Quality Standards, or if they did, they could be controlled.

To attain the upper bound of benefits it was assumed that all the benefits flowing from the implementation of BPT have been realized

and that any additional benefits that occur may be ascribed to BAT. This overstates the benefits attributed to BAT to the extent that some of the benefits anticipated from PBT have not been realized. To achieve the upper bound on benefits it was further assumed that all potential uses made possible by the achievement of the Water Quality Standards would be utilized to maximum capacity and that whatever additional costs required for land acquisition, access, or developmental purposes would be made.

In addition to this upper bound estimate of benefits, a second and more likely estimate was calculated in which the effects of site constraints and more realistic assumptions concerning the utilization of the potential opportunities created by the new water quality standards were made.

No improvement of the Mahoning River bottom is mandated by either the Ohio or Pennsylvania Water Quality Standards, However, since recent studies indicated that many of the recreational benefits would be deferred for a period ranging from 5 to 10 years until the bottom was scoured by natural forces, it was felt necessary to assume such an expenditure to dredge the bottom would be made so that the benefits would be available quickly and would not be unduly delayed. The U. S. Army Corps of Engineers (USCE) commissioned a feasibility study of the cost of removal of the bottom sediments in the Mahoning River (USCE 1976, Appendix III). They considered alternatives ranging from $234,000 for selective dredging of one small reach of the river and the removal of two dams to $17,768,000 in 1980 prices, respectively, for the complete dredging of the river bottom.

In order to make all benefits comparable they were all expressed in terms of present discounted value in 1981 prices employing a

10 percent rate of discount. The rate of discount chosen is that required by the Office of Management and the Budget to be given in the evaluation of all water resource projects. Where it was necessary to convert various sums into 1981 prices, the Consumer Price Index was employed. This probably resulted in an overstatement of the benefits but it is consistent with the upper bound methodology employed.

The study concluded that the assumed improvement in water quality on the Mahoning River resulting from the passage to BAT would yield significant gross social and economic benefits; the net benefit depends on a consideration of the costs involved which are beyond the scope of this study. The upper bound on these benefits was $70.8 million present discounted value and the most likely benefit was estimated at $28.3 million disregarding the effect of the fish population on angler participation. The components of the total potential benefits are shown in Table 1 on a present discounted value basis and on an annual basis in Table 2. The increasing value of the annual benefit is the result of estimating the cost of leisure at the prevailing wage rates and assuming this would rise in real terms over time. The benefits given in Tables 1 and 2 assume that the publicly owned waste treatment works and non-point sources of pollution will be brought under control. The effect of the timing of this attainment was not considered in this study.

User Benefits

The principal benefits accrue to recreational users of the Mahoning in the form of increased fishing opportunities. The major portion of the boating benefits have already been realized as a result of the now in place BPT and only a small additional increment may be possible. The benefits to industrial users was found to be negligible.

In the case of industrial users it was found the potential water users quality requirements were either so stringent as to require extensive

TABLE 1

Summary of the Social and Economic Benefits of the Implementation of Best Available Technology Economically Achievable on the Mahoning River (in Millions of 1981 dollars)[1/]

	Gross Upper Bound Estimate	Best Upper Bound Estimate
Diversionary Users	0.6	0.1
Industrial	0.3	0.0 [2/]
Potable Water	0.3	0.1
Recreational Users	46.8	26.8
Fishing	40.8 (23.5)[3/]	23.6 (13.6)[3/]
Boating and Canoeing	6.0	3.2
Total User Benefits	47.4	26.9
Total Non-User Benefits	23.4	1.4
TOTAL	70.8 (53.5)[3/]	28.3 (18.3)[3/]

1/ All benefits expressed as present discounted values.

2/ Less than $100,000.

3/ Benefit if condition were imposed that anglers would have to catch at least one lb. of fish per activity day and the standing crop of fish equalled 300 lb./acre. See page 48a.

TABLE 2. Annual Social and Economic Benefits of the Implementation of BAT on the Mahoning River

(thousands of dollars)

Upper Bound Estimate

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Diversionary Users	64	64	64	64	64	64	64	64	64	64
Industrial	29	29	29	29	29	29	29	29	29	29
Potable Water	35	35	35	35	35	35	35	35	35	35
Recreational Users	4244	4305	4366	4425	4487	4553	4620	4690	4762	4835
Fishing	3729	3783	3837	3893	3951	4010	4070	4132	4196	4261
Boating	515	522	529	532	536	543	550	558	566	574
Total User Benefit.	4308	4369	4430	4489	4551	4617	4684	4754	4826	4899
Total Non-user Benefit	2122	2152	2183	2212	2243	2276	2310	2345	2381	2417
Total Annual Benefit	6430	6521	6613	6701	6794	6893	6994	7099	7207	7316

Source: Text below

Best Estimate

Diversionary Users	13	13	13	13	13	13	13	13	13	13
Industrial	4	4	4	4	4	4	4	4	4	4
Potable Water	9	9	9	9	9	9	9	9	9	9
Recreational Users	2430	2469	2509	2550	2592	2634	2679	2724	2771	2818
Fishing	2152	2186	2221	2257	2294	2331	2370	2410	2451	2492
Boating	278	283	288	293	298	303	309	314	320	326
Total User Benefits	2443	2482	2522	2563	2605	2647	2692	2737	2784	2831
Total Non-User Benefits	140	140	140	140	140	140	140	140	140	140
Total Annual Benefits	2583	2622	2662	2703	2745	2787	2832	2877	2924	2971

Source: Text below

treatment of water from any source, or so low as to permit the use of water from any source with little or no treatment. In fact, the effect of BPT on water treatment costs at the Beaver Falls Water Treatment Plant demonstrated that improved water quality may impose negative benefits on industrial users (see Federal Water Pollution Control Administration 1966 and Peskin and Seskin 1975, p. 71).

A small benefit was found to accrue to the present potable water facilities at Beaver Falls, the sole public water supply on both the Mahoning below Warren and on the Beaver River.

In an almost complete survey of industrial users, reproduced in Appendix III, it was also found that many industrial users' reasons for not using the river for part of their water needs had nothing to do with the quality of the water. In many cases their consumption of water was so low that it did not warrant the installation of pumping equipment or that the varying level of the river posed too much of a problem. Large users of water from the river employ it with little, or no, treatment. The one large company that was found considering switching to the river for part of its water supply, and which was included in the benefits of Table 1, indicated it might do so even with the present water quality.

No health benefits were assigned even though the question of possible health benefits was examined. No food processing or agricultural use of water was found on either the Mahoning or Beaver Rivers. Whatever health effects that might exist would have to result from the Beaver Falls public water supply which also serves the community of New Brighton.

The principal health damages found to occur as a result of poor water quality are bacterial and viral infections, neither of which pose a problem at Beaver Falls. The widely publicized link between chlorination and cancer was found to be tenuous and even if established would have little effect on public health under the conditions which exist at the Beaver Falls Public Water Authority.

Non-User Benefits

Non-user benefits were the most difficult to estimate both because they are both difficult to define and difficult to measure. The problem is further complicated by the paucity of empirical studies on the subject. Freeman (1979a) cites only three estimates of non-user benefits and, to the best of our knowledge, there have only been two published studies added to this list since 1979. None of these studies are fully applicable to the problem at hand. The problem of how to assign non-user benefits, some of which are based on national estimates, to a specific water pollution site has largely been neglected thus far.

The handful of empirical studies attempting to measure non-user benefits must be considered exploratory and experimental. There is no agreement concerning the definition of non-user benefits, the validity of the techniques thus far employed to measure them, and their commensurability with user benefits. This lack of consensus is shown in the wide range of estimates that have been obtained thus far (Freeman 1979a). There is no question that the concept of non-user

benefits is a valid one as has been shown in various national public opinion polls. But these same polls also have shown the relative importance placed on environmental quality is variable over time. Of 10 national issues reported regularly upon (Council on Environmental Quality, 1980, p. 7), environmental quality ranked ninth in 1965, second in 1975 and sixth in 1980 in the priority the public wished the government to give to it. Whether non-user water quality benefits have shown the same instability, or whether the value placed on other national goals have been the cause of this instability has not been tested.

The principal method that has been employed to estimate the value of non-user benefits have been questionnaires directly asking people what they would be willing to pay to achieve, or preserve, some level of environmental quality. However, since no attempt has been made to establish a budget constraint on the respondents, one does not know how to evaluate the sums given in reply to the questions. In a democracy one could argue that what people are willing to pay for environmental quality is what they are paying. Survey methods implicitly assume there is a defect in the political process which prevents this willingness to pay from becoming manifest in political decisions. The survey results are sometimes difficult to reconcile with people's actual behavior with respect to approving relatively small increases in their water bills to improve sewerage treatment facilities, and reluctance to approve new bond issues for improved water treatment facilities.

Non-user benefits comprised one-third of total benefits in the upper bound estimate and 5 per cent of total benefits in the best estimate. The empirical basis for both of these estimates was very slender and they represent no more than educated guesses.

Given our present state of knowledge concerning non-user benefits, any decision in which the consideration of non-user benefits is important enough to be a decisive factor should be examined very carefully.

Net Social and Economic Benefits

The ultimate determination of whether proceeding from BPT to BAT on the lower Mahoning River may produce significant net social benefits as distinguished from the gross benefits calculated in this study will depend on the cost of obtaining these benefits. This study has provided one element of the cost-benefit equation. It suggests that the maximum upper bound costs of implementing BAT would have to lie in the $28 - $71 million range for it to result in positive net social and economic benefits. A more realistic estimate of benefits taking into account the effect of the fish population on angler participation would lie in a range of $18 - $53 million. Furthermore, rational decision making would require the linking of specific benefits with specific costs to arrive at a socially optimal decision.

II. THE MAHONING RIVER WATER QUALITY STANDARD

The purpose of this study is to determine the social benefits which can be anticipated from the passage from the Best Practicable Control Technology Currently Available (BPT) to the Best Available Technology Economically Achievable (BAT).

The Federal Water Pollution Control Act of 1956 as amended enumerates the benefits to be considered from the implementation of water quality standards:

1. Support of a warm water fishery
2. Provide a water supply for domestic uses, human consumption after treatment, industrial uses, livestock and irrigation
3. Boating
4. Fishing
5. Swimming
6. Natural area qualities (esthetic setting)
7. Treated waste accumulation

The general procedure to be followed is to assume that all the benefits from the present water quality at BPT have been realized, although this is probably not true, and to calculate the additional benefits accruing to users and non-users made possible by the passage

to BAT. This assumption will tend to overstate the benefits derived from BAT to the extent that the benefits from BPT have not yet been fully realized.

The Ohio and Pennsylvania Water Quality Standards are not fully coordinated for the Mahoning River. The Mahoning River is supposed to meet the Pennsylvania Standard at the state line. For purposes of this study it is assumed that the Pennsylvania Water Quality Standards are controlling and that the entire Mahoning River lying in the study area will meet the Pennsylvania Standard with the passage to BAT, without confirming whether or not this assumption is technically feasible. The present Pennsylvania Water Quality Standards for the Mahoning River are given in Table 3.

The relatively small improvement in water quality which has occurred since 1976, even though five of the eight steel plants located on the Mahoning River ceased discharges to the river with their closure, raises substantial doubts as to whether the implementation of BAT will effect the major change in water quality which this study assumes occur. It appears that the role of non-point sources of pollution (including the type, amount, and timing of reservoir draw-downs) may be relatively more important than was previously believed in determining water quality on the Mahoning River. Adequate analysis of the relationship between changes in point source effluent pollution and changes in stream quality is lacking and unfortunately such important environmental characteristics as the turbidity and odor of the water are no longer monitored.

No improvement in the Mahoning River bottom is mandated by either the Ohio or Pennsylvania Water Quality Standards.

Table 3

Pennsylvania Water Quality Criteria
Adopted September 2, 1971
Amended 3 times in 1974
Mahoning River-Ohio-Pennsylvania Line to Mouth

pH	6 to 8.5	
DO	5 mg/L min. daily avg.-not less than 4	
T iron	not more than 1.5 mg/L	
Temp.	Not to exceed -	
	January	50°
	February	50°
	March	60°
	April	70°
	May	80°
	June	90°
	July	90°
	August	90°
	September	90°
	October	78°
	November	70°
	December	57°
Diss. Solids	Not more than 500 mg/L as monthly avg.-max. 750 mg/L	
Bacteria	Fecal coliform-geometric mean of 200/100 ml	
Threshold Odor No.	Not more than 24 at 60° C.	
Fluoride	Not more than 1.0 mg/L	
Cyanide	Not more than .025 mg/L	
Phenol	Not more than .005 mg/L	

Mahoning River·

Uses - warm water fish, water supply (domestic, use by humans after treatment for drinking, industrial, livestock water supply, irrigation), boating, fishing, swimming, natural area (esthetic setting), power, treated waste accumulation

However until the river bottom is scoured by natural forces, which might take 5 to 10 years according to Havens and Emerson, consulting engineers (USCE 1976, Appendix III p. VI-1), the recreational benefits resulting from the establishment of a warm water fishery will be delayed (Wurtz 1973, p. 38). In order not to unduly delay the level of recreational benefits it was assumed that some action would be taken to improve the river bottom. The U.S. Army Corps of Engineers (USCE hereafter) commissioned a feasibility study of the cost of removal of the bottom sediments in the Mahoning River (USCE 1976, Appendix III). The study considered alternative ranging from $234,000 to $17,768,000 in 1980 prices for the complete dredging of the river bottom.

III. Definition of the Study Area

For purposes of this analysis, the study area is defined as the lower Mahoning River from Warren, Ohio to its mouth, a distance of 42.0 miles. The width of the Lower Mahoning in this stretch varies from approximately 139 feet to 239 feet with a mean width of 165 feet, encompassing approximately 839 acres of surface area (Oral communication, Dr. Robert Raucher, EPA Washington, D.C.) an average of 20 acres per mile.

The Beaver River is formed by the confluence of the Mahoning and Shenango Rivers. The Mahoning and Shenago Rivers drain approximately equal areas and contribute approximately equal volumes of water to the Beaver River Connoquessing Creek flows into the Beaver River (river mile 9) 6.5 miles above the Eastvale Dams.

For purposes of calculations used in this study, therefore, effluent limitations on point sources on the Mahoning River will affect the water quality of 42.0 miles of stream, which encompass 839 surface acres of water.

These waters lie in Mahoning and Trumbull Counties, Ohio, and Lawrence County, Pennsylvania. Mahoning and Trumbull Counties contain the Warren-Youngstown industrial complex including the cities of Niles and Girard. They are bounded by Ashtabula, Geauga, Portage, Stark and Columbiana Counties in Ohio. Lawrence County, Pa. is located between the Warren-Youngstown metropolitan area to the northwest and the

Pittsburgh metropolitan area to the southeast. Lawrence County is bounded by Mercer, Beaver, and Butler Counties in Pennsylvania and by Trumbull and Mahoning Counties in Ohio.

The lower Mahoning riverfront is occupied 60 per cent by industrial development and railroads, 10 per cent by urban development and 30 per cent by open and undeveloped land (USCE 1976, p. 60). The riverfront from Niles to Lowellville is virtually continuous industrial development. A large part of the undeveloped riverfront property is owned by steel and railroad companies.

The Mahoning River is intensively used by a steel manufacturing complex (which, until 1977, consisted of eight separate plants), a power generating station, and eight Ohio municipalities which discharge treated wastewaters into the river. Between 1977 and 1980, five of the steel plants ceased operations. To maintain current industrial and other water uses, the flow of the Mahoning River is highly regulated for low flow augmentation, temperature control, and flood control with a complex system of reservoirs operated by the U.S. Army Corps of Engineers.

As the steel industry expanded in the Mahoning valley, it found that the stream flow was inadequate in low water conditions. To assure adequate water supply and to permit further expansion of the steel industry, five major reservoirs were constructed between 1916 and 1963. This program resulted in the creation of large, new water resources which now provide most of the

TABLE 4

Population Growth of Counties of the Beaver Valley Watershed

Ohio	1970	1980	Percentage Change 1970 - 1980	Average Annual Percentage Change
Ashtabula	98,237	104,215	6.1	0.6
Columbiana	108,310	113,472	4.8	0.5
Geauga	62,997	74,474	18.2	1.7
Mahoning	304,545	289,487	- 4.9	-0.5
Youngstown	(140,880)	(115,427)	(-18.1)	(-0.3)
Portage	125,868	135,856	7.9	0.8
Stark	372,210	378,823	1.8	0.2
Trumbull	232,579	241,863	4.0	0.4
Girard	(14,001)	(12,489)	(-10.8)	(-1.1)
Niles	(20,447)	(21,324)	(4.3)	(0.4)
Warren	(63,494)	(56,624)	(-10.8)	(-1.1)
Pennsylvania				
Beaver	208,418	204,441	- 1.9	-0.2
Butler	127,941	147,912	15.6	1.5
Lawrence	107,374	107,150	- 0.2	0.0
Mercer	127,225	128,299	0.8	0.1
United States				
	203,300,000	226,500,000	11	1.1

Source: U. S. Census 1980

water recreational opportunities for the Mahoning Valley and adjacent areas.

The rate of growth of population in recent years as shown in Table 4 has been well below the national average with the exception of Butler County in Pennsylvania and small Geauga County in Ohio. This decline has been largely associated with the decline in employment in the steel industry in the region. The rate of population growth is expected to remain below the national average until at least the end of the century (USCE 1976, p. 24).

Existing Recreational Facilities

Residents of the Mahoning Valley have ready access to many bodies of water that are suitable for recreation. (See Table 5 and 6). It is noteworthy that most of the water acreage currently available for recreation is as close to the major concentrations of population in the Mahoning Valley as the potential recreation areas that may be created by the passage from the BPT to BAT figure 1). For example, Warren is 5 miles, Niles is 7 miles, and Youngstown is 16 miles from Mosquito Lake. Youngstown is also 15 miles from Shenango Lake.

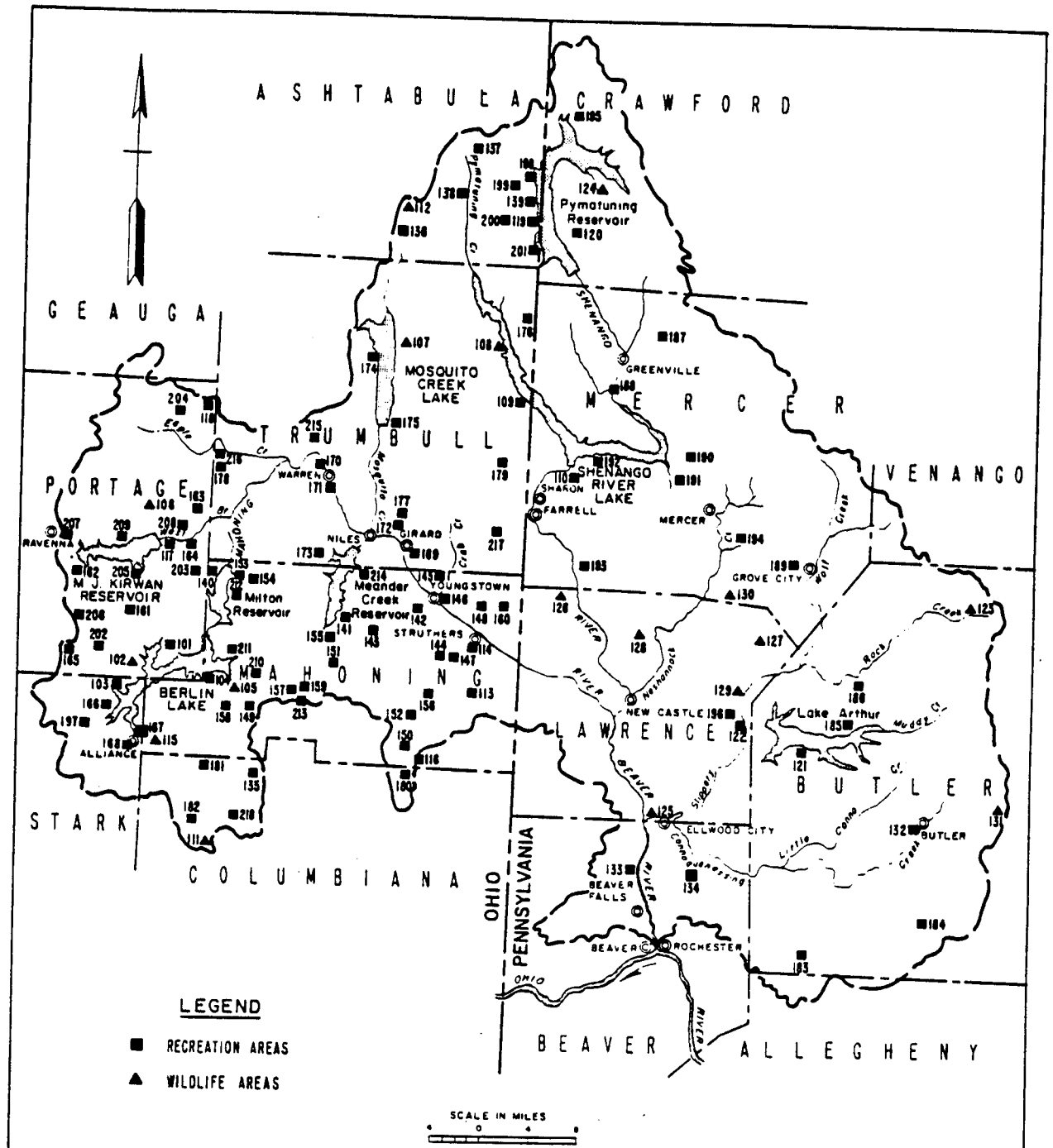
There are 46,585 acres of recreational water in the Beaver Valley watershed of which 18,011 acres, or 39 percent, are available for recreation in Mahoning and Trumbull Counties, 6,439 acres in Mahoning County and 11,572 in Trumbull County. The 839 acres of the Mahoning's water encompassed in the study area represent 1.8 per cent of the recreational water acres in the Beaver watershed and 4.6

Table 5

Principal Recreational Water Facilities in the Warren-Youngstown-New Castle-Butler Area.

Name	LOCATION		ACREAGE			
	County	State	Water	Swimming	Boating	Fishing
Berlin Lake	Portage, Stark and Mahoning	Ohio	3,336	X	X	X
Mosquito Creek Lake	Trumbull	Ohio	7,850	X	X	X
Shenango River Lake	Trumbull	Ohio	3,550	X	X	X
Evans Lake	Mahoning	Ohio	556		X	X
Hamilton Lake	Mahoning	Ohio	104		X	X
Pine Lake	Mahoning	Ohio	474		X	X
Michael J. Kirwan (reservoir)	Portage	Ohio	2,650	X	X	X
Pymatuning State Park	Ashtabula and Crawford	Ohio Penna.	20,000	X X	X X	X X
Moraine State Park	Butler	Penna.	3,225	X	X	X
Lake Milton	Mahoning	Ohio	1,685	X	X	X
Mill Creek Park	Mahoning	Ohio	176		X	X
TOTAL			43,606			

Source: U.S. Army Corps of Engineers, 1976.



BEAVER RIVER BASIN STUDY AREA
OHIO AND PENNSYLVANIA
RECREATION AND WILDLIFE AREAS

FIGURE 1

20

TABLE 6

RECREATION INVENTORY

BEAVER RIVER BASIN		LOCATION		ACREAGE		WATER ORIENTED	SWIMMING	BOATING	FISHING	PICNICKING	CAMPING	HIKING	HUNTING	REMARKS
SITE NO	NAME	COUNTY	STATE	LANDS	WATER									
101	BERLIN LAKE	PORTAGE	OHIO	3.090	1.720	X	X	X	X	X	X	X	X	
102	BERLIN LAKE WILDLIFE AREA	"	"	709	4				X				X	
103	BERLIN LAKE	STARK	"	215	292	X	X	X	X	X	X		X	
104	BERLIN LAKE	MAHONING	"	735	1 324	X		X	X	X			X	
105	BERLIN LAKE WILDLIFE AREA	"	"	570					X			X	X	
106	RAVENNA ARSENAL - U S.													
	MILITARY RESERVATION	PORTAGE	"	21 408	16								X	
107	MOSQUITO CREEK LAKE	TRUMBULL	"	3.983	7 650	X	X	X	X	X	X	X		
108	SHENANGO RIVER LAKE WILDLIFE AREA	"	"	4 829									X	
109	SHENANGO RIVER LAKE	"	"	11 500	3 550	X	X	X	X	X	X		X	
110	SHENANGO RIVER LAKE	MERCER	PENNSYLVANIA											
111	ZEPERNICK LAKE WILDLIFE AREA	COLUMBIANA	OHIO	473	41	X		X	X					
112	NEW LYME WILDLIFE AREA	ASHTABULA	"	930									X	
113	EVANS LAKE	MAHONING	"		566			X	X					
114	HAMILTON LAKE	"	"		104			X	X					
115	LAKE PARK WILDLIFE AREA	"	"	73	20			X	X				X	
116	PINE LAKE	"	"		474			X	X	X				
117	MICHAEL J KIRWAN RESERVOIR	PORTAGE	"	5.223	2 650	X	X	X	X	X	X	X	X	
118	NELSON-KENNEDY LEDGES	"	"	167						X		X		
119	PYMATUNING STATE PARK	ASHTABULA	"	1 339	3 566	X	X	X	X	X	X	X	X	
120	PYMATUNING STATE PARK	CRAWFORD	PENNSYLVANIA	3 957	16 420	X	X	X	X	X	X	X	X	
121	MORAINE STATE PARK	BUTLER	"	12.696	3 225	X	X	X	X	X	X	X		
122	McCONNELLS MILL	LAWRENCE	"	2.800				X	X	X	X	X	X	
123	STATE GAME LANDS #95	BUTLER	"	6.420									X	
124	STATE GAME LANDS #214	CRAWFORD	"	1.135									X	
125	STATE GAME LANDS #148	LAWRENCE	"	369									X	
126	STATE GAME LANDS #150	"	"	504									X	
127	STATE GAME LANDS #151	"	"	1 039									X	
128	STATE GAME LANDS #178	"	"	163									X	
129	STATE GAME LANDS #218	"	"	1 186									X	
130	STATE GAME LANDS #284	MERCER	"	1 241									X	
131	STATE GAME LANDS #164	BUTLER	"	399									X	
132	ALAMEDA PARK	"	"	400			X			X		X		
133	BRADY'S RUN PARK	BEAVER	"	1 460	22	X	X	X	X	X	X	X		
134	BRUSH CREEK PARK	"	"	807										
135	WILLOW SPRINGS LAKE	COLUMBIANA	OHIO	53	7		X		X	X				
136	CONNEAUT PARK	ASHTABULA	"	40			X		X	X				
137	PENKUS FISHING	"	"	50	5				X	X	X			
138	JEFFCO LAKE	"	"	106	35		X	X	X	X	X	X		
139	SHADY LAKE CAMP	"	"	72	0					X	X			
140	LAKE MILTON	MAHONING	"	1.171	1 685	X	X	X	X	X	X	X	X	
141	MEANDER LAKE F & G REFUGE	"	"	2.868	2.010									
142	MILL CREEK PARK	"	"	2.213	176			X	X	X		X		
143	AUSTINTOWN TOWNSHIP PARK	"	"	97						X				
144	BOARDMAN TOWNSHIP PARK	"	"	198	2					X		X		
145	CRANDALL PARK	"	"	41	1					X		X		
146	LINCOLN PARK	"	"	59			X			X				
147	POLAND MUNICIPAL FOREST	"	"	245						X		X		

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TABLE 6 (Cont'd)

RECREATION INVENTORY

BEAVER RIVER BASIN		LOCATION		ACREAGE		WATER ORIENTED	SWIMMING	BOATING	FISHING	PICNICKING	CAMPING	HIKING	HUNTING	REMARKS
SITE NO	NAME	COUNTY	STATE	LANDS	WATER									
148	ROOSEVELT PARK	MAHONING	OHIO	64			X			X				
149	RURITAN PARK	"	"	80						X		X		
150	ARROWHEAD LAKE PARK	"	"	275	25	X	X	X	X	X	X			
151	DAY CAMP	"	"	50	5		X			X				
152	GREENFIELD LAKE	"	"	72	8				X	X				
153	HIYA SWIM CLUB	"	"	75			X			X	X	X		
154	KOASIS	"	"	62			X				X			
155	LAKE PALMYRA PARK	"	"	103	3		X			X				
156	LAKE WILACO	"	"	192	8				X				X	
157	PONDEROSA PARK	"	"	77	10		X			X	X			
158	ROLLING MEADOWS LAKE PARK	"	"	77	3				X	X	X			
159	WESTERN RESERVE LAKE	"	"	80	15		X		X		X			
160	WILLOW RANCH	"	"	50						X				
161	FAMILY ACRES	PORTAGE	"	50	2		X		X	X	X			
162	HICKORY HILLS PARK	"	"	47	15		X	X		X	X			
163	HIDEAWAY WOODS LAKE	"	"	52	5				X	X	X			
164	LEISURE LAKE PARK	"	"	187	13		X		X	X	X			
165	SHULTZ LAKE	"	"	23	37			X	X	X	X			
166	DEER CREEK LAKE	STARK	"	10	313			X	X				X	
167	MAPLE BEACH PARK	"	"	44					X	X		X		
168	SILVER PARK	"	"	54	1				X	X		X		
169	LIBERTY PARK	TRUMBULL	"	75			X			X				
170	PACKARD PARK	"	"	48						X				
171	PERKINS PARK	"	"	40						X				
172	TOD MEMORIAL PARK	"	"	55						X				
173	CEDAR LAKE	"	"	36	8		X			X				
174	DEMUKAITIS TRAILER PARK	"	"	40				X	X	X	X			
175	FARMER JIM'S	"	"	40	2		X			X				
176	KINROD GUN CLUB	"	"	80	8				X				X	
177	LIBERTY LAKE	"	"	20	99			X	X	X				
178	RIDGE RANCH	"	"	100	15	X	X	X	X	X	X			
179	YANKEE LAKE	"	"	80	40	X	X	X	X	X				
180	FIRESTONE PARK	COLUMBIANA	"	40	2		X			X				
181	WESTVILLE LAKE	"	"	21	139	X	X	X	X	X	X			
182	PARADISE LAKE PARK	"	"	100	30		X		X	X	X			
183	KOA	BUTLER	PENNSYLVANIA								X			
184	GLADE LAKE CAMPGROUND	"	"								X			
185	KOA MORAINE PARK	"	"								X			
186	MORAINE PARK SAFARI CAMP	"	"								X			
187	FARMA CAMPGROUND	MERCER	"								X			
188	REIMOLD BROS TENT PARK	"	"								X			
189	HALE'S EVERGREEN CAMPGROUND	"	"								X			
190	JIM'S PICNIC & CAMPSITE	"	"								X			
191	RED CARPET CAMPGROUND	"	"								X			
192	COSTAR MARINE & SPORT CENTER	"	"								X			
193	CAMPBELL'S CAMP SHENEGO	"	"								X			
194	KOA-MERCER-GROVE CITY	"	"								X			
195	WHISPERING TRAILS	CRAWFORD	"								X			

FOR SITE LOCATION, SEE FIGURE 1

percent of the recreational waters presently in Mahoning and Trumbull Counties, if this entire acreage were available for recreational use. As a consequence, the addition of the Mahoning to the recreational supply should not have any major impact on the use of existing water recreational facilities.

IV. Benefits to Industrial Users Resulting From BAT

To determine the benefits that would accrue from the improvement in water quality a survey of all industrial water users in Mahoning and Trumbull Counties in Ohio, and Beaver and Lawrence Counties in Pennsylvania was undertaken. Sources of industrial water supply were identified from records of the Bureau of Water Quality Management of the Pennsylvania Department of Natural Resources, Ohio EPA, U.S. Army of Corps of Engineers and commercial registers. In all, 39 firms were surveyed either by telephone or mail. Transcripts of these interviews are given in Appendix IV. It was found that none of the lists examined were totally current and there is the possibility that a few firms may have been missed but these would all be small users of industrial water and would not change the general results obtained.

It was found that water that does not meet the Pennsylvania water quality standards is still suitable for many uses. Babcock and Wilcox draws water from the Beaver River at West Mayfield as does the Townsend Division of Textron at New Brighton and the Union Drawn Division of Republic Steel at Beaver Falls, all without significant treatment.

On the other hand it was found that most industries would not draw water from the Mahoning or Beaver Rivers even if the Pennsylvania water quality standard were met. Plants located at significant elevations or distances from the river find the pumping costs too high

to warrant use. The difficulty of pumping and the problem of variable water depth caused the Ellwood Stone Company to discontinue drawing river water. Other firms indicated they had specialized water requirements which would not be met by the attainment of the Pennsylvania standards. For example, the McDaniel Porcelain Refactory in Beaver Falls purifies publicly supplied water before use. Improved river water quality would not be of significance to these firms. Finally, many firms and municipalities have already developed water supplies that are not dependent on the Mahoning and Beaver Rivers. These users indicated that the improvement of the water quality on the Mahoning and Beaver Rivers to meet the Pennsylvania standards would not provide sufficient economic incentive to them to change their source of water supply as long as their present supplies proved adequate. The supply of ground water in the Beaver River watershed, which includes the Mahoning River, appears to be adequate until at least the end of the century (USCE 1976, Appendix II, p. 72).

While the present water quality does not prevent its use as a water supply, it does impose higher treatment costs for some firms than would be incurred if the Standards were met. Of all the firms surveyed only three indicated there was a possibility that the improvement in water quality to be achieved by BAT would produce a savings to them. The Mayer China Company indicated an annual saving of $2400 and Falcon Foundry indicated an unspecified saving. The Falcon Foundry Company had an annual water bill of $2400 to $3600 and

it is assumed that their maximum saving would be 50 percent of the larger amount, or $1800 annually.

The Packard Electrical Division of General Motors is considering using the present river water for cooling operations, at an annual gross cost saving of $24,960 a year producing a present discounted value of $249,600 (not including capital and operation costs). The total upper bound prospective savings by industrial users equals $29,160 annually producing a present discounted value of $291,600. our upper bound limit. However, since Packard Electrical indicated it might use the river at its present water quality, it was excluded from our best estimate.

Consideration was also given to the possibility that the presence of higher water quality could attract new industry. The few studies which have examined the effect of improved water resource availability on regional economic development suggest that this is not a powerful instrument of economic growth:

> "Water does not constitute a barrier to economic development nor does the presence of large quantities of water guarantee rapid growth" (Howe, 1960).
>
> "Water resource development projects are likely to be poor tools for accelerating economic growth of rural counties" (Cox, 1971).
>
> "Correlation between population growth and investment in water resource projects is statistically insignificant" (Carson, 1973).

These studies were supported by the Survey, particularly the interview with Mr. William Decicco of the Castlo Community Improvement Corporation located in Struthers, Ohio (reproduced in Appendix IV).

who is trying to develop an industrial park. On the basis of the survey and the existing evidence, it was concluded that improved water quality will not prove a major stimulus to industrial development in the Mahoning Valley. Adequate sources of low-cost industrial water supplies are presently available in the Mahoning Valley.

V. Reduced Treatment Cost for Potable Water

The principal treatment cost savings from water quality improvement would accrue to the Beaver Falls Municipal Water Authority, the only operator of potable water plants drawing water from either the lower Mahoning or Beaver Rivers. This Authority operates two plants that draw water from the Beaver River at Eastvale and New Brighton. These plants use two types of treatment: break-point chlorination and a potassium permanganate treatment process.[1]

The potassium permanganate system is used instead of the chlorination system whenever the organics in the river require too high a dosage of chlorine to effectively operate the chlorination system. Such conditions exist about 8-1/2 percent of the time. The chlorination treatment is preferred both because it produces water of better taste and odor and because it is less expensive. The cost savings which could be realized if the potassium permanganate treatment were never used would be $5,063 per year. In addition, with current water quality, chlorine is used not only to disinfect, but also to precipitate out iron and manganese. If the need for

---

[1]This information is based on interviews conducted in 1976 and 1981 reproduced in Appendix IV.

precipitation were eliminated, the use of chlorine could be reduced from 600 lbs per day to 400 lbs per day. At a cost of $2.45 per lb, this would amount to a cost savings of $49 per day or $17,885 per year. The elimination of the chlorite treatment would save $12 a day or $4,380 annually.

Carbon is used to improve the taste and odor of the water. The type of the musty taste and odor sometimes present in the water is not that normally associated with the type of pollution present in the Mahoning River. It is likely the present taste and odor arises mainly from leaves and other natural organic material during run-offs and reservoir drawdowns. Nevertheless, for our upper bound estimate we assume that the complete elimination of the carbon treatment would be made possible by the passage to BAT, resulting in an annual cost saving of $17,885.

The total potential upper bound cost savings to the Beaver Falls Municipal Water Authority resulting from BAT would amount to $35,358 annually and is summarized in Table 7. Using a 10 percent rate of discount, the present discounted value of all future cost savings is $353,580. This is an upper bound estimate and is unlikely to be realized in practice. We have assumed all the water treatment problems at Beaver Falls are due to pollution in the Mahoning, when, in fact, the Mahoning contributes less than half the total volume of water to the Beaver River by the time it reaches Beaver Falls. Significant sources of pollutants arise in the Shenango River and Connoquenessing

Creek. Secondly, as mentioned above, the taste and odor problem probably is not caused by pollution in the Mahoning River so that the carbon treatment would still be necessary. Taking all these factors into account for our best estimate, we omit the savings due to the elimination of the carbon treatment and ascribe only one-half the remaining cost savings to the implementation of BAT on the Mahoning River. This results in an annual cost saving of $8,737 and a present discounted value of all future savings of $87,370 as our best estimate of the cost saving resulting from BAT.

It is paradoxical that the improvement in water quality resulting from BPT actually increased the treatment costs at the Beaver Falls Water Authority. The use of chlorine declined by 100 lbs a day for an annual savings of $4,015 but the use of aluminum sulphate increased by 800 lbs. a day, costing an additional $21,900 per year for a total net annual additional cost increase of $17,885. The reason for the additional aluminum sulphate was that it requires a slightly acidic environment to work most efficiently. The reduction in pollutants not only from the Mahoning, but also from acid mine drainage in the Connoquesnessing Creek, reduced the acid of the Beaver River and decreased the efficiency of the aluminum sulphate treatment.

TABLE 7

Summary of Upper Bound Costs Savings by the
Beaver Falls Water Authority Resulting
from the Implementation of BAT

	Annual Cost Saving
200 lbs/day chlorine @ $0.11	$ 8,030
200 lbs/day carbon @ $0.245	17,885
160 lbs/day potassium permanegate @ $1.02 (Used only 8.5% of time)	5,063
12 lbs/day sodium chlorite @ $1.00	4,380
Total Annual Savings	$ 35,358

Source: 1976 and 1981 interviews with the Beaver Falls Water Authority, reproduced in Appendix IV.

VI. Health Benefits

As mentioned above, no community in the lower Mahoning Valley covered by this study draws its drinking water from the Mahoning. The one public water supply which exists on the Beaver River is located at Beaver Falls (river mile 15.5) and New Brighton (river mile 3.5) and serves 16,500 residential customers. The waters of the Beaver and the Mahoning are not used for agricultural purposes or for food processing.

The Mahoning River has been designated for full body contact recreation, however, it is doubtful if there would be any significant use of the river for this purpose because of its physical characteristics, variable flow, relatively elevated temperature, which would be close to the maximum established by the standard and the large amount of suspended solids originating from non-point sources (USCE 1976, p. II-58).

The communities in the Mahoning and Beaver Valley draw their water supply from wells, tributaries, lakes and reservoirs (USCE 1976, p. 153). There is adequate ground and surface water to meet anticipated future needs. No municipal water supply authority indicated it would draw water from the Mahoning River even if the Pennsylvania water quality standards were met because of the variable level of the river and high suspended solids after rain runoffs. (USCE 1976 pp. 156-60).

Whatever health affects there may be from pollution in the Mahoning River have to operate wholly through their effect on the Beaver Falls water supply.

The relationship between water pollution and health has not been established. Myrick Freeman in summarizing the literature on the subject states," . . . it is not clear that water pollution has affected health and mortality rates in a quantitatively significant way (Peskin and Seskin 1975, p. 95)." There has been no reported problem in Beaver Falls with bacterial and viral diseases transmitted by the public water supply.

There was a widely publicized but poorly read study on the relationship between chlorination of drinking water and cancer. (Science Research Systems 1980). Since there is a possibility that pollution in the Mahoning may affect the rate of cholorination at the Beaver Falls plant (although see the interview with the plant manager in Appendix IV), it may be useful to recall the conclusions of the Science Research Systems study:

> "Estimates made from animal data of human cancer risks from lifetime consumption of water from some highly polluted (italics added) wells are small enough that they would probably not contribute noticeably to human cancer rates" (p. vi).
>
> "No clear trend of increasing cancer risks with the increasing exposure to organic contaminants [including trihalogenated methanes] in drinking water has been demonstrated by the studies conducted to date although evidence suggestive [italics added] of such trends has been obtained for rectal cancer in one study and for colon cancer in another study.") p.v).

Even under BAT, chlorination of drinking water will still be required since sufficient bacterial contamination will be present even in water that meets the Water Quality Standard.

There is not sufficient evidence to establish a causal link between the presence of chloroform and trihalogenated methanes and cancer (National Academy of Sciences 1978, pp. 4-5, and Science Research Systems 1980, p.35), and there is no other evidence to link pollution in the Mahoning River with any health hazard in the Beaver Falls Municipal water supply. As a consequence, no benefits are assigned for health resulting from the passage from BPT to BAT.

VII RECREATION BENEFITS

There is no standard method for estimating the benefits derived from the greater availability of outdoor recreation. In the past some studies have made use of the personal costs incurred by users in securing outdoor recreation (Mack 1965). The 1975 National Survey of Hunting, Fishing and Wildlife-Associated Recreation found anglers spent an average of $11.50 per recreation day and hunters spent $12.50.

The Federal Government specifies that the benefits of a water project are to be measured by "the willingness to pay for each increment in supply provided." (18 CFR Part 713 Subpart K) The basic theory underlying this approach is shown graphically in figure 2 (a more complete explanation is given in Appendix I). The horizontal axis measures the number of recreation activity days demanded and the vertical axis measures the willingness to pay (cost) for a specified number of activity days. The curve DD' shows how much the public would be willing to pay for a given number of recreational activity days. Above a certain cost no activity days would be demanded and at increasingly lower costs there will be progressively a larger number of recreational activity days demanded. If there is some explicit cost P, e.g. an entry fee charged, this will determine the number of activity days actually demanded (OQ_1). The difference between what consumers actual pay for the activity $OPAQ_1$ and the maximum they would

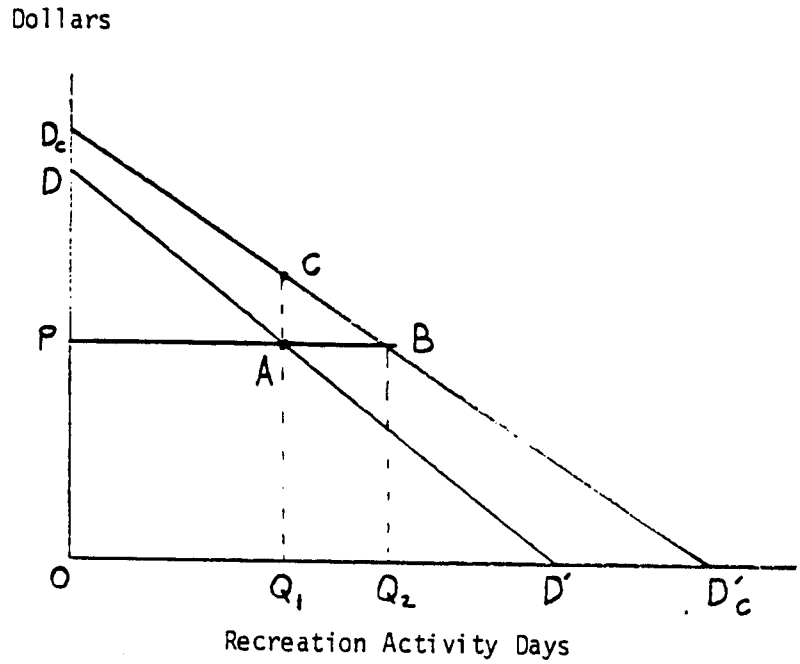


FIGURE 2

be willing to pay if the seller were a discriminating monopolist is the triangle PAD which is called the consumer surplus by economists.

Now if the water quality improved, consumers would presumably be willing to pay more for each activity day if they believed its value to them were now greater and as a consequence the demand curve would shift upward to D_cD_c' in figure 2. If the entry fee remained the same, the amount $0Q_2$ activity days would be demanded and the consumer surplus would be now PBD_c. The change in consumer surplus $DABD_c$, is the measure of increased social benefits the consumer receives.[1] If the capacity of the activity were strictly limited to say $0Q_1$ then this would constrain the change in consumer surplus to the amount $DACD_c$.

The problem then is to determine the demand for the recreational activity before and after the change in water quality. The Federal Government specifies three alternative methods for evaluation of the change in consumer surplus (18 CFR Part 713 Subpart K).

A. The Travel Cost Method (TCM).

The basic premise of the method is that per capita use of a recreation site will decrease as out-of-pocket and personal time costs increase while other variables remain constant. TCM derives a demand curve using the variable costs of travel and the value of time as proxies for price [see Clawson and Knetsch (1966) for specific details]. This method is approved by the Federal Government for site specific and regional studies.

[1] See Mäler (1971) for a rigorous presentation of this approach.

B. Questionnaire (Contingent Valuation) Method

This method asks individual households directly what is their willingness to pay for changes in recreation opportunities at a given site. Aggregate values are obtained by summing up the willingness to pay of all users of the recreation activity.

C. Unit day value.

This method relies on expert or informed opinion and judgement to estimate the average willingness to pay of recreation users in order to obtain an approximation of a projects recreation benefits. For general recreation, fishing and hunting a range of from $1.07 to $3.20 per activity day is given. Applying the criteria provided, an experience on the Mahoning River would be valued at approximately $2.07 an activity day (Federal Register, Vol.44, No. 242 pp. 72962-3).

In addition to these methods approved by the Federal Government, economists have employed another method to estimate the demand for a specific recreational activity. This approach estimates econometric equations relating the participation in specified recreation activities by a given population to the socio-economic characteristics variables of a specific population (e.g. income, age, education, etc.) and to the supply and quality of specific recreation opportunities available to that population (Davidson, Adams and Seneca 1966). In this method, an improvement in water quality is treated as an increase in supply of recreational opportunities which, when

plugged into the expenditure equation, yields an estimate of the changed participation of the given population in the specified recreational activity. What it, in fact, has done is estimate the point B on the new demand curve in figure 2. A monetary value to a recreation is assumed, or derived from some other source and used to calculate the total value of the increased participation. This method is population specific. For example, it would not be theoretically justified to apply an expenditure equation of this type based on a national sample to estimate the demand for a recreation activity in Ohio, except as a rough approximation. One of the important weaknesses of this method is that it is not site specific and cannot take into account site constraints, e.g. if one has wall-to-wall factories along a stretch of stream that limit public access, where it is obvious that a change in participation rates forecast by a change in water quality will not be realized in this stream segment and some external adjustments must be made to the participation forecast.

This digression on the variety of methods used to estimate the social benefits resulting from an improvement in water quality has been made to lay the groundwork for appreciating the value of an alternative simpler method that will be employed in this study. In order to avoid the many empirical and theoretical complexities in estimating the shape of the present demand curve for a recreational activity and a hypothetical new curve demand curve under the assumption of some assumed change in water quality, a simpler method is

suggested, namely, the calculation of an upper bound limit on the social benefits arising from a change in water quality.

The Upper Bound Limit on Social Benefits

The upper bound limit on the increased social benefits arising from the water quality improvement resulting from the passage from BPT to BAT is based on two assumption:

1. There are alternative substitute sites for the newly augmented water quality site. For example, there are fishing opportunities available to the potential users of the Mahoning at other sites in Ohio and Pennsylvania equivalent to those that will be created on the Mahoning.

2. The newly created site will be used to its maximum supply capacity.

The first assumption places an upper bound on the unit value of the newly created recreational experience. No one will be willing to pay more for the new opportunity than one would have to pay for the equivalent opportunity at another site. The second assumption places an upper bound on the demand for the recreation activity at the new site. Demand cannot exceed the supply capacity of the new site.

The estimation of this upper bound requires a great deal less information than any of the other methods employed to calculate social benefits discussed above except the unit value day method. One needs only information on the cost of access of the nearest equivalent recreation opportunity and the supply capacity of the new recreation opportunity. Both items of information

are relatively easy to obtain at low cost and entail far fewer and less constroversial techniques than those required to estimate the demand curves for a recreational activity.

The method applied in this study, rather than employing, the opportunity costs of access to the nearest equivalent recreation opportunity, employs the cost of access to the most distant equivalent activity (actually the equivalent activity whose distance is such that only 5 percent of the participants in the specified travel further for such an experience). What is calculated is not a least upper bound but an upper bound which is normally much larger than a least upper bound on benefits. Graphically this upper bound may be compared with the measure of social benefits present in figure 2. Point Q* of figure 3 exceeds or equals Q_2 as it must always do and point T is the user cost of the equivalent substitute stream with the highest user cost. The benefit is the rectangle OTT'Q* is the upper bound by a considerable margin, as it must always be.

The advantage of the upper bound limit approach is that it provides one side of a cost-benefit analysis and permits rapid screening of those projects in which the costs greatly outweigh the benefits as explained in the OECD technical handbook on the Economic Measurement of Environmental Damage (Mäler and Wyzga 1976).

> "The accuracy demanded of monetary damage estimates [benefits] will depend on the size of the difference between the estimates of the benefit-cost equation. If the costs are much greater than the benefits, then even a sizeable error in the estimate of either side of the equation will allow the same decision to be

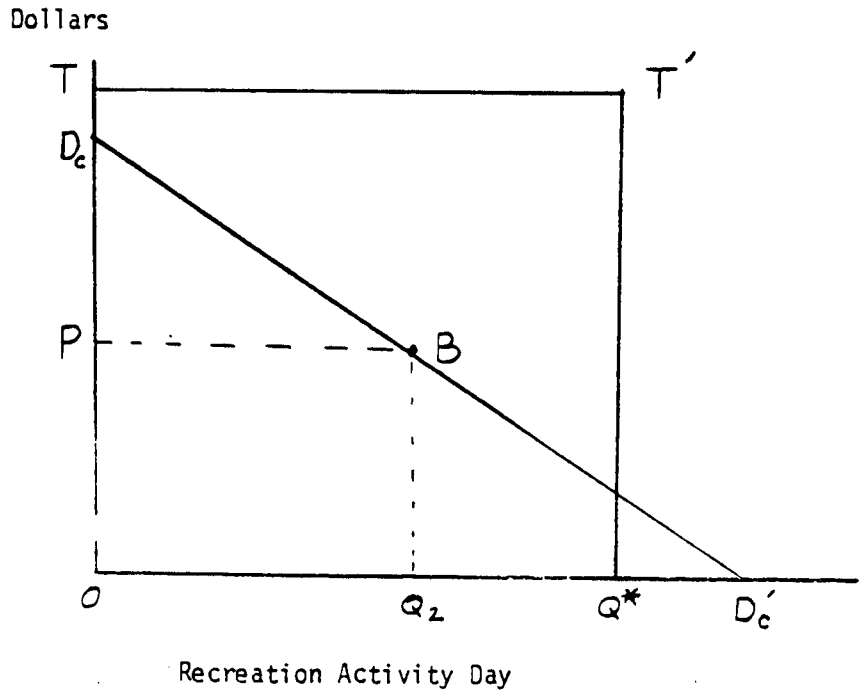


FIGURE 3

> reached. The magnitude of the difference between the two sides of the equation is not known in advance (or the analysis would never have been undertaken), but if the resulting difference is large, substantial confidence can be placed in the result of the analysis. (p. 119)

Where the difference between the estimates of costs and benefits are small, then a more detailed analysis must be undertaken in order to make a decision.

VIII. Recreation Benefits on the Mahoning

For the purposes of evaluating the recreation benefits to be obtained from the adoption of BAT, the Mahoning River must be divided into three distinct segments:

1. The mouth of the Mahoning (river mile 0) to Lowellville, Ohio (river mile 13.0). The banks of the river here are largely in a natural state. Since this segment of the river lies in a flood plain most development is well back from the river at higher elevations. There is abundant natural cover and a substantial wildlife population. Although largely natural, the scenery lacks any particular interesting features. The oil on the water and the banks of the river which was observed in 1976 has disappeared below the Lowellville Dam. The segment holds the largest recreational potential of the river in our study area.

2. The segment from Lowellville to Niles (river mile 32.3) which at present is heavily polluted consists of wall-to-wall industrial development almost over its entire length (figs. 4-5). It contains five low head dams and numerous water intakes and outfalls. There is an almost lack of public access and, in fact, the river in this segment only may be observed by the public at bridge crossings. This segment has no recreational potential irrespective of the quality of the water in the Mahoning River.

Figure 4

The Mahoning River, Ohio-Youngstown to Lowellville

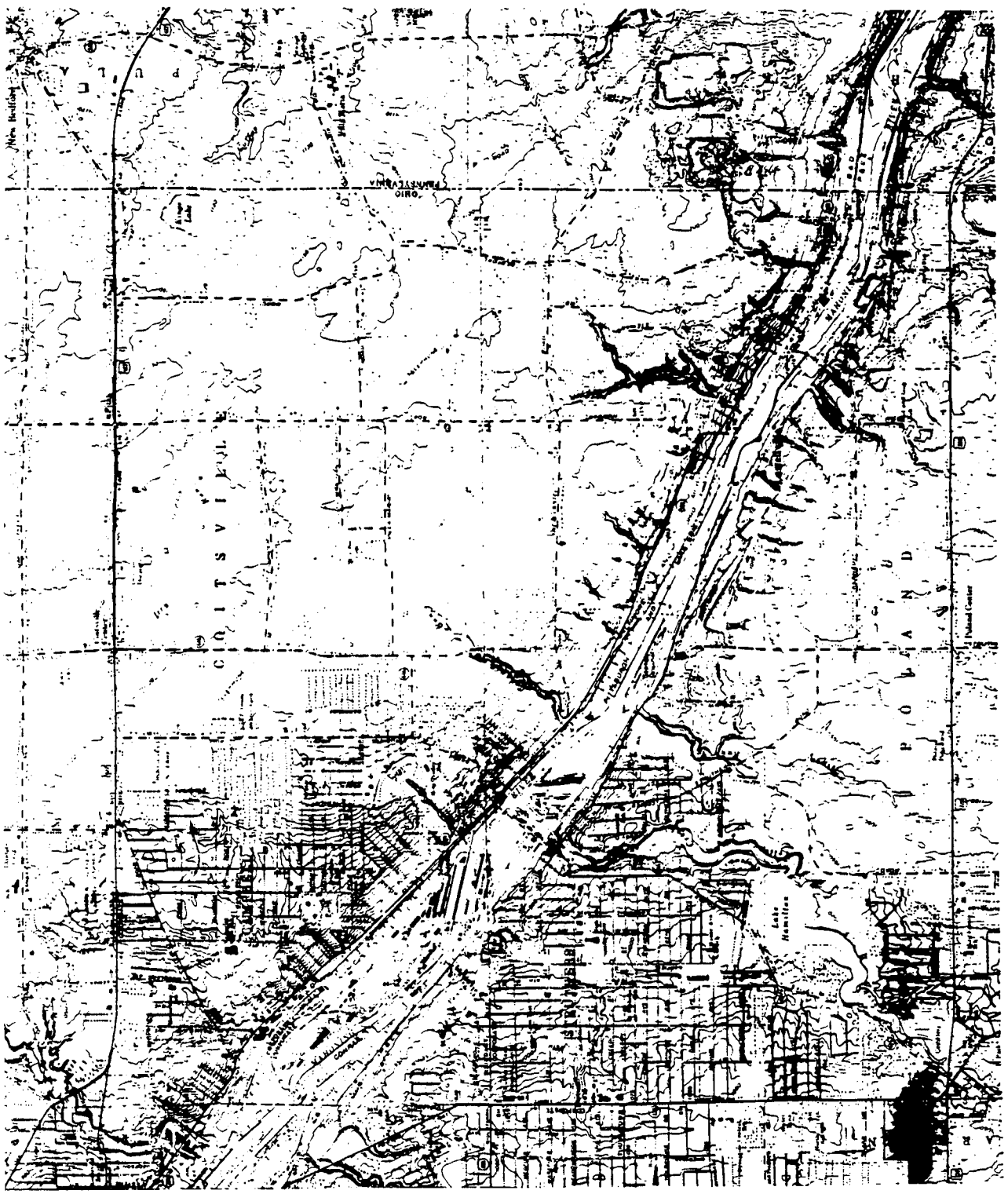
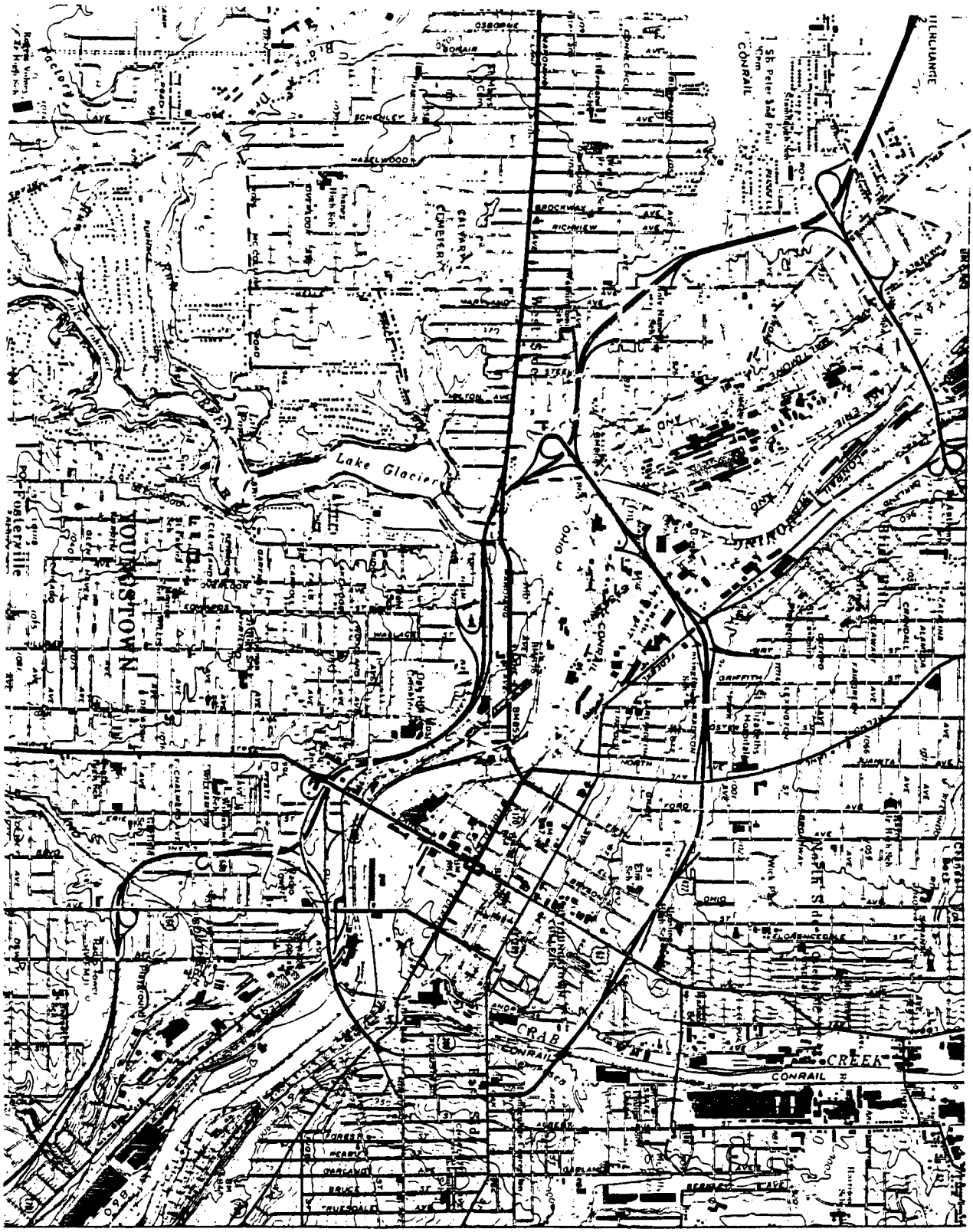


Figure 5

The Mahoning River, Ohio-Youngstown



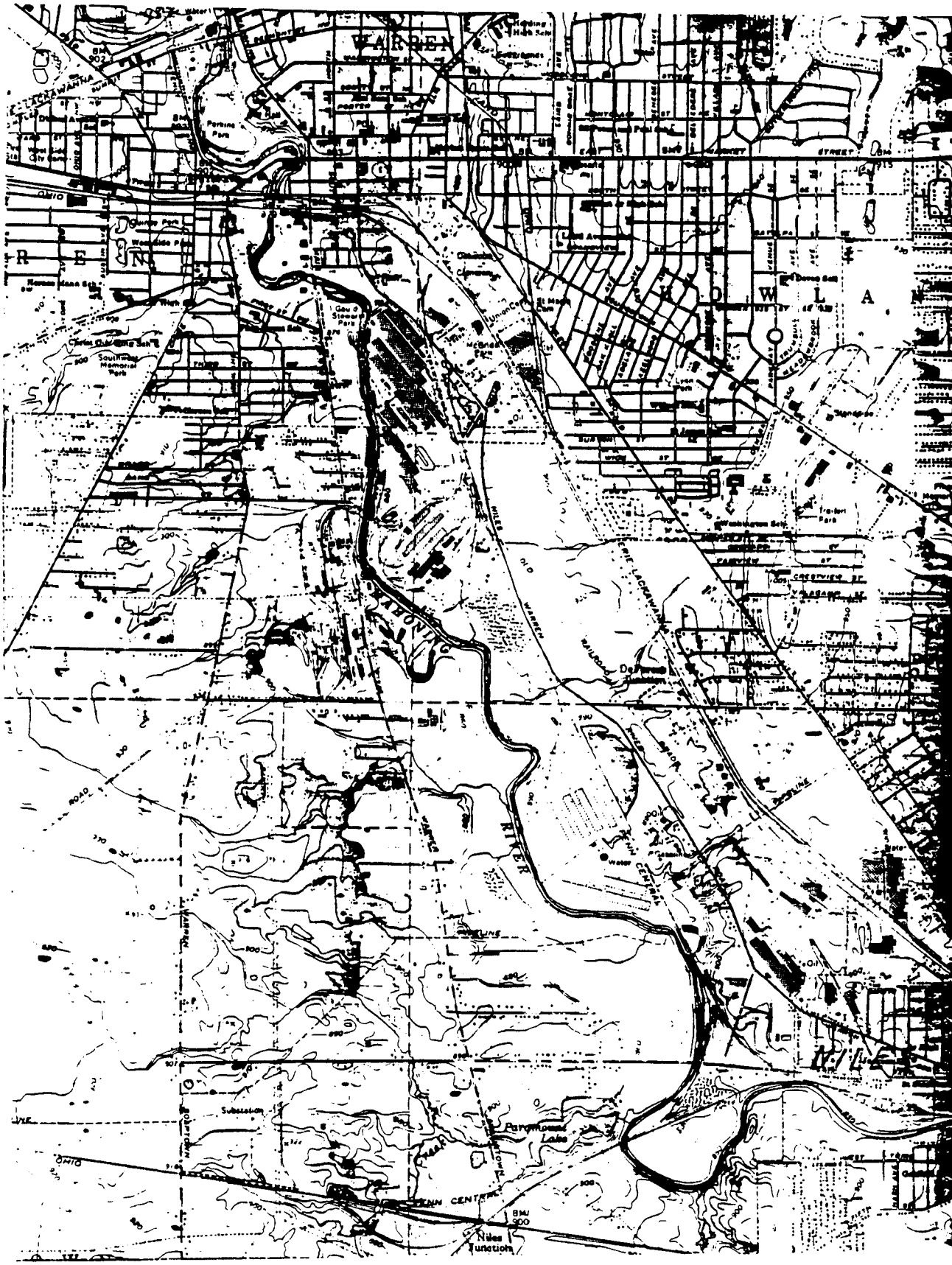
3. The third segment is from Niles to Warren (river mile 42.0). This sector is mixed industrial, urban and undeveloped areas (figs. 6 & 7 Three small public parks are on the river at Warren which, at present, make no use of the river. The northern bank of the river contains almost continuous industrial development. On the southern bank, however, there is a large area of undeveloped land below the Republic Steel Plant in Warren which may hold some recreational potential (see figure 4).

The major water recreation areas even after BAT will remain the large reservoirs which surround the Mahoning Valley (EPA 1981, p. III-40).

A. Benefits from the Creation of a Fishery

The current conditions of the lower Mahoning are such that the river does not support a warm water sports fishery. Neither the present water quality nor the condition of the river bottoms are amenable to the establishment of a self sustaining sport fishing population although some fish do exist throughout our study area (Ohio EPA, Fish Survey, 1981). It has not been determined at present whether it is the water quality or the river bottom which is the constraining force on the present fish population (Wurtz 1973). Sediment deposits have formed behind the series of low head dams that are found throughout the entire length of our study area on the Mahoning River. The U. S. Corps of Engineers (1976 Appendix III) commissioned a feasibility study for the removal of some of the low head dams and the deposits on the river bottom. Even assuming both water quality improvements and the

FIGURE 7. The Mahoning River, Ohio - Warren to Niles



elimination of the dams, it is still a matter of speculation as to what quality fishery could be sustained with the indigenous bottom material, current rate of sedimentation occuring from nonpoint sources of pollutants and gradient found in the lower Mahoning River (Wurtz 1973).

In order to establish an upper bound on the benefits that would be produced by BAT, if this would support a warm water fishery, it is necessary to determine the maximum supply capacity of the Mahoning River for fishing days. The standards adopted by the Ohio Statewide Comprehensive Outdoor Recreation Plan (SCORP, 1980, p. 48) were employed to determine the supply capacity of the Mahoning River for fishing. The standards were developed as a result of extensive literature review and a survey of recreation professionals in Ohio. The 1980 SCORP standard is 1.00 per person per surface acre of water and 20 fisherman per day per river mile. Since the Mahoning River has an average of 20 surface acres of water per mile this averages out to 1 bank fisherman per acre or a total of 2.00 bank and boat fisherman per surface acre of water on the Mahoning river or 4.00 bank and boat fishermen per mile of waterway. It is important to note that this standard is designed to accommodate peak periods of use and is not intended to reflect an average daily rate of use or to determine whether the cropable fish population can support this level of activity.

To calculate the total number of activity days per year, the SCORP counts Sundays and holidays as peak days, and Saturdays as an equivalent to .5 Sundays use. Implicitly weekdays were assigned zero use. The SCORP standard was modified for this study by assuming total weekday use is equal to .2 Sundays use, so the weekly use is 1.7 Sundays use, total annual use is the total weekly use plus the number of holidays during the fishing season. This gives the total use per

season in terms of peak day equivalents. SCORP (1975) included a correction for days lost to inclement weather of 20.5% of total peak equivalent days based on historical experience. For some unexplained reason, this correction was omitted from the 1980 SCORP. If this correction is omitted, the Ohio data does not seem reasonable either in comparison with data obtained from the 1980 Pennsylvania Recreation Survey or the 1975 National Recreation Survey. As a consequence this correction factor has been added to the 1980 SCORP participation data (See Appendix II for the details of the calculation and relevant references).

The daily peak day use of the Mahoning is then 908.0 days (40.0 fishermen/miles x22.7 miles) The total number of activity days per year is simply the peak day used multiplied by the number of peak day equivalents per year or 43,856 fishing activity days (908.0 x 48.3) which is the maximum annual supply of fishing days added by the implementation of BAT which shall serve as the basis for the upper bound limit estimate.

As a check on the reasonableness of our calculation we can compare it with the use made of local facilities already available for fishing. The U.S. Army Corps of Engineers calculated in 1976 (USCE 1976 p. 75) that there were 686,240 fishing recreation activity days at the heavily used Mosquito Creek Lake located 4 miles north of Warren. The Corps counts an individual who fishes from a boat as contributing both a fishing day and a boating day. With 7,850 acres of surface water, this implies 87 fishing days per acre of water per year on this

popular body of water. The Olentangy River, Ohio is considered an excellent heavily used fishery and is of a similar size (average width 123ft.) to the Mahoning River but with better aesthetics. Weber (1977, p. 32) in a 1975 survey estimated the angler use of the River at 653 anglers per kilometer per year or 70.5 anglers per surface acre per year. These estimates compare to our upper bound limit calculation of 96.6 activity days per acre (2.0 x 48.3 days) on the Mahoning.

One may make one further check on the reasonableness of the estimated annual number of fishing days possible on the Mahoning. Since the object of fishing is to catch fish, one can see if the above participation rates are reasonable in face of the expected fish population.

On Mosquito Lake, seven miles north of Warren, the average angler caught 4.02 game and panfish per angler day (calculated from the most recent Mosquito Lake Management Report, Summer 1978. Federal Form F53RS-15, information supplied by telephone Fish Management Division of the Ohio Department of Natural Resources). To attain the same level of fishing success on the Mahoning River while retaining the upper bound limit on the number of fishing activity days would require a standing crop of fish of 1044 lbs. per acre[1/] of which 313.3 lbs. would be game and panfish.

1/ To arrive at this figure it is assumed 4 fish equal 2 lbs., half the standing crop can be caught on a sustained basis, and 30 per cent of the standing crop consists of game and panfish (the ratio found in the Mahoning sector surveyed by the Ohio EPA which contained the largest weight of game and panfish). The calculation is then: 43,856 activity days x 2 lbs. x 2 ÷ 560 ÷ .3 = 1044 lbs.

Fish biologists are loath to make estimates of the maximum holding capacity of fish in a given body of water because of the large number of variables to be considered. When asked to give an educated guess based on their experience but with the understanding that there could be a considerable variation in any particular stream, the following responses were obtained:

"...the approximate average fish population in Illinois streams is 150 lbs./acre of which 20-30 per cent might be bass (telephone interview with Dr. Weldon Laramore, Natural History Institute, Champaign, Illinois, December 10, 1981)".

"...the approximate carrying capacity of a stream may vary from 30-250 lbs./acre of which 10-30 per cent may be gamefish depending on the site (Dr. Richard Hoopes, Pennsylvania Fish Commission, Bellefonte, Pa., telephone interview, August 31, 1981)".

An estimate of the standing fish crop for 170 United States Reservoirs larger than 500 hundred acres gave the expected sportfish standing crop of 99 lbs./acre of which 19 lbs. per acre were estimated to be centrachid bass (quoted in R. G. Martin, "Philosophy of Sport Fisheries Management," Fisheries, Vol. I, No. 6, Nov./Dec. 1976).

It is obviously based on the above information, as rough as it is, that the Mahoning River will not be able to sustain the level of fishing activity hypothesized above based on capacity peak day usage. Assuming the entire Mahoning River is accessible to fish and fishermen except the section from Lowellville (river mile 13.0) to Girard (river mile 27.0), this area would contain 560 acres.[1/]

1/ The excluded section of the river is almost inaccessible to fishermen and the rest of the river is not easily accessible to the fish in this section because of the presence of six low head dams.

If one further assumes that the maximum carrying capacity of the Mahoning River were 300 lbs./acre of fish of which 90 lbs. would be game and panfish, and an angler on the average only caught one pound of fish per activity day, the Mahoning River would only sustain 25,300 fishing activity days (90 x .5 x 560 acres) or only 57.5 per cent of the activity days hypothesized above and the benefits to fishing would be reduced accordingly.

The Value of Fishing Day

There are two basic points to consider in valuing a fishing day on the Mahoning River. First, fishing on the Mahoning will not be a unique experience. As noted above, many substitute warm water fisheries exist which are currently accessible to fishermen of the Mahoning and Beaver Valleys. Secondly, the expansion of the total surface water acreage will be small relative to the total of such acreage accessible to fishermen who reside within an hour's drive of the Mahoning. Therefore, the addition of these surface waters to the total stock of surface waters available to local fishermen will have negligible effect on participation rates of the local population in fishing activity. In other words, all those individuals who can be expected to use the newly created water resource would otherwise have engaged in such activity in other nearby fisheries at about the same rate as they can be expected to participate on the Mahoning.

The benefits derived by those who fish the Mahoning River will take the form of a reduced cost of access to a fishable body of water. According to a survey done for the Ohio SCORP 1980-85 (Appendix II), fewer than five per cent of the participants who engaged in fishing in Ohio travel more than two hours round trip to engage in fishing activity. Given the ready accessibility of fishing waters in Mahoning, Trumbull and Portage counties in Ohio and Crawford and Butler Counties in Pennsylvania, it is reasonable to assume the mean travel time to other warm water fisheries is less than one hour round rip. If the unrealistic assumption is made that everyone who uses the Mahoning River incurs zero travel time cost, then we have an upper bound on the possible time savings per trip. For purposes of this evaluation, we assume this upper bound to be a round trip travel savings of two hours.

At an average travel speed of 40 miles per hour and average operating cost of 24 cents a mile,[1] the automobile operating cost savings associated with the reduced travel time are $38.40 (4 x 40 x .24). In addition, more time is available for other activities. One standard procedure for valuing an individual's time is to assign the value of an individual's wages per unit of time. According to the U. S. Bureau of Labor Statistics, the average hourly wage of manufacturing workers in the Youngstown-Warren SMSA labor market was

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[1]Cost calculated by Runzheimer and Company for a 1981 Chevrolet six cylinder (229 cu. in.) Malibu Classic 4 door sedan with standard accessories, driven up to 15,000 miles per year with gasoline costs at $1.30 per gallon. Insurance is based on a pleasure use category where the vehicle is driven less than 10 miles to and from work and there is no youthful operator. (AAA, Your Driving Costs, 1981 edition, Falls Church, Va.1981.)

$11.66. This rate is considerably higher than the average rate for manufacturing in Ohio, which was $9.46, because of the heavy weight of the steel industry, a high wage industry, in the Youngstown-Warren SMSA. Using $11.66 as the value of leisure time, the total value of travel time saved would be $46.64. This would yield a total value of a fishing day of $85.04 as an upper bound.

Total Fishing Benefits

Using the participation rate derived above of 43,856 days annually and an average round trip travel time savings of two hours, the total annual automobile operating cost savings would be $1,684,070. At a 10 percent rate of discount, the present value of the infinite stream of automobile operating cost savings is $16,840,704.

In addition, the personal time cost savings would be $2,045,444 per year. In order to calculate the present value of the personal time cost savings, one should allow for the expected increase in the real wage rate (a proxy for the price of leisure) which is assumed to equal the increase in worker productivity. The productivity of workers in the United States increased at an average rate of 2.4 percent per year from 1964 to 1975. (U.S. Department of Labor, 1976.) If we assume this rate of productivity increase will continue indefinitely, then the present value of the time saving for fishermen is $26,913,735 ($2,045,444 ÷ .076).

The total saving to fishermen of the new activity on the Mahoning River for both automobile operating costs and their increased amount of leisure time is $40,754,439. This estimate of the present discounted value is an upper bound estimate. It is not a realistic estimate for the following reasons:

1) In the above estimate, it is assumed that each participant would drive his own vehicle. Fishing is often a family or group activity, and one expects to observe more than one participant per trip. If on the average, as few as two participants share a vehicle, the savings from vehicular operating costs would be reduced from $16,940,704 to $8.420,352.

2) Not all participants are in the labor force. In the above estimate, the opportunity cost of all participants was valued at $11.66 per hour. This is clearly inappropriate for persons aged 14 years and under for whom the opportunity cost of time is probably close to zero. Data on participation by age are not given in the 1980 Ohio SCORP but were published in Pennsylvania's Recreation Plan 1976 (p. V-19) where it was found 14.6 percent of the total fishing activity days were accounted for by individuals 14 years or less. If we assume this age group had the same participation rate in Ohio and assign a zero opportunity cost of time to them, the personal time cost savings estimated above would be reduced from $26,913,735 to $22,984,330.

3) In the above estimate it was assumed that participants could attain access to the Mahoning River at zero time cost. However, the characteristics of the river are such that it is inaccessible except at a relatively small number of locations. Moreover, these locations are not adjacent to any of the large concentrations of population in the Mahoning Valley. Con-

sequently, participants who use the Mahoning will incur significant travel time costs. The total adjusted travel costs computed above are $31,404,682.. If on the average, each participant would incur a 60 minute round trip to gain access to the Mahoning River, the total social benefits would be further reduced to $23,553,512; which is our best estimate of the fishing benefits to be obtained from the passage to BAT.

Boating

The Mahoning River is not wide enough to permit extensive power boating and does not meet the Pennsylvania Fish Commission's minimum standard for power boating over the greatest part of its length. Other forms of boating with the exception of sport canoeing are unlikely to be popular because of the current which on many occasions would make returning upstream difficult. There is a possibility for a small rental boating activity in connection with two of the three small parks located on the riverfront in Warren.

The Mahoning River from the Lowellville dam to its mouth is boatable at present as is the Beaver River from its origin to the Eastvale dam at Beaver Falls. There is little current use of these segments largely because of their past reputation although some boating does take place on the Beaver River. There has been a considerable improvement in the appearance of the water below Lowellville since 1976 (See Thorn and Ochs 1976, p. 29). There was no oil or odors below the Lowellville dam (river mile 13.3). The water clarity also has greatly improved since 1976 with the bottom being

visible to depths of several feet. The U.S.G.S., unfortunately, stopped monitoring odor and turbidity in 1975. These observations however were confirmed by informal observatory made by Chris Yoder and Dan Dudley of the Ohio EPA (personal interview September 1, 1981) who made three field trips on the Mahoning River in 1981 in connection with their survey of acquatic life (Ohio EPA 1981), Wurtz (1981), who made a biologic survey of the Mahoning in September 1981 and the author on September 3, 1981.

The Mahoning River and the Beaver River to the Eastvale dam below Lowellville would be rated A-B by the American White Water Association for difficulty, indicating a stream velocity of 0-4 miles per hour, one of their least difficult classifications. In scenic attraction the rivers would be rated B ("basically natural state but lacking appealing natural features--often of rural character having scattered summer homes"), although, of course, there are no summer homes, there are several residences and villages. Both rivers would have a present pollution rating of B, moderate but not offensive, which would be an improvement over their 1975 rating of C, foul (American Youth Hostels 1975).

No further improvement in water quality from the passage from BPT to BAT will affect the quality of the boating/canoeing experience on the Mahoning below the Lowellville dam. Ninety-five percent of the suspended solids in the Mahoning River originate from non-point sources according to Havens and Emerson:

> "The impact of controlling point sources would, therefore, have little influence on the mass of sediment produced in the Mahoning Watershed, even under the most optimistic sedimentation reduction program." (USCE 1971, Appendix III, Chapter II, p. 58.)

No further improvement in water clarity is foreseen, the only improvement foreseen that could be made to enhance the boating experience.

Niles to Struthers

As previously mentioned the river stretch from Niles to Campbell consists almost entirely of wall-to-wall industrial development and railroad yards and would not provide a satisfactory boating experience irrespective of the water quality attained. There is no access to the river, the stretch contains five dams which would be difficult to portage around, and there are numerous water intakes and outfalls along the river which would further detract from a satisfactory boating experience. As a consequence it is concluded that the passage from BPT to BAT will produce no additional boating benefits on this stretch of river.

Warren to Niles

There is considerable industrial and urban development between Warren and Niles although less than that below Niles, in addition there are two small parks on the riverfront in Warren.

Canoeing and boating could potentially take place below the Republic Steel plant to the City limits of Niles, a distance of approximately 4 miles. This boating experience would be inferior to

that below Lowellville because of heavy industry counted on the north bank (see figure 4) but would be given a similar canoe rating of A/B/B after BAT (river velocity less than 2 m.p.h./basically natural state but lacking appealing natural features/and moderate but not offensive pollution.

In addition, there is the possibility that the recreational possibility of the two small public parks in the Warren city limits could be enhanced by a rental boat facility to permit boating and canoeing in the vicinity of the parks. It is estimated that benefits would be confined to about one mile alongside each park for a total of 2 miles.

In summary, therefore, benefits resulting from boating could potentially be improved over 6 miles of the Mahoning River by BAT.

Calculation of the Additional Benefits Accruing to Boating

For purpose of calculating the benefits accruing to boating resulting from the passage to BAT, it will be assumed that this will take the form of canoeing over 4 miles of river corresponding to the Warren-Niles segments and 2 miles in the form of general boating in the vicinity of the two parks in Warren.

It shall be assumed that these sections of the river are used to the maximum capacity. Since there is no SCORP standard for non-powered boats, the standard for canoeing will be applied to non-powered boating also. For planning purposes the Ohio SCORP 1980, (p. 48) adopts a standard of 33.6 persons per mile per peak day for canoeing capacity or about sixteen canoes a mile for peak Sunday and

holiday use.[1] Based on information given in the Ohio SCORP the total seasonal use of the recreational activity, calculated in terms of equivalent peak days, is 26.7 peak activity day equivalents of use each canoeing season. (See Appendix II for details) This results in a seasonal capacity of 5383 additional boating and canoeing activity days resulting from the passage to BAT (33.6 x 26.7 x 6.0 miles).

Waters for canoeing are not as accessible as fishing waters. The Ohio SCORP (1980) found that 5 per cent of the canoeists surveyed over the entire state travel more than 2-1/4 hours round trip to a canoeing area. (Appendix II). However, the survey also indicated that only 20 percent of the canoe activity that was engaged in by residents of Planning Region II (Mahoning, Trumbull, Ashtubula, and Columbiana County) occurred outside the Region. We assume, therefore, for our upper bound estimate that the average travel time by canoeists in our study area is no more than 2-1/4 hours round trip.

Automobile operating costs are $9.60 per hour (40 x $0.24). Assuming zero travel costs for the new additional canoeing and boating opportunities made possible by BAT, the total automobile operating cost saving is $43.20 per trip ($9.60 x 4.5 hours). Assuming each participant drove his own vehicle, the total annual operating cost

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[1]The standard for general boating calculated from the Ohio SCORP 1980 would be 30.3 persons per mile assuming an average stream width of 165 feet.

saving would be $232,546 ($43.20 x 5383). At a discount rate of 10 percent, this has a present discounted value of $2,325,460.

The value of the personal travel time saved under the upper bound assumption that canoeists who use the lower Mahoning River incur zero travel time and have an opportunity cost of time of $11.66 per hour would be $52.47 per participant day ($11.66 x 4.5). This yields a total annual value of time saved of $282,446 ($52.47 x 5383). Taking into account, as before, that wages can, on average, be expected to increase at least as fast as labor productivity has in the past, namely 2.4 percent per annum, and employing a 10 percent discount rate yields a present discounted value of saved travel time of $3,716,395 ($282,446 ÷ .076).

Add the savings in vehicular costs and the opportunity cost of personal time, one obtains the upper bound limit for canoeing and boating of a present discounted value of $6,041,854.

The above estimate of the value of benefits to canoeists/boating resulting from BAT is not a best estimate for the following reasons:

(1) The above estimate assumes that each participant drives his own vehicle. However, the SCORP planning standard upon which the participants' days are calculated assumes 2.5 persons per canoe. It is reasonable to assume that each canoeing party travels in a single vehicle. Consequently, more realistically the vehicular cost saving should be divided by 2.5 to yield $ 930,184.

(2) Not all participants are in the labor force. The breakdown of recreational participants are not given in the Ohio SCORP (1980) but are given in the Pennsylvania Recreation Plan (1976) but are not shown separately there from the more inclusive category of boating, canoeing and water skiing. The 1976 Pennsylvania Recreation Plan shows that 15.6 percent of the participant days in boating, canoeing and water skiing were by individuals 14 years of age or under and 31.2 percent were by individuals 65 years old or more. The opportunity cost of participants' time was evaluated at $11.66 per hour. This rate is clearly inappropriate for participants 14 years and under and is also probably inappropriate for participants 65 years old or more. For the younger group, an opportunity cost of zero would be more nearly appropriate, especially if we view the cost savings as a proxy for the willingness to pay for the activity. If we assume the participation rates by age are the same in Pennsylvania and Ohio and assign a zero opportunity cost of time to participants aged 14 years or younger, then the present discounted value of time saved is reduced from $3,716,395 to $3,136,637.

(3) In the upper bound estimate, it was assumed that participants could attain access to the Mahoning River at zero time cost. This is unrealistic. If the average participant would

incur a 60 minute round trip to gain access to the river, then vehicular and personal cost savings would be further reduced from $4,066,821 to $3,163,987 to produce a best estimate of the social benefits arising from boating due to the implementation of BAT.

Swimming

The Pennsylvania standard designates the Mahoning River as available for full body contact recreation. It is unlikely the Mahoning and Beaver River will ever be used for swimming even if the standards are attained. The current in the river in periods of high water make the river unsafe for swimming. The Mahoning River is only three or four feet deep over most of its length except at the pools behind the low head dams, most of which lie in the Niles-Youngstown sector. The bottom of the river is heavily sedimented with an oozy consistency. The water temperature in the summer months will be close to the maximum permitted by the standard (90^{o} in July and August) and is unlikely to provide a pleasant experience.

In addition, given the steepness of the valleys, the existence of railroad tracks close to the shore line for most of the distance along the rivers and the relatively few places of easy access, the opportunity for the development of supervised safe swimming sites is very limited and unlikely ever to be undertaken given the alternatives available. Informal bathing is unlikely to take place for the same reasons. For all these reasons we do not provide any estimate for potential swimming benefits resulting from BAT.

VIII. Non-User Benefits

Non-user benefits are the most difficult to define and the hardest to measure quantitatively. The problem for the practitioner is further complicated by the paucity of empirical studies on the subject.

Non-user water resource benefits are defined as those benefits accruing to individuals who do not make direct use of the water. Three broad categories of non-user benefits are generally recognized: aesthetic, existence and option benefits. Some writers (Krutilla, 1967) have distinguished a bequest benefit but it appears that this may be subsumed as a special category of option benefit.

Non-user benefits in the economic literature for a want of any other alternative have been defined in terms of individuals' willingness to pay. Humanists may object to this approach that all human values can be denominated in terms of dollars but economists thus far have not consider the philosophical problems posed by their simple assumption.

Aesthetic benefits are the pleasure derived by non-users from observing and being surrounded by a body of water and its environs. To experience this benefit requires visual contact with the body for water or its environs. Property values may in some cases capitalize these values e.g. one may pay a premium for the apartment advertised, "with a beautiful view of the bay" over one without such a view.

Existence benefits are the benefits obtained from the knowledge that a natural habitat such as a body of water exists even though the indivdual has no intention to visit it. This knowledge of course, is conditioned upon an information system which informs one of the state of the habitat. In this case ignorance may be bliss or painful depending on whether the information system one relies on, overstates or understates the actual condition of the habitat. It is interesting in this respect to learn that there is no accurate data on the quantity and quality of water that is polluted in the United States nor for that matter an up-to-date statistic for the total quantity of fishable-swimmable surface water in the United States.

Option Values were introduced into the economic literature by Weisbrod (1964) as the benefits derived from having the opportunity to choose among alternative environments in the future. This value implies there will be some irreversible change in the environment. Presumably also one would value differently a reversible from an irreversible change in water quality according to the difficulty of reversibility. This is a particularly important problem in assessing water quality benefits since most water quality damage is reversible over some period of time.

Non-user benefits are difficult to measure since they cannot be inferred from objective observable behavior as in the case of recreation benefits. In general, two methods have been used to quantify non-user benefits: the observation of property values in response to a change in water quality and direct questioning of

individuals as to their willingness to pay for a particular non-user benefit.

A. Aesthetics

The passage from BPT to BAT will not alter the basic scenic values along the Mahoning River. In the section below Lowellville, the banks are presently heavily wooded with a large variety of tree and shrubs with abundant wildlife present apparently unaffected by the present state of pollution of the river (see Havens and Emerson, USCE 1976, Appendix III, p. II-1). The principal improvement to the scenic setting that could be brought about would be a further improvement in water clarity. However, this is strongly influenced by water borne sediments of which 95 per cent originate in non-point sources which are not covered by BAT (USCE 1976, Appendix III, p .56). The heavy increase in recreational use of the River assumed to occur in this study as a result of BAT will undoubtedly result in a sharp reduction in waterfowl and riparian wildlife. The abundant wildlife which exists now is the result of abundant natural cover and the absence of human disturbances. If the Mahoning is used to its maximum recreational supply potential, as has been assumed in this study, what one would see is a substitution of aquatic wildlife for terrestial widlife. There are no empirical studies to indicate how this trade off might be evaluated.

The most heavily polluted part of the river, from Niles to Struthers, which would experience the largest visual improvement, is inaccessible to the general public because of the almost continuous

industrial development along both banks of the river. In addition, there is four tracked railroad which runs along the northern bank of the river for its entire length to Warren and a double tracked railraod that runs along the river from its mouth to Niles.

The river from Niles to Warren has almost continuous industrial development on its northern bank but the southern bank from below the Republic Steel Warren plant to Niles is relatively undeveloped. The river from Warren to the Republic Steel plant below the city is not visually unpleasant.

The present existing roads, with one small exception above Edinburgh on the northern bank, lie well back from the river and the river is not generally visible from them. There would be few non-recreational observers of the river. Accessible views of the river are relatively rare and are largely confined to the few river crossings.

The river banks are sparsely inhabited either because of the steep slopes or the danger of the flooding in low lying places. Most of the riparian inhabitants live considerably back from the river and would detect no visual change in scenic values resulting from the passage to BAT.

In view of all these considerations, no benefit is assigned to a change in scenic values resulting from BAT.

B. Non-User Benefits as Measured by Changes in Property Values

There is only one published study on the increase in property values due to an improvement in water quality (Dornbush 1975) and this

study is of questionable value in that it did not employ any of the usual methods to evaluate benefits. This study gave a value of $74.5 million per year in 1980 resulting from BPT and rising to $92.5 million per year in 1985 reflecting the implementation of BAT. The incremental change due to BAT was therefore $18.5 million per year in 1975 prices of $31.1 in June 1981 prices.

A recent study employing the Resources for the Future Water Network Model (Vaughn) estimated that the passage from BPT to BAT would add approximately 2 percent to the nation's fishable inland waters, excluding the Great Lakes and Alaska. The National Survey of Needs for Hatchery Fish (U.S. Department of Interior, 1968) estimated the stock of fishable inland waters excluding the Great Lakes and Alaska at 30,615,000 acres in 1965. Using this latter figure as a base, a 2 percent increase in inland fishable waters due to BAT represents 612,300 acres.

Combining Dornbush's estimate of total annual benefits due to increased property values resulting from BAT with the additional fishable acreage available gives an incremental benefit of $50.79 per acre per year in 1981 prices, assuming that all the increment was due to the addition of fishable waters rather than the improvement of existing fishable water. Applying this amount to the 839 acres on the Mahoning produces an annual benefit of $42,613 or a present discounted value benefit of $420,613.

C. The Questionnaire Method

There is only one published study employing the questionnaire method to determine the value of non-user benefits (Walsh et.al., 1975) and one study in progress (Mitchell and Carson, 1981) both sponsored by the Environmental Protection Agency. Walsh's research team interviewed 202 residents in the South Plate River Basin in Colorado to determine their willingness to pay for improved water quality. The 25 non-user respondent households, 19.2 percent of the sample, reported an average existence value of $24.98 and a bequest (option) value of $16.97 for a total of $41.95 per household in 1977 prices, or $62.70 in June 1981 prices.

In 1981 there were approximately 80 million households in the United States. Assuming that the $62.70 per household amount for non-user benefits is representative of the average for these households, there is a total national benefit of $5,016,000,000, or $163.84 per acre of inland fishable waterways. Assuming that the passage from BPT to BAT will add 839 acres of fishable water on the Mahoning River and that all the increased benefits are due to this increase in fishable water, there will be an increase of benefits of $137,462 per year on the Mahoning which yields a present discounted value of $1,374,620.

One Canadian study for the Fraser River Basin, British Columbia (Meyer 1974) reported existence and option values of $233 per household annually to preserve the existence of a salmon fishery and a free flowing river system from a large water impoundment project. This case represented an irreversible environmental change affecting

an entire region and a unique fishery and is not directly comparable to the previously cited studies.

The existing empirical evidence provides a very slender basis upon which to make either a national or a regional estimate of non-user benefits, not to speak of the problem of trying to discover how much non-user benefits are produced by a water quality improvement at a specific site. Freeman (1979a, p. 162) confronted with this dilemma in making a national estimate of non-user benefits resulting from the 1985 water quality standards fell back on the simple expedient of estimating non-user benefits as equal to one-half total recreation benefits which was approximately the relationship found in Walsh et al.,and Meyer. He appeased his conscience by indicating a possible range which implied a standard deviation which was greater than his "most likely point estimate," and allowed the statistical possibility that the true value might be zero (Dixon and Massey 1957, p. 274).

Having no more information at our disposal than Freeman, and less experience, the upper bound limit for non-user benefits is set at 50 percent of the upper bound recreation benefits. Our "best estimate," in this instance, is only a lower alternative estimate since we have no reason to believe it is any better than that arrived by employing Freeman's hypothesis, these methods produce an upper bound limit on non-user benefits of $23.4 million and a "best" estimate based on the Walsh study of $1.4 million present discounted value.

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APPENDIX I

ESTIMATING THE SOCIAL BENEFIT OF IMPROVING WATER QUALITY

In the above study the concept of an upper bound estimate on the social benefits resulting from the improvement in water quality resulting from BAT is employed. The purpose of this note is to give a more rigorous demonstration that this upper bound limit is, in fact, a true limit on the change in social benefits brought about from a change in water quality.

1. The Willingness to Pay as a Measure of Social Benefit

The notion that the value of a new investment is properly measured by what people are willing to pay for it was first introduced by the French engineer, Jules Dupuit (1844) in connection with the evaluation of public works. In assessing the amount people are willing to pay for a new road or canal, Dupuit argues, what people would be willing to pay for such investments would be determined by the decrease in costs of production which the new facility brought about. Dupuit recognized that there were substitutes already available for the proposed project, and that the user cost of these substitutes established an upper bound on the consumers' willingness to pay.

Dupuit's discussion of the problem of measuring the value of a public investment laid the foundation for the partial equilibrium welfare analysis found in Marshall (1920). Harold Hotelling (1938) provided a generalization of Dupuit's principle in a general equilibrium setting in which feedback among a set of interrelated markets was

considered. In this paper Hotelling argued that when a policy change (construction activity, quality improvement) induces reactions throughout the economy, then Dupuit's measure of gross benefits (B):

$$B = \int_0^{q^0} f(q)\, dq \tag{1}$$

should be generalized to the line integral

$$B = \int_0^{0} \Sigma_i\, f_i\, (q_1, q_2, \ldots, q_n)\, dq_i \tag{2}$$

where $P_i = f(\vec{q})$ is the "cost of the best alternative to the use of an additional small unit of the commodity (i) when q units are already used," or, more generally, where f_i is the demand function for commodity i.

Hotelling showed that this line integral measure of the gross benefits of a policy change is itself an approximation to the income equivalent measure of the effect of a policy change on an individual's utility measure. The source of the approximation lies in the use of the marginal utility of money, λ, to convert a change in the utility measure into its income equivalent. In general, the value of λ would itself change in response to the policy. The line integral measure implicitly assumes that λ is constant. Hotelling argued that as long as the policy change has little impact on income this error would be small. Willig (1976) confirmed Hotelling's conjecture. This placed on a sound footing the use of information from Marshallian demand functions as a basis for benefit estimation.

It is important to note that the Dupuit-Hotelling measure of benefits only accounts for those benefits of a policy which result in a change in the pattern of consumption. Early studies on the benefits from improvement in recreational opportunities only measured this dimension of the benefits e.g., Clawson and Knetsch (1971) . However, an improvement in water quality may improve the recreational experience for an individual who visits a given site, even in the absence of any effect on the number of times which that site is visited. In this case, the Hotelling measure would ignore all of the increase in benefits on the inframarginal recreation visits. Under certain conditions, these inframarginal benefits can also be estimated from observed demand behavior (Mäler, 1971). The discussion that follows as to how the Hotelling measure, suitably augmented to account for inframarginal effects can be applied to improvements in water quality, reproduces that of Freeman (1979b, pp. 196-199).

2. The Benefits from Improved Water Quality

Assume that individual utility depends on the consumption of a vector of private goods X, the number of days of recreation at various sites V_j (j = 1, ..., n), and water quality at these sites Q_j. Then there is an expenditure function for the ith individual which is a function of private goods prices, gate fees, unit travel costs, and the distances and water qualities of the various sizes. The marginal demand price of Q_j is the partial derivative of the expenditure function with respect to Q_j. And the benefit to the ith individual of a change in water quality at the jth site is

$$B_i = -\int_{Q_j}^{Q_j'} \partial E_i / \partial Q_j \, dQ_j \qquad (3)$$

Since recreation activity is a divisible good which can be--and in some cases is--provided through private markets, we can specify a set of ordinary individual demand functions for each potential recreation site where quantity (visits) is a function of prices, incomes, travel costs, and qualitative characteristics such as water quality. For each individual there are separate demand functions for each site

$$V_{ij} = V_{ij} (P_v, P_x, D_i, c, t_i, h_i, Q, M_i) \qquad (4)$$

where V_{ij} = number of visits by individual i to site j

P_v = vector of money prices of entry (possibly zero) to the various sites

P_x = vector of private goods prices

D_i = vector of distances from residence of individual i to the various sites and return

c = unit travel cost

t_i = vector of travel times to the various sites

h_i = cost of travel time

Q = vector of water quality measures of the various sites

M_i = money income of individual i

This general representation of the demand relationship shows that the number of visits to a particular site depends not only on its own price, distance, travel time, and quality, but also on the attributes of competing or substitute sites.

Maler (1971) has shown that if the number of visits to site j by individual i is "weakly complementary" to the quality of the water at j, then it is possible to estimate (3) from a knowledge of (4). Recall that a public good and a private good are weakly complementary if, when the private good consumption is zero, the marginal value of marginal willingness to pay for the public good is also zero. We assume that weak complementarity holds for water-based recreation. In other words, we assume that individuals' utilities are unaffected by changes in water quality in areas which the individuals does not visit for recreation.

An improvement in water quality shifts the demand curve for visits to the site out and to the right. According to the analysis of weak complementarity, the area between the two demand curves for the site is an exact measure of equation (3), that is, of the benefits of a water quality improvement. A graphical analysis is developed in Figure A1. The demand curves are aggregate demand curves, that is, the horizontal summation of equations of (4) across individuals. The demand curves are drawn holding all private goods prices, distances and travel times to other sites, quality levels at other sites, and income, constant. When the price of entry to this site is known, as indicated by the line P, actual recreation use or quantity demanded can be predicted. Of course, the price could be zero. When the facility has pollution, the demand curve is D_p and the quantity of recreation days is $0Q_1$. Now assume that water quality is improved and that the new demand curve reflecting the quality improvement is D_c. Individuals

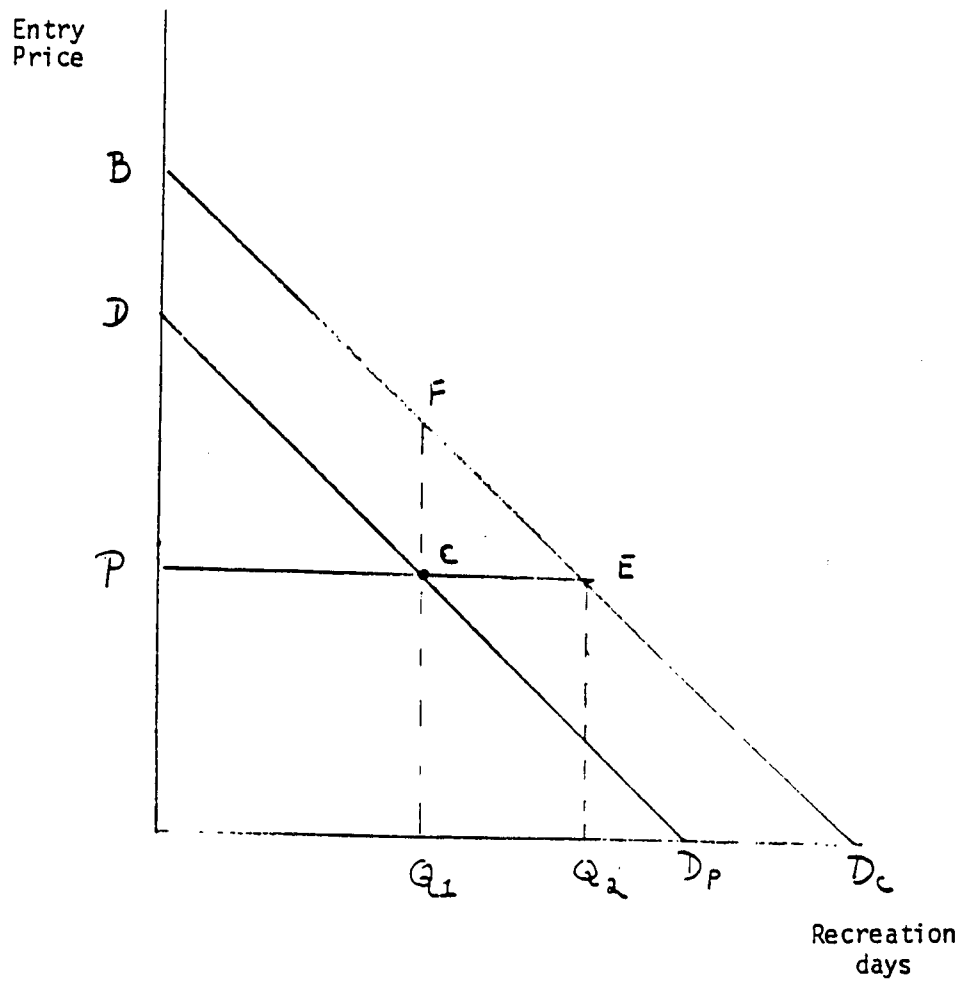


Figure A1. Effect of Improved Water Quality on Demand for Water Recreation

could be taxed an amount equal to the area between the two demand curves to maintain the original utility level. The area BDCE is the benefit attributable to the improvement of water quality.

The net benefit can be divided into two categories. The first is the increase in utility, or consumer surplus, associated with the original OQ_1 level of use when the facility was polluted. This is the area BDCF. This area represents the increase in willingness to pay to maintain present use rates at this recreation site rather than do without. In addition, the greater attractiveness of this site relative to alternative sites and alternative consumption activities (other than recreation) results in an increase in recreation days at this site equal to Q_1-Q_2. This increase could be in part a diversion of acitivity from other sites where, by assumption, quality has not changed, and, in part, an increase in aggregate recreation activity. The benefit associated with this increase in use is the area CEF.

In utilizing this measure of benefits, there is no need to take into account changes in recreation use at other sites or savings in travel cost (Knetsch, 1977). These are captured by the BDCE benefit measure. For example, if recreation is switched from an alternative site, the demand curve for that site shifts in to the left. But it would be incorrect to measure the area between those demand curves to adjust the measure of benefits. There has been no change in water quality at the alternative site, so the integral equation (1) for that size is zero.

This approach assumes that the water quality at substitute sites remains unchanged. If they do change at the same time, the estimate of the social benefit (BDCE) in Figure A1 is an overestimate since the new activity will attract fewer new users than it would otherwise attract, if water quality at the substitute sites remained unchanged (see Freeman 1979b, p. 200).

There is also the possibility that the improvement in water quality at the new site may relieve congestion at substitute sites and increase consumer's utility at these substitute sites without any improvement in water quality at these sites. Generally, this effect can be neglected when the supply of recreational opportunities at the new site is small relative to the stock of substitute opportunities or when the users of the new site are drawn from a large number of substitute sites, a situation which, for example, can be assumed to exist in the Mahoning Valley.

If there are individuals that have "option" or "existence" demand for water quality at sites they presently do not plan to use for recreation, then the area BDCE is an underestimate of the true benefits. A separate calculation of these benefits must be made and added to the user benefits to obtain the toal social benefit derived from the improved water quality.

3. The Thorn-Ochs Upper Bound Limit on Social Benefits

Thorn-Ochs (1977) proposed a relatively simple method for calculating an upper bound limit on the social benefits resulting from water quality improvement at a specific site. It is not a least upper bound limit. There may be smaller upper bound limits, and, as shall be shown, the limit proposed is a gross over-estimate of the least upper bound limit.

This upper bound limit is based on two theoretical assumptions:

1. There are alternative substitue sites for the newly augmented water quality site. For example, there are fishing opportunities available to the potential users of the Mahoning at other sites in Ohio and Pennsylvania equivalent to those that will be created on the Mahoning.

2. The newly created site will be used at its maximum supply capacity.

The first assumption places an upper bound onthe value of the newly created recreational experience. No one will be willing to pay more for the new opportunity than he would have to pay at an equivalent substitute site. In this study we have, in fact, employed the alternative opportunity as the one with the highest user cost so that benfits will be further augmented than if the lowest cost substitute were employed.

The second assumption places an upper bound on the demand for the recreation activity at the new site. Demand cannot exceed the supply capacity of the site.

The relationship of this upper bound limit to the estimate of the least upper bound limit as described by Freeman (1979b) can best be shown graphically as in Figure A2. For simplicity's sake it is assumed that the level of the recreational activity before the water quality improvement is zero but this is not a necessary assumption.

The demand curve (BED_c) in Figure A2 is the identical demand $BFED_c$ in Figure A1 after the change in water quality change has taken place.

The Thorn-Ochs upper bound procedure can be interpreted geometrically and compared with a least upper bound estimating procedure as shown in Figure A2.

The curve BED_c is the willingness to pay function post water quality improvement. A is the true user cost/activity day on the Mahoning. T is the user cost on that substitute stream with highest user cost. Given estimates of BED_c and A, the least upper bound estimate of the improvement in water quality is represented by the area of BAE. Given $\overline{Q}$ (the estimate of the maximum supply capacity) and T, the upper bound estimate is the area of the rectangle $OTT'\overline{Q}$. As long as $\overline{Q}$ exceeds or equals the least upper bound estimate of actual use, Q_2, as it alwyas must, the Thorn-Occhs estimate is necessarily greater than the Freeman estimate of the social benefit resulting from the water quality improvement.

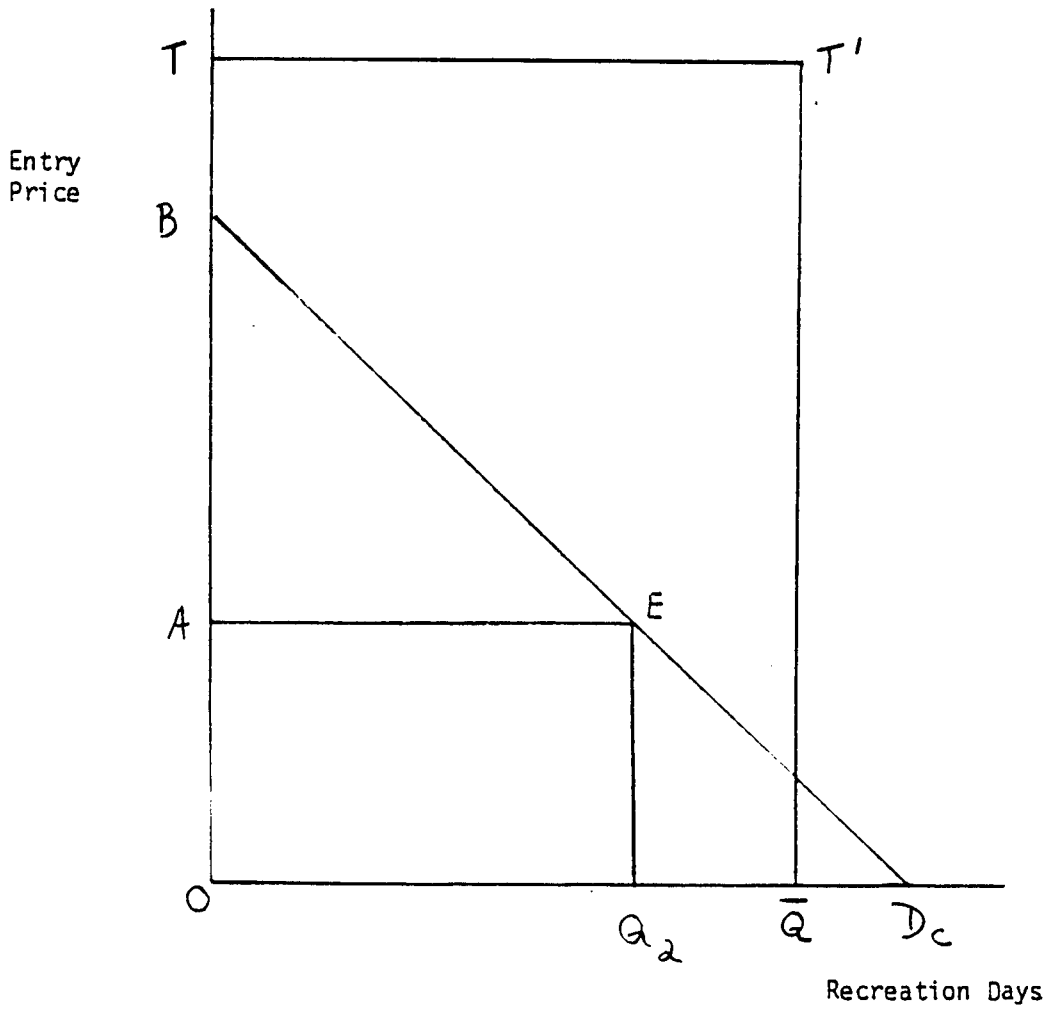


Figure A2. Upper Bound Limit on Recreational Benefits

APPENDIX II

COMPUTATION OF ACTIVITY DAYS AND PARTICIPATION RATES

MAXIMUM TRAVEL TIMES

Table A1. Calculation of Activity Days Per Capita by Recreational Activity in Ohio

	SCORP Standard	Number of Sundays in Season	Total Peak Day Equivalents In Season	Participation Rate per Peak Day per Person	Activity Days Per Capita Per Season		
					Ohio	Pennsylvania (1980)	U.S. (1975)
Fishing (bank)	20 persons/mile	34	48.3	.1302	6.29	5.3	6.2
Fishing (boat)	1 person/acre	34	48.3	.1302	6.29	5.3	6.2
Canoeing	33.6 persons/mile	18	26.7	.0248	.66	3.7*	-
Boating	.66 persons/acre	18	26.7	.0713	2.40		

Source: Column 1: SCORP 1980, p. 48.
Column 2: Calculated from SCORP 1980, p. 46.
Column 3: Column 2 x 1.7 plus number of holidays in season.
Total x .795 to allow for inclement weather.
Column 4: SCORP 1980, p. 51; participation rate per household x 3.1.
Column 5: Column 3 x Column 4
Column 6: Pennsylvania Recreation Plan 1980-85, p. 75
Column 7: 1975 U. S. Survey of Hunting, Fishing and Wildlife, p. 65.

*Boating, canoeing and waterskiing.

Table A2. Maximum One-Way Travel Time in Ohio*

	Minutes
Boating	120
Canoeing	135
Fishing	120

*Time not exceeded by 95 percent of participants.

Source: Ohio SCORP 1980, Appendix on Methodology, mimeo.

APPENDIX III

PROPOSAL OF

REPUBLIC STEEL CORPORATION FOR

COST BENEFIT ANALYSIS FOR PROPOSED

EFFLUENT LIMITATION GUIDELINES

COST - BENEFIT ANALYSIS FOR PROPOSED EFFLUENT LIMITATION GUIDELINES
REPUBLIC STEEL CORPORATION

Background

On January 7, 1981, the United States Environmental Protection Agency proposed effluent limitation guidelines (ELGs) for the iron and steel manufacturing point source category. The proposed guidelines would define Best Practicable Control Technology Current Available (BPCTCA), Best Available Technology Economically Achievable (BATEA), New Source Performance Standards (NSPS), and Pretreatment Standards for discharges to publicly owned waste water treatment facilities. On May 8, 1981, the American Iron and Steel Institute (AISI) submitted extensive comments on the proposed regulation including that 1) the cost-benefit justifications required of the proposed BPCTCA and BATEA regulations were ignored in the Agency's Economic Analysis and 2) the overall cost-benefit requirements of Executive Order 12291 were not performed.

Proposed Study

Republic Steel proposes to perform a cost-benefit analysis of the proposed regulations as they will affect the six Steel Operating Districts of Republic and streams receiving discharges from these plants. The main purpose of the study is to determine the actual benefits to be accrued by the public through the installation of the BATEA technologies and their associated costs. In so doing, the study will be based on the assumption that water quality standards have been achieved. Republic will select a contractor(s) to perform an economic evaluation of the costs of achieving certain water treatment levels at Republic's facilities and the benefits which have or will accrue to the public under the following conditions.

1) The present water quality that has resulted from the facilities now in place and the identifiable benefits at that quality level.

2) A water quality level which complies with the specific water criteria designed to achieve the fishable-swimmable water use goals in the Clean Water Act. For purpose of this condition, it will be conservatively assumed that the installation of BATEA by Republic will result in the achievement of the water quality goals in the Act. This assumption would disregard the effects of other point sources, non-point sources, and non-water quality

impacts, and would also disregard any necessity for Republic to install additional facilities beyond the BATEA technologies to comply with specific water quality criteria.

3) A water quality level which considers those quality and other conditions not affected by BATEA but which would influence the achievement of the designated uses. Such conditions could include a likely inability to achieve a specific and required criterion for such uses or a non-water quality condition such as inadequate access to a water body to enjoy such uses. The same assumptions concerning the installation of BATEA as were applied to (2) above, will also be used for purposes of this condition.

Requirements

The study will require the services of both water quality and economic experts to identify the types of benefits to be derived from varying levels of waste treatment control and to quantify, where possible, these benefits. Republic Steel will provide the costs associated with the two levels of control for each specific plant.

APPENDIX IV

SURVEY OF MAHONING AND BEAVER VALLEY INDUSTRIAL WATER USERS

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Larry Deitz
Controller
Aeroquip Corp.
1350 Albert St.
Youngstown, Ohio 44505

Dear Mr. Deitz:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Larry Deitz
Controller
Aeroquip Corp.
1350 Albert St.
Youngstown, Ohio 44505

1. Q. Does your firm draw water from the Mahoning River?

   A. We don't draw any water. At one time we had our own well. Now we purchase water from the city of Youngstown.

2. Q. If the Pennsylvania Water Quality Standards were met would you draw water from the Mahoning River?

   A. That is difficult to answer. I don't see any tremendous benefit. It would be expensive to get it from where we are located. If anything, we'd go back to our existing well. Our consumption of water is much lower than it used to be. (This is just my opinion, the engineers are out to lunch.)

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

Pitts. PA. 15260

October 5, 1981

Mr. Glen Stock
Plant Superintendent
A.F.C. Corporation
5183 W. Western Reserve Rd.
Canfield, Ohio 44406

Dear Mr. Stock:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

We draw water from Indian Creek - about 4 miles from the entrance to Mill Creek that flows into the Mahoning River.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Glen Stack
Plant Superintendent
A.F.C. Corporation
5183 W. Western Reserve Rd.
Canfield, Ohio 44406

1. Q. Do you currently draw water from the Mahoning River?

   A. No, we draw water from a stream that is near the Mahoning River.

We draw water from Indian Creek about 4 miles from the entrance to Mill Creek Park that flows into the Mahoning River.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Pejack
Production Superintendent
Air Reduction Co. - Airco Division Gas
Pine Ave. Ext. S.E.
Warren, Ohio

Dear Mr. Pejack:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

AIRCO Industrial Gases

P.O. BOX 750 • WARREN, OHIO 44482 • TELEPHONE: 216-392-8603 / 394-4541

October 20, 1981

Ms. Phyliss Ochs, Department of Economics
University of Pittsburgh
Pittsburgh,
Pennsylvania 15260

Dear Ms. Ochs:

Per your requested letter, dated 10/5/81, we are returning the duplicate copy. Please note the typed words are correct; our correct name has been specified.

If we can be of any further assistance to you, please do not hesitate to contact us.

Very truly yours,

I. L. PEJACK
PRODUCTION SUPT.

ILP:js

Enc.

Mr. Pejack
Production Superintendent
~~Air Reduction Co. - Airco Division Gas~~
~~Pine Ave. Ext. S.E.~~
Warren, Ohio 44482

AIRCO INDUSTRIAL GASES
DIVISION OF AIRCO, INC.
SOUTH PINE ST., EXT. - P.O.BOX 750

1. Q. Does your firm currently draw water from the Mahoning River?

   A. No.

2. Q. If the Pennsylvania Water Quality Standards were met would you then draw water?

   A. No, we don't use that much water. What we use is treated and recirculated.

University of Pittsburgh
ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Hinsdale
Alcan Aluminum
390 Griswald N.E.
Warren, Ohio 44483

Dear Mr. Hinsdale:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Hinsdale
Alcan Aluminum
390 Griswald N.E.
Warren, Ohio 44483

1. Q. Do you currently draw water from the Mahoning River?

A. No, we draw water from the Mosquito Resovoir.

The Warren plant of Alcan Sheet & Plate receives all of its water from the City of Warren. I believe they draw water from the Mosquito Reservoir.

R.C. Hinsdale
12-14-81

University of Pittsburgh
ECONOMIC POLICY INSTITUTE
Department of Economics

October 15, 1981

Mr. Wondisford
Chief Engineer
Aluminum Color Industries
114 Park Avenue
Lowellville, Ohio 44436

Dear Mr. Wondisford:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Wondisford
Chief Engineer
Aluminum Color Industries
114 Park Avenue
Lowellville, Ohio 44436

1. Q. Do you currently draw water from the Mahoning River?

   A. No.

2. Q. If the quality of the water were to improve, would you draw water from the Mahoning River?

   A. Doubtful - quality of water needed for rinsing in anodizing department is very high. In summer the water in Mahoning is well over 100°. We use city water and wells from small creeks and streams. Probably wouldn't draw water from river under any circumstance.

No Change

J Wondisford

Aluminum Color Ind.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

American Welding & Mfg. Co.
Dietz Rd. N.E.
Warren, Ohio 44483

Dear Sirs:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

American Welding & Mfg. Co.
Dietz Rd. N.E.
Warren, Ohio 44483

1. Q. Do you draw water from the Mahoning River?

   A. No, we are not located right on the river. We are too far from the river to draw water from it.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 12, 1981

Mr. Harold Champion
Engineer
Babcock and Wilkox
2556 Darlington Road
Beaver Falls, Pa. 15010

Dear Mr. Champion:

You were kind enough to reply to the survey I made in 1977 of your firm's potential use of the water from the Beaver River if the River met the Pennsylvania Water Quality Criteria.

We are in the process of updating the 1977 survey and would like to know if there is any change in your response from 1977 and whether your use of the River water has changed.

Enclosed is a copy of your 1977 response and a copy of the Pennsylvania Water Quality Criteria for your information. If you wish you may make any necessary changes directly on the sheet with your previous response.

A self addressed envelope is enclosed for your convenience. Thank you for your cooperation.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Babcock and Wilkox
2556 Darlington Road
Beaver Falls, Pa 15010

Main Plant - West Mayfield
Koppel Steel Division - Ellwood City

Mr. Harold Champion - Engineer

1. Ques. Do you draw water from the Beaver River?

   Ans. Yes, the main plant in West Mayfield draws water from the Beaver. No, the Koppel Steel plant uses Ellwood City water.

2. Q. Do you treat that water?

   A. Sometimes we treat the water. Filters are used to screen out heavy materials. In the spring a chemical is used to keep mud in suspension.

3. Q. If the water quality were to improve, would you draw water from the Beaver at his Koppel Plant.

   A. I couldn't say. You would have to speak to the Plant ~~Manger~~ Manager Al Dahlgren or the Assistant Plant Manager, Leo Kaercher

University of Pittsburgh
ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Frank Richter
Plant Superintendent and Chief Chemist
Beaver Falls Municipal Water Authority
1425 8th Avenue
Beaver Falls, Pa.

Dear Mr. Richter:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Cohn

Phyllis Cohn

Enclosures.

Mr. Frank Richter
Plant Superintendent and Chief Chemist
Beaver Falls Municipal Water Authority
1425 8th Avenue
Beaver Falls, Pa.

Q. I am a Research assistant for Prof. Richard Thorn of the University of Pittsburgh. Four years ago we conducted a study of water usage on the Beaver River. Today we are resurveying those users.

1. Q. Are you still Plant Superintendent and Chief Chemist?

A. Yes.

Q. I am going to read the interview we conducted four years ago and then ask you some questions.

2. Q. Has your usage of water changed since 1977?

A. No, we are pumping about the same.

3. Q. Has there been any change in the way you treat the water?

A. Yes, the Ph levels on the Beaver River are now higher. They range from 7.3 to 7.5. Four years ago the Ph level was about 7.1. We, therefore, have to use more Alum. The river is too clean. We need more acid.

4. Q. Are you still using Break Point Chlorination?

A. Yes, we are still using Break Point Chlorination. Perhaps we are using a little less chlorine. Usage varies from day to day. We may be using a total of 600 lbs. a day of chlorine instead of 700 lbs. a day.

5. Q. Has there been any change in the costs of treating the water?

A. Yes, Potassium Permanganate which used to cost $.75 a lb., now cost $1.02 a lb. (Q. Is that increase due to inflation? A. Yes) Chlorine is still $.11 a lb., and we are using a little less due to the river being cleaner. Because of the higher Ph of the river, we are using more Aluminum Sulfate which costs $.075 a lb. For the two plants we are now using a total of about 2000 lbs. where four years ago we were using 1200 lbs. Sodium Chlorite now costs over $1 per lb. (Q. Due to inflation? A. Yes)

6. Q. Has the amount of Sodium Chlorite changed?

A. No.

A. Flouride costs $.18 a lb. We still use Carbon. We use about the same amount, but the price has gone up to $.245 a lb.

7. Q. You are then using about the same amount of most chemicals, for which the price has risen due to inflation. Because of a change in acidity you are using more Alum. Because the river is cleaner you are using a little less chlorine.

A. Yes

8. Q. If the Pennsylvania Water Quality Standards were met would there be any change in your use of chemicals and costs?

A. Chlorine demand might go down. We might be able to use less carbon. Carbon is used to improve the taste and odor. But if the level of algae increased we might have to use more carbon. The quality of the Beaver River is effected by Pymatuning. Even if the organics are substancially reduced, there is still runoff. If the river becomes cleaner other problems may occur. You don't get something for nothing.

Second Phone Call

Q. Mr. Richter, thank you again for your interview of several weeks ago. I have a few additional questions to ask you.

9. Q. What is your major problem with the water before you treat it?

A. Taste and odor.

10. Q. How would you describe these problems? What is the taste and odor?

A. The taste is musty. The odor is on the musty side. It varies. It's not bad right now.

11. Q. Do you regularly monitor taste and odor? Do you have records available?

A. We run taste and odor tests, but they are done by different individuals. Each individual has a different idea of a standard. This time of year leaves effect the river.

12. Q. Do you know of any health effects from the water (for example have users complained of illness?)

A. No, there haven't been any.

634 Hastings Street
Pittsburgh, PA 15206
March 14, 1977

Mr. Frank Richter
Beaver Falls Municipal Water Authority
1425 8th Avenue
Beaver Falls, PA 15010

Dear Mr. Richter:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on it and return the duplicate copy to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Beaver Falls Municipal Water Authority
1425 8th Avenue
Beaver Falls, PA

Mr. Frank Richter
Plant Superintendent and Chief Chemist

1. Q. Do you currently draw water from the Beaver River?

   A. Yes -- We draw water from Beaver River at two points:

   Eastale Plant (10 million gallon capacity)

   New Brighton Plant (6 million gallon capacity)
   New Brighton is downstream from Eastale.

2. Q. Do you treat the water?

   A. Absolutely, have to

3. Q. What is the treatment?

   A. We have two systems which are used. They are Break Point Chlorination and a system which uses Potassium Permangnate. The first system Break Point Chlorination is the one that is used generally -- most always. The second system is used when the pollution becomes so high that it puts excessive demand on the chlorination of the first system. The first system is preferred because it results in better taste and odor. There is little difference between the operation of the two plants. The same dosage of chemicals is applied to both plants.

   Break Point Chlorination System

   Generally the systems uses chlorine to precipitate iron and manganese. The chlorine also sterilizes and disinfects. Chlorine acts on the taste and odor from algae.

   The general process is as follows:

   The Primary Basin

   1. Add alum - aluminum sulfate for coagulation
   2. Goes through primary basin for detention time
   3. Add Chlorine (to precipitate iron and manganese, to sterilize and disinfect and to act on algae
   4. Add Carbon for taste and color

5. Add lime for ph adjustment

6. Flouride for tooth decay prevention

7. Add Sodium Chlorite - this combines with the chlorine to form Chlorine Dioxide. The purpose of the chlorine dioxide is as follows:

It disinfects and eliminates organics particularly phenols.

Goes to Secondary Basin

Secondary Basin

Goes through filters which remove additional suspended additional suspended solids. Filters for color and turbidity. Final operation to clear well and pumped to system

Second System - Used when needed. Potassium Permangnate is used to precipitate and disinfect. Use it when chlorine demand on first system is too high as when organics in river are very high. They use liquid chlorine in first system. When demand is too high, the chlorine freezes which in turn freezes up the chlorinators. The second system is not used too often. In a year it might be used about one month. The second system is more expensive to use as Potassium Permangnate costs $ .75 a lb. whereas Chlorine costs $ .11 a lb.

Uses 160 lbs. per day of Potassium Permangnate when in use at $ .75 per lb or $125 and 700 lbs. per day of chloride at $ .11 a lb. or $77 a day, so ~~Chloride~~ CHLORINE is cheaper than Potassium Permangnate.

4. Q. If the Pennsylvania water quality standards were met, would you modify or reduce your treatment efforts?

A. Definitely. Chlorine dosage would be lower. Could eliminate sodium chlorite. Could eliminate carbon.

5. Q. What do you estimate you would save?

A. Carbon cost currently is $ .21 a lb. Combined usage at both plants is about 200 lbs. per day. Therefore about $42 dollars a day could be saved. If there were no phenols that would eliminate the need for Sodium Chlorite. Costs $ .75 a lb. Use about 12 lbs. a day at combined plants - $ 9 a day.

If iron and manganese were not problems we could reduce chlorine treatment. Chlorine would not be used to precipitate but to disinfect. Currently using 700 lbs of chlorine a day per two plants. If we could cut back to 400 lbs we would save $33 a day for chlorine. If water were pure enough, could even eliminate basin.

Additional Comments

Doesn't think proposed standards can be met particularly for dissolved solids. Even if industrial pollution is reduced, rain and run off from rain still would effect the river.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 7, 1981

Mr. William Decicco
Castle Community Improvement Corp.
527 Youngstown-Poland Road
Struthers, Ohio 44471

Dear Mr. Decicco:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my notes are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Dana

Enclosures.

PITTSBURGH PA 15260 (412) 624-5727

The CASTLO Project
COMMUNITY IMPROVEMENT CORPORATION SERVING CAMPBELL, STRUTHERS, LOWELLVILLE, - TOWNSHIPS OF COITSVILLE & POLAND.
[illegible] Youngstown-Poland Rd., Struthers, Ohio 44471

October 16, 1981

Ms. Phyllis Ochs
University of Pittsburgh
Economic Policy Institute
Department of Economics
Pittsburgh, Pennsylvania 15260

Dear Ms. Ochs:

I have enclosed a modified record of our recent telephone conversation to more accurately relate the situation as it pertains to existing and proposed water consumption at the CASTLO Industrial Park.

I have also enclosed a CASTLO Brochure to answer additional questions that you might have about our organization.

CASTLO would appreciate a copy of your final research product.

Sincerely,

William D. DeCicco, Executive Director
CASTLO Community Improvement Corporation

wdd/kg
encl.

Mr. William DeCicco
CASTLO Community Improvement Corporation
522 Youngstown-Poland Road
Struthers, Ohio 44471

1. Q. Do any firms in the Industrial Park currently draw water from the Mahoning River?

   A. No.

2. Q. If Pennsylvania Water Quality Standards were met would any firms draw water from the Mahoning River?

   A. It is very unlikely that any existing or future tenants at the CASTLO Industrial Park will draw water from the Mahoning River. Although the previous owners of the 120 acre parcel, the Youngstown Sheet and Tube Company, once operated a river pump house, the facility has been abandoned for several years and would be very costly to rebuild.

   CASTLO recently was awarded a Grant from the Economic Development Administration and plans are being drafter for a new Water Distribution System. This system will include separate lines for industrial service water and drinking water. The Ohio Water Service Company will provide water for both systems from their privately owned reservoirs.

3. Q. If the Pennsylvania Water Quality Standards were met do you think that would be a factor in drawing firms to locate in the Industrial Park?

   Again, CASTLO has no plans to draw water from the Mahoning River. The most significant factors for attracting prospects to the CASTLO Industrial Park are as follows:

   .Sound industrial buildings at a reasonable rent.
   .Excellent access to railroad and interstate hightway networks.
   .Closeness to regional and national markets.
   .Closeness to other industries which supply basic materials for the products of industrial tenants.

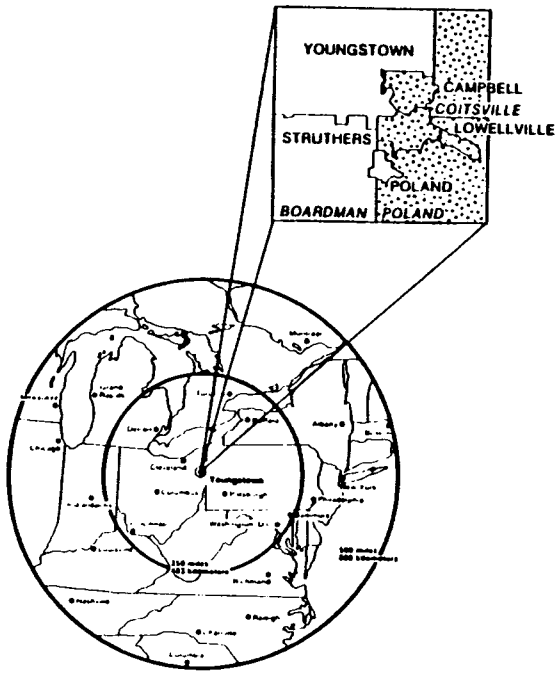
CASTLO

WHAT SERVICES DOES CASTLO PROVIDE?

CASTLO provides many services to businesses, government, industry and private entrepreneurs.

- **Financial Assistance** - CASTLO helps new and established firms obtain financial assistance from Federal, State and Local organizations. Industrial revenue bonds, loans, loan guarantees, or grants may be available.
- **Industrial Site Selection** - CASTLO maintains information on industrial sites and buildings available in the CASTLO area. Data is also available on public utilities, community facilities, transportation accessibility, physical features and other factors essential to evaluate the site for prospective industry.
- **Grantsmanship** - CASTLO helps local governments and businesses in the CASTLO area apply for Federal and State grants that promote economic and community development.
- **Community Data** - CASTLO has collected data on the advantages of operating a business in the area. Detailed information on the State of Ohio, the Mahoning Valley, and the five CASTLO communities is available.
- **A Liaison with Federal, State and Local Agencies** - CASTLO has access to numerous Federal, State and Local agencies that can assist new or established businesses with development or expansion plans.

CASTLO



FOR ADDITIONAL INFORMATION CALL OR WRITE:

CASTLO Community Improvement Corporation
522 Youngstown-Poland Road
Struthers, Ohio 44471
Telephone: (216) 750-1363

CASTLO
COMMUNITY IMPROVEMENT CORPORATION

SERVING

CAMPBELL, STRUTHERS, LOWELLVILLE,
TOWNSHIPS OF COITSVILLE & POLAND

CASTLO

WHAT IS CASTLO?

CASTLO is a private non-profit community improvement corporation serving Campbell, Struthers and Lowellville and Poland and Coitsville Townships. The CASTLO name was derived by combining the first two letters of its three charter communities - CAmpbell, STruthers and LOwellville. These communities experienced the brunt of economic hardships associated with steel plant closings in the Mahoning Valley in 1977. On March 21, 1978, local officials created CASTLO to advance, encourage and promote the industrial, economic, commercial and civic development of the CASTLO communities. Within a year Poland and Coitsville Townships surrounding the three charter communities became full partners in CASTLO.

CASTLO is governed by a Board of Trustees comprised of public officials and private business persons. The private-public partnership is an essential ingredient to CASTLO's Development Program. The public sector works diligently toward creating conditions that allow business and industry to thrive while the private sector identifies actions necessary to assure a good business climate.

CASTLO

WHAT IS THE CASTLO INDUSTRIAL PARK?

The CASTLO Industrial Park is a 120-acre steel mill complex once known as the Struthers Rod and Wire Division of the former Youngstown Sheet and Tube Company. CASTLO purchased this facility in early 1980 and is redeveloping it into a first class industrial park with very attractive lease arrangements for companies that can provide jobs for area residents.

The complex is located along the Mahoning River in downtown Struthers and contains 10 major structures which together offer more than 700,000 square feet of floor area. Most of the structures can be easily subdivided or grouped together to satisfy almost any need. Major improvements to the Park over the next few years will include a new centralized access road, new utility lines, new rail connections, and retrofitting existing buildings for new industry.

CASTLO

WHAT ARE CASTLO's GOALS?

- To retain existing jobs and bring new jobs into the CASTLO communities.
- To serve as a conduit for Federal, State and Local funding aimed at job retention and expansion.
- To promote the productive reuse of non-operating facilities in the CASTLO communities.
- To identify and promote the land zoned and equipped for industrial development.
- To work with the Mahoning Valley Economic Development Corporation, the Ohio Department of Economic and Community Development, the utility companies and other area-wide agencies toward the economic development of the Youngstown-Warren Metropolitan area.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 8, 1951

Yard Superintendent
Chessie System
B&O and C&O Railroad
Trumbull County
Lordstown, Ohio

Dear Sir:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Wallace

Enclosures.

Yard Superintendent
Chessie System
B&O and C&O Railroad
Trumbull County
Lordstown, Ohio

1. Q. We are doing an independent survey of firms that draw water from the Mahoning River.

   A. Mam, you are talking to the Baltimore and Ohio Railroad.

2. Q. I know. I'd like to verify with an engineer or manager that you don't draw water.

   A. We don't.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 8, 1981

Yard Superintendent
Chessie System
B&O and C&O Railroad
530 Mahoning Ave.
Youngstown, Ohio 44502

Dear Sirs:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Yard Superintendent
Chessie System
B&O and C&O Railroad
530 Mahoning Ave.
Youngstown, Ohio 44502

1. Q. Does your firm draw any water from the Mahoning River?

   A. No, we get all our sink water from Ohio Water Services. The only water we ever used for industrial purposes was for steam engines in the 40's.

Youngstown, Ohio
October 19, 1981

Ms. Phyllis Ochs:

The above words per our phone conversation are essentially correct and I see no need for any changes.

M. E. Novosel
Terminal Trainmaster
Chessie System

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 12, 1981

Mr. Stewart
Representative
Culligan Water
1021 Twenty-Fourth Street
Beaver Falls, Pa. 15010

Dear Mr. Stewart:

You were kind enough to reply to the survey I made in 1977 of your firm's potential use of the water from the Beaver River if the River met the Pennsylvania Water Quality Criteria.

We are in the process of updating the 1977 survey and would like to know if there is any change in your response from 1977 and whether your use of the River water has changed.

Enclosed is a copy of your 1977 response and a copy of the Pennsylvania Water Quality Criteria for your information. If you wish you may make any necessary changes directly on the sheet with your previous response.

A self addressed envelope is enclosed for your convenience. Thank you for your cooperation.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Culligan Water
1021 Twenty-Fourth Street
Beaver Falls, PA 15010

Mr. Stewart
Representative of Culligan

---

1. Ques. Do you currently draw water from the Beaver River?

   Ans. No

2. Ques. If the water quality met the proposed PA standards would you draw water from the Beaver?

   Ans. I doubt it. There would be no advantage. With the use of city water there are no problems and no headaches. The rates are not that bad.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Dave Pinney
Chief Engineer
Denman Rubber Manufacturing Co.
P.O. Box 951
Warren, Ohio 44482

Dear Mr. Pinney:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Dave Pinney
Chief Engineer
Denman Rubber Manufacturing Co.
P.O. Box 951
Warren, Ohio 44482

1. Q. Do you currently draw water from the Mahoning River?

   A. No, but we are soon going to start drawing water from the Mahoning River. We currently use well water which is high in suspended solids and total disolved solids. The river water only measures 300 to 400 for total solids, while the well water had 720. By using the river water we think we can ~~save half the amount we spend on~~ fuel for our boiler and also reduce our chemical usage. We can handle the turbidity of the water ~~later.~~

2. Q. If the Pennsylvania water standards were met would you anticipate any further reductions in treatment or costs?

   A. No, the river is rather clean here. There are no oils.

3. Q. Exactly where is your firm located?

   A. Leôvittsburg, which is west of Warren, upstream from Warren.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 12, 1981

Mr. Jim Oelschlager
Plant Manager
Dravo Corporation
Keystone Division
Railroad Street
Rochester, Pa. 15074

Dear Mr. Oelschlager:

You were kind enough to reply to the survey I made in 1977 of your firm's potential use of the water from the Beaver River if the River met the Pennsylvania Water Quality Criteria.

We are in the process of updating the 1977 survey and would like to know if there is any change in your response from 1977 and whether your use of the River water has changed.

Enclosed is a copy of your 1977 response and a copy of the Pennsylvania Water Quality Criteria for your information. If you wish you may make any necessary changes directly on the sheet with your previous response.

A self addressed envelope is enclosed for your convenience. Thank you for your cooperation.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Jim Oelschlager
Plant Manager
Dravo Corporation
Keystone Division
Railroad Street
Rochester, PA 15074

1. Q. Do you currently draw water from the Beaver River?

   A. No. We use city water in our concrete facility. (Beaver Falls Water Authority)

2. Q. If the water were to meet the proposed Pennsylvania Water Quality Standards, would you draw water from the Beaver?

   A. If would depend on state requirements. We supply concrete to PennDot. They now specify that we cannot use river water in the concrete. If the water quality were to change, it would be PennDot, not Dravo who would make the decision.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Tom Duff
Professional Engineer
Easco Aluminum Co.
3786 Oakewood Ave.
Youngstown, Ohio 44515

Dear Mr. Duff:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Cichs

Phyllis Cichs

Enclosures.

PITTSBURGH PA 15260 (412) 624-5727

Mr. Tom Duff
Professional Engineer
Easco Aluminum Co.
3786 Oakewood Ave.
Youngstown, Ohio 44515

1. Q. Does your firm currently draw water from the Mahoning River?

   A. No, we buy from Ohio Water Services.

2. Q. If the Pennsylvania Water Quality Standards were met would you draw water from the Mahoning River?

   A. I doubt it.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Mackall
Vice President
East Fairfield Coal Co.
Box 217
N. Lima, Ohio

Dear Mr. Mackall:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH PA 15260 (412) 624-5727

Mr. Mackall
Vice President
East Fairfield Coal Co.
Box 217
N. Lima, Ohio

1. Q. Does your firm draw water from the Mahoning River for industrial purposes?

   A. No, we have a well. We are not even close to the river. We are located in Southern Mahoning County. The river is located in Northern Mahoning County.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 12, 1981

Mr. R.T. Jones
Vice President
Ellwood Stone Company
Ellwood City, Pa. 16117

Dear Mr. Jones:

You were kind enough to reply to the survey I made in 1977 of your firm's potential use of the water from the Beaver River if the River met the Pennsylvania Water Quality Criteria.

We are in the process of updating the 1977 survey and would like to know if there is any change in your response from 1977 and whether your use of the River water has changed.

Enclosed is a copy of your 1977 response and a copy of the Pennsylvania Water Quality Criteria for your information. If you wish you may make any necessary changes directly on the sheet with your previous response.

A self addressed envelope is enclosed for your convenience. Thank you for your cooperation.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. R. T. Jones
Vice President
Ellwood Stone Company
Ellwood City, PA 16117

1. Q. Do you currently draw water from the Beaver River?

   A. No. 15 to 20 years ago we did draw water from the Beaver River.

2. Q. What do you do now?

   A. We have our own lake.

3. Q. Why did you switch?

   A. We had to pump the water uphill and we had pump maintenance problems plus we were always fighting high and low water conditions.

4. Q. Did the quality of the Beaver River influence your decision?

   A. No. There was no problem.

5. Q. If the quality of the Beaver were to improve would you use it for plant?

   A. No.

OK
No changes necessary
RJ
7/16/81
Conditions remain the same as above RJ

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 12, 1981

Mr. Ralph Skerratt
President
Falcon Foundry Company
96 6th Street
Lowellville, Ohio 44436

Dear Mr. Skerratt:

You were kind enough to reply to the survey I made in 1977 of your firm's potential use of the water from the Mahoning River if the River met the Pennsylvania Water Quality Criteria.

We are in the process of updating the 1977 survey and would like to know if there is any change in your response from 1977 and whether your use of the River water has changed.

Enclosed is a copy of your 1977 response and a copy of the Pennsylvania Water Quality Criteria for your information. If you wish you may make any necessary changes directly on the sheet with your previous response.

A self addressed envelope is enclosed for your convenience. Thank you for your cooperation.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Falcon Foundry Co.
96 6th Street
Lowellville, Ohio 44436

Mr. Ralph Skerratt
President

1. Q. Do you draw water from the Mahoning River?

   A. No

2. Q. Would you draw water from the Mahoning if Water Quality Standards were met?

   A. Maybe. At present our water service is from the Ohio Water Service which is not the best in the world. Our usage is small, currently from $200 to $300 a month. If we could use the water without applying any treatment, it might pay to pump it from the river. But our consumption is quite, quite small.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 15, 1981

Mr. Ralph Skerratt
President
Falcon Foundry
96 6th Street
Lowellville, Ohio 44436

Dear Mr. Skerratt:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Ralph Skerratt
President
Falcon Foundry
96 6th Street
Lowellville, Ohio 44436

Q. I am going to read an interview I conducted four years ago.

1. Q. Have there been any changes?

A. No. We don't draw any water from the Mahoning. I don't remember what I said four years ago about the water service. The ~~Village of Lowellville~~ gives us good service. We don't have much trouble.

2. Q. If the Pennsylvania Water Quality Standards were met would you draw water from the Mahoning River?

A. I don't believe so. We are not a big consumer of water at all.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Floyd Shick
General Electric Glassworks
403 N. Main St.
Niles, Ohio 44446

Dear Mr. Shick:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Floyd Shick
General Electric Company
403 N. Main Street
Niles, Ohio 44446

1. Q. Do you currently draw water from the Mahoning River?

   A. No, we buy all of our water from the city of Niles which comes from the Meander Reservoir. The plant has several closed loop cooling systems. Our once through process water is then discharged to Mosquito Creek under an NPDES permit.

2. Q. If the Pennsylvania Water Quality Standards were met would you draw water from the Mahoning River?

   A. No, the Mahoning River is located too far from our plant.

Floyd Shick

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Frank Kovacs
General Motors Corp.
Packard Electrical Division
P.O. Box 431
Warren, Ohio 44486

Dear Mr. Kovacs:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Frank Kovacs
General Motors Corp.
Packard Electrical Division
P.O. Box 431
Warren, Ohio 44486

1. Q. Does your firm draw water from the Mahoning River?

   A. No, most of the residential and industrial water in the area is drawn through Mosquito Lake. Most industry is located away from the river.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 15, 1981

Mr. Robert Bowser
Environmental Control Engineer
General Motors Corporation
Packard Electrical Division
P.O. Box 431
Warren, Ohio 44486

Dear Mr. Bowser:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Richard S. Thorn

Richard S. Thorn

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Robert Bowser
Environmental Control Engineer
General Motors Corporation
Packard Electrical Division
P.O. Box 431
Warren, Ohio 44486

Q. I was away when Ms. Ochs interviewed Mr. Kovacs and I would like to amplify some of the statements made by Mr. Kovacs.

1. Q. Please make any additions or amendments you wish.

A. We do not draw any water from the Mahoning River. We obtain all our water from the Warren public water authority which in turn draws its water from Mosquito Lake.

2. Q. Would you use the Mahoning River water if it met the Pennsylvania Water Quality Standard?

A. Possibly we could use it for our cooling water. We use approximately 325,000 G.M. of water a month at a cost of $4 m.c.f. About 40% of our water is used for cooling and we could save 30-40% on this water if we could draw it from the River.

Q. Thank you for amplyfying Mr. Kovacs remarks.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Frank Oris
Industrial Engineer
General Refractories
400 Refractory Drive
Warren, Ohio 44483

Dear Mr. Oris:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my notes are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Frank Oris
Industrial Engineer
General Refractories
400 Refractory Drive
Warren, Ohio 44483

1. Q. Does your firm draw water for industrial purposes from the Mahoning River/

   A. No, our only source of water is from the city of Warren. For the small amount of water we use in processing, city water is fine. It is not worth it to run lines to the river.

2. Q. If the Pennsylvania Water Quality Standards were met, would you draw water from the river?

   A. Probably not.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Roy Tlasck
Manager of Plant Administration
Heltzel Steel Form and Iron Co.
1750 Thomas Rd.
Warren, Ohio 44484

Dear Mr. Tlasck:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Roy Tlasck
Manager of Plant Administration
Heltzel Steel Form and Iron Co.
1750 Thomas Rd.
Warren, Ohio 44484

1. Q. Does your firm draw any water from the Mahoning River for industrial purposes?

   A. No, we just use city water.

2. Q. If the Pennsylvania Water Quality Standards were met would your firm draw water from the Mahoning River?

   A. No, we don't use any water for production. We have a fabricating shop in which we weld and burn. We make no product other than putting steel together.

University of Pittsburgh
ECONOMIC POLICY INSTITUTE
Department of Economics

October 8, 1981

Mr. Tom Golubic
Koppers
1359 Logan St.
Youngstown, Ohio 44504

Dear Mr. Golubic:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Cohn

Phyllis Cohn

Enclosures.

PITTSBURGH PA 15260 (412) 624-5727

Mr. Tom Golubic
Koppers
1359 Logan St.
Youngstown, Ohio 44504

1. Q. Does your firm currently draw water from the Mahoning River?

   A. No. Though Crab Creek runs by our plant the flow is too low, so we purchase city water.

2. Q. If the Pennsylvania Water Quality Standards were met would you draw river water?

   A. No, we are a mile and a half from the Mahoning River. No matter what the quality of the river we are too far from the river.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 12, 1981

Mr. Ralph Runyan
Plant Engineer
Mayer China
Sixth and Second Avenue
Beaver Falls, Pa. 15010

Dear Mr. Runyan:

You were kind enough to reply to the survey I made in 1977 of your firm's potential use of the water from the Beaver River if the River met the Pennsylvania Water Quality Criteria.

We are in the process of updating the 1977 survey and would like to know if there is any change in your response from 1977 and whether your use of the River water has changed.

Enclosed is a copy of your 1977 response and a copy of the Pennsylvania Water Quality Criteria for your information. If you wish you may make any necessary changes directly on the sheet with your previous response.

A self addressed envelope is enclosed for your convenience. Thank you for your cooperation.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Ralph Runyan
Plant Engineer
Mayer China
Sixth and Second Avenues
Beaver Falls, PA 15010

---

1. Ques. Do you currently draw water from the Beaver River?

   Ans. No

2. Ques. Would you draw water if the proposed Pa. Water quality standards were met.

[After the standards were read, Mr. Runyan wanted to know what the standard for conductivity was. I indicated that I didn't know. Mr. Runyan continued.]

Ans. We would probably draw some water for cooling, but not for processing. We currently use wells and city water. Our bills are about $1,000 a month. If we drew water for cooling, we could knock off $200 a month or better.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 15, 1981

Mr. Winton Ramsey
Plant Engineer
Mayer China
Sixth and Second Avenue
Beaver Falls, Pa. 15010

Dear Mr. Ramsey:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Winton Ramsey
Plant Engineer
Mayer China
Sixth and Second Avenue
Beaver Falls, Pa. 15010

Q. Four years ago I conducted an interview with Mr. Ralph Runyan. I will read that interview to you.

1. Q. Does your firm draw water from the Beaver River currently?

   A. No. 04

2. Q. Have there been any changes from four years ago?

   A. No, we still use wells and city water. 04

3. Q. If the Pennsylvania Water Quality Standards were met, would your firm draw water from the Beaver River?

   A. It is very unlikely. For the amount of water that we draw, it wouldn't be worth the cost of setting up facilities to draw it. Now, we even have to treat city water before we process it. We pull water out of the well for clay in the kiln process. It is more efficient to draw and treat well water, than to draw it from the river. 04

Winton H. Ramsey

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 12, 1981

Mr. Mike Brdar
Plant Engineer
McDaniel Porcelain Refactory
510 Ninth Ave.
Beaver Falls, Pa. 15010

Dear Mr. Brdar:

You were kind enough to reply to the survey I made in 1977 of your firm's potential use of the water from the Beaver River if the River met the Pennsylvania Water Quality Criteria.

We are in the process of updating the 1977 survey and would like to know if there is any change in your response from 1977 and whether your use of the River water has changed.

Enclosed is a copy of your 1977 response and a copy of the Pennsylvania Water Quality Criteria for your information. If you wish you may make any necessary changes directly on the sheet with your previous response.

A self addressed envelope is enclosed for your convenience. Thank you for your cooperation.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

McDaniel Porcelain Refactory
510 Ninth Avenue
Beaver Falls, PA 15010

Mr. Mike Brdar
Plant Engineer

---

1. Ques. Do you currently draw water from the Beaver River?

   Ans. No, NOT DIRECTLY; THE CITY OF BEAVER FALL DOES AND SUPPLIES IT TO McDANIEL P.P. Co

2. Ques. Would you draw water from the Beaver River if the quality were improved?

   Ans. No, we couldn't afford to. Our water has to be extremely pure. We purify the water after we take it from the city, FOR OUR PRODUCT WHICH IS RUN THROUGH DE-IONIZED SYSTEM, THE REMAINING WATER IS USED AS IS FOR PERSONEL CONSUMPTION, DRINKING, SHOWERS, TOILET FACILITIES, CLEANING ETC.

M. Brdar
3-17-77

Mrs Phyllis Acker

Rec. Ave Dame. as in '77 Couldn't Afford & Buy Into the B.F. Municipal Water System from Steel Rent & Costs Purification Etc

M Brdar
10-14-81

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Tony Chesny
Mold Tech
801 N. Meridian Road
Youngstown, Ohio 44509

Dear Mr. Chesny:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Tony Chesny
Mold Tech
801 N. Meridian Road
Youngstown, Ohio 44509

1. Q. Does your firm currently draw water from the Mahoning River?

   A. We don't draw any water from the Mahoning River. We never did. We used to put waste water into the Mahoning, but we don't anymore.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Dan Steen
Environmental Resources-Water Group
Ohio Edision
76 South Main
Akron, Ohio 44308

Dear Mr. Steen:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

OHIO EDISON COMPANY
76 SOUTH MAIN STREET, AKRON, OHIO 44308 • 216-384-5100

October 9, 1981

Ms. Phyllis Ochs
University of Pittsburgh
Economic Policy Institute
Department of Economics
Pittsburgh, PA 15260

Dear Ms. Ochs:

Your October 1, 1981 letter and enclosure asked that I review the enclosure which was a summary of our recent telephone conversation regarding the use of the Mahoning River by industrial facilities. You indicated you were conducting a survey on behalf of an industrial firm having a facility on the Mahoning River and sought my answers to three questions. I have reviewed these questions and answers on the enclosure and have revised the answers to better reflect my intent. The revisions are attached.

Very truly yours,

Daniel V. Steen
Senior Engineer

sjp
Atts.

Mr. Dan Steen
Environmental Resources-Water Group
Ohio Edison
76 South Main
Akron, Ohio 44308

1. Q. First let me verify that it is only the Niles Generating Plant which draws water from the Mahoning River.

   A. Yes, our only power plant on the Mahoning River is the Niles Generating Unit

2. Q. Is the water treated before using it?

   A. ~~Primarily~~ no. ~~Sometimes~~ We chlorinate the condenser cooling water to avoid buildup of bacteria and algae in the condenser tubes. ~~It is more to control the tubes than a need to~~ modify the water. Our purpose is to control buildup rather than

3. Q. If the Pennsylvania Water Quality Standards were met, would you modify or reduce your treatments?

   A. Very little. As long as any algae or ~~and~~ bacteria existed it could contaminate the condensor tubes, ~~create that kind of an environment~~. We'd still have to treat to some degree, but chlorination would probably be reduced.

OHIO EDISON COMPANY
76 SOUTH MAIN STREET, AKRON, OHIO 44308 • 216-384-5100

November 5, 1981

Ms. Phyllis Ochs
University of Pittsburgh
Economic Policy Institute
Pittsburgh, PA 15260

Dear Ms. Ochs:

In addition to my letter of October 9, 1981, and in response to a question raised in our recent telephone conversation, the following information is provided.

Ohio Edison Company's Niles Power Plant discharges an average of 2000 pounds per month of chlorine into the Mahoning River via injection into the condenser cooling water. In addition, two or three pounds of calcium hypochlorate are used each month for sewage treatment.

Should you have any questions or require additional information, please do not hesitate to call.

Very truly yours,

Daniel V. Steen
Senior Engineer

JMD:dm

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Tom Bunosky
Superintendent of Filtration
Ohio Water Services
235 State St.
Struthers, Ohio 44571

Dear Mr. Bunosky:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Cohs

Phyllis Cohs

Enclosures.

PITTSBURGH PA 15260 (412) 624-5727

Mr. Tom Bunosky
Superintendent of Filtration
Ohio Water Services
235 State St.
Struthers, Ohio 44571

1. Q. Does your water company draw any water from the Mahoning River?

   A. No. For domestic water we use Pine and Evans Lake. For water for the industrial users (steel mills), we use four lakes: Liberty, Girard, McKelvy and Hamilton.

2. Q. If the Pennsylvania Water Quality Standards were met would your company draw water from the Mahoning River?

   A. We have no reason to take any water from the river. We have the lakes. The steel companies would have to pump whereas now they use gravity feed.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

R. C. Isler
Head of Purchasing
H. K. Porter Co.
1401 W. Market St.
Warren, Ohio 44485

Dear Mr. Isler:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

OK as shown - Per Rebsch 10/8/81

PITTSBURGH, PA. 15260 (412) 624-5727

R. C. Isler
Head of Purchasing
H. K. Porter Co.
1401 W. Market St.
Warren, Ohio 44485

1. Q. Does your firm draw water from the Mahoning River for industrial purposes?

   A. No, we draw water from the city of Warren.

2. Q. If the Pennsylvania Water Quality Standards were met, would your firm draw water from the Mahoning River?

   A. No, we are not located directly on the river. We are about 8 to 10 blocks from the river. We are just not located where we would use the river.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Bill Wenzel
Industrial Engineer
Republic Steel - Union Drawn Division
220 Seventh Ave.
Beaver Falls, Pa. 15010

Dear Mr. Wenzel:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

O.K. as is

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Mr. Bill Wenzel
Industrial Engineer
Republic Steel - Union Drawer Division
220 Seventh Ave.
Beaver Falls, Pa. 15010

Q. Today we are resurveying the users.

1. Q. I have been told by your secretary that the person I interviewed four years ago has been transferred?

   A. Yes.

2. Q. Do you still draw water from the Beaver River?

   A. We stopped about a month ago.

3. Q. Why?

   A. Because of a dam above the plant on the river. It was purchased by some people who built a raceway in preparation for building a hydroelectric power plant. They broke our intake connection. We are now using city water which is very expensive.

4. Q. Up until a month ago (before the accident) did you treat the water before using it?

   A. No.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. William Shoenfeld
Asst. Production Manager
R.M.I. Co.
1000 Warren Ave.
Niles, Ohio 44446

Dear Mr. Shoenfeld:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Cohs

Phyllis Cohs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. William Shoenfeld
Asst. Production Manager
R.M.I. Co.
1000 Warren Ave.
Niles, Ohio 44446

1. Q. Does your firm currently draw water from the Mahoning River?

   A. No.

2. Q. If the Pennsylvania Water Quality Standards were met would you draw water from the Mahoning River?

   A. I'm not sure. We have our own pond which we use to recycle water for cooling purposes. We also use city water. I doubt it.

RMI TITANIUM

RMI Company

P O. BOX 269
1000 WARREN AVENUE
NILES. OHIO 44446
216/652-9951 TWX 810-436-2600

October 27, 1981

Ms. Phyllis Ochs
Economic Policy Institute
University of Pittsburgh
Pittsburgh, Pennsylvania 15260

Dear Ms. Ochs:

The following is presented in response to your letter to Mr. William Schoenfeld dated October 1, 1981.

1. RMI Company, Niles Plant, does not currently draw water from the Mahoning River.

2. RMI Company currently uses Niles City Water to supply its needs and does not anticipate changing water supplies. However if supply characteristics or cost warrant a change, Mahoning River water would obviously be considered.

If you have any further questions, do not hesitate to contact me.

Sincerely,

Joe T. Holman
Staff Environmental Engineer

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Philip Gregory
Plant Manager
Schaefer Equipment Co.
Phoenix Rd. N.E.
Warren, Ohio 44483

Dear Mr. Gregory:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Philip Gregory
Plant Manager
Schaefer Equipment Co.
Phoenix Rd. N.E.
Warren, Ohio 44483

1. Q. Do you currently draw water from the Mahoning River?

   A. No, we only use wells.

2. Q. Exactly where is your firm located?

   A. N.E. of Warren.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Walter Fridley
Asst. Vice President Environment
Sharon Steel
P.O. Box 291
Sharon, Pa. 16146

Dear Mr. Fridley:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH PA 15260 (412) 624-5727

IARONSTEEL

AN NVF COMPANY

ION STEEL CORPORATION • SHARON PENNSYLVANIA 16146 • TELEPHONE (216) 448 40'1

WALTER I. FRIDLEY
TANT VICE PRESIDENT - ENVIRONMENTAL CONTROL

October 12, 1981

Phyllis Ochs
University of Pittsburgh
Economic Policy Institute
Department of Economics
Pittsburgh, Pennsylvania 15260

Dear Ms. Ochs:

The answers which you have indicated are to the best of my knowledge correct. A copy of your questions and answers is attached for reference.

Please feel free to contact me if you have any further questions.

Yours very truly,

Walter I. Fridley
Assistant Vice President-
Environmental Control

WIF/atw
Attachment

Mr. Walter Fridley
Asst. Vice President Environment
Sharon Steel
P.O. Box 291
Sharon, Pa. 16146

1. Q. Does the Brainard Strapping Division in Warren draw any water from the Mahoning River for industrial purposes?

   A. No.

2. Q. If the Pennsylvania Water Quality Standards were met, would they draw water from the Mahoning River?

   A. No, the plant uses all city water. I don't think that the plant is close enough to the river to draw water from the river.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 12, 1981

Standard Steel Speciality
West Mayfield, Pa.

Gentlemen:

You were kind enough to reply to the survey I made in 1977 of your firm's potential use of the water from the Beaver River if the River met the Pennsylvania Water Qualitv Criteria.

We are in the process of updating the 1977 survey and would like to know if there is any change in your response from 1977 and whether your use of the River water has changed.

Enclosed is a copy of your 1977 response and a copy of the Pennsylvania Water Quality Criteria for your information. If you wish you may make any necessary changes directly on the sheet with your previous response.

A self addressed envelope is enclosed for your convenience. Thank you for your cooperation.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Standard Steel Specialty
West Mayfield, PA

Wbc

1. Ques. Do you currently draw water from the Beaver River?

   Ans. No, nor do we use any water for plant operations.

No change —
Wm H. Alexander
October 19, 1981

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Ms. Betty Purdue
Secretary
Ted Mesner and Sons
10950 Woodworth Ave.
N. Lima, Ohio

Dear Ms. Purdue:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA. 15260 (412) 624-5727

Ms. Betty Purdue
Secretary
Ted Mesner and Sons
10950 Woodworth Ave.
N. Lima, Ohio

1. Q. We are conducting an independent survey of firms that draw water from the Mahoning River. I'd like to speak to the Chief of Production or Plant Superintendent.

   A. We don't draw any water. We don't need water for industrial purposes.

Mrs. Betty Perdue
We don't draw water from the Mahoning River because there is no need.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Thompson Brothers Mining
3379 E. Garfield Rd.
New Springfield, Ohio 44443

Dear Sirs:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Thompson Brothers Mining
3379 E. Garfield Rd.
New Springfield, Ohio 44443

1. Q. Do you currently draw water from the Mahoning River?

   A. We don't have operations that require river water. The only water we use is for the office.

University of Pittsburgh
ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Thomas McDevitt
Chief Plant Engineer
Townsend Division of Textron, Inc.
Route 351
Ellwood City, Pa. 16117

Dear Mr. McDevitt:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Thomas McDevitt
Chief Plant Engineer
Townsend Division of Textron, Inc.
Route 351
Ellwood City, Pa. 16117

1. Q. I understand that Mr. Mark Richards is no longer with the firm?

   A. Yes, I am the Chief Operating Engineer.

2. Q. Do you still draw water from the Beaver River?

   A. Yes.

3. Q. Do you treat that water in any way?

   A. No.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 5, 1981

Mr. Ted November
Engineer
Van Huffel Tube
P.O. Box 1540
Warren, Ohio 44482

Dear Mr. November:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Ted November
Engineer
Van Huffel Tube
P.O. Box 1540
Warren, Ohio 44482

1. Q. Does your firm currently draw water from the Mahoning River?

   A. No, it comes from the city of Warren.

2. Q. If the Pennsylvania Water Quality Standards were met would you draw water from the Mahoning River?

   A. I don't think so. I don't think it could be cleaned up enough to meet our standards. We use boilers. It depends on how clean the water would be--the amount of irons and solids.

   Q. The standard on the Mahoning River for iron is not more than 1.5 mg/liter and for disolved solids a maximum monthly average of 500 mg/liter with a maxim any time limit of 750mg/liter. If this standard were met would your firm draw water from the Mahoning River? You may if you wish add your answer below.

University of Pittsburgh
ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Harry Hamilton
President
Warren Concrete and Supply
P.O. Box 1408
Warren, Ohio 44482

Dear Mr. Hamilton:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH PA 15260 (412) 624-5727

Mr. Harry Hamilton
President
Warren Concrete and Supply
P.O. Box 1408
Warren, Ohio 44482

1. Q. Do you draw water from the Mahoning River for industrial purposes?

   A. No, we use city water.

2. Q. If the Pennsylvania Water Quality Standards were met would you draw water from the river?

   A. No. Unless the water were pristine and drinkable it is not good enough. Also, we don't use enough to justify pumping equipment.

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Craig Newmeyer
Corporate Engineer
Warren Tool Corporation
3900 E. Market St.
Warren, Ohio 44484

Dear Mr. Newmeyer:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Craig Newmeyer
Corporate Engineer
Warren Tool Corporation
3900 E. Market St.
Warren, Ohio 44484

1. Q. Does your firm draw water from the Mahoning River for industrial purposes?

(NO) A. We get cooling water from the municipal system.

2. Q. If the Pennsylvania Water Quality Standards were met, would your firm draw water from the Mahoning River?

(No)

A. It doesn't make any difference. We don't use water to process. We use water for cooling. We don't use that great a quantity. We use the source that is most economical. Quality does matter in regard to temperature.

(YES) 3. Q. Would the temperature of the river be suitable now?

A. Yes

University of Pittsburgh

ECONOMIC POLICY INSTITUTE
Department of Economics

October 1, 1981

Mr. Randy Wilkoff
President
P.O. Box 118
1609 Wilson Ave.
Youngstown, Ohio 44501

Dear Mr. Wilkoff:

Enclosed is a memo of our recent telephone conversation. Could you please verify that my words are essentially correct and make any changes that are appropriate on the duplicate copy and return same to me.

Thank you very much.

Sincerely,

Phyllis Ochs

Phyllis Ochs

Enclosures.

PITTSBURGH, PA 15260 (412) 624-5727

Mr. Randy Wilkoff
President
P.O. Box 118
1609 Wilson Ave.
Youngstown, Ohio 44501

1. Q. Do you draw water from the Mahoning River?

   A. No, we only draw water for sink purposes and that comes from a creek located before the Mahoning River.

October 7, 1981

Dear Ms. Ochs,

Per our phone conversation of last month, the facts that you show in your letter are essentially correct. The only water (other than city) drawn off for use by The Wilkoff Company is a small amount from a tributary of the Mahoning River (Dry Run Creek) for use in one sink only.

If I can be of any future assistance to you, please feel free to contact me.

Sincerely,

THE WILKOFF COMPANY

Randy Wilkoff
Vice President

RW/pm

APPENDIX V

ROLE OF NON-POINT SOURCES AND MUNICIPAL SEWERAGE TREATMENT PLANS IN BAT ESTIMATE OF SOCIAL AND ECONOMIC BENEFITS

1

The benefits evaluated in this study employ the critical assumption that the publically owned sewerage treatment plant sources (STP) will implement secondary treatment (ST) and the non-point sources of pollution (NPS) such as urban storm sewer discharges, agricultural runoff and reservoir discharges will be brought under control at the same time as BAT is achieved. If this is not accomplished the marginal benefits of point sources of pollution going from BPT to BAT may be very small, even zero or negative, in some cases.

NPS of pollution emanating from urban areas may be particularly damaging to water quality. Urban runoff has been shown to contain concentrations of biochemical oxygen demand (BOD), suspended solids and coliform bacteria in as great, or greater, concentrations than treated sewerage effluents (Abernathy 1981). In many urban centers and areas receiving significant non-point pollution, the lowest dissolved oxygen (DO) concentrations and the worst water quality conditions in general, are observed when surface runoff from a large storm enters a stream after a prolonged period of low flow (Novotny and Chesters 1981). These considerations are particularly relevant to this study since the Mahoning River segment under study runs through the heart of the Youngston-Warren SMSA and realistically ST and NPS controls will not be achieved by 1983.[1/]

1/ The U.S. Office of Management and the Budget announced plans to cut sewer grants to state and local governments to $1.0 billion in 1982 down from $2.4 billion in 1981 (Wall Street Journal, December 4, 1981, p. 23).

To achieve the theoretical maximum benefits projected in this study or to maximize actual benefits requires that progress in reducing point sources of pollution be synchronized with the attainment by the STP's of ST and the control of NPS pollution.

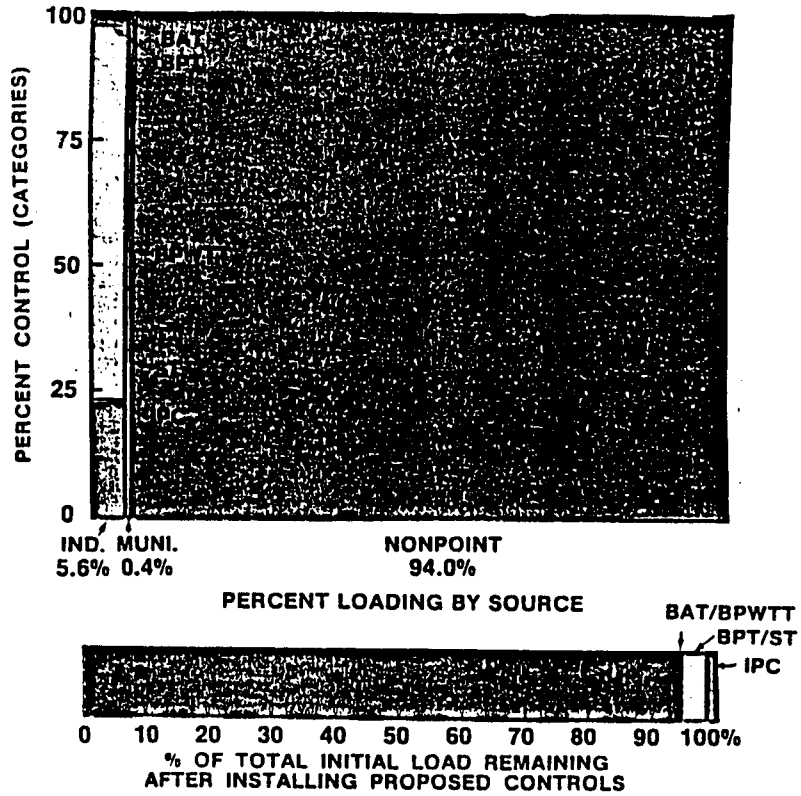
The problem of lagging progress in controlling STP and NPS discharges preventing significant improvements in water quality being attained may be illustrated by the example of the control of total suspended solids (TSS) and BOD on the Mahoning River.

If the mid-seventies are taken as a base period (one cannot be more precise than this because all the necessary data are not available for a single year), point sources accounted for 5.6 percent and STP's accounted for only 0.4 percent, respectively of the TSS loading, while NPS accounted for 94.0 per cent as shown in Table i. With the full implementation of BPT and ST, industry in the Mahoning Valley will have eliminated 97.4 per cent of its total loading (including the five closed plants) and STP's will have eliminated 30.8 per cent of their total loading. Together, however, point sources and STP's by implementing BPT will have only reduced total TSS loadings by 5.6 per cent. The passage to BAT and Best Practicable Wastewater Treatment (BPWTT) by point sources and STP's will reduce total TSS loadings only another 0.2 per cent. Even at BAT and BPWTT 94.2 per cent of the base period TSS loadings will remain due to NPS contributions. All this is shown graphically in Figure A3.

A similar story is unfolded for BOD. Unfortunately the data for the base period is not as complete. Only the BOD loading for STP's in the base period are available. To illustrate the general

Figure i

MAHONING RIVER SUSPENDED SOLIDS LOADING DISCHARGE SUMMARY *



*TOTAL AREAS REPRESENT 2,582 MILLION LBS./YEAR SUSPENDED SOLIDS

KEY: BPT - BEST PRACTICAL CONTROL TECHNOLOGY
BAT - BEST AVAILABLE CONTROL TECHNOLOGY
ST - SECONDARY TREATMENT
BPWTT - BEST PRACTICAL WASTEWATER TREATMENT TECHNOLOGY
IPC - INDUSTRIAL PLANT CLOSINGS

INFORMATION SOURCES:

1. MAHONING RIVER - WASTE LOAD ALLOCATION STUDY, USEPA, MAY 1977.
2. MAHONING RIVER - WASTE LOAD ALLOCATION STUDY, USEPA, NOV. 1980.
3. THE NATIONAL RESIDUAL DISCHARGE INVENTORY, R.A. LUKEN ET AL, JAN. 1976.
4. PRELIMINARY REPORT ON FEASIBILITY STUDY ON THE REMOVAL OF BANK AND RIVER BOTTOM SEDIMENTS IN THE MAHONING RIVER, HAVENS & EMERSON, JUNE, 1976.

Figure A3

MAHONING RIVER
SUSPENDED SOLIDS
DISCHARGE LOADING SUMMARY
(Million Pounds/Year)

	SOURCE OF LOADING			
	Industrial	Municipal	Non-Point	Total
Mid 1970's Load	145.9[1/]	10.4[1/]	2426[2/]	2582
% Distribution	5.6%	0.4%	94.0%	100%
Source of Reduction:				
* Industrial Plant Closings				
Projected Load	113.2[3/]	10.4	2426	2550
% Controlled				
of Category	22.4%	0	0	--
of Total	1.3%	0	0	1.3%
* BPT & ST (includes Plant Closings)				
Projected Load	3.8[1/]	7.2[1/]	2426	2437
% Controlled				
of Category	97.4%	30.8%	0	--
of Total	5.5%	0.12%	0	5.62%
* BAT & BPWTT				
Projected Load	0.34[1/]	4.9[1/]	2426	2431
% Controlled				
of Category	99.8%	52.9%	0	--
of Total	5.6%	0.20%	0	5.85%

Sources:

1/ Amendola 1977

2/ Havens and Emerson 1976

3/ Amendola 1980

point, it has been assumed that the BOD load is distributed among point sources, NPS and STP's in the same proportion as was found in the Ohio River in 1976 as is shown in Tableii.

The implementation of BPT will reduce point source BOD loadings by 82.1 per cent and the implementation of ST will reduce STP loadings by 60.3 per cent. Together point source and STP's will reduce total BOD loadings by 28.8 per cent.

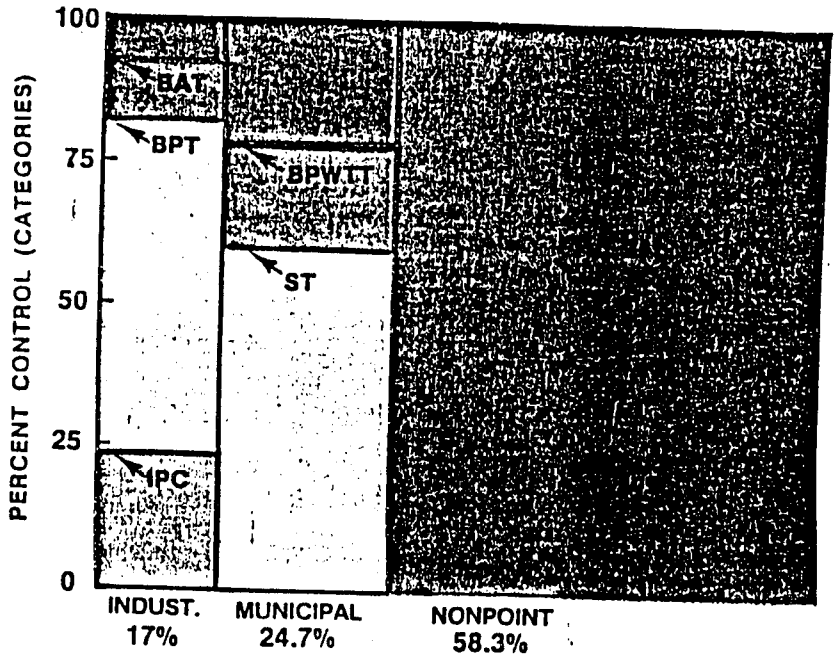
The passage to BAT and BPWTT will reduce base period BOD loadings another 6.1 per cent still leaving 65.1 per cent of base period BOD loadings as a result of lack of control of NPS of BOD. These results are summarized in FigureA4.

If secondary treatment by STP's on the Mahoning is delayed, as appears likely, then the attainment of BAT by industrial sources will only reduce the base period BOD loading by 15.7 per cent in which case the passage from BPT to BAT would account for a reduction of only 1.6 per cent in total BOD loadings. Since the increase in dissolved oxygen is one of the critical parameters for the reestablishment of the fish population and fishing is the principal benefit to be obtained from the attainment of BAT, in practice, on the Mahoning River, the attainment of BAT will result in only a small fraction of the benefits projected in this study with a possibility that they will be zero.

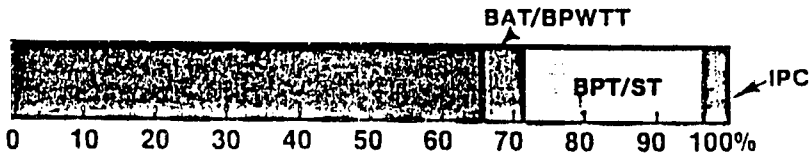
The need for a coordinated pollution control strategy embracing all sources of pollution is evident. Rapid progress in dealing with point sources of pollution will not be sufficient to compensate for a lack of progress in achieving control of STP's and NPS pollution and will result in a low level of benefits from the passage from BPT to BAT.

Figure ii

MAHONING RIVER
BOD
LOADING DISCHARGE SUMMARY*



PERCENT LOADING BY SOURCE



* TOTAL AREAS REPRESENT 72.5 MILLION LBS./YEAR BOD

KEY: BPT - BEST PRACTICAL CONTROL TECHNOLOGY
BAT - BEST AVAILABLE CONTROL TECHNOLOGY
ST - SECONDARY TREATMENT
BPWTT - BEST PRACTICAL WASTEWATER TREATMENT TECHNOLOGY
IPC - INDUSTRIAL PLANT CLOSINGS (IND)

INFORMATION SOURCES:

1. MAHONING RIVER - WASTE LOAD ALLOCATION STUDY, USEPA, MAY 1977.

2. MAHONING RIVER - WASTE LOAD ALLOCATION STUDY, USEPA, NOV. 1980.

3. THE NATIONAL RESIDUAL DISCHARGE INVENTORY, R.A. LUKEN ET AL, JAN. 1976.

3a

Figure A4

MAHONING RIVER
BOD
DISCHARGE LOADING SUMMARY
(Million Pounds/Year)

	SOURCE OF LOADING			
	Industrial	Municipal	Non-Point	Total
Mid 1970's Load	12.3	17.9[1/]	42.3	72.5
% Total	17.0[4/]	24.7[4/]	58.3[4/]	100
Source of Reduction:				
* Industrial Plant Closings				
Projected Load	9.5[3/]	17.9[1/]	42.3	69.7
% Controlled				
of Category	22.4%	0	0	--
of Total	3.9%	0	0	3.9%
* BPT & ST (includes Plant Closings)				
Projected Load	2.2[1/]	7.1[2/]	42.3	51.6
% Controlled				
of Category	82.1%	60.3%	0	--
of Total	13.9%	14.9%	0	28.8%
* BAT & BPWTT				
Projected Load	0.95[1/]	3.9[1/]	42.3	47.2
% Controlled				
of Category	92.3%	78.2%	0	--
of Total	15.7%	19.3%	0	34.9%

Sources:

1/ Amendola, et al. (1977)

2/ Havens and Emerson (1976)

3/ Amendola, et al. (1980)

4/ R. A. Luken, et al. (1980)

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