3/6/01

Total Maximum Daily Load

PCB and Chlordane

Ohio River

From the Point in Pittsburgh to the State Border

Beaver, Lawrence, Washington and Allegheny Counties

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Introduction

Pennsylvania has conducted monitoring of fish tissue contaminants since 1976. Early efforts were comprised of special studies in major water-bodies as well as smaller waters with suspected sources of contaminants. Routine sampling for tissue contaminants began in 1979 with implementation of the EPA "CORE" monitoring network that mandated collection of whole fish samples. Because Pennsylvania wanted the fish tissue monitoring program to focus on protection of public health, we began sampling both the edible portion and whole body at one-half of the stations. In 1987, Pennsylvania began sampling the edible portion almost exclusively. In order to increase spatial coverage, the Department also began rotating sampling through its routine ambient monitoring network and provided both Department of Environmental Protection (DEP) and Fish and Boat Commission field biologists the opportunity to sample suspected problem areas.

Fishing is a wholesome, relaxing pastime, and fish are nutritious and good to eat. Some fish, however, may accumulate contaminants to levels that may be harmful to those who eat them over a long period of time. In an attempt to protect public health, the Commonwealth periodically (at least annually) issues fish consumption advisories based on monitoring data from a number of sources. Advisories are issued jointly by the Department of Health, the Fish and Boat Commission, and DEP. The list of advisories is published in the "Pennsylvania Summary of Fishing Regulations and Laws" which is provided to each fishing license buyer, and is also available from the Department in hard copy and through the Internet at http://www.dep.state.pa.us. In addition, the annual list and any individual advisories needed between lists are issued using press releases.

A number of Pennsylvania water bodies with fish consumption advisories were listed on the Clean Water Act Section 303(d) List of Impaired Waters for 1996. They were listed because long-term, unrestricted consumption of these fish could potentially lead to human health problems. This document addresses contamination of fish tissue in the Ohio River, Beaver Lawrence, Washington, and Allegheny Counties by PCB and chlordane.

Background

This Total Maximum Daily Load (TMDL) applies to the Ohio River (Stream Code 32317) from the point in Pittsburgh to the State border, listed in Basins 20-B, D and G (RMI 981 to 941). The River Mile and the Segment Id for the 303(d) List are as follows:

The point in Pittsburgh to Beaver River ID 9917 [20-G] RMI 981 – 955.5
The point from Beaver River and Raccoon Creek ID 9918 [20-B] RMI 955.5-949.29
The point from Raccoon Creek to Montgomery Dam ID 9918 [20-B] RMI 949.29-948
The point from Montgomery Dam to Ohio/PA State Line ID 9918 [20-D] RMI948-940.74

The Ohio River was included on the 1998 Section 303(d) list [with IDs 9917 and 9918] as a high priority for TMDL development. It should be noted that in the 1996 303(d) List SWP 20-E designation as a low priority was erroneous.

The first advisory for Ohio River was issued on December 12, 1979. The public was warned not to eat carp taken near Brunot Island due to PCB contamination (6.0 ppm). A statewide release on June 26, 1986 included the same advice for carp at the Dashields and Montgomery Locks and Dams due to chlordane levels of 0.40 ppm and 0.28 respectively, and for channel catfish at Dashields due to PCB concentrations of 2.45 and 3.43 ppm respectively. These advisories were re-issued a number of times in cooperation with ORSANCO and other states. The carp and channel catfish advice remained generally unchanged until application of the Great Lakes protocol for 1998. At that time, the downstream segment limit was changed to the Montgomery Lock and Dam. The 1998 “Do Not Eat” advice remains for carp and channel catfish. Since implementation of the Great Lakes protocol, the public is advised to eat no more than one meal per month (Group 3) of walleye, sauger, white bass and freshwater drum from the point in Pittsburgh to the Mongomery Lock and Dam (RM 31.2). The advisory issued by Ohio and West Virginia is in place for the remainder of the main stem Ohio River in Pennsylvania. In this reach, one meal per week is given for largemouth bass, small mouth bass, spotted bass and sauger. One meal per month advice applies to white bass, hybrid striped badd and freshwater drum. Flathead catfish and channel catfish are limited to six meals per year.

TMDL Development

Endpoint Identification

The overall goal of a TMDL is to achieve the "fishable/swimmable" goal of the federal Clean Water Act. Because consumption advisories are in place for a number of species for PCB and chlordane, these goals are not being met in this segment of the Ohio River.

The specific goal of a TMDL is to outline a plan to achieve water quality standards in the water body. For this segment of the Ohio River, the TMDL goal is for levels of PCB and chlordane in the water column to be equal to or less than the Commonwealth's water quality criteria. The criteria, found in the "Water Quality Toxics Management Strategy - Statement of Policy" (Chapter 16 of the Department's rules and regulations) are 0.00004 ug/L (micrograms per liter, equivalent to parts per billion) for PCB and 0.0005 ug/L for chlordane. Both of these compounds are probable human carcinogens, and these are human health criteria developed to protect against excess cancer risk. Specifically, the Department's water quality toxics management program controls carcinogens to an overall risk management level of one excess case of cancer in a population of 1 million (1×10^{-6}). Expressing this another way, the probability of an individual getting cancer is increased by a factor of 1 in 1 million.

Two means were employed in an effort to obtain readily available data on instream PCB and chlordane levels for comparison to the criteria. First, the Department's Southwest Field Office

searched for PCB and chlordane data in or upstream from the Ohio River fish consumption advisory segment. Second, data from the EPA Storage and Retrieval System (STORET) was obtained. An "Inventory" retrieval that would include data collected by all agencies using STORET was run for all areas around the Department's fish tissue sampling stations. For the Ohio River, the search was conducted using a six-mile radius around Water Quality Network Station 902 and a 15-mile radius around the fish tissue sampling station just below the Montgomery Lock and Dam. This station is WQF32317-032.0 (Ohio River at Montgomery Lock and Dam) and WQN Station # 902 (Ohio River at RMI 969.2 miles; Bridge off SR4025 in Allegheny County). No water column data were found near Montgomery. A number of data points collected at WQN Station # 902 (1970 and 1977) and at Montgomery (1970 and 1979) were found. All samples were less than detection except for one sample that showed PCB 1260 at 0.4 ug/l. In any event, these data do not represent current conditions.

As a means to compare current conditions to the water quality criteria, an estimated water column concentration was calculated based on the fish tissue concentrations and bioconcentration factors. The calculation involves dividing the average fish tissue concentration by the bioconcentration factor to obtain a projected water column concentration.

The equation is:

$$\frac{TC}{BCF} = WC \times 1000, \text{ where}$$

TC = Tissue Concentration in mg/kg (equivalent to mg/L)
BCF = EPA Bioconcentration Factor in L/kg
WC = Water Column Concentration (estimated) in mg/L
(multiply by 1000 to obtain (ug/L)

The average fish tissue concentration is the mean of all samples shown in the table below. A Storet data retrieval of all the PCB and chlordane fish tissue data for all the fish tissue sampling stations on the Ohio River are included in Appendix A. The average concentration is used for two main reasons. First, the fish tissue samples are composites. This means that the sample result represents the average tissue concentration in three to five individuals, and not an exact value. Second, use of an average value considers the natural variation in tissue burden found in wild fish populations. The PCB bioconcentration factor (BCF) of 31,200 from the EPA criteria development document (EPA 440/5-80-068, October 1980) was used. The chlordane BCF of 14,100 from the EPA criteria development document (EPA 440/5-80-027, October 1980) was applied. These BCFs were used because no Bioaccumulation Factors (BAFs) are available for statewide use. The use of the BCFs is consistent with the provisions of the Department's water quality toxics management strategy. Average PCB and chlordane tissue levels were determined for each species using all samples. An estimated water column concentration was then calculated for each compound for each species. These estimated water column concentrations were averaged for each compound in order to provide a single estimated water column concentration for each parameter for the segment.

Fish Tissue Data Used to calculate the TMDL for the Ohio River

Parameter	Fish Species	Number of Data Sets	Range of Years	Years
PCB	Walleye	4	1988 - 1997	1988, 1991, 1992, 1997
	White Bass	2	1989 - 1995	1989, 1995
	Drum	2	1990 - 1997	1990, 1997
	Carp	13	1985 - 1994	1985, 1988, 1989, 1990, 1991, 1992, 1994, 1995, 1997
	Channel Cat	22	1988 - 1997	1988, 1989, 1990, 1991, 1992, 1994, 1995, 1997
Chlordane	Carp	13	1985 - 1994	1985, 1988, 1989, 1990, 1991, 1992, 1994, 1995, 1997
	Channel Cat	22	1988 - 1997	1988, 1989, 1990, 1991, 1992, 1994, 1995, 1997

The average PCB levels in the Ohio River segment are carp – 2.14 mg/kg; walleye and sauger mg/kg –0.605; white bass – 0.735; freshwater drum –0.740 and channel catfish - 2.92 mg/kg. The estimated concentration of PCB in the water column is 0.04577 ug/L. The average chlordane concentration in carp is 0.24 mg/kg and channel catfish is 0.276 mg/kg. The corresponding estimated water column concentration for chlordane is 0.01830 ug/L**.**

These estimated concentrations exceed the applicable water quality criteria. These values most likely do not represent the actual existing instream concentrations due to the basis for the back-calculation. The back-calculations from tissue level to water column concentration were performed using data on species for which consumption advisories have been issued, i.e., fish with elevated tissue levels of these compounds. It must also be noted that the average tissue concentrations may be artificially elevated because of the use of one-half of the detection limit for data reported as less than detection. The actual concentration could lie anywhere between zero and the detection limit. The use of one-half of the detection limit is merely a means of obtaining a reasonable value to use in calculating the average. While the actual concentrations in the water column are not known, they are likely to be lower than the calculated estimates.

Source Assessment

The production and use of PCB in the United States was banned in July of 1979. While it is now illegal to manufacture, distribute, or use PCB in the United States, these synthetic oils were used in the past as insulating fluids in electrical transformers and other products, as cutting oils, and in carbonless paper. PCB was introduced into the environment while use was unrestricted, and occasional releases still occur. In addition, some permitted discharges and Superfund sites contribute PCB to surface water. Once in a waterbody, PCB becomes associated with solids particles and enters the sediments. PCB is very resistant to breakdown and thus remains in river and lake sediments for many years.

Chlordane is a man-made organochlorine compound that was widely used as a broad-spectrum agricultural pesticide before its use was restricted to termite control around building foundations. All uses of chlordane have been banned since April 1988. Chlordane may be introduced to surface waters through contaminated ground water or surface runoff, and is therefore a nonpoint source contaminant. Once in a waterbody, chlordane becomes associated with solids particles and enters the sediments. Fish are exposed to and accumulate PCB and chlordane from the water, through contact with or ingestion of sediments, and in the food they eat.

It should be noted that in the Southwest Region, the configuration of the listed streams (primarily the Allegheny, Monongahela and Ohio Rivers) consists of a series of Locks and Dams. Any PCB contaminated sediments tend to stay in the river pools rather than being washed out as they would be on free flowing streams. All known point source discharges of PCB or Chlordane in the Southwest region have been required to obtain an NPDES permit with water quality based effluent limits and a requirement of “not detectable” for limits lower than detection.

Two methods were employed in order to locate known sources of PCB or chlordane in the Ohio River. First, the Southwest Field Office searched for information on known existing or historical sources that might contribute PCB or chlordane in or upstream from the fish consumption advisory reach. Second, the EPA Permit Compliance System (PCS) database was searched for any major discharge permits containing PCB or chlordane as an effluent limitation. No major dischargers for either compound were found on the PCS.

Prior to 1980, no federal legislation existed which addressed past disposals of hazardous wastes. Therefore, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to address the hazards created from past disposals. Sites identified as possible sources of PCBs are to be remediated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which is commonly referred to as Superfund. The act deals with environmental response, providing mechanism for reacting to emergency situations and to chronic hazardous material releases. In addition to establishing procedures to prevent and remedy problems, it establishes a system for compensating appropriate individuals and assigning appropriate liability.

CERCLA required the Environmental Protection Agency (EPA) to develop criteria for prioritizing among sites potentially needing remediation. Those sites scoring high enough on the ranking system are included on the National Priorities List (NPL). Only NPL sites are eligible for EPA remedial action. Once a site on the NPL has been selected for remediation, a formal process must be followed to determine and implement appropriate actions. A Remedial Investigation/Feasibility Study (RI/FS) is done first. The conditions at the site must be determined, including the extent of contamination, migration offsite, and potential for human and environmental exposure. A series of specific remediation alternatives must be developed, including specification of costs, technical feasibility, and environmental impacts. Based on the RI/FS, a Record of Decision (ROD) is written by the EPA, which documents and justifies the selection of a particular cleanup option. This process must include substantial public and state participation. Following the ROD, the detailed engineering plans are prepared (the Remedial Design), and implementation (Remedial Action) can begin.

The Superfund Amendments and Reauthorization Act (SARA) of 1986 provided additional guidance for determining "how clean is clean" for the level of removal during a site cleanup. Cleanups must be protective of human health and the environment, be cost-effective, and use permanent solutions, including treatment and resource recovery, as much as practicable. Land disposal is discouraged.

The decision-making framework for the management of sediments has two major components: the remedial investigation and the feasibility study (RI/FS). For a Superfund site with contaminated sediments, the remedial investigation identifies the character of the sediments and the extent of contamination, among other information. The feasibility study includes an evaluation of all reasonable remedial alternatives, including treatment and non-treatment options.

Pennsylvania's Hazardous Sites Cleanup Act (HSCA) was created so that Pennsylvania could effectively fulfill their statutory responsibilities under CERCLA; recover costs incurred fulfilling those statutory responsibilities; and supplement CERCLA by creating a state program for cleanup of sites not included on the National Priorities List.

The following sites are identified as potential non-point sources of PCB to the Ohio River: the Breslube-Penn site, the former H.K. Porter site, the former Allis Chalmers site, the Texas Eastern Holbrook compressor station, and the Ohio River Park Site:

Former H.K. Porter Site

The H.K. Porter site is located in Hopewell Township, Beaver County on Shouse Run (stream code 36638, RMI 0.2 miles). Shouse Run is tributary to the Ohio River at RMI 966.2. PCB concentrations in the soils are documented to be as high as 130 mg/Kg, however no PCBs were detected in Shouse Run. This site is being addressed under the state's HSCA program.

The former H.K. Porter Drum Dump Site is located on approximately 17.5 acres of property situated ¼ mile west of the Ohio River and adjacent to State Route 51 (Rt. 51) in Hopewell

Township, Beaver County, Pennsylvania. One small stream, Shouse Run, transects the property, and is located at the toe of the disposal area, which contained between 1,500 and 2,000 rusted 55-gallon drums containing various hazardous wastes. Analytical results from the associated soils and wastes collected from October 1990 through January 1993 revealed the presence of lead and PCB at elevated concentrations.

In 1991, H.K. Porter excavated approximately 7,875 tons of non-hazardous wastes and 4,260 tons of hazardous wastes from the disposal area. In the late 1990s, DEP conducted additional cleanup activities under HSCA that included the excavation and off-site disposal of approximately 50,000 cubic yards of hazardous waste. DEP then installed a soil cover and revegetated the entire site. Therefore, the site does not represent a source of contaminated soil erosion to Four Mile Run or to the Ohio River.

Breslube-Penn Site

The Breslube-Penn site is located in Coraopolis, Allegheny County, Pennsylvania. The site is situated along Montour Run, which is a tributary to the Ohio River. The facility, identified by EPA identification number PAD089667695, site comprises approximately 11.1 acres and borders Montour Creek. The facility historically operated as a solvent recovery and oil recycling facility and currently is inactive.

Elevated levels of PCB have been found in soil and groundwater at a soil staging area and filter cake area, where soils and filter cake wastes from past remedial activities have been stockpiled on site. Sampling of this pile, which is 90 feet wide, 145 feet long and 30 feet high revealed an average PCB concentration of 52 mg/kg. The site may be an existing source of PCB to the Ohio River through contaminated soil erosion, but there is insufficient data to quantify its contribution.

The Breslube-Penn site is undergoing investigation and cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The members of the Breslube Joint Steering Committee have entered into an Administrative Order on Consent with the EPA to conduct a Remedial Investigation/Feasibility Study at the site (RI/FS). After approval and implementation of the RI/FS, remediation activities will be implemented.

Former Allis Chalmers Site

The Allis Chalmers site is located in Pittsburgh, Allegheny County on the North Bank of the Ohio River (RMI 979) across from Brunot island. During the 1970s EPA conducted an investigation and it was documented that a 30,000 gallon vault of PCBs was at this site. Based on information provided by EPA, the 30,000 gallon vault of PCB contaminated oil at this site has since been removed, and there is no evidence to suggest this is currently a source of PCB contamination in the Ohio River basin.

Texas Eastern Holbrook Compressor Station

The Texas Eastern Holbrook Compressor Station is located in Richhill Township, Greene County and is covered by NPDES permit PA0216593 in the Ohio River watershed (North Fork of Dunkard Fork Creek at RMI 1.96). This site was an historic nonpoint source of PCBs in the watershed. As a result of a statewide CO&A with Texas Eastern, this site and others were required to remove PCB contaminated soil, and to collect and treat contaminated groundwater. The facility currently discharges treated groundwater to Dunkard Fork Creek, an Ohio River tributary at River Mile 1.96, under National Pollutant Discharge Elimination System NPDES permit No. PA0216593 with "not detectable" limits, and the groundwater is treated with carbon. Because of the remedial actions conducted, the site no longer is a source of PCB contamination in the watershed.

Ohio River Park

This site is located approximately 10 miles downstream of Pittsburgh, Pennsylvania on the western end of Neville Island, which is situated within the Ohio River. This site has a NPL status of final. Remedial actions have been completed under CERCLA and a sports complex has been developed on the site, thereby covering any remaining contaminated soil that could serve as a potential nonpoint source of PCB. Therefore, this site is not a nonpoint source of PCB to the Ohio River.

Atmospheric Deposition: Development of the TMDLs for the Ohio River considers background pollutant contributions. The natural in-stream background concentration of chlordane is assumed to be zero because chlordane is a man-made product and there are no natural sources. PCB is also a man-made product and no natural sources of PCB load exists in the environment. Nonetheless, due to the pervasive use of PCBs prior to their ban in the late 1970s and their slow degradation rates, PCBs are now widespread in the environment. This pervasive distribution of PCBs in air, soil, and water effectively creates a background load of PCB in all water bodies. Atmospheric deposition can contribute to background concentrations of PCB in water bodies.

Atmospheric deposition of PCB plays a dominant role in PCB cycling in many freshwater systems. Monitoring conducted under the Integrated Air Deposition Network (IADN) and the Great Waters Program indicate that wet and dry deposition of PCB can vary greatly both regionally and by season. According to EPA's Lake Michigan Mass Balance (LMMB) Study, atmospheric transport and deposition of PCB provides about 82 percent of the total PCB load to Lake Michigan. Because PCB is no longer produced, the major source of PCB to the atmosphere is volatilization from sites where they have been stored, disposed, or spilled; from incineration of PCB-containing products; and, to a lesser extent, from PCB formation during production processes.

Although analysis predicts that atmospheric deposition may provide a significant source of PCB load to the water body, volatilization from the water column and sediments is likely to result in continuing PCB loss from the water body, thereby reducing, or negating, the atmospheric load. Hillery, et. al., (1998) found that the Great Lakes are currently experiencing a net loss of PCB. In

each of the five Great Lakes, the net deposition of PCB is believed to be insignificant because gas transfer out of the lakes counteracts the flow into the lakes from wet and dry deposition. Similar processes are likely to be occurring in Pennsylvania water bodies.

PCB air deposition values specific to Pennsylvania have not been identified. Therefore, no definitive data exists to document this as a source of PCBs to the impaired water.

Driving Directions: from Philadelphia to HK Porter Site:

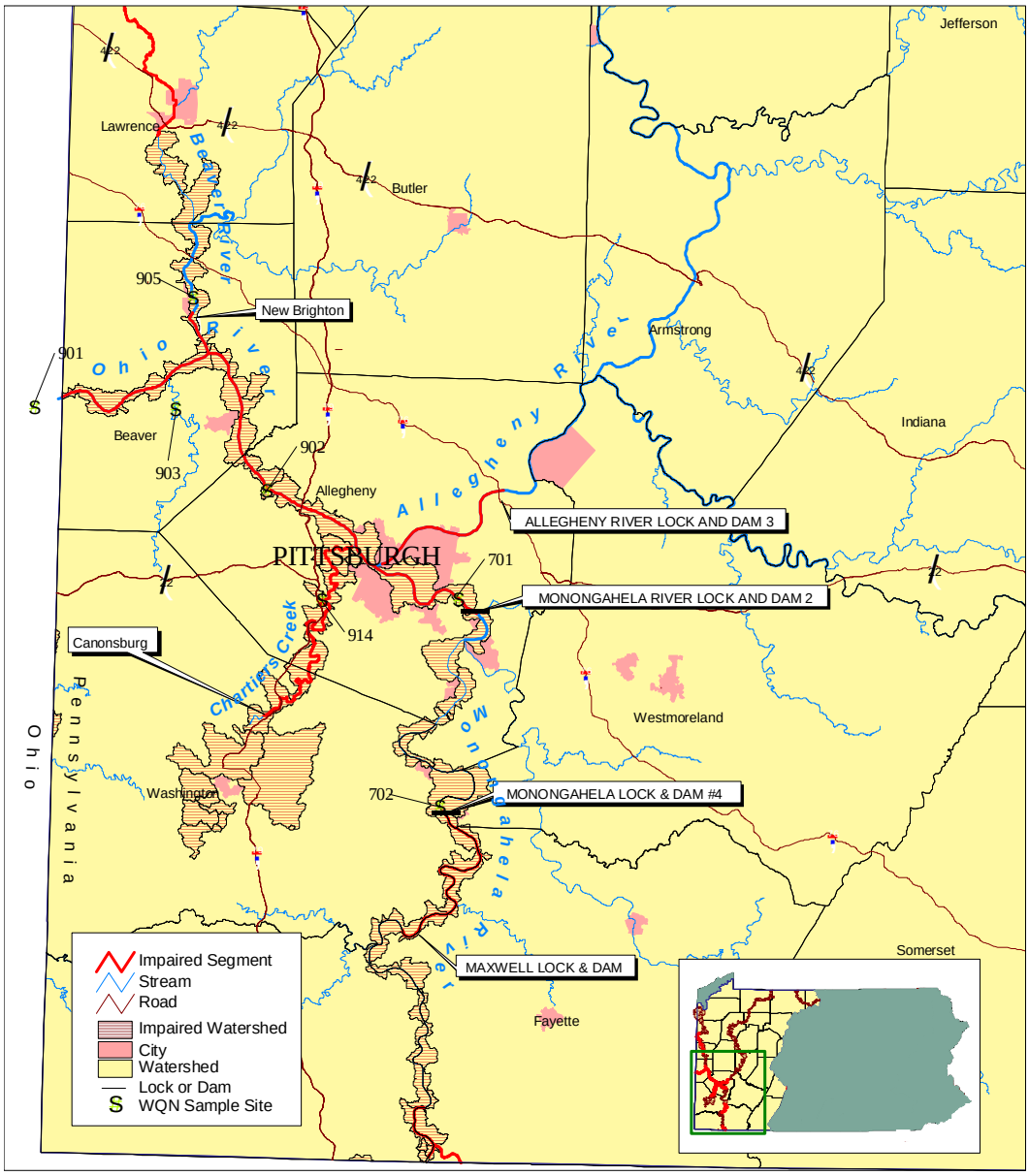
1. Take I-76 West to I-79, Exit No. 3 onto I-79 South
2. Take I-79 South to Exit 17, take Rt 51 North
3. Follow Route 51 North 12.0 miles to the Ambridge Bridge
4. Continue on Rt 51 North.
5. The site is on the left side of route 51 about 1.5 miles north of the Ambridge Bridge

Driving Directions from Philadelphia to Allis Chalmers Site:

1. Take I-76 West to I-79, Exit No. 3
2. Follow I-79 South to Exit 19, and take Rt 65 South about 6 miles
3. The site is on the right

Driving Directions from Philadelphia to Texas Eastern Holbrook Station:

1. Take I-76 West to Exit 8, Take I-70 West
2. Follow I-70 West to I-79
3. Take I-79 South to Exit 3, and get on Rt. 21 West
4. Follow Rt 21 West to Wind Ridge.
5. Stay on Rt 21 West for 1.5 miles past Wind Ridge and turn left at the last road before Ryerson Station.
6. The Compressor Station is about 0.5 miles up this road on the right



TMDL Calculation

Development of TMDLs includes consideration of background pollutant contribution, appropriate and/or critical stream flow, and seasonal variation.

Monitoring for Background Concentrations of PCBs

PCB concentrations in surface waters may be greater than zero in waters where no specific source, either point or nonpoint source, can be identified. Only site-specific data can be used for the TMDL calculations. However, because sufficient data does not exist for this particular

waterbody segment that would allow the selection of such a background value for TMDL calculation purposes, a value of zero was used. In order to verify this assumption, or to properly select a background concentration for calculating a TMDL, site-specific water quality monitoring for PCBs may be conducted at this site some time in the future.

If future background sampling were to identify PCB levels greater than zero for this segment, Pennsylvania would review and appropriately revise the TMDL. Currently, there is no approved and widely available analytical method for analyzing water column samples at the ultra low levels at which PCBs may be present. EPA method 1668-A may offer such capability, but is currently only approved for use in analyzing sewage sludge, is very expensive to run and of limited availability.

PCB and chlordane are probable human carcinogens. Carcinogenesis is a nonthreshhold effect, an adverse impact that may occur at any exposure greater than zero. Such an effect is often related to long-term exposure to low levels of a particular chemical or compound, rather than an immediate effect due to a short duration exposure to a high level. As noted earlier, the Department's water quality toxics management program uses a cancer risk level of 1×10^{-6} to protect human health. Attainment of this risk level is predicated on exposure that includes drinking 2 liters of water and ingesting 6.5 grams of fish per day over a 70-year lifetime. The Department uses harmonic mean flow as the appropriate design condition for dealing with exposure to carcinogens. This is a long-term flow condition that will, when applied to the Total Maximum Daily Load, represent long-term average exposure. Because seasonal increases and decreases in concentration are less important than the long-term exposure to a carcinogen, use of harmonic mean flow adequately considers seasonal variations in PCB and chlordane concentrations.

The calculation of the Ohio River TMDLs utilizes the water quality criteria and flow data from the U.S. Geological Survey (USGS) surface water discharge station 11.8 miles downstream from confluence of Allegheny and Monongahela Rivers [03086000]. The harmonic mean flow was calculated using the low flow yield method found in the Department's "Implementation Guidance - Design Stream Flows" (Document No. 391-2000-023, p 4). The Segment Qhm for the Ohio River is 20,500 cfs (based on ORSANCO's Report Appendix B – Critical Flow Values Montgomery Dam to Willow Island Dam.)

The Segment Qhm is used in calculating the Total Daily Maximum Load (TMDL) by multiplying it by the water quality criterion and a multiplier (0.00539) to convert from cfs x ug/L to lbs/day (pounds per day).

The PCB TMDL for the Ohio River is calculated as follows:

20500 cfs x 0.00004 ug/l = 0.82 cfs x ug/l x 0.00539 = 0.00442 lbs/day.

The chlordane TMDL is calculated as follows:

20500 x 0.0005 ug/l = 10.25 cfs x ug/l x 0.00539 = 0.0553 lbs/day.

The Total Maximum Daily Load of PCB for this segment of the Ohio River is 0.00442bs/day.. The chlordane TMDL is 0.0553 lbs/day.

Percent Reduction for Ohio River Basins 20-B, D and G

The goal of this TMDL is to achieve the water quality criteria in order to protect public health. In order to achieve this, the instream concentration must be reduced from the estimated current levels to the criteria. Percent reduction is calculated using the following formula:

% Reduction = (1 - TMDL Goal/ Existing Concentration) x 100.

The percent reduction for PCB is calculated as follows:

% Reduction = (1 - 0.00004/0.04577) x 100
% Reduction = (1 - 0.00087) x 100 = 99.91 %

Percent reduction for chlordane is:

% Reduction = (1 - 0.0005/0.0183) x 100
% Reduction = (1- 0.02732) X 100 = 97.27 %

Overall reductions of 99.9% for PCB and 97.3% for chlordane are needed to achieve the TMDL goal.

Margin of Safety (MOS)

Achievement of the TMDLs will generally ensure achievement of the water quality criteria. To account for uncertainties that may be associated with the TMDL calculations, the Department proposes to hold 10% of the TMDLs in reserve. Applying this 10% margin of safety results in a PCB MOS of 0.000442 lbs/day and the chlordane MOS of 0.005525 lbs/day. The remaining load is available for allocation to all sources for the Ohio River segment.

Wasteload Allocations (WLAs) and Load Allocations (LAs)

There is no data available on PCB or chlordane concentrations upstream of the segment of the Ohio River from Basins 20-B, D and G.

Since the former point sources identified in the Source Assessment Section have ceased operations, there are no known point source discharges of PCBs in the Ohio River watershed other than those identified in the TMDL reports for Chartiers Creek. The NPDES source that was initially identified was Texas Eastern Holbrook Station (PA 0216593) is primarily from treated discharge of PCB contaminated ground water. However, this discharge flows into North Fork Dunkard Creek[Quad: Wind Ridge, PA] to Dunkard Creek to Wheeling North Fork Creek

[Quad: Majorsville, W-VA-PA] to Ohio River. This segment of the Ohio River watershed lies in West Virginia and not in Pennsylvania. Therefore, the PCB load contributed by this point source is not considered. The PCB load is contributed primarily by nonpoint sources and may be introduced to surface water through contaminated ground water, surface run-off, or contaminated sediment. The Source Assessment notes that once in a water body, PCB becomes associated with soil particles and enters the sediments. Fish tissue contamination results from this sediment load.

Because of this and because there is no way to accurately quantify loadings from groundwater or erosion, the entire remaining PCB load of 0.00398 pounds per day is assigned to a Load Allocation for the instream sediment and tributary streams for the Ohio River segment Basins 20 –B, D and G.

Because there are no known point sources of Chlordane to this segment of the Ohio River, it is treated as a nonpoint source contaminant that may be introduced to surface water through contaminated ground water, surface runoff, or contaminated sediment. Chlordane also becomes associated with soil particles and enters the sediments once in a water body. Fish tissue contamination results from this sediment load. Because of this and because there is no way to accurately quantify loadings from groundwater or erosion, the entire TMDL for chlordane for the reach of the Ohio River is assigned to Load Allocation (LA) for the instream sediment. For the Ohio River segment from Basins 20-B, D and G, the chlordane Load Allocation (LA) is 0.04973 pounds per day.

TMDL Summary

The TMDLs for the Ohio River segment from Basins 20-B, D and G can be summarized as follows:

Ohio River From Basins 20-B, D and G				
Pollutant	**TMDL (lbs/day)**	**WLA (lbs/day)**	**LA (lbs/day)**	**MOS (lbs/day)**
PCBs	0.00442	0.0	0.00398	0.000442
Chlordane	0.0553	0.0	0.0497	0.00553

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TMDL Verification

The stated goal of this TMDL is to meet the PCB and chlordane water quality criteria for the protection of public health in this reach of the Ohio River. Another way to state the goal is to reach a point where fish consumption advisories are no longer needed because tissue levels of PCB and chlordane are no longer above the levels of concern.

The three agencies involved with the issuance of fish consumption advisories in Pennsylvania currently apply the "Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory" (commonly referred to as the Great Lakes protocol) for issuance of consumption advisories due

to PCB. Following this method, meal-specific consumption advice is issued by species. The first level of consumption advice, eat no more than one meal per week, is issued when the tissue PCB concentration is 0.06 to 0.20 mg/kg. The upper limit for unrestricted consumption is 0.05 mg/kg. In order to verify the level of protection the PCB TMDL would provide, the estimated fish tissue concentration expected to accumulate at a water column concentration of 0.00004 ug/L was calculated. Reaching the PCB criterion would result in an estimated tissue concentration of 0.001 mg/kg, well below the 0.05 mg/kg level for unrestricted consumption.

Pennsylvania currently uses the U.S. Food and Drug Administration (FDA) Action Level of 0.3 mg/kg for issuance of advisories due to chlordane contamination. Achievement of the chlordane water quality criterion of 0.0005 ug/l would result in an estimated fish tissue concentration of 0.007 mg/kg, much lower than the Action Level. The consumption advisory could be lifted at that level.

This TMDL analysis estimates, based on back calculations from fish tissue concentration, that the concentration of PCBs in the receiving water exceeds water quality standards. The TMDL analysis also shows that the existing loads of PCBs need to be reduced. The source analysis identifies various sources of this contamination including Breslube-Penn, a Superfund site. For this TMDL and the specific superfund site identified, it was assumed that controls associated with remediation of the identified sites will result in the removal of the pathway that is associated with sediment loading to the water. This elimination of the surface runoff and sediment loading pathway may reduce the associated runoff of soil-bound PCBs.

The TMDL focuses on the amount of PCBs that the water body can receive and still maintain water quality standards while the Superfund/CERLA programs focus on meeting environmental goals by eliminating the pathways of exposure of pollutants. Together, these programs can meet the allocations/goals set in this TMDL. The collaboration of the Superfund program and the TMDL program to address the impacts of legacy pollutants, such as PCBs, is the next step in an on-going and complex process of meeting water quality standards through the remediation of contaminated sediments. The integration of two often-separate programs is necessary in situations such as this where a land-based source contributes to the contamination of a waterbody. The goal of the TMDL is to reduce PCBs in the water column to water quality standards levels. This is separate from the Superfund goal which is to eliminate the pathway of contamination and not necessarily the elimination of the pollutant. Superfund balances remediation with risk determinations of human health and feasability. The TMDL program does not - it is absolute in its goal to meet standards.

A TMDL is a planning tool that may change over time as the data improves and the watersheds change. As additional data are collected the identified sources of PCBs are confirmed, a determination will be made as to whether this new data is significant and a TMDL revision is necessary. In some instances the final decision on remediation methods at the Superfund sites have not yet been made. While it is expected that this TMDL will serve as a decision tool for those remediation plans, it may be found that the removal of the sediment/runoff pathway may not be feasible or acceptable for other reasons. If this should be the case, the TMDL would be

reopened and the allocations re-distributed, but still meeting the total allowable load from all sources, to take into consideration the final remediation plan. However, it is important at this time to provide a goal that is based on the need to meet water quality standards to serve as a focal point for site plan development.

Recommendations

The use of both PCB and chlordane has been banned in the United States, so there should be no new point sources to which controls can be applied. There are no known additional sources of PCB and chlordane to the Ohio River segment other than the ones identified above. PCB and chlordane present in the main stem of Ohio River are believed to reside primarily in the sediment due to historical use and improper disposal practices.

Generally, the levels of PCB and chlordane are expected to decline over time due to the bans on use through natural attenuation. Examples of processes in natural attenuation are covering of contaminated sediments with newer, less contaminated materials, and flushing of sediments during periods of high stream flow.

Natural attenuation may be the best implementation method because it involves less habitat disturbance/destruction then active removal of contaminated sediments. Mechanical or vacuum dredging removes the habitat needed by certain benthic macroinvertebrates. In addition some of these organisms will be killed during the dredging process. Suspension of sediments during dredging may also cause abrasive damage to the gills and/or sensory organs of benthic macroinvertebrates or the gills of fish. Suspended sediments can also affect the prey gathering ability of sight-feeding fish. In addition, active removal may cause resuspension of contaminated materials thus making PCB and chlordane available for additional uptake. This alternative is also the least costly option.

For the Ohio River segment outlined above, long-term natural attenuation is the best alternative. This approach provides reasonable assurance that the TMDL will be implemented.

More than ten Federal statutes provide authority to many EPA program offices to address the problem of contaminated sediment. These statutes include: the National Environmental Policy Act; the Clean Air Act; the Coastal Zone Management Act; the Federal Insecticide, Fungicide, and Rodenticide Act; the Marine Protection, Research, and Sanctuaries Act; the Resource Conservation and Recovery Act; the Toxic Substances Control Act; the Clean Water Act; the Great Lakes Water Quality Agreement of 1978, and the Comprehensive Emergency Response, Compensation, and Liability Act. These statutes do not include any type of sediment criteria or a cleanup standard for PCBs or chlordane. Therefore, a determination on whether to conduct remediation of contaminated sediments is not as simple as comparing the sediment concentration to a criteria or standard. Generally, areas with sediment concentrations of PCB of 50 ppm or greater are considered areas of high concentration or “hot spots” and are actively remediated.

EPA's Contaminated Sediment Management Strategy (CSMS), indicates, "Widespread, low levels of contaminants may favor natural attenuation, while geographically limited areas containing high levels of contaminants favor active remediation." Natural attenuation may include natural processes that can reduce or degrade the concentration of contaminants in the environment including biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biologic stabilization, transformation or destruction of contaminants, and the deposition of clean sediments to diminish risks associated with the site.

There are no known sediment data for the advisory portion of the receiving stream. With the ban on the production of chlordane and PCBs, the mitigation of there release into the environment as the result of the remedial actions being conducted, and the continued natural attenuation that is occurring in the receiving stream, it is believed the criteria for these pollutants in the water column will eventually be achieved and the goal of the TMDL for the receiving stream to be "fishable" will be met.

Monitoring

Pennsylvania will continue to monitor PCB and chlordane in fish from this reach of the Ohio River. Samples will be collected once every five years. The data will be used to evaluate the possible threat to public health and to determine progress toward meeting the TMDL. The consumption advisories will remain in place until the water quality criteria are achieved and advisories are no longer needed.

Public Participation

Notice of the draft TMDL for the Ohio River was published in the *Pittsburgh Post-Gazette*, a daily newspaper of approximately 1.2 million readers, on Friday October 6, 2000 (Section-Classifications 444 to 479) and in the PA Bulletin on September 29, 2000. A public meeting was held on November 14, 2000 at DEP's Southwest Regional Office, located at 400 Waterfront Drive, Pittsburgh, PA 15222 (Waterfront Rooms A & B) to discuss and accept comments on the proposed TMDL. The public comment period closed on November 29, 2000.

At the public meeting four people showed up. They were form the Army Corps of Engineers, a local watershed group and a USX attorney. Primarily, the following concerns were noted in our discussions:

a) Will the State be responsible for cleaning up the PCBs in the river sediment if "natural attenuation" approach is not acceptable?
b) How long will "natural attenuation" take in order to reduce PCBs to acceptable levels?
c) Will industries be required by EPA to sample for soils and groundwater to find any unknown existing sources of PCBs?

Additionally, "Friends of the Riverfront" furnished written comments on 11/28/00. their comments applied to Shenango River, Beaver River, Chartiers/Little Chartiers Creek,

Monongahela River and the Ohio River. Their comments centered on “implementation” issues of the TMDLs. These comments were addressed. Please refer to Appendix B for a copy of the letter and the response.

The Department considered all comments in developing the final TMDL, which is submitted to the Environmental Protection Agency (EPA) for approval. Notice of final TMDL approval will be posted on the Department website.

Appendix B

COMMENT AND RESPONSE ON THE PROPOSED PCB/CHLORDANE TMDL FOR THE OHIO RIVER

EPA Region III

Comment: General: The report notes that the major fate process for PCBs and chlordane is adsorption to soil and sediment organic matter. However, only contaminants moving to lower layers of the sediment may be effectively sequestered. Otherwise, the sediments may act as an environmental reservoir, and any hydrologic processes that disturb or scour sediments also act to redistribute contaminants. The dam structures should be included in the TMDL analysis as they may act to trap the majority of sediments from reaching the downstream impaired segments of the Ohio River. In addition, given that volatilization is a significant environmental transport process for dissolved PCBs, the presence of a dam or other feature that may increase aeration rates could act to decrease PCBs in the water column prior to the impaired segment.

Response: The comment suggests that instream concentrations of the contaminants may be less than expected because of possible resuspension in the water column and volatilization. There are no data to adequately characterize the water column concentrations and the TMDL states that estimating from fish tissue concentrations (as was done) likely over-estimates the water concentration. Because movement of the fish is prohibited to upstream of the dam, there is no reason to address concentrations of PCB or chlordane (even if there were data) that may exist above the dam.

Comment: TMDL Development/Endpoint Identification: PA DEP found that insufficient STORET data were available within a five-mile radius of the fish tissue sampling stations to estimate water column concentrations for PCBs or chlordane. The TMDL should specify whether PA DEP searched for STORET data in any other portions of the listed segment to support the water column concentration estimates. Also, the TMDL should specify the analytical detection limit for those results that were reported as less than detection and whether the analytical results were only for PCBs.

Response: The STORET search was designed to be representative of the fish advisory segment, and was intended to supplement the file search conducted by the Southwest Field Office. For the Ohio River, the search was conducted using a six-mile radius around Water Quality Network Station 902 and a 15-mile radius around the fish tissue sampling station just below the Montgomery Lock and Dam. The report has been revised to reflect this search, rather than stating that a five-mile radius was used in both instances. The data found were from 1970, 1977 and 1979. The STORET retrieval request included both PCB and chlordane. Only one detection, for PCB, was found and noted in the report to document the search. As noted, this data is not representative of current water quality conditions. Therefore, the detection limits are not relevant.

Comment: TMDL Development/Endpoint Identification: A table shows the range of years and the years of available fish tissue data for PCBs and chlordane in various fish species. Because the time frame is over ten years, the data may show a decreasing trend. An attempt should be made to evaluate time trending of PCB and chlordane levels in fish tissue.

Response: The Department does not believe trend information based on the limited sampling results would be meaningful in this TMDL document. The important factor is that fish consumption advisories are in place and the estimated water column concentrations exceed the criteria. This means that a TMDL must be developed.

Comment: TMDL Development/Endpoint Identification: The table also shows that the number of data sets are either the same or more than the number of years, suggesting that in one or more of the years listed, two or more sets of analytical data are available. The table should be modified to reflect the exact number of data sets available for each listed year followed by an explanation of how the tissue data was used to arrive at the arrive at the estimated water column concentrations.

Please consider listing the fish tissue data that were used to back-calculate the instream water concentration of PCBs or chlordane. This would help clarify whether the tissue concentrations were determined by averaging all data for both carp and channel catfish for each of the years identified. Did the state observe any changes in fish tissue concentrations from 1985 through 1997 that would support natural attenuation as the best alternative for the TMDL?

Response: Average PCB and chlordane tissue levels were determined for each species using all samples. An estimated water column concentration was then calculated for each compound for each species. These estimated water column concentrations were averaged for each compound in order to provide a single estimated water column concentration for each parameter for the segment. The report has been revised to include this explanation. A listing of the fish tissue data is included in the final TMDL as Appendix A. The back-calculation was done to provide an estimated water column concentration for comparison to the water quality criteria because no current data are available. The important point for the TMDL is that the data show the criteria are most likely exceeded making a TMDL necessary.

The Department does not believe trend information based on the limited sampling results would be meaningful in this TMDL document.

Comment: Source Assessment: PA DEP indicates that known point sources of PCBs or chlordane must obtain an NPDES permit, but does not identify these potential sources. The report notes that several potential nonpoint sources have been identified, but they are not listed. Furthermore, the report states that no data are available to quantify the potential nonpoint source loads. Non-detect readings for effluent, soil or ground water samples may not be sufficient to omit point or nonpoint sources from the TMDL analysis. Current testing techniques lack the precision necessary to accurately quantify levels that could ensure compliance with the water

quality criteria for PCBs. If the point sources can demonstrate they are no longer accepting any discharge potentially containing PCBs or chlordane, their removal from the TMDL can be justified. Otherwise, the TMDL analysis and allocation should be revisited to consider the impact of point sources. Also, the relevance of the statewide ground water and soil loading standards to the TMDL is not clear. They should have no effect on the assessment of attainment of the PCB or chlordane criteria.

Response: The report states in at least two places that there are no known point sources of PCBs or chlordane. Non-detect readings are the readily available data supporting the TMDL. In the absence of data, it is not correct to assume non-compliance with water quality standards and attempt to refine allocations.

Comment: A search of potential sites undergoing remediation under CERCLA, SARA TSCA or Pennsylvania's Hazardous Site Cleanup Act (HSCA) should be conducted to locate potential PCB or chlordane sources.

Response: The Department acknowledges EPA's assistance in looking for additional data, and added appropriate discussion in the Source Assessment section.

Comment: Source Assessment: This section provides a summary of CERCLA, SARA and HSCA in an apparent attempt to define the programs under which sediment remediation could occur. The TMDL implementation, however, relies on natural attenuation, so these discussions do not appear to be relevant.

Response: The discussions have been deleted as irrelevant.

Comment: Source Assessment: The report states, "Appropriate level of cleanup is difficult to determine. Removal of all contaminates is virtually impossible and exceedingly expensive. However, cleaning up to any other level raises issues of dose response, which links an amount of a contaminate to the resultant effect, which is difficult to accurately predict." The word "contaminate" is used here instead of "contaminant." The entire paragraph should be clarified, and may not be appropriate for this section.

Response: The paragraph has been deleted.

Comment: Wasteload Allocations and Load Allocations: Because there are three sites contaminated with PCBs, it is not sufficient to simply allocate to instream sediments given that theses are current or former nonpoint sources of PCBs. EPA recently assisted DEP in developing a PCB TMDL for Valley Creek that serves as a useful example of how to allocate when such sites are identified. The TMDL should be revised and PA DEP should contact applicable state/Federal agency personnel involved in the three sites. If possible, an approach similar to Valley Creek should be used. This approach is predicated on the existence of remedial actions that will ensure that sources of PCB contamination (land-based contaminated soil runoff or instream sediments) will be controlled so that applicable water quality standards will be attained

and maintained. If not, PA DEP must allocate to each of the three land-based sources as well as instream sediments. That allocation method must be scientifically defensible.

Response: DEP thanks EPA for providing the resources to gather additional file and literature data that allowed for increasing the information in the Source Assessment. Allocation to the potential sources was not made because there is limited information to use in such determinations.

Comment: TMDL Implementation: Implementation relies on natural attenuation of the contaminated sediment. Existing fish tissue or sediment data demonstrating that this process is ongoing would support the reasonable assurance section of this TMDL.

Response: The Department used existing and readily available and has revised the TMDL where appropriate.

Comment: Sediment Remediation: This section provides background information on the federal statutes and regulations that address sediment contamination and appears to have been pasted from another document without editing. This section should be revised to include only information relevant to this TMDL. The document indicates that a number of "criteria have been evaluated in order to determine the appropriate remedial actions for the four sites of concern." Throughout the TMDL, there is no mention or description of any four specific sites of concern.

Response: The Department agrees and has revised the TMDL accordingly.

Comment: Sediment Remediation: The last paragraph states that there are no known "hot spots" in the advisory segment where sediment samples exceed 50 mg/kg. This suggests that sediment samples have been collected, but there is no mention of such sampling throughout the document.

Response: There are no known sediment data for the advisory portion of the receiving stream and the report is revised to state that.

Comment: Monitoring: This section states that fish tissue monitoring will continue once every five years. First, other EPA-approved for comment TMDLs include monitoring of fish tissue every two years. Secondly, this section does not specify which fish species will be monitored and for what parameters. Last, given that this TMDL segment is about 39.6 miles in length with several tributaries, the monitoring will require multiple locations. A consolidated fish tissue monitoring program for the whole Ohio river watershed may be appropriate.

Response: Pennsylvania's fish tissue monitoring program is generally based on a five-year sampling rotation. Two particular streams, currently under No Kill regulations, are monitored every two years. This TMDL is for PCB and chlordane. Both of these compounds are included in the parameter list for the Department's routine monitoring program. Any monitoring will

attempt to target the species for which consumption advisories are in place, although obtaining target species is not always possible.

Appendix C

References

Field Investigation Team Activities at the Uncontrolled Hazardous Substances Facilities (Breslube-Penn). NUS Corporation, 1991.

Hillery, et al. "Atmospheric Deposition of Toxic Pollutants to the Great Lakes as Measure by the Integrated Atmospheric Deposition Network." *Environmental Science and Technology*. 1998.

Inorganic Analytical Data Package, Roy F. Weston Inc., 1994.

McConnell, L.L., 1998. "Air Concentrations of Organochloride Insecticides and Polychlorinated Biphenyls Over Green Bay." *Environmental Pollution.* Volume 101, Number 3. pp. 391-399.

Prickett, Thomas A., 1994. A Primer on Random Walk Techniques for Mass Transport Groundwater Modeling. TD Productions Book Company, Urbana, Illinois.

Pennsylvania Department of Environmental Protection, 1998. Implementation and Guidance – Design Stream Flows. (Document No. 391-2000-023). PADEP.

Pennsylvania Department of Environmental Protection, 1991. PATG Section I Erosion Prediction. PADEP.

Pennsylvania Department of Environmental Protection, 2000. Section 303(d) List 1998, Final. DEP Web Site. http://www.dep.state.pa.us/

Pennsylvania Department of Environmental Protection, 2000. 1998, 1999 and 2000 Fish Advisories. DEP Web Site. http://www.dep.state.pa.us/

Phase II Site Verification Report for the Holbrook Compressor Station Greene County, Pennsylvania, Roy F. Weston Inc., 1992.

Site Inspection using Available Information of Holbrook Compressor Station. NUS Corporation, 1990.

Soil Conservation Service, 1963. Soil Survey for Chester and Delaware Counties, Pennsylvania. United States Department of Agriculture, Washington, D.C.

U.S. Environmental Protection Agency, 1980. Ambient Water Quality Criteria for Polychlorinated Biphenyls. EPA 440-5-80-068. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1980. Ambient Water Quality Criteria for Chlordane. EPA 440-5-80-027. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1996. Approval of Removal Action. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1996, Clean Water Act Section 303(d) List of Impaired Waters. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1998 Clean Water Act Section 303(d) List of Impaired Waters. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 1993. The Technical Basis for Deriving Sediment Quality Criteria for Nonionic Organic Contaminants for the Protection of Benthic Organisms by Using Equilibrium Partitioning (EPA-822-R-93-011). U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 2000. Lake Michigan Mass Balance Study.

U.S. Environmental Protection Agency, 2000. Ohio River Park, Current Site Status. U.S. EPA, Web Site. http://www.epa.gov/reg3hwmd/super/ohio.html

U.S. Environmental Protection Agency, 1993. PCB Information Package. U.S. EPA, Washington, DC.

U.S. Environmental Protection Agency, 2001. PCB Sample Results. U.S. EPA, Washington, DC.

U.S. Geological Survey, 1994. USGS Water-Resources Investigation Report (94-4060). USGS, Washington, DC.

Workplan for Remedial Investigation/ Feasibility Study: Breslube-Penn Superfund Site, Allegheny County, Pennsylvania. Civil and Environmental Consultants, Inc., 2000.