3/8/01

Total Maximum Daily Load

PCB

Levittown Lake

Falls Township and Tullytown Boro, Bucks County

Table of Contents

	Page
Introduction	**2**
Background	**2**
TMDL Development	**4**
Source Assessment	**5**
TMDL Calculation	**8**
Recommendations	**11**
Monitoring	**11**
Public Participation	**12**

Appendix A – STORET retrieval of PCB and chlordane fish tissue data

Appendix B – Comment and Response

Appendix C - References

Introduction

Pennsylvania has conducted monitoring of fish tissue contaminants since 1976. Early efforts were comprised of special studies in major water bodies as well a smaller waters with suspected sources of contaminants. Routine sampling for tissue contaminants began in 1979 with implementation of the U.S. Environmental Protection Agency (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, we also began rotating sampling through our 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. The Department of Health, the Fish and Boat Commission, and DEP issue advisories jointly. 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. In addition, the annual list and any individual advisories needed between lists are issued using press releases.

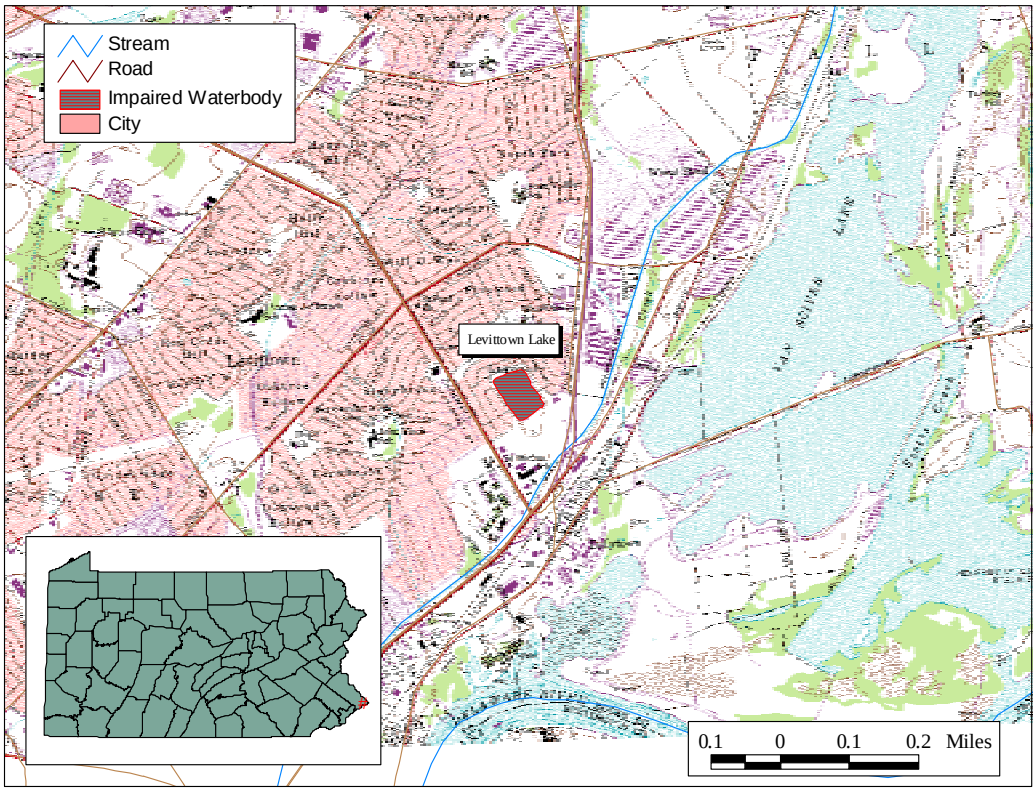
A number of Pennsylvania waterbodies with fish consumption advisories were listed on the Clean Water Act Section 303(d) List of Impaired Waters for 1996 and 1998. They were listed because long-term, unrestricted consumption of these fish could potentially lead to human health problems. This document addresses contamination of fish tissue in Levittown Lake, Bucks County, by PCB.

Background

Levittown Lake was included on the 1996 CWA Section 303(d) list in State Water Plan Watershed 2-D. In 1998, the lake was included on the revised list in State Watershed Plan 2-E also as impaired by chlordane. These listings erroneously indicate the cause of impairment as chlordane. Fish tissue data collected by DEP, and discussed in further detail below, clearly determined that the cause of impairment to Levitown Lake is PCB contamination.

Levittown Lake has a surface area of approximately 22 acres, and was created in the 1950's by the flooding of a sand/gravel quarry. It has no natural inlets, being fed solely by groundwater, and is at equilibrium with the water table. Several storm sewers discharge into the lake from the surrounding residential neighborhood. They drain an area approximately ¾ of a square mile. The only outlets are by evapotranspiration and infiltration to the ground water. According to a 1956 engineering survey, the mean depth of the lake is 10 feet and its maximum depth is 18 feet. There are no surface water inflows, so siltation of the lake should occur at a slower rate than with other artificial lakes. Even after more than 40 years, these depths may still be fairly accurate. The Pennsylvania Fish and Boat Commission (PFBC) currently stocks the lake with Rainbow and Palomino Trout. Also found in the lake are Channel Catfish, White perch, Yellow Perch, Pumpkinseed, Bluegill, Largemouth Bass, and Black Crappie.

Location Map



Levittown Lake (impaired area highlighted

On the adjoining property, only about 200 feet southeast of the lake, is St. Michael's Landfill. This landfill is also an abandoned sand/gravel quarry. The site accepted municipal and industrial waste from approximately 1960 to 1975, when it was closed by US Environmental Protection Agency (EPA) order. A liquid chemical fire occurred at the site in 1968, although the landfill was not licensed to accept liquid industrial waste. A 1982 inspection report noted erosion gullies leading from the landfill to the lake, potentially allowing landfill runoff to enter Levittown Lake.

The PFBC and the Department of Environmental Protection (DEP, the Department) first collected fish tissue samples from Levittown Lake in 1986 because chlordane and PCBs were detected in lake sediments the previous year by the EPA. The initial sample of white perch fillets contained concentrations of PCB and chlordane above the US Food and Drug Administration's (FDA) Action Level. The Department also sampled white perch in 1989, 1994, and 1995. The lake was first added to the 303(d) list in 1996. When the Department applied the Great Lakes Sport Fish Consumption Advisory Protocol in 1998, chlordane levels were below the Action Level. Average PCB concentration ($0.329^{mg}/_{kg}$) did exceed the standard, warranting advice to eat no more than one meal of white perch per month.

Levittown Lake ($40^{o}09$'N, $74^{o}49$' W, Trenton West Quadrangle) is located in Falls Township and Tullytown Boro, Bucks County, Southeastern Pennsylvania. To reach the lake, take the Pennsylvania Turnpike (I-276) to exit 30. Follow route 13 (Bristol Pike) north for approximately four miles to Levittown Parkway. Turn Left onto Levittown Parkway and after about ½ mile, turn right onto Lakeside Drive. Follow Lakeside Drive ¼ mile to the lake.

TMDL Development

Endpoint Identification

The overall goal of a TMDL is to achieve the "fishable/swimable" standard of the Federal Clean Water Act. Because a consumption advisory is in place for white perch due to PCB contamination, this standard is not being met for Levittown Lake.

The specific goal of a TMDL is to outline a plan to achieve the water quality standard in a particular water body. For Levittown Lake, the goal is for the concentration of PCB in the water column to be equal to or less than the Commonwealth's water quality criteria. The criterion for PCBs, found in the "Water Quality Toxics Management Strategy – Statement of Policy" (Chapter 16 of the Department's rules and regulations) is 0.00004 ug/L (micrograms per liter, equivalent to parts per billion – ppb). PCBs are probable human carcinogens, and the Department developed this criterion to protect against excess cancer risk. The Department's water quality toxics management program controls carcinogens to an overall risk level of one excess case of cancer in a population of one million.

To equate fish tissue data with this water quality criterion, the Department calculated an estimated water column concentration using a bioconcentration factor (BCF) taken from an EPA criteria development document (EPA 440/5-80-027, October, 1980). The calculation involves dividing the average fish tissue concentration by the bioconcentration factor to obtain an estimated water column concentration. The equation is:

TC/BCF = WC x 1000

Where:

TC = Tissue concentration in mg/kg (equivalent to mg/L)
BCF = EPA Bioconcentration Factor in 1/kg, equal to 31,200 for PCB
WC = Water Column Concentration (estimated) in mg/L

Multiply by 1000 to obtain ug/L

$0.329^{mg}/_{kg} / 31{,}200 = 0.00001054^{mg}/_{L}$

$0.00001054^{mg}/_{L} \times 1000 = 0.01054\ ^{ug}/_{L}$

Average fish tissue concentration is the mean of all samples shown in the table below. The data are included as Appendix A. DEP uses average concentration for two reasons. First, fish tissue samples are composites; a sample represents the average concentration among three to five individuals, not an exact value. Second, use of an average value considers the natural variation in tissue burden found in wild fish populations. The Department uses the EPA bioconcentration factor because PA DEP has no bioaccumulation factor available for statewide use. The use of BCFs is consistent with the provisions of the Department's water quality toxics management strategy.

Fish Tissue Data Used to calculate the TMDL for the Levittown Lake

Parameter	Fish Species	Number of Data Sets	Range of Years	Years
PCB	NA	3	1989 - 1995	1989, 1994, 1995
Chlordane	NA	4	1986 - 1995	1986, 1989, 1994, 1995

The average PCB concentration in white perch from Levittown Lake is 0.329 mg/kg (ppm). The estimated water column concentration of PCB is 0.01054 ug/L (ppb). This estimated concentration exceeds the applicable water quality criterion (0.00004 ug/L). This water column concentration is most likely a conservative estimate. Back calculations from tissue concentration to water column concentration using average values tend to be higher that the actual concentration. It is standard practice to assign a value of one half of the detection limit to tissue data reported at below detection. The actual value may be anywhere between the detection limit and zero. While the actual water column concentration is unknown, it is likely to be lower than the calculated estimate.

Source Assessment

The production of PCBs (polychlorinated biphenyls) began in 1929, and the United States alone produced about 400,000 tons until production and use were banned in 1979. Prior to the ban, these synthetic oils were used as insulating fluid in electrical equipment,

as hydraulic fluids, plasticizers, cutting oils, and in carbonless paper. They exhibit excellent thermal stability, strong resistance to attack by acids and bases, extremely low water solubility, and general chemical inertness.

When they enter the aquatic environment, PCBs are rapidly adsorbed onto particulate matter and ultimately are deposited in bottom sediments, usually close to the point of discharge. Dispersal is primarily dependant on the movement of the associated sediments. PCBs enter the aquatic food web when organisms ingest PCB-bearing sediments, and to a lesser degree, by direct uptake from the water column through the gills. Although solubility in water is low, PCBs are soluble in nonpolar (organic) solvents and lipids. They rapidly transfer from water or food to an organism's fatty tissues, where they accumulate throughout the organism's lifespan. Bioconcentration occurs when animals from higher trophic levels (higher on the food "chain") consume many contaminated organisms.

In an effort to locate the source of PCB contamination, and to ~~possibly~~ determine if PCBs are still entering the Levittown Lake, we studied all available information pertaining to the geology, groundwater movement, and land use history of the area. The lake basin consists of coastal plain deposits of sandy silt and gravel. The aquifer feeding the lake is unconfined, and water within it travels in a southeasterly direction at an average rate of approximately 10 feet per day. Its level is dependant on rainfall and the level of the nearby Delaware River. To the northwest, northeast, and southwest of the lake in a radius of one mile, land use is approximately 75% medium density residential, 20% commercial and 5% light industrial. In a radius of ½ mile, land use is strictly residential and commercial. Southeast of the lake, as previously mentioned, lies the now-sealed St. Michael's landfill. This landfill has long been suspected to be the source of the PCB contamination, but our review found little evidence to support this claim.

Some PCBs may travel from the landfill to the lake via groundwater. Even though groundwater in this area flows southeast, *away from the lake*, some groundwater movement perpendicular to the main direction of flow can occur. The possibility of PCBs reaching Levittown Lake due to lateral movement is unlikely due to their strong physical attraction to soil particles, compounded by the landfill's "downstream" location. In New York State, PCBs *were* found to move with groundwater (in the direction of flow) under geologic conditions similar to those at Levittown Lake, but at a rate *two orders of magnitude slower* than the rate of groundwater flow. At the Levittown Lake site this would mean a rate of travel of approximately 0.1 feet per day, or between 35 and 40 feet per year. Unless PCBs were present in the groundwater *northwest of the site* prior to the lake's creation, it is unlikely that any PCB could have reached the lake from further away than ¼ mile prior to the date of first detection (1986).

Considering the above information only, PCB-contaminated groundwater from St. Michael's Landfill could not be ruled out, but we uncovered additional information which casts further doubt on groundwater infiltration from St. Michael's Landfill as the source of PCB in Levittown Lake: In a 1985 field trip report, EPA concluded that there was insufficient evidence to link the landfill to domestic well contamination in Tullytown

Boro, a small community about ½ mile to the south (in the path of groundwater flow from the landfill). Environmental Resources Management Corporation (ERM) studied St. Michael's Landfill in 1997 at the request of the landowner, St. Michael's Church, due to methane gas build-up in the soil. ERM drilled five monitoring wells around the landfill, and sample results from these wells seem to indicate that hazardous materials are not migrating from the landfill to Levittown Lake via groundwater. Although PCBs were not specifically tested for, levels of far more soluble and transportable materials (metals and VOCs) were highest in the wells furthest from the lake. Samples from the wells near the lake were among the cleanest, even for these more active substances.

After analyzing the available evidence, we conclude that the most likely route of entry of PCBs into Levittown Lake was through the storm sewers or by overland transport of contaminated soil particles via runoff and erosion. We also conclude that it is unlikely that PCBs are entering the lake today. Although a 1982 report noted the presence of erosion gullies connecting the lake with the landfill, this condition has been corrected. Surface runoff should now be contained within the landfill, barring catastrophic flooding. The storm sewers still discharge directly into the lake. They drain approximately ¾ of a square mile of the surrounding developed area, excluding the landfill. All surface runoff, along with any contaminants on the surface of lawns, streets, roofs and parking lots within this area could potentially enter Levittown Lake. PCBs are not usually found in residential neighborhoods, but at some time in the past, small amounts of the material could conceivably have ended up within the area drained by these sewers. There is also the possibility of intentional dumping. Since the manufacture and use of PCB has been illegal for over 20 years, it is unlikely that this material would exist today in a residential/commercial area to serve as a continuing source of surface runoff contamination. Although we may never know the source of the PCB contamination at this site, we are reasonably certain, based on currently available information, that there is no continuing discharge of PCBs into Levittown Lake, either from groundwater infiltration or surface runoff.

Atmospheric Deposition: Development of the TMDLs for Levittown Lakeconsiders 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.

TMDL Calculation

Development of a TMDL usually includes consideration of such factors as background levels, point source contributions, stream flow variation, soil type, slope, and land use. Many of these factors do not apply for this pollutant and this unusual water body.

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.

Stream flow is not an issue, because there are no inflows to the lake (other than storm water runoff), and no outlets. Water lost due to evapotranspiration is replaced by groundwater infiltration, and water level (and therefore lake volume) is dependant on the height of the water table. Land use is an issue with regard to source assessment, but for allocation and loading issues it is not relevant. The use of a watershed model to calculate loading isn't necessary due to the static nature of the system and the stability of the pollutant. We believe PCB was introduced into the lake at some point in the past and now cannot leave, except by the very slow process of chemical breakdown or the physical removal of contaminated sediments.

Since lake volume is relatively constant, all that's needed to compute the maximum allowable load is lake volume, the current (estimated) water column concentration of PCB, and the target PCB concentration (water quality criterion). Computation will yield the maximum amount of PCB allowable in the lake while still meeting the water quality criterion. From this follows the percent reduction required to meet the target concentration.

Lake volume:

Volume = surface area x mean depth
Volume (Levittown Lake) = 22 acres x 10 feet
Volume (Levittown Lake) = 220 acre/feet

m^3 = acre/feet x 1234.0

220 acre/feet = 271,480 m^3

m^3 = liters (L) x 1000

Volume (Levittown Lake) = 271,480,000 L

Estimated Total PCB in the Water Column:

Estimated WC concentration (PCB) x Lake Volume = Total PCB in WC

0.01054 $^{ug}/_{L}$ x 271,480,000 L = 2,861,399.2 ug

= 2.86 g, Estimated total PCB in water column (Levittown Lake)

Calculation of the PCB Load Allocation

A TMDL is made up of two types of allocations: a load allocation (LA) and a waste load allocation (WLA). The waste load allocation is that portion of the total allocation contributed by point source discharges. There is no waste load allocation in this calculation because there are no point sources discharging into Levittown Lake. The total PCB load is the result of non-point source discharges.

Achievement of a TMDL should ensure achievement of the fishable/swimable standard. To account for uncertainties that may be associated with TMDL calculations, the Department proposes to hold 10% of the TMDL in reserve. When we apply this 10% margin of safety (MOS), the LA equals only 90% of the calculated TMDL.

LA = [WQ criterion (PCB) x Lake Volume] – 10% margin of safety (MOS)

[0.00004 $^{ug}/_{L}$ x 271,480,000 L] = 10,859.2 ug = <u>0.0108592 g</u>

MOS = 0.1 x 0.0108592 g = <u>0.00108592 g</u>

<u>LA = [0.0108592 g] – 0.00108592 g = 0.0097732 g</u>

Final TMDL Calculation

TMDL = WLA + LA (PCB) + MOS

<u>TMDL = 0.0 + 0.0097732g + 0.00108592 g = 0.0108591 g PCB</u>

<u>Percent Reduction</u>

The goal of this TMDL is to protect public health by meeting the water quality criterion for PCB. In order to achieve this, we must reduce the PCB concentration in Levittown Lake from the estimated current level to the criterion level. To put this task in perspective, we report the percent reduction in PCB concentration required to achieve the water quality criterion:

Percent Reduction = 1 – (TMDL goal / existing concentration) x 100

Percent Reduction = 1 – (0.00004 $^{ug}/_{L}$ / 0.01054 $^{ug}/_{L}$) x 100 = 99.6%

<u>Required Percent Reduction in PCB Water Column Concentration = 99.6%</u>

<u>TMDL Verification</u>

Our goal is to meet the PCB water quality standard in Levittown Lake for the protection of public health. We hope to reach a point where fish consumption advisories are no longer needed because fish tissue concentrations of PCBs are no longer a 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 PCBs. Following this method, they issue meal-specific consumption advice by species. They issue the first level of consumption advice (eat no more than one meal per week) when the tissue concentration of PCB is between 0.06 $^{mg}/_{kg}$ and 0.20 $^{mg}/_{kg}$. The upper limit for unrestricted consumption is 0.05 $^{mg}/_{kg.}$ In order to verify the protectiveness of this PCB TMDL, we calculated the estimated fish tissue concentration that would accumulate at a water column concentration of 0.00004 $^{ug}/_{L.}$ Reaching the PCB water quality criterion would result in an estimated fish tissue concentration of 0.001 $^{mg}/_{kg}$, well below the 0.05 $^{mg}/_{kg}$ level for unrestricted consumption.

Recommendations

The PCB present in Levittown Lake resides primarily in the sediment. The substance was most likely carried into the lake by runoff and erosion from the nearby St. Michael's Landfill, or through the storm sewers. Due to the ban on PCB use and the subsequent capping and securing of the landfill, we do not believe that PCBs continue to enter the lake today. Therefore, the concentration of PCB in the water column and fish tissue should decline over time through natural attenuation. Contaminated sediments will gradually be covered by newer, uncontaminated material, and chemical breakdown will eventually occur, though at a very slow pace. Natural attenuation may be the best implementation method because it involves less habitat disturbance and destruction than the active removal of contaminated sediments. Mechanical or vacuum dredging of a relatively small, closed system such as Levittown Lake will result in the destruction of many fish and invertebrates, and seriously damage the lake habitat for those remaining. Active removal will also cause resuspension of contaminated material, making PCBs more available for uptake. Natural attenuation is also the least costly option.

Monitoring

Pennsylvania will continue to monitor white perch in Levittown Lake for elevated tissue concentrations of PCB. The Department will collect samples once every five years. We will use the data to evaluate the possible threat to public health and to determine progress toward attaining the TMDL. We will leave consumption advisories in place until the water quality standard is achieved.

Public Participation

Notice of the draft TMDL for Levittown Lake was published in the Bucks County Courier Times, a newspaper of general circulation, on October 2, 2000 and in the PA Bulletin on September 30, 2000 with a 60-day public comment period. A public meeting was held on November 15, 2000 at DEP's Southeast Regional Office, located in Lee Park, Suite 6010, Conshohocken, PA 19428, to discuss and accept comments on the proposed TMDL. The public comment period closed on November 29, 2000. Notice of final TMDL approval will be posted on the Department's website.

Appendix B

COMMENTS AND RESPONSE ON THE PROPOSED PCB/CHLORDANE TMDL FOR LEVITOWN LAKE, BUCKS COUNTY, PENNSYLVANIA

EPA Region III

Comment: The TMDL for Levitown Lake is developed for impairments of PCBs, and EPA believes there is data available indicating PCB impairment. However, we note that Pennsylvania's 1996 303(d) list denotes Levitown Lake as being impaired by chlordane. Please clarify.

Response: The final report has been changed to include chlordane and to address this comment.

Comment: This TMDL provides substantially less informative information than the others being public noticed by the Department at this time. In the Source Assessment section of the proposed TMDL, the one potential source is briefly mentioned by name; however, no additional information is included. Specific information on the potential source should be provided. The Implementation and Reasonable Assurance section of the proposed TMDL states that PCBs are believed to be present primarily in sediment. This statement should be supported by characterization reports. These reports should also demonstrate whether any potential land-based sources exist as current sources or that remedial actions have been or will be taken to eliminate them as potential sources. If neither can be demonstrated, a portion of the load should be allocated to the potential sources

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: The TMDL development can be assisted with the use of data and information from Superfund. In addition, consideration should also be given to Section 121 of CERCLA, which says that any remedial activities must comply with any Applicable or Relevant and Appropriate Requirements of Environmental Laws (ARARs) including 25 PA Code 93 pertaining to Water Quality Standards for discharge to streams. It is EPA's interpretation that the cleanup of soils and stream sediments will be done such that these sources of PCBs will comply with water quality standards. The revised analysis thus allows for explicit consideration of the contaminated land based source of PCBs in the allocation. In addition, the margin of safety accounts for unknown sources of PCB contamination. The remedial action further provides reasonable assurance that the TMDL can be achieved. This type of approach is predicated on the existence of remedial actions which will ensure that sources of PCB contamination (land-based contaminated soil runoff or in stream sediments) will be controlled in a manner such that applicable waterbody, will attain and maintain applicable water quality standards. Alternatively, the TMDL must allocate PCB loading The TMDL should indicate the details of the research.

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: The section on TMDL Development does not include any readily available data on the current water quality of Levittown Lake. An effort should be made to obtain and include readily available water quality data. A search of potential sites undergoing remediation under CERCLA, SARA, or Pennsylvania's Hazardous Sites Cleanup Act (HSCA) within the watershed should be conducted as another method of source assessment. A search of the STORET data base should also be completed.

Response: The Department used readily available data in developing the TMDL and acknowledges EPA's assistance in looking for additional data. No additional data on potential sites of PCB/chlordane contamination were found. This statement has been added to the text.

Comment: The implementation of this TMDL relies on natural attenuation of the contaminated sediment. Existing data (either fish tissue or sediment) demonstrating that this process is ongoing would further support the reasonable assurance section of this draft TMDL.

Response: Thank you for this perspective. The Department believes implementation is best addressed under the lead of local citizen groups, following completion of the TMDL.

Appendix C

References

Connell, D.W. and Miller, G.J. 1984. Chemistry and Ecotoxicology of Pollution. John Wiley and Sons, Inc. N.Y.

Ecology and Environment, Inc. 1982. Site Inspection of Levittown Dump, EPA Contract # 68-01-6056.

Environmental Resources Management. 1988. Report of Findings of the Supplemental Ground Water and Soil Gas Investigation of the Former Levittown Landfill

Leis, W.M. et al. (Undated) Migration of PCBs by Groundwater Transport – A Case Study of Twelve Landfills and Dredge Disposal Sites in the Upper Hudson Valley, N.Y.

Lind, O.T. 1985. Handbook of Common Methods in Limnology, Second Edition. Kendall/Hunt Publishing Company. Dubuque, Iowa.

NUS Corporation, Superfund Division, 1986. A Field Trip Report for Levittown Dump, EPA Contract # 68-01-6699.

O'Hara, T.F. 1956. Reconnaissance Engineering Survey of Levittown Lake, Tullytown Borough, Falls Township, Bucks County.

PADEP. 1989. Hazardous Site Evaluation Report, St. Michael's Dump.

United States Environmental Protection Agency. 1987. Ground Water Handbook. #625/6-87/016

United States Geological Survey. Water Supply Paper 2220. Basic Ground-Water Hydrology.