Total Maximum Daily Load (TMDL) Documentation for Chlordane in Back River

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ATTACHMENTS

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Basin Code: 02-13-09-01

EXECUTIVE SUMMARY

Chlordane, a pesticide no longer authorized for use in the United States, has been detected in certain Back River fish tissues at levels that required the issuance of a consumption advisory. This advisory has been in place since February 5, 1986 (attachment 1). As a consequence of this impairment by chlordane, Back River was identified as a water quality limited segment on the 1996 Section 303(d) list. This document establishes a TMDL of 0.00059 ug/L in the water column based on the United States Environmental Protection Agency water quality criterion for chlordane and the U.S. Food and Drug Administration guidance level of 0.3 mg/kg in fish tissue. Since the TMDL value is impracticable to monitor directly in the water column, the U.S. FDA guidance level will serve as the targeted endpoint. In the absence of any defined current sources of chlordane other than sporadic low levels from urban runoff sources, there is no opportunity to allocate loadings among point and non-point sources. The State intends to periodically monitor the contaminant levels of fish and sediments in Back River to track the expected gradual declines, which are indicated in currently available sediment data. The goal of the monitoring program will be to identify fish tissue levels that would allow for the withdrawal of the fish consumption advisory.

PREFACE

Section 303(d) of the federal Clean Water Act directs States to identify and list waters, known as water quality limited segments (WQLSs), in which current, required controls of a specified substance are inadequate to achieve water quality standards. For each WQLS, the State is to establish a Total Maximum Daily Load (TMDL) of the specified substance that the water can receive without violating water quality standards.

On the basis of water quality problems associated with Back River, the watershed was identified on the Maryland's 1996 list of WQLSs as being impaired by toxic contaminants, specifically the pesticide chlordane. This report documents the proposed establishment of the chlordane TMDL for the Back River.

Once the TMDL is approved by the United States Environmental Protection Agency (EPA), the approved TMDL will be documented through the State's Continuing Planning Process. In the future, the established TMDL will document monitoring activities required to track restoration of the impaired resource and the lifting of the associated fish consumption advisory.

1.0 INTRODUCTION

The Clean Water Act Section 303(d)(1)(C) and federal regulation 40 CFR 130.7(c)(1) direct each State to develop a Total Maximum Daily Load (TMDL) for all impaired waters on its Section 303(d) list. A TMDL reflects the maximum pollutant loading of the impairing substance a waterbody can receive and still meet water quality standards. A TMDL can be expressed in mass per time, toxicity, or any other appropriate measure (40 CFR 130.2(i)). TMDLs must take into account seasonal variations and a margin of safety (MOS) to allow for uncertainty. Maryland's 1996 303(d) list, submitted to EPA by the Maryland Department of the Environment (MDE), lists the Back River watershed segment for toxics, specifically the pesticide chlordane. That 1996 listing was prompted by historical fish tissue data and an associated fish consumption advisory based on 1980s monitoring of the fish resources.

This report documents the development of a Total Maximum Daily Load (TMDL) for chlordane in the estuarine portion of Back River. This watershed, referred to as basin 02-13-09-01, was first identified as being impaired because of chlordane on Maryland's 303(d) list for 1996.

Chlordane has been identified as a pollutant of concern because it is a bioaccummulative pesticide that can cause both acute toxic and longer-term chronic effects, and it has carcinogenic potential in animals. Chlordane was used from its introduction in the 1940s until it was withdrawn from the market in 1988 as a broad-spectrum pesticide for agricultural, home, and commercial control of insects. Its polycyclic chlorinated organic structure produces biological effects similar to those of DDT, PCBs, and other related substances.

The Maryland Department of Agriculture suspended broad-based uses of chlordane in 1975 by restricting its use to termite control. Only certified applicators were authorized to purchase quantities greater than ½ gallon after that date. The U.S. Environmental Protection Agency (EPA) reached an agreement with the sole producer of the product on July 1, 1986, which led to the further restriction of use to the exterior of buildings, and to the ultimate termination of all sales by April 15, 1988. EPA officially cancelled the product's registration in 1993.

Concerns with the substance were largely brought to the State's attention through results of its fish tissue monitoring, which has been an element of the State's water quality monitoring efforts since the 1970s. Water quality impairments in the estuary of Back River were initially suggested as a result of fish taken from waters of the tidal portion of the basin in 1981. The levels were of sufficient magnitude to justify the issuance of a fish consumption advisory. All available evidence indicates that the source of the chlordane in the fish tissue is the historical accumulation of chlordane in the sediments of the tidal reaches of the watershed.

The river's designation as a "water quality limited segment" is based upon violations of the use designation for the waterbody and the narrative standard for toxic substances in the State's regulations. Specifically, the use designation of Class I waters, which requires at Code of Maryland Regulations (COMAR) Title 26.08.02.01 B (2) (a), that "All waters of this State shall be protected

for the basic uses of water contact recreation, fish, other aquatic life, wildlife, and water supply." Later in the regulations at COMAR 26.08.02.01 C, the narrative statement concerning toxic pollution states that "the waters of this State may not be polluted by: . . . (3) high temperature, toxic, corrosive or other deleterious substances attributable to sewage, industrial wastes, or other waste in concentrations or combinations which: . . . (b) are harmful to human, animal, plant, or aquatic life." Because the fish inhabiting the waters cannot be consumed without restriction, the river is considered to be impaired.

2.0 WATERSHED CHARACTERIZATION AND WATER QUALITY DESCRIPTION

2.1 General Setting

Back River is a tidal estuary of the Chesapeake Bay located on the western shore just north of Baltimore Harbor (see attachment 2). The watershed of Back River is fed primarily by Herring Run, Redhouse Run, and Stemmers Run. The entire watershed is about 15 miles long and 6 miles wide at its widest point. The watershed has a northwest to southeast longitudinal orientation.

The upper-most portion of the watershed originates in the Piedmont Plateau region of the State. At about six miles from its origin, the primary tributary, Herring Run begins to traverse the Fall Line, which separates the Piedmont Plateau from the Coastal Plain. Thus, a majority of the watershed lies within the Coastal Plain Province.

The watershed is largely developed, with most being in residential use. There is some industrial development along the lower end of the free flowing portion of Herring Run, and along the south shore of the tidal portion of the basin. The largest wastewater discharge is from the Back River sewage treatment plant. It discharges approximately 120 million gallons per day of treated wastewater to the upper tidal reaches of the estuarine portion of the system.

2.2 Water Quality Characterization

Water quality information on chlordane in ambient waters of the basin is limited. Data from an unpublished 1994 urban stormwater runoff study by the Department of the Environment (MDE draft August 1997) suggests that the occurrence of chlordane is unpredictable in spatial scope and temporal extent. Seven of the ten samples taken from Back River watershed stations (ZHR0001-upstream and HRR0033-downstream) produced chlordane levels that were either not detected (ND), or less than the level of quantification. Of the three that were measurable, one was at the level of quantification (0.02 ug/L or parts per billion - ppb), one was at 0.03 ug/L, and the third was at 0.08 ug/L (Table 1). Downstream observations were equal to or less than upstream observations.

Table 1 Pesticides in Back River Tributary – 1994

Herring Run	Winter	Spring	Summer-1	Summer-2	Fall
ZHR0001[a]	0.03	ND	0.02	<0.02	0.08
HRR0033[b]	<0.02	ND	<0.02	<0.02	<0.02

Units in ug/L or ppb.

a. Upstream

b. Downstream

Since the level of detection in this study was two orders of magnitude above the EPA water quality criterion for chlordane, and the measured levels were relatively close to the level of detection, the reliability of the data for determining absolute conditions is considered to be questionable.

The only chlordane data from point sources in the watershed is from the Back River wastewater treatment plant. In 1989 no chlordane was detected. More recent sampling in May and August 1998 also produced no detectable chlordane. The detection levels in 1998 were 0.086 ug/L (personal communication – John Martin, Baltimore City DPW).

2.3 Supporting Data

Fish tissue samples serve as a key source of data for chlordane. Two or more fish species, representing bottom feeders and higher trophic level predators, are targeted for collection at each statewide monitoring location. Species having a wide range of occurrence are targeted to allow for regional comparisons in addition to the temporal trends at each network site. Chlordane has been identified in almost every fish tissue sample collected under the State's fish tissue monitoring program, which was institutionalized in 1976. The fish tissue monitoring program currently consists of a network of over thirty monitoring locations where triennial sampling allows for statewide trend assessments. This network is supplemented with additional monitoring sites of suspected concern.

Statewide, most fish tissue chlordane levels have been well below the 0.3 ppm action level established by the U.S. Food and Drug Administration (USFDA). Elevated levels of chlordane in fish tissue have appeared most commonly in urban areas, especially those located near the head of tidal influence. Among the sites of greatest accumulation were Baltimore Harbor (Patapsco River) and Back River. In these water bodies, and Lake Roland (an impoundment on Jones Falls and a tributary to the Patapsco River), the levels of chlordane in selected fish tissues frequently exceeded the action guidelines of the USFDA.

Following the initial surveys of the 1970s, where the results indicated a potential for problems in selected urban areas, additional monitoring efforts were focused on the areas of greatest concern, which included Back River. The limited monitoring conducted in Back River in 1981 substantiated the concern for urban waters and resulted in additional and more definitive monitoring in subsequent years. Results of the monitoring in the Back River watershed are contained in the files of the Department of the Environment and are summarized in Table 2.

Table 2. Fish Tissue Data from Back River

Sampling Year	Species	Sample Type	Concentration mg/kg wet weight	Number of Fish	River Region
1981	Brown bullhead	Whole fish	**0.50**	N/A	1
	White perch	Whole fish	**0.46**	N/A	1
1982	Gizzard shad	Edible portion	0.24	N/A	N/A
	Channel catfish	Edible portion	0.15	N/A	N/A
	White catfish	Edible portion	**0.60**	N/A	N/A
	White perch	Edible portion	0.13	N/A	N/A
1983	American eel	No skin, no head	0.07	1	4
	Brown bullhead	Fillet	**0.31**	15	1
	Channel catfish	Fillet	**0.67**	14	1
	White perch	Fillet	**0.49**	5	1
	White perch	Fillet	0.20	14	4
	Yellow perch	Fillet	0.10	3	1
1985	Channel catfish	Fillet	**1.06**	10	1
	Channel catfish	Fillet	**0.82**	4	2
	Channel catfish	Fillet	**0.77**	5	3
	Channel catfish	Fillet	0.17	24	4
	White perch	Fillet	0.29	20	1
	White perch	Fillet	0.08	3	2
	White perch	Fillet	0.16	19	3
	White perch	Fillet	0.10	27	4
	American eel	No skin, no head	**0.33**	5	1
	American eel	No skin, no head	**0.44**	1	2
	American eel	No skin, no head	0.18	1	4
	Brown bullhead	Fillet	0.24	23	1
	Brown bullhead	Fillet	0.16	18	2
	Brown bullhead	Fillet	0.13	18	3
	Brown bullhead	Fillet	0.15	38	4
	Spot	Fillet	0.08	1	4
	White catfish	Fillet	0.12	1	4
1986	Brown bullhead	Fillet	**0.31**	16	1
	Brown bullhead	Fillet	**0.38**	4	2
	Channel catfish	Fillet	**1.34**	2	1
	Hogchoker	Whole fish	0.15	31	3
	White catfish	Fillet	**1.25**	5	1
	White catfish	Fillet	**0.39**	2	2
	White perch	Fillet	**0.38**	4	1
	White perch	Fillet	0.16	4	2
	White perch	Fillet	0.17	7	3
1987	Channel catfish	Fillet	0.25	11	2
	White catfish	Fillet	**0.39**	1	1
	White catfish	Fillet	0.26	2	4
	Hogchoker	Whole fish	0.08	5	2
	Hogchoker	Whole fish	0.08	5	3
	White perch	Fillet	0.05	1	1
	White perch	Fillet	0.12	11	3
	White perch	Fillet	**0.34**	2	4

N/A – Information not available

*River region = 1 – head of tide, 2 – upper middle, 3, lower middle, 4 – lower region (attachment 3)

Concentrations in bold exceed the USFDA guidance level of 0.3 mg/kg

Since chlordane was detected in a number of fish tissue samples above the 0.3 ppm USFDA action level, primarily in the headwaters region of the estuary, the waterbody was considered to be impaired.

2.4 Technical Methods

Because chlordane was banned nearly 15 years ago, chlordane loadings other than those from existing bottom sediments are expected to be negligible (see Section 4.0, Source Assessment). Consequently the bottom sediments are assumed to be the dominant current day source of chlordane in Back River water and fish tissue[1]. This means that the rate of reduction of chlordane concentrations in the biologically active sediment layer will ultimately control the water column and fish tissue concentrations. Chlordane concentrations in sediments are reduced by a number of processes.

- Burial/dilution of contaminated sediments;
- Dissolution into, followed by vaporization from, the water column;
- Uptake by biota living in the sediment;
- Chemical degradation; and
- Biological degradation.

The dominant processes are likely burial and/or dissolution followed by volatilization from the water body. Eskin *et al*. (1996) estimated sedimentation rates in the Back River estuary to range from 0.2 to 0.93 cm/yr. Howard (1991) provides estimated volatilization half-lives from a representative environmental pond, river and lake as 8-26, 3.6-5.2, and 14.4-20.6 days, respectively. Howard also states that adsorption to sediments can significantly affect the importance of volatilization. Within this system, neither uptake by biota or degradation are expected to significantly reduce chlordane levels in sediments.

Water quality criteria have been developed by EPA to protect marine aquatic life from toxic effects (0.004 ug/L) and to protect humans from the consumption of aquatic organisms (0.0022 ug/L) (EPA 1999). These values were recently updated from the earlier water quality criteria developed by EPA to protect marine aquatic life from toxic effects (0.0043 ug/L) and to protect humans from the consumption of aquatic organisms (0.00059 ug/L) (EPA 1999). As an added margin of safety, the earlier and more conservative ambient water quality criteria for the protection of humans from the consumption of organisms was employed, adding a safety margin of over a factor of three to the TMDL.

An equilibrium approach, based on the EPA 1993 sediment criteria development methodology (EPA 1993), was employed to provide an upper estimate of the dissolved water column concentration based on recent sediment concentrations following the steps provided below.

[1] Note that Observed data (Eskin 1996), and other analyses (See Section 2.4) suggest that the sediment concentrations of chlordane in the Back River are declining over time due to natural recovery of the estuary, through gradual biodegradation, dispersal, and natural burial by sedimentation.

First, the log K_{oc} is estimated from the log K_{ow} from the empirically derived equation provided below.

$$\log K_{oc} = 0.00028 + 0.983 \times \log K_{ow}$$

where:

K_{ow} = octanol/water equilibrium partition coefficient
K_{oc} = octanol/organic carbon equilibrium partition coefficient

Substituting the experimentally determined log K_{ow} chlordane (5.54) from Howard, 1991 into this equation yields:

$$\log K_{oc} = 0.00028 + 0.983 \times 5.54$$

$$\log K_{oc} = 5.45$$

$$K_{oc} = 279{,}000 \text{ L/kg}$$

The concentration in water in equilibrium with this sediment can be estimated by the equation provided below. It should be emphasized that this best represents the pore water concentration and the overlying water column may be subject to greater dilution.

$$C_w = C_s / (f_{oc} \times K_{oc})$$

where:

C_w = concentration in water (ug/L)
C_s = concentration in sediment (ug/kg)
f_{oc} = fraction organic carbon (unitless)
K_{oc} = organic carbon/water equilibrium partition coefficient (L/kg)

Recent measurements of Back River sediments (Baker *et al.* 1997) indicate an average concentration of 1.12 ng/g (dry weight) for chlordane, 5.06% total carbon (dry weight). Applying these values yields a predicted water column concentration of 0.0000793 ug/L (7.93×10^{-5} ug/L), significantly lower than the most conservative water quality criteria.

$$C_w = C_s / (f_{oc} \times K_{oc})$$

$$C_w = 1.12 \text{ ug/kg} / (0.0506 \text{ g/g} \times 279{,}000 \text{ L/kg})$$

$$C_w = 0.0000793 \text{ ug/L} = 7.93 \times 10^{-5}$$

This equilibrium approach can also be used to estimate a sediment quality benchmark (SQB) from the water quality criteria as shown in the equation below (EPA 1993).

$$SQB = WQC \times f_{oc} \times K_{oc}$$

where:

WQC = water quality criteria

Substituting 0.00059 ug/L value for the water quality criteria in the above equation:

$$SQB = 0.00059 \text{ ug/L} \times 0.0506 \text{ g/g} \times 279{,}000 \text{ L/kg}$$

$$SQB = 8.33 \text{ ug/kg or } 8.33 \text{ ng/g}$$

Current sediment levels (1.12 ng/g dry weight) are well below the calculated SQB. This represents indirect evidence that sediment concentrations of chlordane have declined below levels that would result in elevated fish tissue levels.

Direct evidence of this decline is provided by comparing the recent concentration of chlordane in Back River sediments to older studies. Baker *et al.* 1997 report an average chlordane concentration of 1.12 ng/g in Back River sediments while Eskin *et al.* 1996 report 22.4 ng/g in 1991. Although historical data are sparse, these data indicate a twenty-fold decrease in measured chlordane concentrations over a five year period. This indicates that natural attenuation processes have already reduced chlordane levels below all pertinent water quality criteria and sediment quality benchmarks. Further, it is anticipated that continued watershed monitoring efforts will indicate a corresponding reduction in fish tissue concentrations as well as continued reductions in sediment concentrations.

3.0 TARGETED WATER QUALITY GOALS

Although the State has not adopted any specific guidance levels for chlordane in its regulations or water quality standards, it does take action on environmental contaminants that significantly increase the risk of cancer. The level of significance used by the State in these analyses is that level that produces an increased risk greater than one in 100,000 of the population. This is generally expressed as a risk that is greater than 1.0×10^{-5}. Assuming that the general population has a risk of cancer from all causes of at least 25%, or 25,000 in 100,000, the threshold for concern for a single substance would increase the general risk to 25,001 in 100,000.

The United States Food and Drug Administration (USFDA) has established specific guidance levels for fish tissue in the commercial market. This level of 0.3 mg/kg (≈ parts per million (ppm)), in association with the assumed average daily consumption of fish (6.5 grams per day), produces an estimated excess cancer risk associated with chlordane of 1.0×10^{-5}. Since this value approximates the 1.0×10^{-5} level of risk used by the State for determining levels of significant excess cancer risk, Maryland generally considers waters to be impaired when edible fish tissue levels for any species exceed the USFDA guidance level of 0.3 mg/kg. Project endpoints for the control or mitigation of

chlordane as it affects the edibility of fish taken from Back River in the future would be linked to the achieving of a reduction of chlordane in the targeted fish tissues to a level of 0.3 mg/kg or less.

4.0 SOURCE ASSESSMENT

The majority of environmental loadings of chlordane were required to cease as of 1988 with the end of authorized commercial use. However, stocks held by homeowners could be a continuing source, as would be the erosion and transport of existing soils previously contaminated by chlordane and related compounds. Occasional studies of urban and agricultural runoff, as presented in Section 2.2, detect minute amounts of chlordane, but the occurrence is not sufficiently stable to allow for the identification of definitive sources (MDE draft 1997, see Section 2.2). Thus, there do not appear to be any defined sources of chlordane to control or regulate at this time. These undefined sources are gradually diminishing, and are not believed to constitute a significant contribution to the existing conditions in the estuary.

Chlordane is not an expected substance in point source discharges. If it were to occur in municipal discharges, it would be through intermittent, illicit, and generally untraceable sources. Therefore, further regulation and control of point sources is not considered to be a viable means of controlling the environmental occurrence of chlordane. Efforts to enhance these source reductions are being promoted by local governments through the offering of "household hazardous chemical disposal days." These offerings have been ongoing since the late 1980s and are continuing to provide local citizens with an environmentally acceptable means of disposal. Similar efforts have been extended to farmers for disposal of agricultural chemicals no longer suitable for use.

5.0 TOTAL MAXIMUM DAILY LOADS AND LOAD ALLOCATIONS

Chlordane is a persistent substance, which has a high affinity for sediment adsorption and generally settles to the bottom with the sediment in the estuary. Water column measurements are thus generally extremely low and difficult to achieve in a manner that would allow for the adequate characterization of a large estuarine system. Sediment analyses are also costly and provide information only on the precise location where sampling occurred. Fish tissue, however, serves to accumulate and integrate bioaccumulative contaminants, such as chlordane, and is, therefore, the preferred endpoint measure of environmental contamination for this substance.

Water Quality Endpoint: As noted above, the water quality endpoint for this TMDL is expressed in terms of achieving the specific criterion for which Back River was identified on the 303(d) list. Specifically, the current US FDA guidance level for fish tissue concentrations of 0.3 mg/kg were used to determine the need to list Back River as being impaired by chlordane. Consequently, this value is the appropriate water quality endpoint.

Total Maximum Daily Load: The computations provided above establish a linkage of the fish tissue water quality endpoint of 0.3 mg/kg to a water column concentration of 0.00059 ug/L or less (EPA 1980). Thus, MDE is establishing a concentration of 0.00059 ug/L as the appropriate measure for the Back River chlordane TMDL.

Seasonal Variations and Critical Conditions: The TMDL is represented as a concentration level that is protective of toxic human health effects *at all times*. Implicitly, the TMDL accounts for seasonal variations since it is protective throughout the year (i.e., "at all times"). This situation does not present an issue of controlling for critical conditions for several reasons. First, the notion of "critical conditions" does not arise in the traditional sense for this TMDL. The allowable concentrations of chlordane are based on human fish consumption over a long time period, which averages out any critical events. Additionally, human health standards, upon which the TMDL is founded, account critical sub-populations that might be more susceptible to toxic risk. Second, the TMDL is protective at all times, which implies that any "critical conditions" within that timeframe are considered. Finally, the TMDL level established to be protective of human health are more conservative than the chlordane levels established to protect environmental resources, implying that critical conditions for environmental resources are also addressed by the previous logic that applied to human health.

TMDL Allocation: The studies referenced above suggest that the transient events, in which minute levels of chlordane have been observed in association with point and nonpoint sources, are too insignificant to support the quantification of meaningful allocations to these sources. Existing chlordane in the bottom sediment layer of the estuary is the only significant source causing elevated fish tissue concentrations. Therefore, the sole allocation of chlordane is to the existing bottom sediments of the Back River estuary.

Margin of Safety: EPA's TMDL guidance requires each TMDL to include a margin of safety (MOS) that accounts for uncertainty in the relationship between pollutant sources and the quality of the receiving waters. The USDA fish tissue guidance level, which serves as the water quality measurement endpoint, identified the specific need for a TMDL.
The older and more conservative US EPA ambient water quality standard for the protection of humans from the ingestion of aquatic life (0.00059 ug/L) serves as the basis of the TMDL. This criterion is more conservative than the current ambient water quality criteria (0.0022 ug/L) and was employed to add a margin of safety.

TMDL Summary:

Based on the previous discussion, the TMDL or Chlordane may be summarized as follows:

TMDL	=	WLA	+	LA	+	MOS
0.00059	=	0	+	0.00059	+	built-in

(ug/l – at all times). No future allocation is provided.

Where, WLA is Waste Load Allocation
LA is Load Allocation, and
MOS is Margin of Safety

Reasonable Assuredness of Implementation: The State of Maryland is committed to protecting the State's rivers, streams, lakes, wetlands, and estuaries. Observed data (Eskin 1996) suggest that the sediment concentrations of chlordane in the Back River are declining over time due to natural recovery of the estuary, through gradual biodegradation, dispersal, and natural burial by sedimentation. The computations provided in Section 2.4 suggest that current sediment concentrations of chlordane are below levels expected to result in elevated fish tissue concentrations. No observations of fish tissue are currently available to confirm this, and older fish may continue to have elevated levels due to past bioaccumulation.

Aside from the processes of natural recovery, dredging of this shallow estuary would be the only other means of removing the chlordane-contaminated sediments. Environmental concerns and the high costs associated with dredging place the chlordane impairment in Back River in the category of "Extremely Difficult Problems" as defined in Chapter 6 of the Report of the Federal Advisory Committee on the Total Maximum Daily Load (TMDL) Program.

In consideration of the very difficult and extremely costly process that would be involved in removing the contaminated sediments, Maryland is proposing to institute an iterative monitoring and evaluation process to track the natural attenuation of the contaminant as the means of ensuring minimal impact to human health and the environment. Routine sediment and fish tissue monitoring in the estuary, with occasional stream and water column samples, will be established on a time frame sufficient to ensure the discernment of trends. At a minimum, triennial monitoring of the fish and surficial sediments will be conducted in the estuarine or tidal portion of the river. An evaluation of the required sampling frequency will be considered each year as information from the statewide monitoring network is developed.

6.0 PUBLIC INVOLVEMENT

Maryland's inventory of water quality is documented in a report prepared under section 305(b) of the Clean Water Act (CWA). This report, commonly called the "305(b) Report", serves as the primary source of information used to develop Maryland's 303(d) list of water quality limited segments. The 305(b) report is developed with consideration of information provided by State agencies, local governments, and citizens. The 303(d) list, which is updated every two years, undergoes a formal public comment process.

In reviewing options for managing the concerns regarding chlordane in fish tissue, the State opted to issue fish consumption guidelines. A press release issued on February 5, 1986 provided the initial information to the public and continuing information is provided via notification in the fishing guidebooks provided to all licensed anglers in the State.

Notice has been published annually in the State's tidewater fishing guide since the late 1980's. The specific language in the guide is as follows:

Salt Water Fishing Health Advisory

- "Individuals are advised to limit their consumption of channel catfish and American eels from Back River and the Baltimore Harbor because the contamination level of chlordane exceeds FDA's approved standards.
- These fish should not be used as a substantial part of the daily diet.
- These fish should be avoided by women of childbearing age, infants, and children."

Various public information and education documents have been prepared to help reduce the potential for unacceptable exposure by the fish-consuming public. Fact sheets advising of "Contaminants and Toxicity" (attachment 4) and "Monitoring Contamination Levels in Fish, Shellfish and Crabs" (attachment 5) have been produced and distributed by the Department of the Environment. Additional public information literature has been prepared to assist individuals in minimizing risks through proper preparation of fish for consumption.

7.0 REFERENCES

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