Lower Okanogan DDT PCB

Water Quality Implementation Plan (Detailed Implementation Plan)

July 2006
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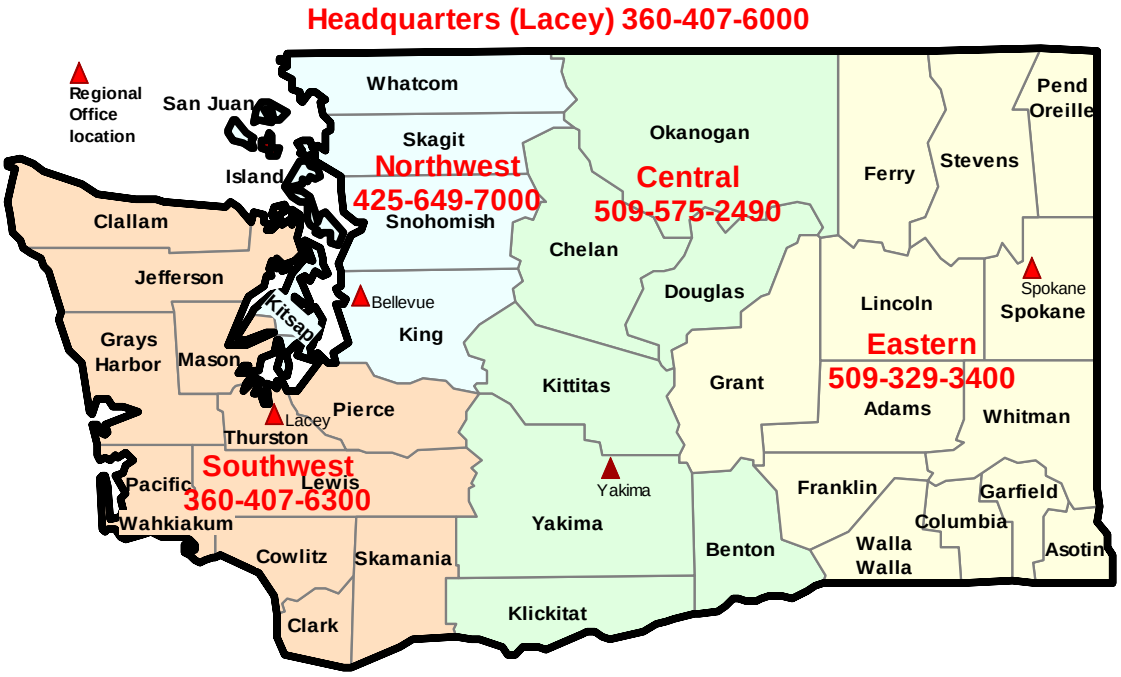

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Executive Summary

The Okanogan River (spelled Okanagan in Canada) originates in south central British Columbia, Canada and flows through a series of lakes; the last of which is Lake Osoyoos straddling the international boundary. The lower Okanogan River flows out of Lake Osoyoos and south to the Columbia River. The Okanogan Valley has had a history of agriculture and industry that is similar on both sides of the international boundary.

DDT, a common pesticide used from the mid 1940s into the early 1970s, and PCBs, a group of industrial chemical commonly used in insulating and cooling oils in electrical equipment, are both persistent bioaccumulative toxins that are long lived in the environment. These compounds are now wide spread in the environment. Considering that the uses of these compounds have been restricted severely for more than 25 years, they are prime examples of legacy contaminants that persist long after their release to the environment.

These legacy contaminants have entered into the Okanogan River system and have accumulated in the tissues of the fish living in these waters. The elevation of contamination in fish is an impairment of water quality. The state of Washington is required to conduct total maximum daily load projects to address and reduce water quality impairments in order to restore water quality to an acceptable level.

The goal of the Lower Okanogan DDT and PCB TMDL project is to reduce these contaminants in fish tissues to an acceptable regulatory value. The technical assessment conducted in the initial phase of the TMDL found that most of the contamination that is affecting the fish is already in the river system. These contaminants will slowly fade from the environment available to the fish through chemical breakdown, dilution, and the sequestering of these contaminants under accumulating sediments. The rate of decline of the contaminants already in the river system will be slow. With a slow rate of improvement, minimizing the amount of contaminants entering from the surrounding watershed is necessary to assure continued water quality improvements.

Residues of DDT persist in soils of the agricultural lands where it was applied. These residues move with the soils from these agricultural lands when erosion occurs. Taking steps to minimize the soil losses from the agricultural lands is the most practical means to minimize the additions of DDT to the river system.

PCBs are more difficult to detect in the environment than DDT. They tend to originate in the urbanized areas where there is a higher concentration of industrial and electrical operations. Opportunities to address the PCB contamination in the environment are limited to the places where they incidentally funnel together and collect. In the lower Okanogan valley, this is limited to the municipal wastewater treatment systems. Ecology is working with the municipalities through the permitting system for wastewater treatment plants to address PCBs and DDT.

Ecology acknowledges that many of the actions have been taken that reduce the loss of DDT and PCB contamination in the environment. Banning the production and use of these materials was the beginning of environmental recovery. Improving efficiency in the delivery and use of irrigation water along with reduced soil erosion and improved management of riparian lands

have all contributed to the reduction of DDT in the Okanogan River. Regulatory restrictions and management of PCB containing wastes have reduced the quantity of PCBs entering the environment.

The Department of Ecology will be tracking progress in the improvement of water quality by monitoring the concentrations of DDT and PCBs in the fish from the Okanogan River. As the amounts of DDT and PCBs continuing to reach the river diminish, the contaminants existing in the river will diminish. The persistent nature of these contaminants will result in a slow reduction of the contamination already existing in the river system. Taking actions to reduce the introduction of contaminants will assure that the reduction of these contaminants already in the river will continue.

Introduction

This detailed implementation plan (DIP) provides direction to assure that DDT, DDD, DDE, and PCB concentrations in the waters and fish tissues from the Okanogan River and its tributaries continue to improve with the goal of meeting the regulatory standards for these persistent bioaccumulative toxins. Waters of the Okanogan River were 303(d) listed as impaired when fish tissues sampled between 1985 and 1995 were found to exceed the applicable criteria in the National Toxics Rule (NTR).

The Washington State Department of Ecology (Ecology) began the TMDL process with an assessment of the 1996 and 1998 listings of DDT, DDD, DDE, and PCBs impaired water quality in Washington's portion of the Okanogan Watershed. The purpose of the investigation was to determine the sources and quantity of DDT and PCBs in the river and provide goals and a plan for improving water quality.

The contaminants addressed by this TMDL project are DDT, its breakdown products DDD and DDE, and the class of chemicals known as PCBs, which includes a number of forms (congeners) detected during the assessment phase of the TMDL. DDT and its breakdown products DDD and DDE come from the same source in the Okanogan Watershed, the historic use and handling of the DDT pesticide. PCBs also do not have individual sources, rather they have common source through use, originating in the same areas and behaving similarly in the environment. To be brief and clear in this DIP, the use of the term "DDT" will mean DDT and its breakdown products DDD and DDE, and the use of the term "PCBs" will mean all the forms of PCBs found in the Okanogan Watershed.

Transport of DDT to streams and movement within aquatic environments is associated with erosion of contaminated soils and elevated loads of suspended solids that are the result of erosion or sediment re-suspension. The tendency for DDT to move with soils of suspended particles in the water is due to the nature of DDT to cling to soil particles rather than dissolve in water.

The environment of the Okanogan River system is a product of its geology, glacial action, and the climate of the eastern slope of the Cascade Mountains. The Okanogan River originates in the southern interior of British Columbia and flows through a series of lakes, the largest of which is Lake Okanagan, before reaching Lake Osoyoos straddling the international boundary. The lower Okanogan River flows out of Lake Osoyoos and runs south 79 miles into the Columbia River. The lower Okanogan River basin is located within a semi-arid region that has an annual precipitation of approximately 20 inches in the higher elevations of the basin, to as little as 10 inches near the valley bottom.

Most of the tributaries to the lower Okanogan River are small or intermittent due to the semi-arid climate of the Lower Okanogan basin. These small tributaries contribute little to the overall flow of the lower Okanogan River. The largest tributary to the Okanogan River is the Similkameen River. The Similkameen River originates high in the Cascade Mountains along the U.S. – Canadian border and is an exception to the small and intermittent characteristics of most of the lower Okanogan tributaries. Mountain snow packs feed the Similkameen River, which flows across the international boundary and then joins the Okanogan River five miles below Lake

Osoyoos. The Similkameen River contributes approximately three quarters of the flow in the Okanogan River below the confluence.

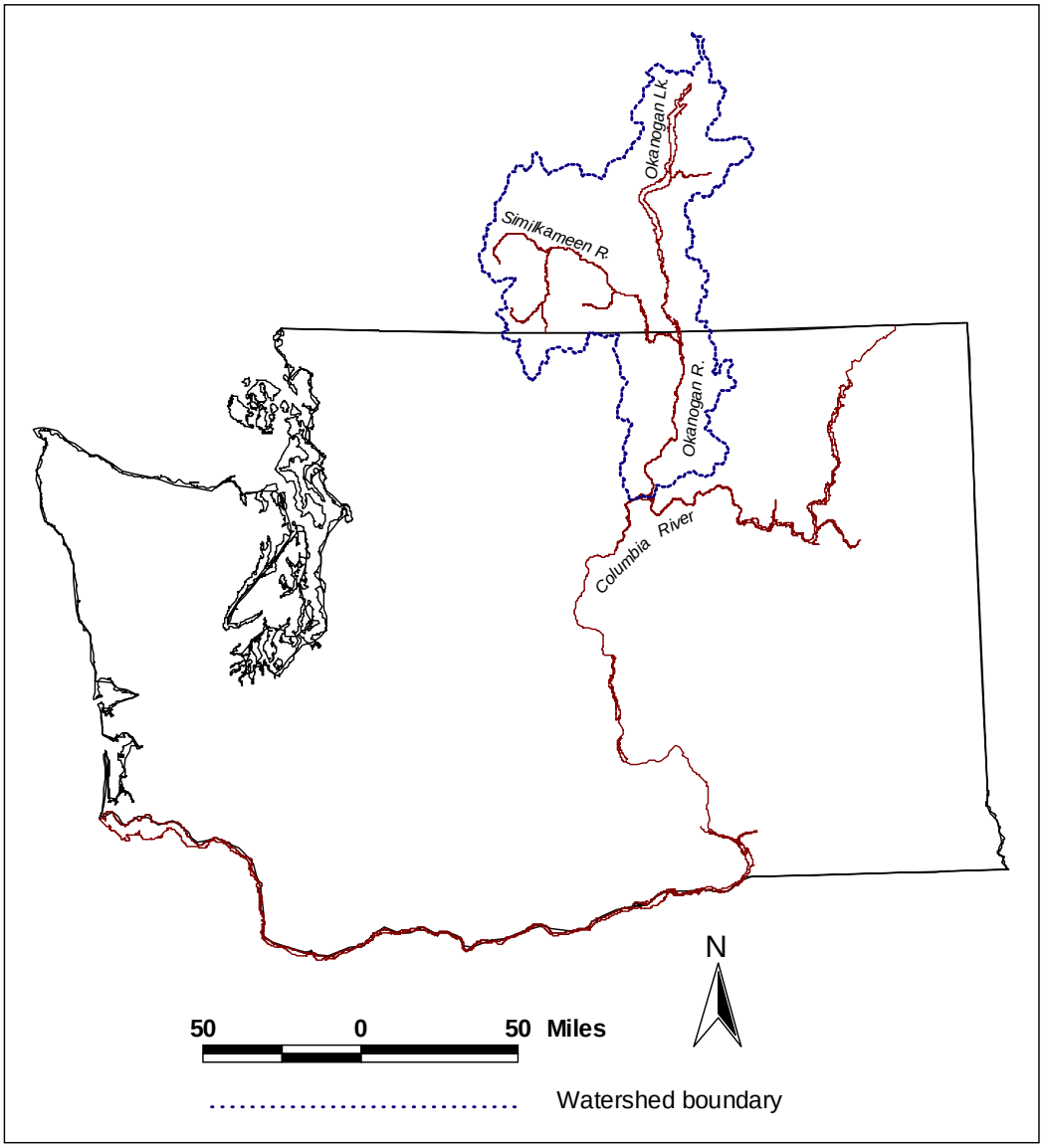


Figure 1: Okanogan River Watershed

In the Okanogan Watershed, the history of land use for forestry, agriculture, and mining and accompanying use of pesticides and PCBs are very similar on both sides of the international boundary. Land cover in the Okanogan Watershed is primarily forest and rangeland, especially in the uplands. Near the valley bottom, orchards and pasture/hay are the primary agricultural uses. Fruit orchards have a long history in the Okanogan valley, with the first planted in 1857. By 1916, there were approximately 12,000 acres of irrigated orchards in the lower Okanogan River valley. Fruit orchards presently comprise about 2 percent or approximately 37,000 acres of the land area. The upper Okanogan River basin (north of the Canadian border) has a similar

composition of orchard lands, providing over 99 percent of the tree fruit grown in British Columbia (Sinclair and Elliott, 1993).

Historical DDT use in the Okanogan Basin, primarily on orchard and other agricultural lands, has resulted in contamination of the aquatic environment. Although banned in the U.S. as a pesticide in 1972, DDT and its breakdown products have persisted, accumulating at high concentrations in lower Okanogan River and Osoyoos Lake fish as shown in the TMDL assessment study and other investigations (e.g., Johnson and Norton, 1990; Davis and Serdar, 1996; Serdar et al., 1998; Serdar, 2003).

PCBs, like DDT, have a similar history in the U.S. and Canada. Beginning in 1929, PCBs were used in many industrial applications where their flame resistance and thermal stability were particularly useful. The most common usage of PCBs was in electrical equipment; though they were put to a wide variety of uses included some consumer goods. The U.S. and Canada banned the manufacture and most non-electrical uses of PCBs by 1979. With the last uses of PCBs scheduled to be phased out through equipment maintenance and replacement. PCBs are now a ubiquitous environmental contaminant. PCBs persist in the aquatic environment and continue to accumulate in fish tissue even though production of PCBs ended more than 25 years ago.

The four municipalities in the lower Okanogan River basin, Oroville, Tonasket, Omak, and Okanogan, each have wastewater treatment plants that discharge to the Okanogan River or, in the case of Oroville, to the Similkameen River just above the confluence with the Okanogan River. The treatment plants for these cities have National Pollutant Discharge Elimination System (NPDES) permits issued and managed by Ecology. The discharges from these treatment plants contribute small amounts of DDT and PCB contamination for which waste load allocations have been set in the TMDL.

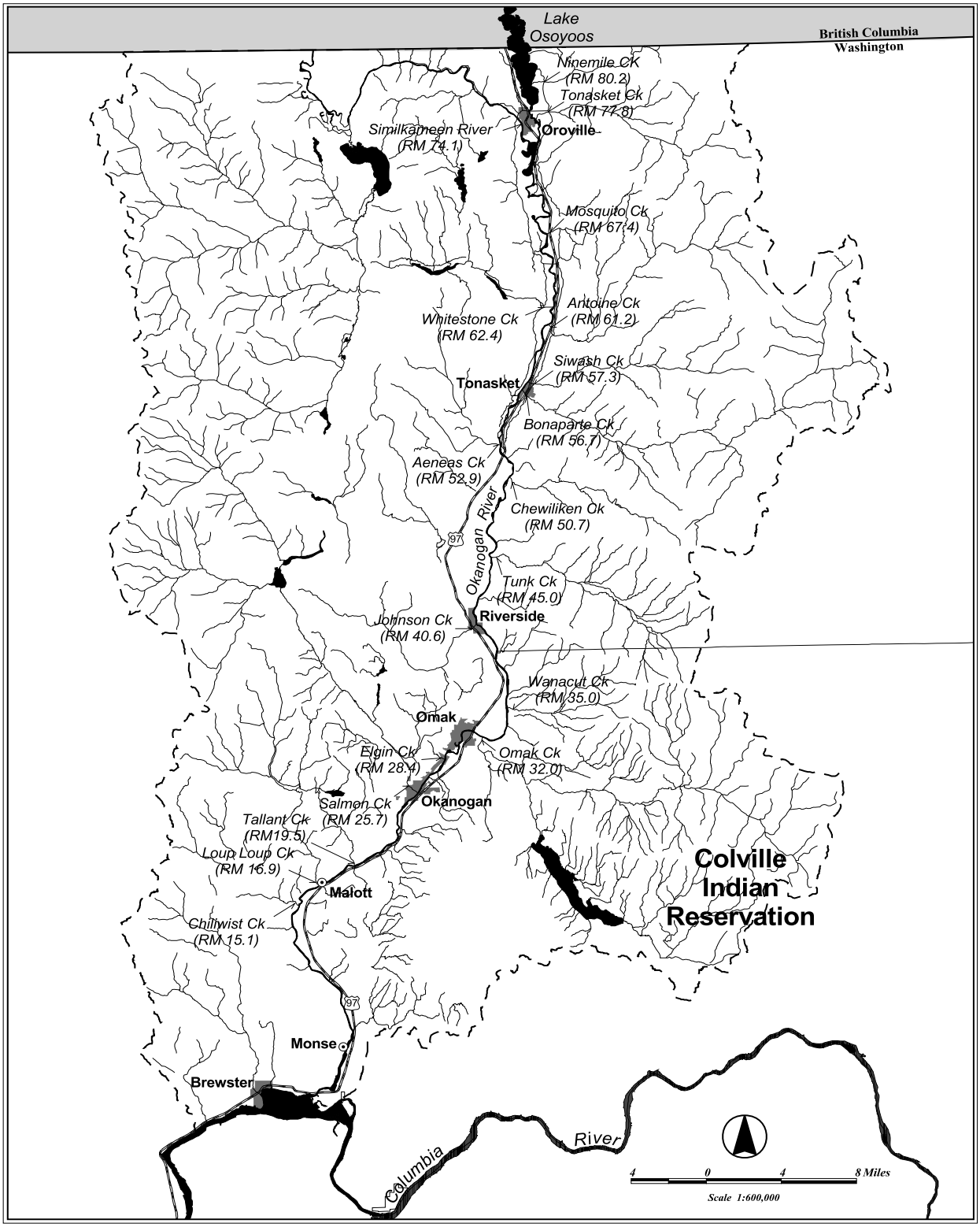


Figure 2: Location of Lower Okanogan River and Osoyoos Lake Tributary Streams

Table 1: Water Body Identification Numbers for Water Bodies Addressed in the Lower Okanogan River DDT/PCB TMDL.

Waterbody	Old Segment No.	New Segment No.	Township, Range & Section	Impairment(s)	Years listed on the 303(d) List:
Okanogan River	WA-49-1010	YN58LL	31N, 25E, Section 27	Exceeds NTR criteria for 4,4'-DDD, 4,4'-DDE, and PCB-1254 in fish tissue[a]	1996 1998
Okanogan River	WA-49-1010	YN58LL	31N, 25E, Section 34	Exceeds NTR criteria for PCB-1260 in fish tissue[a]	1996 1998
Osoyoos Lake	WA-49-9260	060VKD	40N, 27E, Section 22	Exceeds NTR criteria for 4,4'-DDD, 4,4'-DDE in fish tissue[b]	1996 1998
Tallant Creek	WA-49-1017	LD33FC	32N, 25E, Section 02	Exceeds Washington State chronic criteria for DDT in water[c]	1998
Elgin Creek (listed as Unnamed Creek)	WA-49-1022	KR66GR	33N, 26E, Section 03	Exceeds Washington State chronic criteria for DDT in water[c]	1998
Ninemile Creek	WA-49-1049	IP09QF	40N, 27E, Section 15	Exceeds Washington State chronic criteria for DDT in water[c]	1998
Tonasket Creek		QE80IG	40N, 27E Section 27	Exceeds Washington State chronic criteria for DDT in water. Exceeds NTR criteria for 4,4'-DDT, 4,4'-DDE[d]	Unlisted but impaired
Antoine Creek		NN36KM	38N, 27E Section 27	Exceeds Washington State chronic criteria for DDT in water[d]	Unlisted but impaired
Mosquito Creek		QH83Df	39N, 27E Section 27	Exceeds Washington State chronic criteria for DDT in water[d]	Unlisted but impaired

NTR=National Toxics Rule

[a] Davis and Serdar, 1996

[b] Johnson and Norton, 1990

[c] Johnson et al., 1997

[d] Serdar, 2003

Approach

The presence of DDT and PCBs in the Okanogan River is a legacy of past agricultural and industrial practices. These contaminants classify as persistent bioaccumulative toxins, which means that they remain in the environment long after their release to the environment through use, disposal or accident. Banned more than 25 years ago, DDT and PCBs persist in the environment and continue to impact the environment and impair the water quality of the Okanogan River system.

Actions taken pursuant to this TMDL DIP fall into three categories: 1) actions taken in accordance with a law or legal agreement, 2) monitoring activities and 3) actions to address sources of contaminated run off from upland sources. Actions taken in accordance with a law or legal agreement, if applicable, will be completed within the time frame prescribed by the law or legal agreement. This consists primarily of developing and implementing NPDES permits to assure that newly permitted sources do not compromise the integrity of this TMDL. It is important to document the diminishing concentration of DDT and PCBs in fish in the lower Okanogan River through planned monitoring programs.

The widespread and common usage of DDT when it was commercially available and its persistent characteristics means that the contaminant is commonly found in the soils of lands used for agriculture between 1945 and 1972 and in those locations that would accumulate soils eroded from those agricultural lands. The movement of the contaminated soils moves the DDT through the environment. The success of this TMDL primarily relies on the ability to prevent the erosion or movement of contaminated soils from contaminated lands into the waters of the Okanagan River system. This TMDL also relies on the removal of concentrated forms of DDT and PCBs that have not been released to the environment, but represent a risk of contamination to the environment until they are removed from the watershed and disposed of properly.

The Okanogan DDT/PCB TMDL detailed implementation plan recognizes that many actions have been taken prior to the beginning of this TMDL process that have reduced the amount and impact of DDT and PCB contamination in the Okanogan watershed. These actions have been taken on a national, regional, and local scale. Examples of these pre-existing actions include banning DDT, waste pesticide disposal programs, and improving irrigation efficiency to reduce agricultural run off. It is the goal of the implementation plan to assure the continuation of these actions and support them as opportunities arise.

The Okanogan River DDT/ PCB TMDL and this DIP are not new regulations, but a description of contaminant sources and a list of activities that can assure that the trend of improving water quality continues. These actions are voluntary related to this TMDL, but may be required by existing federal, state, county, or city laws.

Pollution Sources and Organizations Responsible for Reductions

Pollution Sources

The lower Okanogan River DDT/PCB TMDL assessment report shows that DDT and PCB contamination exists in the tributaries and sediments of the river. This load of contaminants in the sediments is the accumulation of contamination from the surrounding watershed. The assessment report identified non-point sources from past agricultural and industrial practices as the primary sources of contamination in the lower Okanogan River. The technical assessment also showed that while the water column concentrations in the lower Okanogan River meet the regulatory standards, resident fish in the river exceed the regulatory criteria for contamination. Fish are known to concentrate these contaminants in their bodies from throughout their aquatic environment, including the sediments within the river. The primary goal of the lower Okanogan River TMDL project is to reduce the amount of contamination in the fish and meet the limits set in federal regulations.

The loading analysis from the TMDL assessment report showed that the bulk of DDT impacting the aquatic environment is already in the river, presumably in bottom sediments. This internal load to the river is the build up of contaminated materials from many years of run off and sediment transport into the river.

Non Point Sources

DDT moves through the environment with soil (dust & dirt) particles. Erosion from the agricultural lands where DDT was applied moves the DDT contaminated soil into the river system when water running off the lands carries sediments into the river or its tributaries. The TMDL assessment report has shown that DDT and PCBs continue to enter the river through several small tributaries, though DDT may also enter the river directly through erosion for adjacent agricultural lands.

Another potential nonpoint source of DDT contamination in the Okanogan River watershed is the DDT containing products that are still in the watershed. These products may be stored or may have been buried as a means of disposal after their use was banned more than 30 years ago. Part of the TMDL assessment of DDT contamination in the watershed included sediment core sampling in the southern end of Lake Osoyoos and investigating layers of sediments to determine the historic deposition of DDT in the lake. A large spike in DDT concentrations was seen in sediments deposited around late 1998 or early 1999. Concentrations of DDT were triple those seen during the 1980s and 1990s. The anomalous concentration suggests the source of the spike was a spill, dumping, or other introduction of concentrated DDT into the aquatic environment during the late 1990s. In addition to the high concentration of DDT shown in 1998-1999 spike, the relative concentrations of DDT and its associated breakdown products DDE and DDD suggest that the source of DDT in the spike was from a concentrated source that had not been applied to agricultural crops. DDT with these characteristics may be released into the

environment by dumping or by a rain storm or flood that could have washed it out of an old dump site where it had been buried.

PCB contamination in the lower Okanogan Watershed is very diffuse and difficult to detect except for those locations in the environment that would tend to funnel and concentrate the contaminant. The TMDL technical assessment report recognizes that they are extremely difficult to detect in water without expensive specialized methods. It is also recognized that PCBs are primarily an industrial and urban contaminant. PCBs were detected in the discharge of the municipal waste water treatment plants and these discharges will be addressed through the NPDES permitting system. Another potential source from these municipalities is the stormwater collection systems that could funnel stormwater run-off from the municipalities into the river. Maintenance of these systems, including the cleaning of stormwater catch basins, have the potential for reducing PCB and other contaminant loading to the river system.

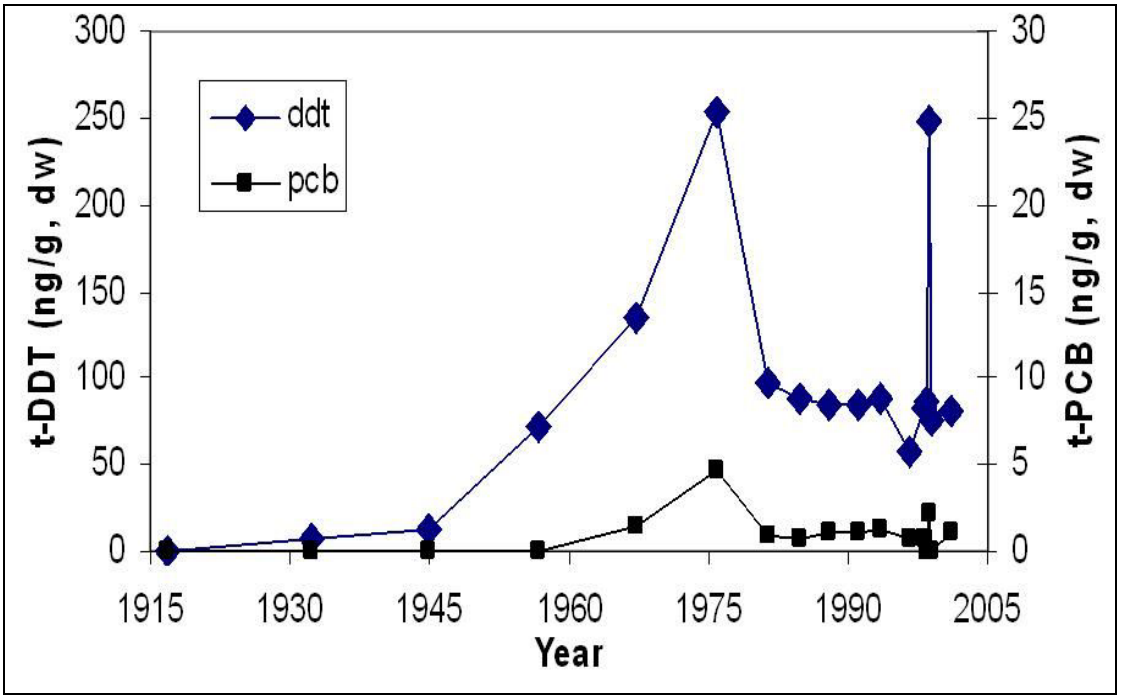


Figure 3: DDT and PCB Concentrations in Lake Osoyoos Sediment Core

Point Sources

Point source contamination was shown to be of concern by the TMDL assessment report. The point sources in the Okanogan Valley are the four NPDES-permitted municipal waste water treatment plants. The four municipalities along the lower Okanogan River, Oroville, Tonasket, Omak, and Okanogan each have NPDES permitted sewage treatment plants that discharge to the river. These point source discharges add small quantities of DDT and PCBs to the Okanogan River system. The discharges of DDT and PCB contaminants by the waste water treatment plant are a function of the waters they receive through the sewer systems. These discharges will be addressed through the administration of the NPDES permits.

Organizations Responsible for Pollution Reduction

Non-point contamination from diffuse sources is difficult to attribute to specific locations. Investigations in the Okanogan have shown that tributary streams carry measurable quantities (loads) of DDT into the river. The tributary sampling occurred near where each tributary joins the Okanogan River and represents the total load entering the river from each tributary. These tributary loads are most likely from run-off from agricultural lands that had DDT applied when it was in use and the accumulation of DDT in the tributary sediments. Agricultural lands adjacent to the river also are non-point sources, as erosion from these lands can move DDT contamination directly into the river.

This TMDL relies on the actions of property owners to control the soil erosion and run-off from lands with an agricultural history that includes the application of DDT. Realistically, individual landowners hold the responsibility for implementing this portion of the plan. Ecology encourages the voluntary actions by responsible landowners through support of programs and education like those offered through the Okanogan Conservation District. The Okanogan Conservation District works with land owners in the lower Okanogan watershed to provide technical assistance for the preservation of soils and water quality and is a valuable partner to the Department of Ecology in implementing the TMDL.

Redevelopment of agricultural lands to alternative land uses brings about new challenges in addressing soil erosion from what were agricultural lands. Conversion of lands that have long been in agricultural use to non-agricultural uses introduces complications in working with land owners to control erosion that could potentially carry DDT into the Okanogan River system. While many agricultural lands remain in production, the economic forces acting on the agricultural industry has resulted in shifting land use changes and changing potential for soil losses through erosion.

Determining which agricultural lands being converted have potentially had DDT applied to them becomes difficult as land use changes obscure the history of the land in question. Encouraging and assisting in the development of best management practices to be applied at all development projects would reduce the potential losses of DDT tainted soils. The persistent nature of DDT makes even short term losses of eroded soils to the river a significant concern because the contaminant would persist in the aquatic sediments for many years.

The potential erosion losses of DDT tainted soils due to land redevelopment can be minimized through compliance with state and local regulations on storm water controls. Washington State has implemented a stormwater permitting system that regulates the potential for stormwaters and the eroded soils it can carry from construction sites. Implementation of best management practices required for compliance with the stormwater construction permit will minimize this potential loading to the Okanogan River system. The *Eastern Washington Storm Water Manua*l provides guidance on the best management practices to minimize the erosion losses from redevelopment and construction sites.

Point Source contamination from the NPDES-regulated waste water treatment facilities is shown by the TMDL assessment report to consist of small, but measurable, loads of DDT and PCBs to the Okanogan River. The cities of Oroville, Tonasket, Omak, and Okanogan are each responsible for the operation and maintenance of their wastewater treatment plants within the limitation of the NPDES permit specific to each facility's discharge. The NPDES permits for facilities discharging to the Okanogan River or its tributaries will be conditioned to implement the TMDL when the permits are revised as part of the regular renewal cycle.

A particular concern when working with the wastewater treatment plants is the source of contamination entering the wastewater treatment plant through the sewer system. A significant portion of the DDT and PCB contamination that enters a wastewater treatment plant is removed from the wastewater with the sludge (solids) from the plant. Unfortunately, some plants still discharge more DDT and /or PCB contamination than the waste load allocation will allow. Methods to reduce DDT/PCB discharges the plants will need to be implemented.

Table 2: DDT and PCB Waste Load Allocations for Wastewater Treatment Plants (mg/day).

STP	RM	Design Flow (Liters/Second)	4,4'-DDE	4,4'-DDD	4,4'-DDT	t-DDT	t-PCB
Oroville[a]	e	21.6	1.1	1.6	1.1	1.9	0.3
Tonasket[d]	56.4	17.5	0.9	1.3	0.9	1.5	0.5
Omak[b]	29.9	82.8	4.2	6.0	4.2	7.2	1.2
Okanogan[c]	24.8	23.7	1.2	1.7	1.2	2.0	0.3

[a]NPDES permit WA-002239-0
[b]NPDES permit WA-002094-0
[c]NPDES permit WA-002236-0
[d]NPDES permit WA-005233-7
[e]Similkameen River mile 4.0. The Similkameen River enters at Okanogan River mile 74.1

Management Roles, Activities, and Schedules

Activities

The persistent natures of DDT and PCBs in the environment truly make them a legacy of past practices. While these toxic compounds continue to persist in the environment their effective levels are reduced over time through degradation and by natural attenuation through dilution and capping. The natural processes resulting in the lower exposure of aquatic life to the contaminants will play a major role in the success of this TMDL, particularly for addressing the contaminants already contained in the river. Activities in this implementation plant have the goal of minimizing the addition of contaminants to the river from the uplands.

As stated previously, actions taken pursuant to this TMDL fall into three categories - stewardship actions, actions that are taken in accordance with a law or legal agreement, and monitoring activities.

It should also be noted that many of the activities included in this implementation plan began long before the TMDL was developed and implementation planning began. This is due to the fact that reducing soil erosion and efficiently applying irrigation waters have many benefits beyond the reduction of DDT and PCB contaminant migration into the Okanogan River system.

Voluntary Activities

These are implementation actions that may be taken, and in many cases have been taken, by individual land owners or larger organizations such as irrigation districts, and result in the reduces rate of contaminant movement from the uplands into the rivers, stream or lakes.

- **Participation in the Washington State Department of Agricultures' waste pesticide program.** The Washington State Department of Agriculture runs a program to collect and properly dispose of canceled, suspended or otherwise unusable pesticides and minimize further accumulation through education and outreach. The pesticides collected by this program are disposed of by the Department of Agriculture at no cost to the person turning in the pesticides. The turn in events held in the Okanogan Valley have collected significant quantities of DDT containing pesticides. The removal of DDT as an unapplied product is very important when considering that the estimated quantity of DDT entering the river is about 200 milligrams per day (1/5 of a pound per year). Removing DDT containing products from the watershed reduces the potential that they may accidentally, negligently or otherwise inadvertently be released to the Okanogan River. The Washington State Department of Agriculture has assured Ecology that the Okanogan Valley will remain a priority for the waste pesticide pickup program.

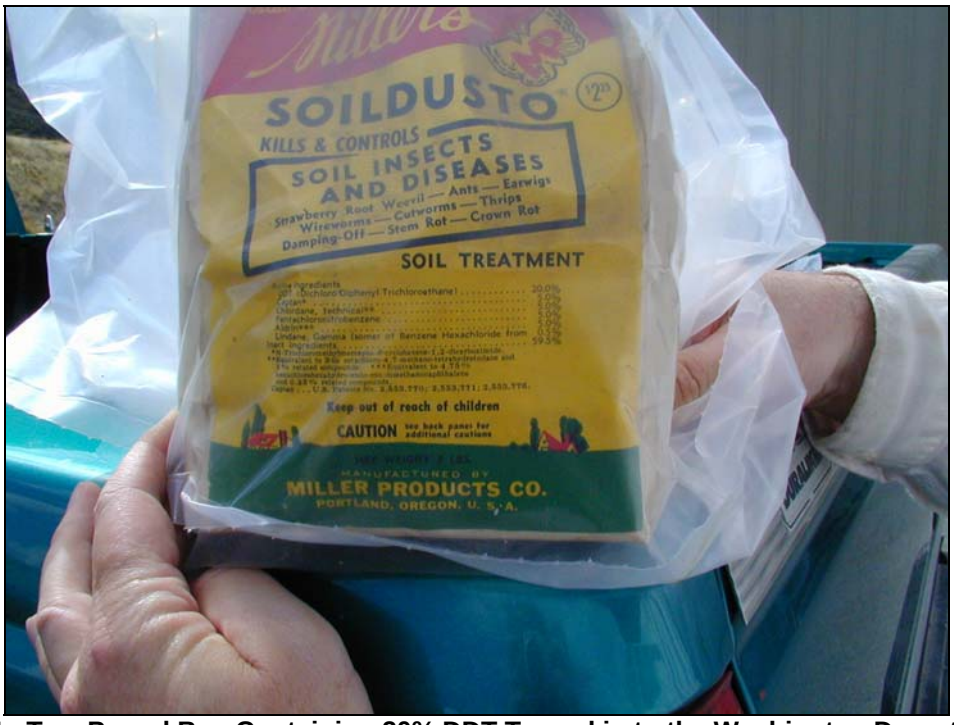


Figure 4: Two Pound Bag Containing 20% DDT Turned in to the Washington Department of Agriculture Waste Pesticide Program at an Okanogan Valley Collection Event in 2001.

- **Protect soils from water or wind erosion.** Residues from DDT application remains in the soils long after its use ended. The residues of DDT move with the soils when water or wind erodes the soils away. Implementation of best management practices on agricultural lands and riparian lands between the agricultural lands and the river to reduce soil erosion minimizes soil losses to the river. Many programs including EQIP, CREP, CRP, and Ecology administered grants of Centennial Clean Water funds, 319 funds, and Salmon Recovery Funds promote best management practices to reduce soil erosion. These funding sources are directed toward reducing a variety of pollutants and can be used to reduce loss of DDT to the river system. Many of the projects, such as exclusion fencing to restrict cattle from riparian areas, which are promoted for environmental restoration and preservation, have the side benefit of DDT reduction through the prevention of erosion.
- **Efficiently deliver and use irrigation water**. The run-off of irrigation water due to over application or the inefficient delivery to agricultural lands can cause irrigation water to move soils into river systems. Generally, the irrigation systems in the Okanogan Valley are modern and effective in their water delivery and do not create these soil transport issues. However, continued improvement on farms and to conveyance systems will reduce the risk and incident of this type of contamination transport.

Actions that are Taken in Accordance with a Law or Legal Agreement

This TMDL is addressing water quality impairment from legacy loading. The primary actions for reducing DDT and PCB in the environment was the regulatory ban on DDT use in 1972 and the 1979 ban on PCB production with the subsequent phase-out and control of PCB products.

- **Compliance with the restrictions on DDT and PCBs.** Stored pesticides that have been removed from use by regulation need to be disposed of in an expedient and legal manner. Participation in the Washington Department of Agriculture's waste pesticide program provides the opportunity to assure DDT containing pesticide products are disposed of properly. The Toxic Substances Control Act (**TSCA)**, title 40 of the Code of Federal Regulations at Part 761 (40 CFR Part 761) strictly regulates PCB management and disposal. TSCA compliance will ensure the safe removal of PCBs from the Okanogan Watershed.
- **Prevention of entry of sediment into the river**. The agricultural history of the Okanogan Valley and the shifting land uses makes it important to prevent sediment laden water from agriculture or land development activities from entering surface waters. Implementation of best management practices required for compliance with the stormwater construction permit will minimize this potential loading to the Okanogan River system. *The Eastern Washington Storm Water Manual* provides guidance on the best management practices to minimize the erosion losses from redevelopment and construction sites.
- **Implementation and compliance with NPDES permits.** NPDES permits will be coordinated with the TMDL project as they are renewed. Actions needed to evaluate and correct for DDT and PCB contamination will be considered as appropriate for each facility through the permitting process.

Table 3: Management Roles, Activities and Schedules

Entity	Responsibilities to be Met	Number of Years in Implementation										
		1	2	3	4	5	6	7	8	9	10	Beyond 10 Years
Washington Department of Agriculture	Continue to bring waste pesticide collection program collections events to the Okanogan Watershed.	X	X	X	X	X	X	X	X	X	X	X
Landowners with waterfront property	Avoid actions that will cause bank destabilization, or will otherwise add sediments to area waterways.	X	X	X	X	X	X	X	X	X	X	X
OCD, NRCS and Ecology	Continue to fund agricultural BMP implementation to reduce soil losses from agricultural lands.	X	X	X	X	X	X	X	X	X	X	X
Cities of Oroville, Tonasket, Omak and Okanogan	Monitoring DDT and PCB in wastewater treatment plant discharges in accordance with NPDES permit requirements	X	X	X	X	X	X	X	X	X	X	X
OCD, Irrigation	Promote continuing	X	X	X	X	X	X	X	X	X	X	X

Entity	Responsibilities to be Met	Number of Years in Implementation										
		1	2	3	4	5	6	7	8	9	10	Beyond 10 Years
Districts, and Ecology	improvements to the efficient and effective use of irrigation water to reduce the potential for agricultural run off to carry sediment to the river system.											
Ecology	Periodic monitoring of the Okanogan River fish tissues, repeated on every 5th year					X					X	X
Land Developers	Prevent sediments from reaching the river and streams by implementing BMPs in the Eastern Washington Storm Water Manual	X	X	X	X	X	X	X	X	X	X	X

Measuring Progress Toward Goals

The lower Okanogan DDT/PCB TMDL was initiated to address the concentration of contamination contained in the tissues of fish in the Okanogan River. The ability of fish to accumulate the contaminants from the environment over long periods of time makes them an indicator of the contaminant levels in the river system. Monitoring fish tissue concentrations of these contaminants will be the most effective means to measure the progress of environmental improvement.

Effectiveness Monitoring Plan

Effectiveness monitoring evaluates whether the management activities achieved the desired effect or goal. Success may be measured against controls of baseline conditions, or desired future conditions. This type of monitoring addresses the effectiveness of a particular project against standards or a desired outcome.

Analytical testing results for fish tissue sampling for the 2003 TMDL technical assessment report show DDT and PCB values that appear to be substantially lower than the fish tissue samples that were taken in the period of 1984 – 1995. Unfortunately, there is insufficient data from 1984 - 1995 to determine if this apparent reduction of contamination in fish tissue is truly significant. The fish tissue data from the 2003 technical assessment report will serve as the baseline data to judge progress of environmental improvement. Repeating the fish tissue sampling efforts on a regular cycle of five years is recommended for the tracking of effective water quality improvements.

The ability to track DDT and PCB contamination in the environment to the low levels found in the waters of the Okanogan River requires specialized analytical practices that make them difficult to track in the water itself. Monitoring the impact of the contamination in the aquatic environment of fish tissues is a more direct measure of overall quality of the environment, including the ambient water quality.

Implementation for control of non-point sources of DDT and PCBs is the continuation of many existing programs that have contributed to the reduction of potential contaminant/sediment transport into the Okanogan River system. Implementation can best be tracked through the continuation of the existing programs that reduce the potential transport of contaminants or even the remove the contaminants from the watershed.

Investigation into the potential sources of contamination in the wastewater collection systems that feed the wastewater treatment plants is another implementation action that will contribute to the success of the TMDL. Wastewater treatment plants in the Okanogan Valley are receiving the DDT and PCB contaminants form the developed communities they serve. The linkage of non-point sources of contamination to the wastewater treatment systems though the sewer systems may provide the identification of points of control for the waste water treatment plants to control the amount of DDT and PCB contaminants they discharge.

The Washington State Department of Ecology maintains the responsibility for the monitoring activities under this TMDL. Periodic, long-term monitoring can be achieved in the routine operation of the department.

Adaptive Management

This implementation plan has provided a framework for action to reduce the amount of contamination in the Okanogan River. If planned implementation activities are not producing expected results, Ecology or other entities may choose or be mandated to perform additional studies to identify additional sources of contaminants in the river system. If the causes can be determined and law or legal agreement requires remedies, then additional implementation measures are necessary.

Additional implementation actions, should they be needed to assure the continued reduction of DDT and PCB contamination, would begin with further investigation of potential sources of contamination. These further investigations should examine the individual tributary watersheds that have been identified as carrying DDT, in particular Ninemile Creek, Tonasket Creek, Antoine Creek, Mosquito Creek, Elgin Creek, and Tallant Creek.

If the causes cannot be determined or are due to aerial deposition from sources outside the Okanogan basin, then the TMDL targets and/or schedule may need to be revised. Re-evaluation of this TMDL is anticipated to occur at five to ten-year intervals. If progress toward reduced fish tissue contamination cannot be detected, then the TMDL may be modified as a result.

Reasonable Assurances

During the development of the DDT and PCB TMDL for the lower Okanogan River basin, available data for water quality throughout the watershed was collected and evaluated. The mass balance approach to the TMDL and the quantity of data shows that the loading of these legacy contaminants are far reduced from the time that they were in active use. Sediment core sampling and dating conducted as part of the TMDL technical assessment indicate the downward trend in the contaminants should continue without new sources of contaminant entering the watershed. Unfortunately, the decline will be at a slower rate from what was seen in the years immediately following the restrictions on the use of DDT and PCBs.

The rate of attenuation due to degradation, dilution, and sequestering of materials in the deep sediments can only be estimated with the current set in data. Documentation of the attenuation will take long-term monitoring of fish tissue in the river system. The conservative assumptions used in setting the regulatory criteria, and the work by the NPDES permitted facilities should provide sufficient assurance that, with time, water quality will improve. Each of these conservative measures will assure that the Okanogan Watershed will be monitored and protected from activities that would threaten the water quality while the legacy loading is mitigated through time and nature.

Public Involvement

The department of Ecology received no public comments regarding this document during the advertised public comment period. Appendix “A” contains a summary of public involvement activities for this document.

Funding Opportunities

The Washington State Department of Agriculture’s waste pesticide program is funded through the state Model Toxics Control Account. This funding is derived from the Model Toxics Control Act administered by the Department of Ecology and should continue to receive Ecology’s support.

Inevitably, water quality protection results from investments made by landowners in the watershed. There are numerous existing and potential funding sources in the lower Okanogan River Watershed that provide incentive to make this investment, including:

- The Natural Resources Conservation Service often provides cost-share funding to agricultural producers for farm plan implementation and conservation improvements on farms via its Environmental Quality Incentives Program (EQIP) and their Conservation Reserve Enhancement Program (CREP).
- Ecology funds water quality facilities and activities through its water quality grants program.

Potential funding sources include resources offered through the Centennial Clean Water Fund and the state 319 grants and loan program. Additionally, there are other sources of funding available for salmon habitat, salmon restoration efforts and associated projects that support actions that could improve riparian conditions and reduce erosion losses to the river system.

Potentially, the above funding resources could be utilized by the lower Okanogan valley municipalities to implement eligible activities leading to improvements in discharge from WWTPs as their NPDES permits are coordinated with the TMDL. Any NPDES permitted point sources discharging effluent to the WWTP may also be eligible for State Revolving Fund (SRF) loans to make capital improvements that improve water quality.

References

Davis, D. and D. Serdar, 1996. *Washington State Pesticide Monitoring Program - 1994 Fish Tissue and Sediment Sampling Report*. Washington State Department of Ecology, Olympia, WA. Ecology Pub. No. 96-352.

Ecology, 1993 (Revised 1997 and 2002). *Assessment of Water Quality for the Section 303(d) List.* WQP Policy 1-11, Washington State Department of Ecology Water Quality Program, Olympia, WA.

EPA, 1980a. *Ambient Water Quality Criteria for DDT*. U.S. Environmental Protection Agency, Office of Water, Regulations and Standards, Criteria and Standards Division, Washington DC. EPA 440/5-80-038.

EPA, 1980b. *Ambient Water Quality Criteria for Polychlorinated Biphenyls*. U.S. Environmental Protection Agency, Office of Water, Regulations and Standards, Criteria and Standards Division, Washington DC. EPA 440/5-80-068.

Johnson, A. and D. Norton, 1990. *1989 Lakes and Reservoir Water Quality Assessment Program: Survey of Chemical Contaminants in Ten Washington Lakes.* Washington State Department of Ecology, Olympia, WA.

Serdar, D., D. Davis, and A. Johnson, 1998. *DDT in Osoyoos Lake Fish*. Washington State Department of Ecology, Olympia, WA. Ecology Pub. No. 98-337.

Serdar, D., 2002. *TMDL Technical Assessment of DDT and PCBs in the Okanogan River Quality Assurance Project Plan.* Washington State Department of Ecology, Olympia, WA.

Sinclair, P.H. and J.E. Elliott, 1993. *A Survey of Birds and Pesticide Use in Orchards in the South Okanogan/Similkameen Region of British Columbia, 1991*. Canadian Wildlife Service, Pacific and Yukon Region. Tech. Rep. Series No. 185.

Definitions and Acronyms

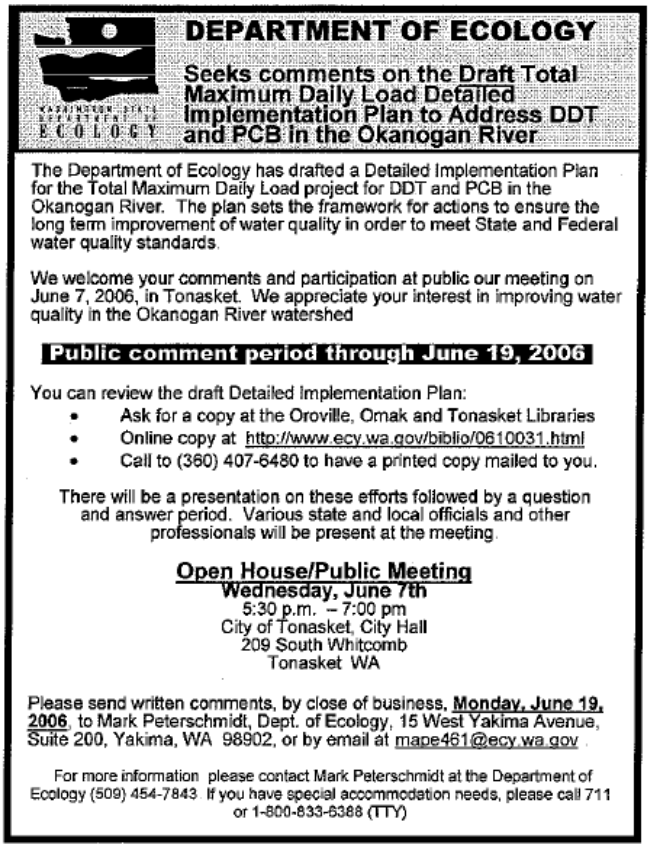
303(d)	Section 303(d) of the federal Clean Water Act
CCT	Colville Confederated Tribes
CFR	Code of Federal Regulations, usually preceded by chapter number and followed by a section number (i.e. 40CFR131.36)
CWA	Clean Water Act
DDD	1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane (a.k.a. 4,4'-DDD)
DDE	1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene (a.k.a. 4,4'-DDE)
DDT	1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane (a.k.a. 4,4'-DDT and also used to refer to the DDD and DDE analogs)
DIP	Detailed Implementation Plan
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
g/day	grams per day
HHC	human health criteria
mg/day	milligrams per day
mg/l	milligrams per liter (parts per billion)
ng/g	nanograms per gram (parts per billion)
ng/l	nanograms per liter (parts per trillion)
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NTR	National Toxics Rule (40CFR131.36)
OCD	Okanogan Conservation District
PCB	polychlorinated biphenyl
RCW	Revised Code of Washington
STP	sewage treatment plant
t-DDT	total DDT (sum of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT in this report)
TMDL	Total Maximum Daily Load
µg/l	microgram per liter (parts per billion)
WWTP	Wastewater Treatment Plant
TSCA	Toxic Substances Control Act, title 40 of the Code of Federal Regulations at Part 761 (40 CFR Part 761)

Appendix A
Response to Public Comments

On the Lower Okanogan DDT PCB Draft Detailed Implementation Plan (Water Quality Implementation Plan)

The Washington State Department of Ecology advertised the public comment period for the Lower Okanogan DDT PCB Draft Detailed Implementation Plan in the Okanogan Chronicle and the Okanogan Valley Gazette Tribune newspapers. The advertisement of the public comment period began with the May 19th posting on the Washington State Department of Ecology's public events list on the internet. Ecology staff presented the DIP and provided copies of the DIP to the public at a public meeting held at the Tonasket City Hall on June 7, 2006.

Ecology received no comments on the On the Lower Okanogan DDT PCB Draft Detailed Implementation Plan were received prior to the close of business on June 23rd 2006.



DEPARTMENT OF ECOLOGY

Seeks comments on the Draft Total Maximum Daily Load Detailed Implementation Plan to Address DDT and PCB in the Okanogan River

The Department of Ecology has drafted a Detailed Implementation Plan for the Total Maximum Daily Load project for DDT and PCB in the Okanogan River. The plan sets the framework for actions to ensure the long term improvement of water quality in order to meet State and Federal water quality standards.

We welcome your comments and participation at public our meeting on June 7, 2006, in Tonasket. We appreciate your interest in improving water quality in the Okanogan River watershed

Public comment period through June 19, 2006

You can review the draft Detailed Implementation Plan:

- Ask for a copy at the Oroville, Omak and Tonasket Libraries
- Online copy at http://www.ecy.wa.gov/biblio/0610031.html
- Call to (360) 407-6480 to have a printed copy mailed to you.

There will be a presentation on these efforts followed by a question and answer period. Various state and local officials and other professionals will be present at the meeting.

Open House/Public Meeting
Wednesday, June 7th
5:30 p.m. – 7:00 pm
City of Tonasket, City Hall
209 South Whitcomb
Tonasket WA

Please send written comments, by close of business, **Monday, June 19, 2006**, to Mark Peterschmidt, Dept. of Ecology, 15 West Yakima Avenue, Suite 200, Yakima, WA 98902, or by email at mape461@ecy.wa.gov

For more information please contact Mark Peterschmidt at the Department of Ecology (509) 454-7843. If you have special accommodation needs, please call 711 or 1-800-833-6388 (TTY)

Figure A-1. Newspaper Display Advertisement for the Detailed Implementation Plan Public Comment Period.

Appendix B
Tracking Table for Implementation Activities

Year	Activity	Brief Description	Date Completed
Any	Waste Pesticide Collection Program collections event in the Okanogan Watershed.	The Washington State Department of Agriculture runs the waste pesticide collection program. This program will revisit the Okanogan Watershed periodically to remove unregistered and unusable pesticides, including those containing DDT products.	
All	Implement BMPs to reduce soil erosion from agricultural lands or land development	DDT remains in the environment in the soils of agricultural lands where it was used. Preventing soil erosion from these lands reduces the potential for DDT to contaminate our waterway and fish.	
All	Monitoring DDT and PCB in wastewater treatment plant discharges in accordance with NPDES permit requirements	Wastewater treatment plants act as funnels for the discharges from urbanized areas. This makes them a point of focus for monitoring the discharges of contaminants from the municipalities in the watershed. The characteristics of WWTP discharges may provide opportunities for controlling contaminant discharge.	
2008, 2013, 2018, 2023,…..	Periodic monitoring of the Okanogan River Fish Tissues, repeated on every 5th year	Fish concentrate the bioaccumulative toxins of DDT, DDD, DDE and PCBs far above the concentrations of these contaminants in the aquatic environment over their lifetimes. Therefore they are the best indicators of how the concentrations of these contaminants are changing over time.	