HONORABLE BARBARA J. ROTHSTEIN

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
AT SEATTLE

SIERRA CLUB; and CENTER FOR ENVIRONMENTAL LAW AND POLICY,

Plaintiffs,

and

SPOKANE TRIBE OF INDIANS,

Plaintiff-Intervenor,

v.

MICHELLE PIRZADEH; MICHAEL REGAN, and UNITED STATES ENVIRONMENTAL PROTECTION AGENCY,

Defendants

and

SPOKANE COUNTY; KAISER ALUMINUM WASHINGTON LLC; and STATE OF WASHINTGON DEPARTMENT OF ECOLOGY,

Defendant-Intervenors.

No. 11-cv-1759-BJR

PLAINTIFFS' MOTION FOR SUMMARY JUDGMENT

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ATTACHMENT 1: Excerpts of Administrative Record.

EXHIBITS A – H: Documents for which judicial notice is requested.

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I. INTRODUCTION

As this Court found more than six years ago, "the Spokane River has been on the 303(d) list since 1996 and after nearly 20 years [now 25 years] still contains the worst PCB pollution in the state." Dkt. 120 at 20:13-14. The extraordinarily degraded state of the river obligates the Department of Ecology (Ecology) to implement a Total Maximum Daily Load (TMDL) program for PCBs to the Spokane River and the Clean Water Act imposes a non-discretionary duty on EPA to prepare its own TMDL where Ecology has no credible plan for finalizing one. *Columbia Riverkeeper v. Wheeler*, 944 F.3d 1204, 1211 (9th Cir. 2019).

In 2015, this Court ordered EPA to consult with Ecology and file a reasonable plan for finalizing a Spokane River PCB TMDL, but what EPA filed was an arbitrary plan not designed to close remaining information gaps or finalize a TMDL. Since then, additional evidence shows that Ecology will never prepare the TMDL. The result has been agonizing delay of a legally mandated process that Ecology and EPA continue to avoid without any improvement to PCB contamination in the river.

At the time of the Court's remand order, the Court already found that Ecology was "coming dangerously close" to a constructive submission, "and with EPA's support." Dkt. 120 at 21:01-04. Ecology has since crossed that line. The time has come for the Court to put an end to Ecology's perpetual delays and illusory processes, find that Ecology has abandoned its duty to prepare a PCB TMDL under the well-developed constructive submission doctrine, and order EPA to prepare the TMDL without further delay.

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II. APPLICABLE LAW

A. Standard of Review.

Summary judgment should be granted when there is no issue of material fact. FED. R. CIV. P. 56.

B. Clean Water Act Section 303, Total Maximum Daily Loads and the Constructive Submission Doctrine.

With the enactment of the Clean Water Act in 1972 (hereafter "CWA"), Congress set important goals for restoration of the chemical integrity of the nation's waters to ensure "water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water." 33 U.S.C. § 1251(a)(2).[1] CWA section 303, entitled "Water Quality Standards and Implementation Plans," is the primary CWA provision addressing receiving water quality. 33 U.S.C. § 1313. Under Section 303, states must establish water quality standards, subject to EPA approval, that protect the desired conditions and uses of water bodies, including harvesting fish that are safe to eat. 33 U.S.C. § 1313(c)(2)(A); 40 C.F.R. §§ 130.0(b), 130.2(d) and 130.3.

Water quality standards comprise designated uses, numeric and narrative water quality criteria and antidegradation requirements, all of which are independent and separately enforceable requirements of federal law. 33 U.S.C. § 1313(c)(2)(A) and (d)(4)(B); 40 C.F.R. §§ 131.3(i) and 131.6; *PUD No. 1 of Jefferson County v. Wash. Dep't of Ecology*, 511 U.S. 700, 714-15 (1994). Where effluent limitations cannot ensure that a point source discharge complies with water quality standards, federal law prohibits the issuance of an NPDES permit. 40 C.F.R. § 122.4(d); *see also* 40 C.F.R. § 122.44(d)(1).

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[1] *See also* 33 U.S.C. §§ 1251(a)(1) and 1251(a)(3).

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Section 303 requires states to identify waterbodies that fail to meet state water quality standards. 33 U.S.C. § 1313(d) and (e). "Once a state has submitted a § 303(d) list, it must then submit a TMDL to EPA for approval for each pollutant in each impaired water segment. This TMDL sets the maximum amount of a pollutant that each segment can receive without exceeding the applicable water quality standard." *Columbia Riverkeeper*, 944 F.3d at 1206 (citations omitted). "The EPA 'shall either approve or disapprove' a TMDL within thirty days of its submission." *Id.* (quoting 33 U.S.C. § 1313(d)(2)). "Where a state has failed to develop and issue a particular TMDL for a prolonged period of time, and has failed to develop a schedule and credible plan for producing that TMDL[,] . . . there has been a constructive submission of no TMDL, which triggers the EPA's mandatory duty to act." *Id.* at 1211.

C. Clean Water Act Citizen Suits.

The Clean Water Act citizen suit provision authorizes lawsuits against the Administrator of EPA when EPA is alleged to have failed to perform any act or duty under the CWA that is not discretionary. 33 U.S.C. § 1365(a)(2).[2] The Ninth Circuit treats citizen enforcement actions "liberally, because they perform an important public function . . . [C]itizens should be unconstrained to bring these actions and the courts should not hesitate to consider them." *Sierra Club v. Chevron U.S.A., Inc.*, 834 F.2d 1517, 1525 (9th Cir. 1987).

III. PROCEDURAL BACKGROUND

The background of this decade-long case has been summarized several times. The Court's Memorandum Order Remanding Matter for Further Consideration (dated March 16, 2015) recounts much of the relevant legal background under the Clean Water Act as well as a

[2] Citizens must provide sixty days' notice of their intent to sue before commencing an action. 33 U.S.C. § 1365(b); *see also* 40 C.F.R. § 135.3(b).

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general history of PCBs in the Spokane River up to that point. Dkt. 120 at 2:10-8:09. In response to the Court's remand order, EPA filed what it titled "EPA's Plan for Addressing PCBs in the Spokane River" (hereafter "EPA Plan"). Dkt. 129-1. Plaintiffs subsequently filed a Second Supplemental Complaint in June 2016 to challenge the EPA Plan[3] and the parties agreed to hold the case in abeyance, which began in September 2016. Dkts. 162 and 182.

In Plaintiffs' motion for the stay, Plaintiffs explained that they would consider voluntarily dismissing this case depending on two factors: (1) whether Ecology issues NPDES permits with total PCB numeric effluent limitations set at the total PCB state water quality criterion, and (2) the adequacy of the then-pending Task Force "Comprehensive Plan to bring the Spokane River into compliance with applicable water quality standards for PCBs." (hereafter "Task Force Comprehensive Plan"). *See* Dkt. 180 at 2:27-3:14. Unfortunately, Plaintiffs' hope that these items would provide meaningful water quality protections in accordance with the CWA went unfulfilled, prompting Plaintiffs to notify EPA of their intention to lift the stay during discussions leading up to a October 16, 2019 Joint Status Report. *See* Dkt. 205, ¶ 3. During the case abeyance, the Ninth Circuit also issued a ruling in *Columbia Riverkeeper v. Andrew Wheeler*, 944 F.3d 1204 (9th Cir. Dec. 20, 2019), affirming the TMDL constructive submission doctrine and setting forth relevant legal standards for the instant motion.

The Court lifted the stay of this case in June 2020 (Dkt. 199) and since that time, EPA has filed two separate dispositive motions (*see* Dkts. 200 and 223), the briefing for which provide additional overview of the history of this litigation and the relevant legal framework. *See* Dkt. 204 at 2:24-13:12.

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[3] Plaintiff-Intervenor Spokane Tribe of Indians filed a Third Amended and Supplemental Complaint on June 24, 2016. Dkt. 168.

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The Court denied EPA's first post-stay dispositive motion, recounted some relevant background in its order (Dkt. 210 at 2:16-8:15) and held that "the EPA Plan is a final agency action subject to judicial review." Dkt. 210 at 13:03-04. Plaintiffs then filed a Third Supplemental Complaint, adding a renewed TMDL constructive submission claim under the CWA, 33 U.S.C. §§ 1313(d)(2) and 1365,[4] and additional claims under the Administrative Procedure Act (hereafter "APA"), 5 U.S.C. § 706. Dkt. 217.[5] EPA's Motion to Dismiss certain APA claims in the Third Supplemental Complaint remains pending. *See* Dkts. 223, 231, 236.

It has now been 15 years since the Washington Department of Ecology (hereafter "Ecology") circulated a draft Spokane River PCB TMDL for comment, abandoned the PCB TMDL, and commenced illusory alternatives to a TMDL via the Spokane River Regional Toxics Task Force (hereafter "Task Force"). *See* Dkt. 120 at 5:02-7:09. The Spokane River remains impaired for PCBs, there is still no PCB TMDL for the Spokane River and no credible plan for one. *See* Dkt. 120 at 20:13-14.

IV. ARGUMENT

A. Ecology Has No Credible Plan for a PCB TMDL and Has Reached the Point of a Constructive Submission.

On the undisputed record, the Washington Department of Ecology (hereafter "Ecology") has no credible plan for producing a PCB TMDL for the Spokane River, constructively repudiating its legal obligation do so, and triggering the EPA's duty to produce the TMDL. As the Ninth Circuit set forth in *Columbia Riverkeeper*:

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[4] Plaintiffs served a supplemental notice of intent to sue by letter dated February 21, 2020, which satisfied the jurisdictional requirement for a citizen suit under the CWA. Dkt. 217 at 30-35; 33 U.S.C. § 1365(b); 40 C.F.R. § 135.3(b).

[5] Plaintiff-Intervenor Spokane Tribe of Indians also filed a Fourth Amended and Supplemental Complaint. Dkt. 226.

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> Where a state has failed to develop and issue a particular TMDL for a prolonged period of time, and has failed to develop a schedule and credible plan for producing that TMDL, it has no longer simply failed to prioritize this obligation. Instead, there has been a constructive submission of no TMDL, which triggers the EPA's mandatory duty to act.

Columbia Riverkeeper v. Wheeler, 944 F.3d at 1211.

There should be no dispute that Ecology has failed to develop a PCB TMDL for a "prolonged period of time." The Spokane River has been impaired for PCBs, with fish advisories in effect, since at least 1996.[6] The River's PCB impairment has been a priority since at least 2000.[7] And it has been fifteen years since Ecology prepared a draft PCB TMDL for the Spokane River (2006), complete with Waste Load Allocations ("WLAs") and Load Allocations ("LAs"), before withdrawing it, renaming it, and pursuing TMDL "alternatives" instead. Dkt. 120 at 5-6; AR 90.

Against this backdrop, in 2015, this Court found that Ecology was already coming "dangerously close" to a constructive submission:

> *There comes a point at which continual delay of a prioritized TMDL and detours to illusory alternatives ripen into a constructive submission that no action will be taken. With the Task Force as presently proposed, Ecology is coming dangerously close to such a point, and with EPA's support*. Accordingly, the Court finds that the EPA acted contrary to law in finding the Task Force, as it is currently comprised and described, a

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[6] AR Supp. 8 at 2996; AR 15 at 94 and 97; AR 34 at 465 (Ecology/EPA MOA identifying risks to public health as a factor to be given the "greatest weight in determining priorities"); AR Supp. 7 at 2950 – 2951; AR Supp. 5 at 2779.

Administrative Record documents (filed by EPA on April 22, 2013 (Dkt. 60)), cited herein with the prefix "AR," are filed as attachments to Dkt. 81. Supplements to the Administrative Record (filed by EPA on September 17, 2013 (Dkt. 79)), are cited herein with the prefix "AR Supp." Administrative Record documents for Plaintiffs' Third Supplemental Complaint (filed by EPA on April 29, 2021 (Dkt. 237)), are cited herein by bates number with the prefixes "ADD_CLAIMS" and "EPA_PLAN," and excerpts are attached to this motion for reference.

[7] AR 105 at 2422; AR 106 at 2431 and 2434; AR 107; AR 108 at 2448; AR 109 at 2462–2463; AR 110 at 2475–2476; AR 111 at 2479; AR 112; AR 113 at 2493; AR 116; AR 117 at 2524; AR 124 at 2590. In the development of TMDLs, the Environmental Assessment Program ("EAP") performs the technical analysis, including monitoring, data- gathering, modeling, and other analysis necessary to produce a TMDL. AR 24 at 302.

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> suitable 'alternative' to the TMDL. For the reasons set forth below, the Court remands the matter to the EPA for further consideration and consultation with Ecology.

Dkt. 120 at 21:01-04 (citation omitted) (emphasis added). Now, Ecology has reached that point and the Court should order EPA to produce the Spokane River PCB TMDL, as required by law.

1. The EPA Plan and Task Force Comprehensive Plan are not credible plans for producing a PCB TMDL.

Following the Court-ordered remand, EPA prepared and filed the EPA Plan. In filing this "plan," EPA proclaimed that it is unenforceable in any way, undermining its force. *See* Dkt. 129-1 at 11. Under the relevant standards, EPA's position that its plan is non-binding (among other reasons discussed *infra* at sec. IV.B) disqualifies the EPA Plan as a "credible plan for producing the TMDL." *Columbia Riverkeeper*, 944 F.3d at 1211. Although the EPA Plan purports to provide a schedule that *could* result in the PCB TMDL, it states:

> In submitting this schedule, EPA clarifies that it does not interpret its regulations at 40 C.F.R. 130.7(d)(1), which are referenced in the Court's order, to give EPA the authority to establish a legally enforceable schedule for either the Task Force or the State. . . . The regulation speaks to the collaborative nature of the development of such schedules. However, it <u>does not authorize EPA to establish a legally enforceable schedule for State submissions of TMDLs or for work by an independent task force</u>. . . .

Dkt. 129-1 at 11 (emphasis added). More recently, EPA again argued that no legal consequences would flow from the EPA Plan. Dkt. 200 at 15-18 ("EPA's Plan encourages the continued, ongoing work by the Task Force, the State, and others . . . This Plan, however, is not legally binding . . ."). Accordingly, EPA has made it perfectly clear, both to Ecology and this Court, that it will not attempt to enforce the purported TMDL schedule.[8]

The Task Force itself also published a "Comprehensive Plan to Reduce Polychlorinated Biphenyls (PCBs) in the Spokane River" ("Task Force Comprehensive Plan").

[8] In addition, even if it is implemented, the schedule in the EPA Plan is flawed, with arbitrary benchmarks that do not ensure PCB reductions or the development of a TMDL. Plaintiffs expand on this below at Section IV.B.

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ADD_CLAIMS_0002108 (Nov. 16, 2016). The Task Force Comprehensive Plan makes no reference to this Court's remand order or this CWA citizen suit, nor incorporates the "schedule" in the EPA Plan. *Id*. Notably, the Comprehensive Plan does not commit to a PCB TMDL, even if the Task Force fails to make "measurable progress" toward attaining water quality standards. *Id*. at 1. Indeed, under its plan, in the event the Task Force fails (even under its own, flawed standards),[9] Ecology may elect to "determine an alternative" to a TMDL:

> Should the Task Force fail to make measurable progress towards this goal, then Ecology is "obligated to proceed with a TMDL in the Spokane River for PCBs **or determine an alternative** to ensure that water quality standards are met."

Id. (emphasis added).[10] This appears to be the only place in the Comprehensive Plan that even mentions a Spokane River PCB TMDL, or its possibility. *Id*.[11] Under the CWA, there is no legal "alternative" to a TMDL for waterbodies on the 303(d) list, as the Spokane River is for PCBs. Ecology's duty under the CWA to develop a PCB TMDL is nondiscretionary. *Columbia Riverkeeper*, 944 F.3d at 1211. This is hardly a "credible plan" for a TMDL. *Id*.

Indeed, pursing an "alternative" to a TMDL is precisely what caught the Court's ire eighteen months before the Task Force issued the Comprehensive Plan. The Court's order was unequivocal: "the EPA may not approve a task force as an alternative to a TMDL, *i.e. a task force not designed to complete or assist in completing a TMDL*." Dkt. 120 at 19:16-18 (emphasis added); *accord id*. at 21:04-06 ("the EPA acted contrary to law in finding the Task Force, as it is currently comprised and described, a suitable 'alternative' to the TMDL").

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[9] *See infra*, Sec. IV.B.

[10] The Comprehensive Plan provides no citation for its use of quotation marks.

[11] In another place, the Comprehensive Plan provides existing loading rates, and asserts those loading rates "would not be appropriate for consideration in developing . . . waste load allocations for the facilities under a TMDL." Those loading rates were calculated as 126 to 165 mg/day for industrial discharges and 51 to 125 mg/day for the municipal discharges and were "derived for the purposes of a semi-quantitative loading analysis to support the Comprehensive Plan." ADD_CLAIMS_0002150.

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Now, six years later, the Task Force remains a "TMDL alternative" (*see* ADD_CLAIMS_0003669), suffering from the same defect, made worse by lost time: the Task Force is not designed to assist in completing a TMDL. At this point, Ecology's continued delegation to the Task Force is no longer merely contrary to the APA, rather it has ripened into a constructive submission of no TMDL. *See* Dkt. 120 at 21.

In fact, the Task Force's own words, as expressed to EPA following this Court's remand order, confirm that assisting with a TMDL is "outside the scope of the Task Force."

> **Many scientific challenges complicate the development of a TMDL**. The efforts of the Task Force have significantly increased the body of knowledge with regard to PCBs in the Spokane River, but substantial data gaps still prevent the development of a scientifically credible TMDL.
>
> Initial studies have led to both an improved understanding of the Spokane River and to the realization that **much uncertainty remains to be resolved**. The following examples illustrate some of the data that would be required, **<u>which is outside the scope of the Task Force</u>**.

EPA_PLAN_0002763. The Task Force's statement is part of a document titled "Coordinated Response to EPA Regarding the Remand from Judge Rothstein," and was "formally approved by the Task Force on June 15, 2015." *Id*. Ecology and EPA are both members of the Task Force.[12] Since then, the inadequate scope of the Task Force has remained unchanged and endorsed by EPA. *See* Dkt. 129-1 at 9 ("Although the Task Force's work will be used if development of a TMDL is necessary, the Task Force was not convened for that purpose."); Dkt. 200 at 17:02 ("EPA's Plan encourages the continued, ongoing work by the Task Force . . .").

Plaintiffs fundamentally disagree that any remaining uncertainties surrounding PCBs in the Spokane River make a TMDL development infeasible. *See* AR Supp. 8 at 2998 (EPA's PCB

[12] *See* Webpage, Spokane River Regional Toxics Task Force, https://srrttf.org/?page_id=5191 (Task Force Member Roster), last visited July 2, 2021.

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TMDL Handbook, encouraging use of the "most recent and best available data," not perfect data).[13] Indeed, other states have developed PCB TMDLs facing similar uncertainties, which are to be expected. *See* Exhibits A - F.[14] However, by arguing it cannot complete a TMDL because of data gaps (*see* Dkt. 94 at ¶ 3),[15] while simultaneously approving a "TMDL Alternative" that is not designed to assist in completing the TMDL (*see* EPA_PLAN_0002763), Ecology has ignored this Court's order (Dkt. 120 at 19:16-18)[16] and reached the point of a constructive submission—now 15 years after it abandoned its draft PCB TMDL.

As the record shows, the time has come for the Court to put an end to Ecology's delays with illusory TMDL "alternatives" and find that Ecology constructively submitted no PCB TMDL for the Spokane River.

2. Ecology's "TMDL Alternative" scheme repudiates CWA Sec. 303(d).

Ecology's use of the Task Force is part of a larger scheme within Ecology to utilize "TMDL Alternatives" in lieu of difficult TMDLs. The Task Force is one of these "TMDL Alternatives," but there are other examples too. *See* ADD_CLAIMS_0003669 ("This document provides guidance on TMDL Alternatives available to TMDL leads . . ."). While the Court need not determine in the context of this case whether this overall scheme is contrary to law, Ecology's programmatic development and endorsement of "TMDL Alternatives" demonstrates that Ecology will not necessarily proceed to a PCB TMDL if and when it acknowledges that the

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[13] This comports with the absence in the CWA and EPA's regulation of permission to delay a legally mandated pollution control mechanism "until better science can be developed, even where there is some uncertainty in the existing data." *Upper Blackstone Water Pollution Abatement Dist. v. EPA*, 690 F.3d 9, 22 (1st Cir. 2012).

[14] Plaintiffs request judicial notice of these EPA-approved PCB TMDLs. *See* 33 U.S.C. § 1313(d)(2).

[15] Ecology declarant: "Ecology concluded that the 2006 draft PCB TMDL had data gaps that needed to be addressed before Ecology could finalize the draft PCB TMDL…"

[16] *See also* Dkt. 210 at 6:14-19 ("This Court further noted 'the worrying lack of progress made with respect to scientific data [regarding PCBs in the Spokane River] in recent years.' The Court found this particularly troublesome because this alleged lack of data is one of the reasons Ecology and the EPA claim that Ecology has been unable to develop a PCB TMDL up to this point." (internal citation omitted)).

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Task Force is ineffectual. This "TMDL Alternatives" scheme provides many other detours for Ecology to pursue, consuming many more years and decades without a TMDL, as the Spokane River remains impaired for PCBs and its fish dangerous to eat.

This Court previously explained that adopting an "alternative may, under some circumstances, represent a reasonable interim measure rather than an abandonment of any future plans to prepare a TMDL." Dkt. 120 at 15:07-10. However, the Court clarified that "EPA may not approve a task force as an alternative to a TMDL, i.e. a task force not designed to complete or assist in completing a TMDL. The Task Force as presently proposed provides no way of determining if the Task Force has been effective in furthering the preparation of a TMDL." *Id.* at 19:16-21 (internal citation omitted) (emphasis added). We now know that the Task Force is still not designed to complete or assist in completing the PCB TMDL. EPA_PLAN_0002763 ("outside the scope of the Task Force"); Dkt. 129-1 at 9 ("not convened for that purpose"); Dkt. 200 at 17:02 ("EPA's Plan encourages the continued, ongoing work by the Task Force…"). Rather, the Task Force is a flawed, experimental "TMDL Alternative." *See* ADD_CLAIMS_008097 (identifying Task Force as "alternative").

In addition to leaving the door open through the Comprehensive Plan for yet another "alternative" if/when Ecology finds the Task Force to be ineffectual (ADD_CLAIMS_0002108 at 1), Ecology has also indicated this intention in other contexts. For example, Ecology's "TMDL Lead" for the Task Force,[17] Karl Rains, prepared a presentation in October 2019 echoing the Comprehensive Plan language that yet another "alternative" remains available:

[17] *See* ADD_CLAIMS_0008097.

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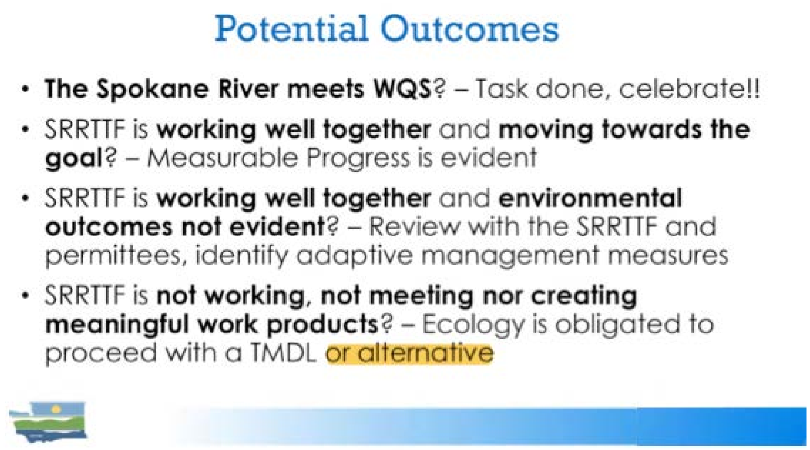

ADD_CLAIMS_0005398 (highlight added). *See also* AR 1 at 2 (May 2012 letter from Ecology to EPA: "if Ecology determines the Task Force is failing . . . Ecology would be obligated to proceed with development of a TMDL in the Spokane River for PCBs **or determine an alternative** . . ." (emphasis added)); ADD_CLAIMS_0001139[18] ("Ecology maintains its authority to pursue [a] A traditional TMDL[, or] [b] **other approach**" (emphasis added)).

There are two problems with this scheme. First, the standards Ecology is using to determine "meaningful work product" or "meaningful progress" are meaningless and not reasonably designed to close data gaps, to attain water quality standards, or to reduce PCB loading, as a TMDL with WLAs and LAs would dictate. This is addressed further at section IV.B, below.

Second, it is contrary to law for Ecology to preserve the option of pursuing TMDL alternatives in perpetuity. Of course, Ecology and the Task Force know to say the right things too, and often state that a TMDL remains an option or will be pursued. But any such statements

[18] EPA describes this document as an attachment to a 2016 email from Ecology to EPA. *See* Dkt. 237-1 at 21.

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are not credible considering other representations to the contrary and Ecology's and the Task Force's history on this issue. *Columbia Riverkeeper v. Wheeler*, 944 F.3d at 1211.

Perhaps Ecology thinks its "alternatives" are superior to a TMDL. But even if Ecology believes it knows better than Congress about how to clean up the Spokane River, no amount of justification changes the law. A PCB TMDL for the Spokane River is a legal obligation. 33 U.S.C. § 1313(d); *Columbia Riverkeeper*, 944 F.3d 1204.

The record demonstrates that Ecology repudiates this statutory duty. Indeed, in the rare instances when Ecology or the Task Force address the possibility of a TMDL, there is no plan for one. Instead, they take the opportunity to lambast the TMDL program as inferior and supplant their own judgment for that of Congress. *See* ADD_CLAIMS_0003669 (TMDLs are "ever more complex, controversial and resources intensive. . . "); ADD_CLAIMS_0002245-46 ("Of the limited number of PCB [TMDLs] prepared to date, not one water body in the country has successfully met applicable water quality standards for PCBs through the TMDL process");[19] ADD_CLAIMS_0001139 ("Toxics reductions require a new strategy. A traditional TMDL establishes limits before action. The new approach starts with action."); ADD_CLAIMS_0008347 ("we are confident the Task Force approach and actions identified in our funding request will yield more tangible results in reducing PCBs than the traditional TMDL process."). This is not how the Clean Water Act is designed to function. The Act imposes clear, mandatory processes for impaired waterbodies. *Columbia Riverkeeper v. Wheeler*, 944 F.3d 1204. These processes are not discretionary and must be enforced. *Id*. Under this Court's standards for a constructive submission, the Task force is an illusory alternative that has ripened

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[19] This kind of defeatist thinking is another explanation for why Ecology has failed to produce a credible plan for the PCB TMDL in the Spokane watershed.

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into a constructive submission that no action on a PCB TMDL will be taken. Dkt. 120 at 21:01-02. The Court should order EPA to step in and prepare the PCB TMDL without further delay, consistent with the law.

3. Ecology and the Task Force have lost credibility.

Under *Columbia Riverkeeper v. Wheeler*, Ecology's credibility is a component of the Court's analysis. 944 F.3d at 1211 (requiring a "credible" plan). Thus, the Court should view any Ecology statement of intent to produce the TMDL against the backdrop of the last fifteen years, since at least 2006, when Ecology had a draft TMDL in hand, and then abandoned it. *See* AR 90 (Draft Spokane PCB TMDL); Dkt. 120 at 5:01-7:03. The weight of the record shows that when Ecology says it will produce a PCB TMDL for the Spokane River, it is an empty promise. To Ecology and the Task Force, a PCB TMDL is a nuisance that need not be pursued so long as they have alternatives to consume years and decades of time without WLAs or LAs for toxic PCBs that would be difficult to meet.

a. Ecology and the Task Force oppose funding for a PCB TMDL.

First, the Task Force has gone out of its way to oppose funding for a Spokane River PCB TMDL, undermining any claim that it intends to prepare one. ADD_CLAIMS_0008347. In March 2021, Spokane Riverkeeper, a local environmental non-profit and former Task Force member (which resigned from the Task Force in protest over its inadequacy and refusal to support a TMDL[20]), wrote to the Governor requesting $800,000 for PCB TMDL development. ADD_CLAIMS_0008288-89. Apparently concerned that the Governor might grant the funding request,[21] the Task Force responded to Riverkeeper with a letter to the Governor of its own.

[20] ADD_CLAIMS_0004866
[21] *See* ADD_CLAIMS_0008342 ("Hi Task Force members, [e]arlier this month Riverkeeper sent a letter to Governor Inslee requesting Monsanto Settlement Funds be used towards establishing a Spokane River TMDL

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Instead of embracing the opportunity to develop a TMDL, as legally required, the Task Force objected:

> You recently received a request from Spokane Riverkeeper, an organization that withdrew from the Task Force in 2019, promoting the traditional TMDL process instead of our more innovative approach. While we share many of the same goals and actions outlined in the Riverkeeper proposal and hope to work with them on achieving these, we are confident the Task Force approach and actions identified in our funding request will yield more tangible results in reducing PCBs than the traditional TMDL process.

ADD_CLAIMS_0008347.

This letter not only reveals the prevailing, disdainful attitude among Task Force members toward the TMDL process, but it also contradicts any argument that the lack of a PCB TMDL is due to a lack of resources. By objecting to TMDL funding, the Task Force, with Ecology,[22] have demonstrated that its 15-year delay since withdrawing the draft TMDL is not a matter of resource prioritization. Ecology and the Task Force simply do not want the resources for a TMDL because they do not want or intend to produce a TMDL. In a literal sense, the Task Force and Ecology would not put money where their mouths are, and this undermines their credibility vis-à-vis TMDL development.

b. Ecology has abandoned the 2006 Draft Spokane River PCB TMDL.

Second, Ecology appears to have designated the 2006 draft PCB TMDL as "obsolete," and archived it in a way that makes it less accessible. Department of Ecology E-mail Correspondence, RE: AO 19-01 Ecology Publication # 0603-024 (July 29-31, 2019), attached hereto as Exhibit H.[23] It is plain that Ecology does not intend to pick the draft TMDL back up to

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process, among other things. We felt it appropriate to respond to this as a Task Force."). Ecology is a Task Force member and recipient of this email.

[22] *Supra* n. 20.

[23] To satisfy the Court's Standing Order (Dkt. 213 at ¶ II.C), the parties have commenced conferral about supplementing the administrative record, including adding this Ecology e-mail correspondence, which Plaintiffs received from Ecology pursuant to a request under the Public Records Act, Chapter 42.56 RCW. The parties'

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complete it— i.e. Ecology has "abandoned" it, constituting a constructive submission. Dkt. 120 at 15:07-10. When Ecology's Surface Water Quality Standards Specialist wanted a copy of the 2006 draft, she could not even find it. Exhibit H. For fifteen years, the draft has been collecting dust, with no progress being made to update and finalize it.

c. A TMDL is against the prevailing interests of the Task Force.

Finally, since this Court's ruling in 2015, the Task Force has continued to demonstrate an aversion to preparing a PCB TMDL, in part because a TMDL would impose requirements adverse to Task Force members' short-term economic interests. With PCB-dischargers dominating the Task Force, substantial obstacles to addressing PCB impairment in the Spokane River have gone far beyond "agency capture"[24]—Ecology has overtly handed over the reins to industry to pursue industry-palatable alternatives to a TMDL, contrary to law. A key environmental group on the Task Force resigned in protest in June 2019. ADD_CLAIMS_0004866. In these circumstances, Ecology and the Task Force have lost credibility vis-à-vis a PCB TMDL, and an order under the CWA citizen suit provision is necessary. *See Adkins v. VIM Recycling, Inc.*, 644 F.3d 483, 499 (7th Cir. 2011) (citing "agency capture" as a reason behind citizen suit provisions in environmental laws). Dischargers should have a role in regulation, but their interests must not override a clean-up process mandated by law.

Kaiser Aluminum, Inland Empire Paper Company, and the City of Spokane—all Task Force members— each discharge exorbitant amounts of PCBs directly to the Spokane River.

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conferral is ongoing and Plaintiffs are hopeful this record will be formally added to the administrative record by stipulation. If EPA does not stipulate, however, Plaintiffs reserve the right to move the Court to add this record.

[24] *See* Rachel E. Barkow, *Insulating Agencies: Avoiding Capture Through Institutional Design*, 89 Tex. L. Rev. 15, 21 (2010) (defining "agency capture" as "undue industry influence" and discussing the policy biases that flow from the phenomenon)

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See ADD_CLAIMS_002150 (providing calculated loading rates in mg/L). And so long as there is no PCB TMDL for the Spokane River, there will be (1) no WLAs that limit their discharges, and (2) no PCB numeric effluent limitations in their NPDES permits that are calculated through the holistic TMDL process. *See* Dkt. 120 at 20:17-21 (citing 40 C.F.R. § 122.44(d)(1)(vii)(B)). Without any such enforceable PCB limits, those dischargers may avoid taking the difficult and costly steps needed to comply with their allocation. *See id*. It is no wonder that the Task Force prefers to focus its energy on problems outside its control and unlikely to change the paradigm—a TMDL deferred is an economic break for its members, to the detriment of the Spokane River and those who depend on it for sustenance. *See e.g.* ADD_CLAIMS_0003469 ("One of the challenges that EPA faces in approaching these issues is that TSCA requires the Agency to consider costs when developing a regulatory standard, and the CWA does not."). These perverse incentives get in the way of meaningful progress toward producing a TMDL and attaining water quality standards. The time has come for the Court to order EPA to step in.

For example, instead of working toward a TMDL, the Task Force has spent considerable effort lobbying EPA to revise Toxic Substance Control Act (TSCA) regulations that set PCB limits in consumer products, despite its miniscule chance of success[25] and comparatively distant connection to the ongoing PCB-loading to the Spokane River. *See* ADD_CLAIMS_0002245; ADD_CLAIMS_0008350 (budgeting $500,000 for related actions in 2021-2031). In the process, the Task Force belittled the viability of a TMDL, and has shown a preference to blame the river's impairment on anything other than Task Force members' own substantial PCB discharges. ADD_CLAIMS_0002245. The Task Force attempts to justify its illusory approach by arguing

[25] *See* ADD_CLAIMS_0003469.

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that "not one water body in the country has successfully met applicable water quality standards for PCBs through the TMDL process." *Id*. This conclusion is unsupported by the record, but even if it were true, surely no illusory alternative, lacking any WLAs or LAs or processes for establishing them, have achieved water quality standards for PCBs, either. Nor does the CWA make them discretionary. *Columbia Riverkeeper*, 944 F.3d 1204.

Although the Task Force has no problem lobbying the EPA on TSCA, it opposed efforts to have EPA approve PCB analytical Method 1668 for PCB enforcement monitoring. Method 1668 can detect and quantify PCBs at far lower concentrations than other methods. *See* ADD_CLAIMS_0001634, Table 26 (comparing methods). It is approved for water quality monitoring,[26] but not to enforce numeric effluent limits in NPDES permits. *See* ADD_CLAIMS_0001634; *Puget Soundkeeper Alliance v. Dept. of Ecology*, 191 Wn.2d 631 (2018). Approval of Method 1668 for compliance monitoring is crucial for improving regulatory oversight of PCB discharges and reducing PCB loads to the Spokane River. Pursuing approval for Method 1668 would also meet this Court's test to "assist in completing a TMDL" (Dkt. 120 at 19:16-18), as the method would provide precision to the WLAs that form a cornerstone of a TMDL. 40 C.F.R. § 122.44(d)(1)(vii)(B); 40 C.F.R. § 130.7. Yet, the Task Force objected to funding to pursue approval of Method 1668, just as it opposed funding for the TMDL itself. *Compare* ADD_CLAIMS_0008291 (Riverkeeper proposing $20,000 to petition EPA to approve method 1668) *with* ADD_CLAIMS_0008349 (Task Force response).

Approving Method 1668 is not a priority for the Task Force, despite (or perhaps, because) without it, any numeric PCB effluent limits would be largely undetectable and thus

[26] *See* Department of Ecology, Implementation Memorandum #12, When to Use EPA Method 1668 for PCB Congener Analysis (July 22, 2015), available at https://apps.ecology.wa.gov/publications/documents/1509052.pdf

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difficult to enforce. The record shows that draft PCB effluent limits for the Spokane River would be much lower than the detection limit of the currently-approved analytical method, 608, so no violation would be reported, even if PCBs were discharged at orders of magnitude above the human-health based limit (but below Method 608's detection limit). *Compare* ADD_CLAIMS_0001212 (draft maximum daily effluent limit of 0.00017 µg/L Total PCBs) *with* ADD_CLAIMS_0001634, Table 26 (Method 608 detection limit is between 0.008 and 0.25 µg/L); *see* Dkt. 129-1 at 25. In other words, the status quo is also a free pass for Task Force members, which discharge PCBs under NPDES permits.[27]

The Task Force alternative is not a credible plan, nor is it a "reasonable interim measure" toward a TMDL. Dkt. 120 at 15:09-10. Ecology's illusory TMDL alternative, which has wasted fifteen years, must end.

B. The EPA Plan is Arbitrary and Capricious.

Plaintiffs respectfully contend that under the relevant legal standards, the Court should hold that Ecology has constructively submitted no PCB TMDL for the Spokane River under 33 U.S.C. § 1313(d)(2) and order EPA to produce the TMDL. In the alternative, and at a minimum, the Court should vacate and remand the EPA Plan as arbitrary, capricious and contrary to law, with instructions to develop a schedule that guarantees prompt issuance of the TMDL. 5 U.S.C. § 706(2)(A).

After the Court found that EPA "acted contrary to law in finding the Task Force, as it is currently comprised and described, a suitable 'alternative' to the TMDL," this Court ordered

[27] It is also important to note that the NPDES permits for dischargers of PCBs to the Spokane River were issued in 2011 and have since been administratively extended, without any numeric effluent limits for their PCB discharges. *See* Dkt. 204 at 6-8 (describing how the prospect for NPDES permits with numeric PCB effluent limits precipitated the stay of this case in September 2016).

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EPA to work with Ecology to develop and file with the Court:

> a complete and duly adopted reasonable schedule for measuring and completion of the work of the Task Force, including quantifiable benchmarks, plans for acquiring missing scientific information, deadlines for completed scientific studies, concrete permitting recommendations for the interim, specific standards upon which to judge the Task Force's effectiveness, and a definite endpoint at which time Ecology must pursue and finalize its TMDL.

Dkt. 120 at 24:23-25:04 (emphasis added); *see also* Dkt. 210 at 6-7. EPA went through the motions to comply with the Court's order, but what EPA filed did not include a reasonable schedule to meet these ends. Rather, it is an arbitrary plan with meaningless benchmarks that does not ensure progress on a TMDL, protect water quality or human health.

Under the APA, the Court shall hold unlawful and set aside agency actions found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). The Court already held that the EPA Plan is a final agency action subject to APA judicial review. Dkt. 210. Now, under the relevant legal standards, the Court must vacate the EPA Plan because of its failure to (1) set a schedule with a reasonable endpoint for a TMDL, (2) its failure to use sediment and fish tissue PCB data when determining benchmarks for measuring progress toward attainment of water quality standards, and (3) even if water column concentrations could be reasonably relied upon, the benchmarks adopted are far too lax and could not reasonably measure progress. The Court should vacate and remand the EPA Plan with specific instructions for its reformulation and reissuance in a way that guarantees prompt issuance of a PCB TMDL.

1. The EPA Plan lacks a reasonable endpoint for a PCB TMDL.

EPA has made abundantly clear that it will not enforce the schedule within the EPA Plan. Dkt. 129-1 at 11; Dkt. 200 at 15-18. On its face, however, the schedule does not even provide a "definite endpoint" to Ecology's delays until July 2030—15 years after the EPA Plan was

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prepared. Dkt. 129-1 at 11. This is patently unreasonable, arbitrarily derived and frustrates the purpose of the Court's remand order.

When Ecology withdrew its draft Spokane River PCB TMDL in 2006,[28] it cited certain data gaps as its purported reason for doing so. *See* Dkt. 120 at 6. Closing these data gaps is precisely what the Court's remand order sought to ensure on a timely basis so that a TMDL would be issued without delay:

> Specifically, the EPA shall work with Ecology to create a definite schedule with concrete goals, including: clear statements on how *the Task Force will assist in creating a PCB TMDL* in the Spokane River *by reducing scientific uncertainty*; quantifiable metrics to measure progress *toward that goal*; regular checkpoints at which Ecology and the EPA will evaluate progress; a reasonable end date, at which time Ecology will finalize and submit the TMDL for the EPA's approval or disapproval; and firm commitments to reducing PCB production from known sources in the interim.

Id. at 22:04-12; *see also id*. at 20:11-10.[29]

Yet, the focus of the EPA Plan is not closing these data gaps or enabling the preparation of a final TMDL. Of the 13-page EPA Plan,[30] 10 pages are devoted to a summary and "context," without regard to the goal of closing data gaps or moving the TMDL forward. Dkt. 129-1 at 1-10. A scant one paragraph describes "Further Work of the Task Force," which says by December 2016, the Task Force would be able to close "one of the data gaps previously identified as the highest priority – source identification." *Id*. at 10. This appears to be the only specific effort described in the EPA Plan to address data gaps.

[28] EPA disputes that the TMDL had sufficient information from which a final PCB TMDL could have been produced, but evidence indicates that the final TMDL would have been issued no later than 2009, had Ecology stayed the course. *See* Dkt. 120 at 5:20-23.

[29] "The EPA found that scientific uncertainty prevents the submission of a TMDL, yet it is unclear how or whether the Task Force will resolve that problem." *See also id*. at n. 20 ("During oral argument, counsel for EPA was unable to articulate precisely how the Task Force would resolve the scientific uncertainty".)

[30] The EPA Plan also includes two appendices: A) a map of the Spokane River watershed, and B) EPA's NPDES permitting recommendations to Ecology. Dkt. 129-1 at 17-31.

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The only other part of the EPA Plan that purportedly satisfies the Court's remand order is the "schedule," which spans 1 ½ pages, a significant portion of which is EPA's disclaimer that it will not enforce the schedule. *Id*. at 11-12. The rest of the EPA Plan seeks to justify why the EPA Plan "does not contemplate immediate initiation of a TMDL" despite the specifics of the Court's remand order. *Id* at 12-13.

The "schedule" uses Spokane River "instream concentration of PCBs" as benchmarks for extending the continual delay of a PCB TMDL, but it lacks any provision to measure progress toward the goal of reducing the TMDL's scientific uncertainty, as the remand order instructed. *Compare* Dkt. 129-1 at 11-12 *with* Dkt. 120 at 22:04-12. The EPA Plan provides that the Task Force should make "recommendations for future studies to address remaining data gaps," but there is nothing about "regular checkpoints at which Ecology and the EPA will evaluate progress" toward closing those data gaps. Dkt. 129-1 at 11-12; Dkt. 120 at 22:04-12.

The reality is that 15 years ago, when Ecology was focused on preparing the TMDL, it projected that, at most, it would have sufficiently complete data by June 2009. Dkt. 120 at 5:24. When issuing the EPA Plan and considering a TMDL schedule, EPA indicated the highest priority data gap would be closed in December 2016. Dkt. 129-1 at 10. How, then, could EPA have reasonably concluded that it could take until 2030 for Ecology to collect sufficient data for a TMDL?

Plaintiffs vehemently dispute that there was insufficient data to complete the PCB TMDL when Ecology abandoned it in 2006, in 2015 when EPA prepared the EPA Plan, and certainly now. There is already ample information about PCB contamination in the Spokane River from more than thirty years of focused study and enough to develop the PCB TMDL. Indeed, the body of scientific information about Spokane River PCB contamination and sources exceeds that

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supporting other PCB TMDLs cited as exemplary by EPA's *PCB TMDL Handbook*. Supp. 8 at 2998.

But even where Ecology reasonably delayed for better data, the EPA Plan in no way assures measurable progress toward resolving the very scientific uncertainties upon which Ecology relies for continuous delays. If Ecology has not closed the gaps over the course of the last 15 years, Ecology is unreasonably pursing near-perfect data—which is unattainable—and not needed for a CWA-compliant TMDL.[31] The EPA Plan is arbitrary on this basis and should be vacated and reissued.

2. The EPA Plan arbitrarily excludes sediment and fish tissue PCB-sampling as bases for measuring progress toward attainment of water quality standards.

Under the EPA Plan, Ecology's submission of the PCB TMDL for the Spokane River may be postponed to 2030 if specified benchmarks are met.[32] These benchmarks are described as instream concentration of PCBs meeting 200 and then 170 pg/L "based on the annual central tendency of the preceding year."[33] These benchmarks are arbitrarily derived as EPA did not consider (1) the narrative water quality criteria that the Spokane River be safe for fish harvesting, and (2) the more important and relevant environmental metrics: total PCB concentrations in sediment and fish tissue.

[31] "TMDLs established under the phases approach [should] include a schedule for installation and evaluation of nonpoint source control measures, data collection, and assessment of water quality standard attainment . . . the schedule [should] include a time frame within which water quality standards are expected to be met and within which controls will be re-evaluated if water quality standards have not been attained. **The information would be used to determine whether the TMDL needs to be revised**." United States Environmental Protection Agency, Memorandum, Clarification Regarding "Phased" Total Maximum Daily Loads (August 2, 2006) at 2 (emphasis added), attached hereto as Exhibit G for judicial notice. The EPA Plan focus on implementation of an initial set of BMPs coupled with continued progress and status monitoring to gauge progress is like the adaptive implementation approach for phased TMDLs—but without the legal mandates for PCB discharge reductions that would accompany a TMDL.

[32] Dkt. 129-1 at 11 – 12.

[33] *Id.*

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Indeed, PCB § 303(d) listings in the Spokane River are based on fish tissue exceedances, not water column exceedances. Dkt. 129-1 at 4; ADD_CLAIMS_0002119.[34] Washington has established narrative water quality criteria for the Spokane River to include "wildlife habitat and fish harvesting." WAC 173-201A-602, Table 602.[35] This fish harvesting designated use is part of the water quality standards for the Spokane River that must be protected. *See PUD No. 1 v. Wash. Dep't of Ecology*, 511 U.S. 700 (1994). The Spokane River remains impaired for this use because PCBs are toxic, hydrophobic and bioaccumulating substances, which move from water to sediments to fish tissue in dangerous concentrations. *See* ADD_CLAIMS_0000968; Dkt. 129-1 at 2-3. As a result, Washington Department of Health public health advisories, warning against eating fish, have been in effect for many years on the Spokane River. *See* AR Supp. 5; *Friends of the Earth v. Gaston Copper Recycling Corp.*, 204 F.3d 149, 156 (4th Cir. 2000) (well-recognized CWA aim is to ensure waters are "fishable and swimmable"). Therefore, attaining water quality standards is not merely about measuring certain concentrations of PCBs in the water column. Water quality standards will not be attained until fish in the Spokane are safe to harvest. The water column benchmarks in the EPA Plan were not reasonably adopted to measure progress toward attaining these standards and must be vacated.

Ecology continues to sample sediment and fish tissue in the river, but the EPA Plan does not adopt benchmarks for PCBs in those mediums. *See* ADD_CLAIMS_0003200; ADD_CLAIMS_0004811. This is despite the clear propensity of PCBs to accumulate in sediments and fish tissue, not to remain suspended in the water column. *See* Supp. 7 at 2984;

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[34] The Department of Ecology's public database cites several studies with tissue exceedances for PCB 303(d) listing. Washington State Water Quality Assessment, Listing ID: 8202 ("Basis Statement"). https://apps.ecology.wa.gov/ApprovedWQA/ApprovedPages/ViewApprovedListing.aspx?LISTING_ID=8202

[35] Table 602 indicates "all" miscellaneous uses are designated for the Spokane River. WAC 173-201A-600, Table 600 defines "miscellaneous uses" to include "Wildlife habitat" and "Fish harvesting."

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Supp. 8 at 2996, 3012. EPA's schedule is arbitrary under the relevant legal standards. *See* 5 U.S.C. § 706(2)(A).

On the administrative record, EPA did not adequately consider the ability of the public to safely harvest fish from the river and the use of sediment and/or fish tissue PCB concentrations as benchmarks. To the extent EPA did consider these standards and benchmarks, its decision to exclude them is not supported by the facts.

3. Even if water-column benchmarks were appropriate, the benchmark concentrations are arbitrary.

In addition to overlooking the significance of the more direct relationship between sediment and tissue contamination and non-attainment of narrative PCB criteria, the concentrations used in the EPA Plan (200 pg/L by 2020 and 170 pg/L by 2024) set irrationally low bars that never left any doubt they would be met. In fact, a consultant for the Task Force summed it up well, back in 2017 during a Task Force e-mail discussion about PCB data and "central tendency":

> If the primary goal is only to show compliance with 200 pg/L, it won't take that many samples purely because the mean at each station is so much less than the target (>50 pg/L difference).

ADD_CLAIMS_0002837. The consultant then contrasted meeting the 200 pg/L benchmark with showing progress on water quality improvement:

> The required number of samples will go way up if the goal is to examine much smaller differences, such as 'is the river improving over time?' As my table indicates, collection of 100 samples will still have an error band around the mean of 18.9 pg/l. This means that hundreds of samples may be needed to discern small changes in concentrations.

Id. *See also* ADD_CLAIMS_0001019 (suggesting "Ambient water quality data shows PCB concentrations are generally below the 170 ppq water quality standard, with some

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exceptions."[36]); ADD_CLAIMS_0002119 (water quality data collected at eight river locations between 2014 and 2016 "show that the central tendencies of the water column data range from 17 pg/L to 154 pg/L total PCB as compared to the current Washington Water Quality Standard of 170 pg/L").

Further, the wording of the thresholds in EPA's plan—that determining attainment of the numeric threshold is "based on the annual central tendency of the preceding year"—is vague. It does not clarify what data is to be averaged or how many data points are needed, does not characterize statistical distribution, or whether any weighing of data will be done. *See* Dkt. 129-1 at 11. And critically, it does not identify the specific locations for this determination. Under the formulation presented by EPA's plan, there is too much discretion left to the agencies to determine whether thresholds or benchmarks are met.

On the administrative record, the water-column benchmarks are arbitrary and the Court should not allow EPA to use them as an unlawful justification to continue this decades-long delay of a PCB TMDL.

If the threshold/trigger approach to further deferring the TMDL is to be used it should be more specific about how and at what representative locations attainment of in-stream PCB concentration targets is to be determined. Any benchmarks must also include (1) fish tissue benchmarks with samples of a variety of ages and species to representatively sample the populations, and (2) sediment benchmarks to reflect the propensity of PCBs to adhere to sediments due to their hydrophobic nature. *See* AR 90 at 1362. Washington regulations provide freshwater sediment cleanup objectives and screening levels for PCBs, which should be

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[36] Also noting no "statistically significant" decrease in PCB concentrations in *fish* since 2005. ADD_CLAIMS_0001019.

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considered as bases for benchmarks. *See* Washington Administrative Code 173-204-130, Table VI. These are needed to provide an appropriately rigorous and scientific evaluation of progress towards compliance with PCB tissue criteria.

C. Plaintiffs Have Standing.

Under the relevant standards, Plaintiffs have standing to sue on behalf of their members who would have standing in their own right, the interests are at stake are germane to Plaintiffs' organizational purposes of environmental protection, and neither the claims asserted nor the relief requested require the participation of Plaintiffs' individual members. *Friends of the Earth, Inc. v. Laidlaw Envtl. Servs. (TOC), Inc.*, 528 U.S. 167, 180 (2000); Declaration of Kathleen Dixon; Declaration of Gunnar Holmquist; Declaration of John Osborn; Declaration of W. Thomas Soeldner.

V. CONCLUSION

For the foregoing reasons, plaintiffs Center for Environmental Law and Policy and the Sierra Club respectfully request the Court find a constructive submission of no PCB TMDL for the Spokane River and order EPA to fulfill its statutory duty to prepare the PCB TMDL without delay. Alternatively, the Court should find the EPA Plan arbitrary, capricious and contrary to law, vacate the plan and order EPA to reissue it in a manner that assures prompt issuance of the PCB TMDL.

[Signatures on following page]

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RESPECTFULLY SUBMITTED this 2nd day of July, 2021.

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ATTACHMENT 1 :

EXCERPTS OF ADMINISTRATIVE RECORD

Sierra Club, et al. v. McClerran, et al. (U.S. EPA),
No. 2:11-cv-01759-BJR (W.D. Wash.)
Administrative Record for Judicial Review, as of April 29, 2021,
for the agency actions and/or inactions alleged in Paragraphs 83-85, 89-90 and 92-96 of
Plaintiffs' Third Supplemental Complaint (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
The listed documents EPA previously submitted to the Court, at ECF Doc. Nos. 59 and 79, incorporated by reference.				
The listed documents EPA submitted to the Court, at ECF Doc. No. 237, for "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015				
001	ADD_CLAIMS_0000001 - 0026	05/03/1996	Washington State Department Ecology's submittal of 1996 303(d) List	
002	ADD_CLAIMS_0000027 - 0194	05/22/1996	Waterbody Segment Identification List for use in Federal Clean Water Act Reports	
003	ADD_CLAIMS_0000195 - 0204	03/21/2011	Information Concerning 2012 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions	Memorandum providing information to assist in preparation and review of the 2012 Integrated Reports (IR), in accordance with the Clean Water Action Sections 303(d), 305(b), and 314.
004	ADD_CLAIMS_0000205 - 0264	03/01/2013	Department of Ecology, Eastern Regional Office, Toxics Cleanup Program, Spokane, Washington, Third Periodic Review (Draft Final) General Electric Spokane Site, CSID 1082, FSID 630	
005	ADD_CLAIMS_0000265 - 0274	07/07/2014	Letter from Department of Ecology, Eleanor Key, Permit Manager, Water Quality Program, to BiJay Adams, General Manager, Liberty Lake Sewer and Water District, re: Approval of Annual Toxics Management Plan received June 20, 2014, satisfying requirements in the Liberty Lake Sewer and Water District NPDES Permit No. WA0045144 with attachment: Toxics Management Plan Checklist for the Liberty Lake Sewer and Water District, July 2, 2014	
006	ADD_CLAIMS_0000275 - 0457	07/29/2014	Recommendations for Improving Water Quality Assessment and Total Maximum Daily Load Programs in Washington State, prepared for Interagency Project Team	
007	ADD_CLAIMS_0000458 - 0468	10/13/2014		
008	ADD_CLAIMS_0000469 - 0469	03/16/2015	2015-03-16 email chain between EPA and Ecology concerning media response on ruling in TMDL lawsuit	RE: MEDIA RESPONSE FW: Spokane River pollution lawsuit
009	ADD_CLAIMS_0000470 - 0471	03/18/2015	2015-03-18 email chain concerning PCBs	FW: PCB Congener database
010	ADD_CLAIMS_0000472 - 0493	03/18/2015	Data Management in Support of State 2 PCB TMDL Efforts (September 13, 2006 PowerPoint presentation)	

Sierra Club, et al. v. McClerran, et al. (U.S. EPA),
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Administrative Record for Judicial Review, as of April 29, 2021,
for the agency actions and/or inactions alleged in Paragraphs 83-85, 89-90 and 92-96 of
Plaintiffs' Third Supplemental Complaint (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
011	ADD_CLAIMS_0000494 - 0501	06/10/2015	NPDES Permit No. ID0025852: City of Post Falls, Idaho, Public Service Department, Water Reclamation Division, Toxics Management Plan, NPDES Permit No. ID0025852	
012	ADD_CLAIMS_0000502 - 0502	06/15/2015		Announcement: Final Coordinated Response has Task Force approval, has been sent to EPA
013	ADD_CLAIMS_0000503 - 0503	06/29/2015		EPA publishes final updated Ambient Water Quality Criteria for the protection of Human Health
014	ADD_CLAIMS_0000504 - 0507	07/08/2015	2015-07-07 letter from Margaret C. Hupp to David J. Kaplan and Ronald L. Lavigne concerning response to Court Order in Sierra Club v. McLerran containing Scientific Studies and Schedule	
015	ADD_CLAIMS_0000508 - 0509	07/09/2015	2015-07-09 emails between EPA and Ecology concerning PCB analytic method	FW: Quick question about the Delaware River estuary permits' PCB monitoring requirements
016	ADD_CLAIMS_0000510 - 0575	07/10/2015	Washington Department of Ecology and EPA, PPA for State Fiscal Years 2016-2017 (7/1/15 - 6/30/17)	Environmental work plans for Ecology and EPA for the next biennium.
017	ADD_CLAIMS_0000576 - 0589	07/22/2015	Approval of Washington State 2012 303(d) List	Washington State 2012 303(d) List
018	ADD_CLAIMS_0000590 - 0591	07/22/2015		RE: EPA Response to U.S. District Court- filed on July 14th, 2015, in response to the Court's order of March 2015
019	ADD_CLAIMS_0000592 - 0593	07/28/2015		RE: Preparing for SRRTF meeting
020	ADD_CLAIMS_0000594 - 0595	08/04/2015		FW: EPA permitted fish hatcheries on Spokane River
021	ADD_CLAIMS_0000596 - 0596	08/05/2015	email from EPA to Ecology transmitting draft response on inadvertent PCBs	our draft response
022	ADD_CLAIMS_0000597 - 0598	08/07/2015	2015-08-07 email from Ecology to others concerning Ecology report: Lake Spokane: PCBs in Carp	New Ecology report: Lake Spokane: PCBs in Carp
023	ADD_CLAIMS_0000599 - 0660	08/12/2015	Spokane River Regional Toxics Task Force Phase 2 Technical Activities Report: Identification of Potential Unmonitored Dry Weather Sources of PCBs to the Spokane River, Prepared for Spokane River Regional Toxics Task Force by LimnoTech with Appendices B-F, available on the SRRTF website, document number 0062, above	

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024	ADD_CLAIMS_0000661 - 0722	08/12/2015	LimnoTech Technical activities report RE: identification of potential unmonitored dry weather sources of PCB to the Spokane River	
025	ADD_CLAIMS_0000723 - 0782	10/30/2015	NPDES Permit No. WA0000825: Inland Empire Paper Company, Permit Condition S6.A, PCB Source Identification Study	
026	ADD_CLAIMS_0000783 - 0789	10/30/2015	NPDES Permit No. WA0000825: Inland Empire Paper Company, Permit Condition S6.B, PCBs Best Management Practices Plan, 2015 Report	
027	ADD_CLAIMS_0000790 - 0801	11/09/2015		
028	ADD_CLAIMS_0000802 - 0803	11/24/2015		RE: Inadvertent PCB Discussion
029	ADD_CLAIMS_0000804 - 0805	11/25/2015		Follow up from Inadvertent PCB Discussion
030	ADD_CLAIMS_0000806 - 0829	12/01/2015	Department of Ecology, Eastern Regional Office, Toxics Cleanup Program, Spokane, Washington, Periodic Review Spokane River Upriver Dam and Donkey Island PCB Sediment Site, Facility Site ID: 65178472, Cleanup Site ID: 4213	
031	ADD_CLAIMS_0000830 - 0833	12/03/2015		City of Spokane PCB reports
032	ADD_CLAIMS_0000834 - 0886	12/03/2015		
033	ADD_CLAIMS_0000887 - 0938	12/03/2015		
034	ADD_CLAIMS_0000939 - 0943	12/04/2015		RE: City of Spokane PCB reports
035	ADD_CLAIMS_0000944 - 0945	12/07/2015		RE: following up_ examples of other water column - fish based PCB listings in the US
036	ADD_CLAIMS_0000946 - 0946	12/22/2015		The draft federal and Tribal aquaculture general permit for Washington is on the web
037	ADD_CLAIMS_0000947 - 0962		Washington Department of Ecology and EPA, PPA Water Quality Program Status Report for July 1, 2015 – Dec. 31, 2015	
038	ADD_CLAIMS_0000963 - 0965	01/08/2016		FW: Language from EPA Hatchey Permit -- what the hell happened?

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039	ADD_CLAIMS_0000966 - 0967	01/28/2016		RE: contact email and introduction for EPA representative for federal hatchery issues
040	ADD_CLAIMS_0000968 - 0968	01/28/2016		
041	ADD_CLAIMS_0000969 - 0971	02/03/2016		RE: request for EPA TSCA rep to join SRRTTF workshop 2/9, 12:15-1:30pm PST
042	ADD_CLAIMS_0000972 - 0973	02/04/2016		RE: Confirming participation at SRRTTF workshop 2/9 at 12:15PST
043	ADD_CLAIMS_0000974 - 0978	02/04/2016		RE: request for EPA TSCA rep to join SRRTTF workshop 2/9, 12:15-1:30pm PST
044	ADD_CLAIMS_0000979 - 0983	02/06/2016		RE: SRRTTF Workshop_ final agenda and session documents
045	ADD_CLAIMS_0000984 - 0985	02/09/2016		Re: Spokane watershed
046	ADD_CLAIMS_0000986 - 0996	02/11/2016		
047	ADD_CLAIMS_0000997 - 0999	02/12/2016		FW: Follow up from Inadvertent PCB Discussion
048	ADD_CLAIMS_0001000 - 1001	02/17/2016		RE: Some info for the BMP workgroup
049	ADD_CLAIMS_0001002 - 1008	02/17/2016		
050	ADD_CLAIMS_0001009 - 1009	02/20/2016		SRRTTF & Toxics Control Program
051	ADD_CLAIMS_0001010 - 1010	02/22/2016	2016-02-22 email from Ecology to others concerning review draft of Ecology's Measurable Progress determination	Agency and Sovereign Internal Review draft of Ecology's Measurable Progress determination
052	ADD_CLAIMS_0001011 - 1011	02/22/2016	Calendar appointment with notes for internal review of Ecology's Measurable Progress determination	Agency and Sovereign Internal Review draft of Ecology's Measurable Progress determination: Talking points attached
053	ADD_CLAIMS_0001012 - 1020	02/22/2016	Measurable Progress Notes (PowerPoint presentation) attachment to: Calendar appointment with notes for internal review of Ecology's Measurable Progress determination	
054	ADD_CLAIMS_0001021 - 1021	02/23/2016	2016-02-23 email from Ecology to others concerning Measurable Progress evaluation	Copy of Measurable Progress evaluation: Agency and Sovereign review version
055	ADD_CLAIMS_0001022 - 1064	02/23/2016	Spokane River Regional Toxics Task Force Evaluation of Measurable Progress, 2012-2014, Attachment to: 2016-02-23 email from Ecology to others	
056	ADD_CLAIMS_0001065 - 1065	02/23/2016		RE: Agency and Sovereign Internal Review draft of Ecology's Measurable Progress determination

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057	ADD_CLAIMS_0001066 - 1108	02/23/2016		
058	ADD_CLAIMS_0001109 - 1109	03/04/2016		Agency and Sovereign Internal Review draft of Ecology's Measurable Progress determination: Talking points attached
059	ADD_CLAIMS_0001110 - 1118	03/04/2016		
060	ADD_CLAIMS_0001119 - 1120	04/13/2016	email from Ecology to others concerning repot on Little Spokane River PCBs: Screening Survey of Water, Sediment, and Fish Tissue	Little Spokane River PCBs… in Water, Sediment, Fish
061	ADD_CLAIMS_0001121 - 1121	04/26/2016	2016-04-26 email from Ecology to EPA concerning Spokane River PowerPoint presentation	Presentation
062	ADD_CLAIMS_0001122 - 1150	04/26/2016	Spokane River: Collaborative Problem Solving at the Community Level (PowerPoint presentation), attachment to: 2016-04-26 email from Ecology to EPA	
063	ADD_CLAIMS_0001151 - 1151	05/06/2016	email from EPA to Ecology concerning Spokane County PMF	Fw: Question about Spokane County PMF
064	ADD_CLAIMS_0001152 - 1152	05/25/2016	Email from Task Force member to EPA concerning PCB presentation	EPA Presentation
065	ADD_CLAIMS_0001153 - 1170	05/25/2016	Inland Empire Paper Company and PCBs (PowerPoint presentation), Attachment to: Email from Task Force member to EPA	
066	ADD_CLAIMS_0001171 - 1171	05/25/2016	Attachment to: Email from Task Force member to EPA concerning PCB presentation	
067	ADD_CLAIMS_0001172 - 1172	05/25/2016	PCB Congener Analysis of Inland Empire effluent	
068	ADD_CLAIMS_0001173 - 1175	05/26/2016		RE: PCBs
069	ADD_CLAIMS_0001176 - 1177	05/31/2016	email chain between Ecology, EPA, and Doug Krapas (Inland Empire Paper) concerning EPA PCB presentation	FW: EPA Presentation
070	ADD_CLAIMS_0001178 - 1178	06/01/2016		EPA rulemaking regarding PCBs
071	ADD_CLAIMS_0001179 - 1181	06/14/2016	2016-06-14 email from EPA to Task Force members and others concerning comments on Draft Cost/Effectiveness of PCB Control Actions Memo	FW: DRAFT: Cost/Effectiveness of PCB Control Actions for the Spokane River - Memo available for Task Force review
072	ADD_CLAIMS_0001182 - 1184	06/14/2016		FW: DRAFT: Cost/Effectiveness of PCB Control Actions for the Spokane River - Memo available for Task Force review

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073	ADD_CLAIMS_0001185 - 1200		Washington Department of Ecology and EPA, PPA Water Quality Program Status Report for Jan 1. – June 30, 2016	
074	ADD_CLAIMS_0001201 - 1202	06/30/2016		Draft Documents for the City of Spokane - Please Read
075	ADD_CLAIMS_0001203 - 1203	06/30/2016		
076	ADD_CLAIMS_0001204 - 1204	06/30/2016		
077	ADD_CLAIMS_0001205 - 1275	06/30/2016		
078	ADD_CLAIMS_0001276 - 1378	06/30/2016		
079	ADD_CLAIMS_0001379 - 1380	06/30/2016		Draft Documents for Liberty Lake Sewer and Water District (LLSWD) - Please Read
080	ADD_CLAIMS_0001381 - 1437	06/30/2016		
081	ADD_CLAIMS_0001438 - 1528	06/30/2016		
082	ADD_CLAIMS_0001529 - 1529	06/30/2016		
083	ADD_CLAIMS_0001530 - 1530	06/30/2016		
084	ADD_CLAIMS_0001531 - 1532	06/30/2016		Draft Documents for Kaiser Aluminum Washington (Kaiser) - Please Read
085	ADD_CLAIMS_0001533 - 1533	06/30/2016		
086	ADD_CLAIMS_0001534 - 1534	06/30/2016		
087	ADD_CLAIMS_0001535 - 1591	06/30/2016		
088	ADD_CLAIMS_0001592 - 1662	06/30/2016		
089	ADD_CLAIMS_0001663 - 1663	07/15/2016	2016-07-15 email from EPA to Task Force concerning comments on Cost/Effectiveness of PCB Control Actions	Comments on Cost/Effectiveness of PCB Control Actions for the Spokane River
090	ADD_CLAIMS_0001664 - 1676	07/15/2016	2016-07-06 Draft Cost/Effectiveness of PCB Control Actions for the Spokane River with comments, Attachment to:2016-07-15 email from EPA to Task Force	
091	ADD_CLAIMS_0001677 - 1716	07/15/2016	2016-07-06 Disposal Assistance for PCB-Containing Items, Attachment to: 2016-07-15 email from EPA to Task Force	
092	ADD_CLAIMS_0001717 - 1718	07/19/2016		FW: SRRTTF 2015 Sampling Draft Report and Databases available for Task Force Review
093	ADD_CLAIMS_0001719 - 1719	07/22/2016		RE: Question about synoptic study reports

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094	ADD_CLAIMS_0001720 - 1723	08/23/2016		RE: permit for hatcheries in Indian Country issued by EPA + SRRTTF mtg 8/24
095	ADD_CLAIMS_0001724 - 1724	09/14/2016	2016-09-14 E-mail regarding EPA information on "category 4B" as an alternative to a TMDL	EPA information on "Category 4B" as an alternative to a TMDL
096	ADD_CLAIMS_0001725 - 1725	09/22/2016	2016-09-22 email between EPA and Ecology concerning Task Force Comprehensive Plan	RE: Would you like to talk about the Comprehensive Plan on Tuesday? Or later today?
097	ADD_CLAIMS_0001726 - 1734	09/22/2016	2016-09-15 Draft Comprehensive Plan to Reduce Polychlorinated Biphenyls in the Spokane River; attachment to 2016-09-22 email between EPA and Ecology	
098	ADD_CLAIMS_0001735 - 1735	09/28/2016	2016-09-28 email from EPA to Task Force transmitting comments on draft comprehensive plan	Comments on the Draft Comprehensive Plan
099	ADD_CLAIMS_0001736 - 1901	09/28/2016	EPA comments on September 15, 2016 Draft Comprehensive Plan to Reduce Polychlorinated Biphenyls (PCBs) in the Spokane River, Attachment to: 2016-09-28 email from EPA to Task Force	
100	ADD_CLAIMS_0001902 - 1902	09/28/2016	2016-09-28 E-mail regarding comments on the draft Task Force Comprehensive Plan.	RE: Comments on the Draft Comprehensive Plan
101	ADD_CLAIMS_0001903 - 1903	10/19/2016		Record of Decision for PCB Superfund site near Rathdrum, ID
102	ADD_CLAIMS_0001904 - 1904	10/19/2016		Record of Decision for PCB Superfund site near Rathdrum, ID
103	ADD_CLAIMS_0001905 - 1989	10/19/2016		
104	ADD_CLAIMS_0001990 - 1992	10/20/2016		RE: Record of Decision for PCB Superfund site near Rathdrum, ID
105	ADD_CLAIMS_0001993 - 2016	11/01/2016	NPDES Permit No. WA0000825: Inland Empire Paper Company, Permit Condition S6.B, PCBs Best Management Practices Plan Update, 2016 Report	
106	ADD_CLAIMS_0002017 - 2018	11/02/2016	NPDES Permit No. ID0022853: City of Coeur d'Alene PCB Informational Flyer	
107	ADD_CLAIMS_0002019 - 2019	11/02/2016		EPA and TSCA Reform: update SRRTTF?

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108	ADD_CLAIMS_0002020 - 2063	11/16/2016	Spokane River Regional Toxics Task Force 2015 Technical Activities Report: Continued Identification of Potential Unmonitored Dry Weather Sources of PCBs to the Spokane River, Prepared for the Spokane River Regional Toxics Task Force by LimnoTech	
109	ADD_CLAIMS_0002064 - 2107	11/16/2016	LimnoTechTechnical activities report re: continued identification of potential unmonitored dry weather sources of PCBs to the Spokane River	
110	ADD_CLAIMS_0002108 - 2232	11/16/2016	LimnoTech Comprehensive plan to reduce PCBs in the Spokane River	
111	ADD_CLAIMS_0002233 - 2233	11/16/2016		PCB source tracing report now posted on Ecology website
112	ADD_CLAIMS_0002234 - 2234	11/21/2016		Document for the City of Spokane - Please Read
113	ADD_CLAIMS_0002235 - 2236	11/21/2016		
114	ADD_CLAIMS_0002237 - 2237	11/21/2016		Document for Liberty Lake Sewer & Water District - Please Read
115	ADD_CLAIMS_0002238 - 2238	11/21/2016		
116	ADD_CLAIMS_0002239 - 2239	11/21/2016		Document for Spokane County - Please Read
117	ADD_CLAIMS_0002240 - 2241	11/21/2016		
118	ADD_CLAIMS_0002242 - 2242	11/21/2016		Document for Inland Empire Paper - Please Read
119	ADD_CLAIMS_0002243 - 2243	11/21/2016		
120	ADD_CLAIMS_0002244 - 2244	12/09/2016	2016-12-09 email on behalf of Task Force to EPA requesting meeting	Spokane River Regional Toxics Task Force requests meeting with EPA
121	ADD_CLAIMS_0002245 - 2250	12/09/2016	Letter from Task Force to Jim Jones and Cynthia Giles at EPA concerning Implementation of TSCA to Reduce Inputs to our Nation's Waters; attachment to 2016-12-09 email on behalf of Task Force to EPA requesting meeting	
122	ADD_CLAIMS_0002251 - 2255	12/09/2016	2013-10-23 Letter from Task Force to Jim Jones and Cynthia Giles concerning Implementation of TSCA to Address PCBs; Attachment to 2016-12-09 email on behalf of Task Force to EPA requesting meeting	

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123	ADD_CLAIMS_0002256 - 2271		Washington Department of Ecology and EPA, PPA Water Quality Program Status Report for July 1 - Dec 31, 2016	
124	ADD_CLAIMS_0002272 - 2289		Washington Department of Ecology and EPA, Comments on Chapter 9 Water Quality Program – Update for 2015-2017	
125	ADD_CLAIMS_0002290 - 2291	01/05/2017	2017-01-05 email chain between EPA and Ecology concerning Task Force meeting with EPA to discuss TSCA implementation	RE: Status of correspondence to Jim Jones and Cynthia Giles
126	ADD_CLAIMS_0002292 - 2293	01/26/2017		FW: NPDES Permit Submittals
127	ADD_CLAIMS_0002294 - 2294	01/26/2017		
128	ADD_CLAIMS_0002295 - 2354	01/26/2017		
129	ADD_CLAIMS_0002355 - 2361	01/26/2017		
130	ADD_CLAIMS_0002362 - 2362	01/26/2017		
131	ADD_CLAIMS_0002363 - 2363	01/30/2017		SRRTTF Comp Plan Press Release - going out today.
132	ADD_CLAIMS_0002364 - 2366	01/30/2017		
133	ADD_CLAIMS_0002367 - 2367	02/01/2017		RE: Spokane River fish tissue congener data
134	ADD_CLAIMS_0002368 - 2368	02/01/2017		
135	ADD_CLAIMS_0002369 - 2370	02/01/2017		
136	ADD_CLAIMS_0002371 - 2379	02/07/2017	NPDES Permit No. ID0022853: Coeur d'Alene, Idaho, Ordinance No. 3558, Council Bill No. 17-1002, re: An Ordinance Amending Municipal Code Section 13.20.2.1(B) to Add Specific Prohibitions to the City's Discharge Standards; Amending Municipal Code Section 13.20.2.4 to Adopt new Local Limits Pursuant to the City's EPA NPDES Permit; Providing for the Repeal of Conflicting Ordinances; Providing for Severability; Providing for the Publication of a Summary; and Providing for an Effective Date	
137	ADD_CLAIMS_0002380 - 2381	02/14/2017	2017-02-14 Task Force mass mailer email requesting comments on draft QAPP	Comments Requested: Draft QAPP PCBs in Soils and Stormwater Associated with Demolition
138	ADD_CLAIMS_0002382 - 2382	03/01/2017		Link to information about the TSCA workgroup
139	ADD_CLAIMS_0002383 - 2383	03/02/2017		Update on the Spokane River Permits

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140	ADD_CLAIMS_0002384 - 2385	03/06/2017		RE: Analysis of congener or homolog patterns in Spokane R. water column PCB data
141	ADD_CLAIMS_0002386 - 2386	03/07/2017		RE: Homolog patterns of Spokane River water column PCB data [WARNING: DKIM validation failed]
142	ADD_CLAIMS_0002387 - 2387	03/07/2017		Homolog Mass Balance
143	ADD_CLAIMS_0002388 - 2388	03/07/2017		
144	ADD_CLAIMS_0002389 - 2390	03/10/2017		RE: Task Force's water column PCB data
145	ADD_CLAIMS_0002391 - 2393	03/23/2017		RE: Spokane River fish tissue congener data
146	ADD_CLAIMS_0002394 - 2394	03/23/2017		
147	ADD_CLAIMS_0002395 - 2395	03/31/2017		Control-Actions_Work-Plan-Tracking.xlsx - Invitation to edit
148	ADD_CLAIMS_0002396 - 2397	04/07/2017		RE: EPA (Superfund and RCRA) cleanup sites in the Spokane watershed
149	ADD_CLAIMS_0002398 - 2399	04/12/2017	2017-04-12 Task Force mass mailer email concerning a special meeting between EPA and the Task Force to address regulatory conflicts between TSCA and water quality standards	Special EPA SRRTTF Meeting Announcement: April 26, 2017
150	ADD_CLAIMS_0002400 - 2401	04/12/2017		RE: Meeting to discuss implementation tools for PCBs in the Spokane River
151	ADD_CLAIMS_0002402 - 2405	04/13/2017		
152	ADD_CLAIMS_0002406 - 2478	04/14/2017	Letter from Spokane County Environmental Services, Kevin R. Cooke, Director, to Diana Washington, Washington State Department of Ecology, Eastern Regional Office, re: NPDES Permit No. WA0093317 Special Condition S12; Submission of the Attached Spokane County Regional Water Reclamation Facility 2017 Annual Toxics Management Report with attachment: 2017 Annual Toxics Management Report, Spokane County Regional Water Reclamation Facility, NPDES Permit No. WA0093317, BC Project 142892, Brown and Caldwell	
153	ADD_CLAIMS_0002479 - 2482	04/25/2017		FW: EPA (Superfund and RCRA) cleanup sites in the Spokane watershed

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154	ADD_CLAIMS_0002483 - 2487	04/25/2017	Federal Cleanup Sites with PCBs in the Spokane River Watershed (PowerPoint presentation): Attachment to email	
155	ADD_CLAIMS_0002488 - 2488	04/27/2017		Developing clean water permits for the Spokane River
156	ADD_CLAIMS_0002489 - 2489	04/25/2017	Washington Department of Ecology letter concerning updating water quality permits for facilities that discharge to the Spokane River; attachment to email	
157	ADD_CLAIMS_0002490 - 2490	04/27/2017		Developing clean water permits for the Spokane River
158	ADD_CLAIMS_0002491 - 2491	04/27/2017		
159	ADD_CLAIMS_0002492 - 2494	04/28/2017		
160	ADD_CLAIMS_0002495 - 2497	04/28/2017		RE: Developing clean water permits for the Spokane River
161	ADD_CLAIMS_0002498 - 2498	05/12/2017		EPA's Mid-Columbia River Fish Toxics Assessment
162	ADD_CLAIMS_0002499 - 2500	05/15/2017		FW: Limnotech: 2016 Monthly Sampling Technical Report, Gravity Field report, and data – available for review.
163	ADD_CLAIMS_0002501 - 2538	05/04/2017	Spokane River Regional Toxics Task force 2016 Monthly Monitoring Report; Attachment to email	
164	ADD_CLAIMS_0002539 - 2539	05/15/2017	Attachment to email 5/15/2017 email	
165	ADD_CLAIMS_0002540 - 2542	05/17/2017		RE: Limnotech: 2016 Monthly Sampling Technical Report, Gravity Field report, and data – available for review.
166	ADD_CLAIMS_0002543 - 2547	05/17/2017	City of Spokane, Washington, CSO Flow Monitoring Project: Flow, Frequency and Duration: Monthly Report, August 2014; Attachment to email	
167	ADD_CLAIMS_0002548 - 2551	05/17/2017	City of Spokane, Washington, CSO Flow Monitoring Project: Flow, Frequency and Duration: Monthly Report, October 2016: Attachment to email	
168	ADD_CLAIMS_0002552 - 2553	05/19/2017		Re: Task Force approves letter to EPA requesting valuate and update the TSCA regulations to eliminate continuing sources of PCBs that are currently allowed
169	ADD_CLAIMS_0002554 - 2604	05/24/2017	Draft Spokane River Regional Toxics Task Force 2016 Monthly Monitoring Report, Prepared for the Spokane River Regional Toxics Task Force by LimnoTech	

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170	ADD_CLAIMS_0002605 - 2606	06/12/2017		FW: More detail about our work in Spokane for Chp 9 of the PPA
171	ADD_CLAIMS_0002607 - 2607	06/21/2017		April 26 EPA/Task Force meeting notes
172	ADD_CLAIMS_0002608 - 2610	06/21/2017		
173	ADD_CLAIMS_0002611 - 2611	06/22/2017		NPDES Permit development on the Spokane River
174	ADD_CLAIMS_0002612 - 2614	06/22/2017		
175	ADD_CLAIMS_0002615 - 2699	06/27/2017	Washington Department of Ecology and EPA, PPA for State Fiscal Years 2018-2019 (7/1/17 - 6/30/19)	Environmental work plans for Ecology and EPA for the next biennium.
176	ADD_CLAIMS_0002700 - 2784	06/27/2017		
177	ADD_CLAIMS_0002785 - 2805	07/05/2017	Memorandum from Dave Dilks and Joseph Helfand, LimnoTech, to Spokane River Regional Toxics Task Force regarding the Draft Homolog-Specific PCB Mass Balance assessment for the Spokane River	
178	ADD_CLAIMS_0002806 - 2806	07/13/2017		Follow up from the 7/12/17 Technical Track Work Group Meeting - Duwamish River PCB Components for presentation - a prioritized list. Please provide feedback!
179	ADD_CLAIMS_0002807 - 2808	07/13/2017		
180	ADD_CLAIMS_0002809 - 2809	07/13/2017		Comments on the draft homolog-specific PCB mass balance for the Spokane River
181	ADD_CLAIMS_0002810 - 2811	08/07/2017		Ecology News: Update on Solid Waste Handling Standards Rule Revision
182	ADD_CLAIMS_0002812 - 2813	08/15/2017	Letter from Adriane Borgias, WA Department of Ecology, to Lucy Edmondson, US EPA Region 10 regarding Ecology listening session concerning applicable PCB Human Health Criteria and wastewater discharge permits for PCBs	
183	ADD_CLAIMS_0002814 - 2814	08/17/2017		Spokane river PCB monitoring
184	ADD_CLAIMS_0002815 - 2820		Washington Department of Ecology email Attachment: Description of EPA's new WQ-27 and -28 Measures and Ecology's proposed priorities as of 8/25/2017	

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185	ADD_CLAIMS_0002821 - 2823	08/28/2017	2017-08-28 Task Force mass mailer email concerning projects and funding	SRRTTF Projects and Funding
186	ADD_CLAIMS_0002824 - 2826	08/28/2017		SRRTTF Projects and Funding
187	ADD_CLAIMS_0002827 - 2829	08/28/2017	2017-08-28 Task Force mass mailer concerning Technical Track Work Group meeting	SRRTTF Projects and Funding
188	ADD_CLAIMS_0002830 - 2830	09/06/2017	email from EPA to Ecology and Task Force members concerning "number of samples required" calculator	"Number of samples required" calculator
189	ADD_CLAIMS_0002831 - 2831	09/06/2017	Excel spreadsheet attachment to: email from EPA to Ecology and Task Force members concerning "number of samples required" calculator	
190	ADD_CLAIMS_0002832 - 2833	09/06/2017	emails between Task Force members, Ecology, and EPA concerning "number of samples required" calculator	RE: "Number of samples required" calculator
191	ADD_CLAIMS_0002834 - 2836	09/06/2017	emails between Ecology, EPA, and Task Force members concerning "number of samples required" calculator	RE: "Number of samples required" calculator
192	ADD_CLAIMS_0002837 - 2839	09/07/2017	Emails between Task Force, EPA, and Ecology concerning "number of samples required" calculator	RE: "Number of samples required" calculator
193	ADD_CLAIMS_0002840 - 2842	09/07/2017	Emails between Task Force members, EPA, and Ecology concerning "number of samples required" calculator	RE: "Number of samples required" calculator
194	ADD_CLAIMS_0002843 - 2884	09/11/2017	NPDES Permit No. WA0024473: City of Spokane, Riverside Park Water Reclamation Facility, Toxics Management Plan	
195	ADD_CLAIMS_0002885 - 2886	09/12/2017	Washington Department of Ecology email (Helen Bresler) RE: forwarded email to TMDL Unit Supervisors about WQ27 Measure	
196	ADD_CLAIMS_0002887 - 2892		NPDES Permit No. ID0025852: City of Post Falls, Idaho, Public Service Department, Water Reclamation Division, Water Reclamation Facility, NPDES Permit No. ID0025852, Toxics Management Plan Annual Report 2017	
197	ADD_CLAIMS_0002893 - 2893	10/03/2017	2017-10-03 E-mail regarding comments on September 25, 2017 draft homolog pattern analysis.	Comments on September 25, 2017 draft homolog pattern analysis
198	ADD_CLAIMS_0002894 - 2895	10/04/2017		RE: Greene St. to Spokane--homolog study?

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199	ADD_CLAIMS_0002896 - 2898	10/04/2017		SRRTTF Projects and Funding
200	ADD_CLAIMS_0002899 - 2900	10/04/2017	2017-10-04 E-mail regarding comments on September 25, 2017 draft homolog pattern analysis.	FW: Comments on September 25, 2017 draft homolog pattern analysis
201	ADD_CLAIMS_0002901 - 2944	10/18/2017	Washington Department of Ecology webinar slides	
202	ADD_CLAIMS_0002945 - 2968	11/01/2017	NPDES Permit No. WA0000825: Inland Empire Paper Company, Permit Condition S6.B, PCBs Best Management Practices Plan Update, 2017 Report	
203	ADD_CLAIMS_0002969 - 2969	11/01/2017		Administrative extensions of Spokane R. individual permits
204	ADD_CLAIMS_0002970 - 2970	11/01/2017		
205	ADD_CLAIMS_0002971 - 2972	11/01/2017		
206	ADD_CLAIMS_0002973 - 2974	11/02/2017		RE: Administrative extensions of Spokane R. individual permits
207	ADD_CLAIMS_0002975 - 2976	11/02/2017		
208	ADD_CLAIMS_0002977 - 2977	11/02/2017		
209	ADD_CLAIMS_0002978 - 2978	11/02/2017		
210	ADD_CLAIMS_0002979 - 2980	11/02/2017		RE: Administrative extensions of Spokane R. individual permits
211	ADD_CLAIMS_0002981 - 2982	11/09/2017		RE: Thoughts on Road Paint Pilot Study
212	ADD_CLAIMS_0002983 - 2983	11/21/2017		
213	ADD_CLAIMS_0002984 - 2986	11/22/2017		RE: Pigments in roadmarking
214	ADD_CLAIMS_0002987 - 3031	11/22/2017		
215	ADD_CLAIMS_0003032 - 3037	12/01/2017	NPDES Permit No. ID0026590: Hayden Area Regional Sewer Board, Best Management Practices for PCB's and 2,3,7,8 TCDD, Toxic Management Plan Annual Report December 2017	
216	ADD_CLAIMS_0003038 - 3038	12/04/2017		RE: City of Spokane sampling of PCBs in oil
217	ADD_CLAIMS_0003039 - 3054	12/04/2017		
218	ADD_CLAIMS_0003055 - 3090	12/04/2017		
219	ADD_CLAIMS_0003091 - 3092	12/04/2017		RE: City of Spokane sampling of PCBs in oil

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220	ADD_CLAIMS_0003093 - 3122	12/20/2017	Letter from City of Coeur d'Alene, Idaho, Wastewater Utility Department, Michael Anderson, Wastewater Superintendent, to Idaho Department of Environmental Quality, Matthew Plaisted, and US EPA, Jason Rodriguez, re: City of Coeur d'Alene (NPDES Permit No. ID 0022853) Toxics Management Plan Annual Report	
221	ADD_CLAIMS_0003123 - 3124	12/21/2017		RE: Traffic Paint
222	ADD_CLAIMS_0003125 - 3125	12/22/2017	2017-12-22 Email from Chris Page to Task Force Members concerning Comprehensive Plan implementation	SRRTTF TTWG--please review: comp plan tasks w/project detail
223	ADD_CLAIMS_0003126 - 3126	12/22/2017	Attachment: Comprehensive Plan Goals	
224	ADD_CLAIMS_0003127 - 3127		Washington Department of Ecology Attachment: Ecology TMDL count by region	
225	ADD_CLAIMS_0003128 - 3129	01/17/2018		
226	ADD_CLAIMS_0003130 - 3156	01/22/2018	Memorandum from Tim Towey and Dave Dilks, LimnoTech, to Spokane River Regional Toxics Task Force, re: Comparison of Homolog-Patterns for Groundwater Well Data and Suspected Loads	
227	ADD_CLAIMS_0003157 - 3183	01/22/2018	Memo from LimnoTech to Spokane R. Regional Toxics Task Force RE: groundwater well data and suspected PCB loads	
228	ADD_CLAIMS_0003184 - 3185	01/23/2018		New Ecology report: Spokane R. PCBs and Other Toxics at the Spokane Tribal Boundary: Recommendations…
229	ADD_CLAIMS_0003186 - 3198	01/24/2018	Spokane River Regional Toxics Task Force: Comp Plan Implementation Review Summary: Year One, 1/1/17-12/31/17, Table 11. Milestones, Timelines and Effectiveness Metrics for Actions that Can Begin Being Implemented in the Short Term	
230	ADD_CLAIMS_0003199 - 3199	02/14/2018		
231	ADD_CLAIMS_0003200 - 3203	03/07/2018		
232	ADD_CLAIMS_0003204 - 3205	03/14/2018		
233	ADD_CLAIMS_0003206 - 3215	03/14/2018		
234	ADD_CLAIMS_0003216 - 3224	03/14/2018		

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235	ADD_CLAIMS_0003225 - 3239	03/14/2018		
236	ADD_CLAIMS_0003240 - 3248	03/14/2018		
237	ADD_CLAIMS_0003249 - 3249	03/14/2018		
238	ADD_CLAIMS_0003250 - 3260	03/14/2018		
239	ADD_CLAIMS_0003261 - 3263	03/15/2018	Washington Department of Ecology email (Melissa Gildersleeve) RE: A-Team meeting notes	
240	ADD_CLAIMS_0003264 - 3265	03/16/2018		SRRTTF - Green Chemistry Workgroup: Updates
241	ADD_CLAIMS_0003266 - 3267	03/16/2018		RE: PCB Product Testing
242	ADD_CLAIMS_0003268 - 3274	03/16/2018		
243	ADD_CLAIMS_0003275 - 3276	03/26/2018		RE: Idaho dischargers
244	ADD_CLAIMS_0003277 - 3303	03/28/2018	DRAFT Spokane River Regional Toxics Task Force ADDENDUM to Comprehensive Plan Annual Implementation Summary for January 1, 2017 - December 31, 2017	
245	ADD_CLAIMS_0003304 - 3306	03/28/2018	Email chain between EPA, Ecology and others concerning "number of samples required" calculator	FW: "Number of samples required" calculator
246	ADD_CLAIMS_0003307 - 3307	03/28/2018	Excel spreadsheet, attachment to: Email chain between EPA, Ecology and others concerning "number of samples required" calculator	
247	ADD_CLAIMS_0003308 - 3311	03/28/2018	Emails between Ecology and EPA concerning "number of samples required" calculator	RE: "Number of samples required" calculator
248	ADD_CLAIMS_0003312 - 3314	03/28/2018		RE: Central Tendency Study 2019
249	ADD_CLAIMS_0003315 - 3319	04/11/2018		Spokane variance
250	ADD_CLAIMS_0003320 - 3324	04/11/2018		RE: Spokane variance

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251	ADD_CLAIMS_0003325 - 3325	04/13/2018	Letter from Spokane County Environmental Services, Kevin R. Cooke, Director, to Diana with Washington, Washington State Department of Ecology, Eastern Regional Office, re: NPDES Permit No. WA0093317 Special Condition S12; Submission of the Attached Spokane County Regional Water Reclamation Facility 2018 Annual Toxics Management Report with attachment: 2018 Annual Toxics Management Report, Spokane County Regional Water Reclamation Facility, NPDES Permit No. WA0093317, BC Project 142892, Brown and Caldwell	
252	ADD_CLAIMS_0003326 - 3326	04/13/2018		Ecology and EPA variance discussion
253	ADD_CLAIMS_0003327 - 3331	04/13/2018		
254	ADD_CLAIMS_0003332 - 3336	04/13/2018		
255	ADD_CLAIMS_0003337 - 3338	04/20/2018		RE: Traffic Paint
256	ADD_CLAIMS_0003339 - 3339	04/23/2018	PCBs in Spokane River Mass Balance Work Group Members, Scope, Status and Future Work	
257	ADD_CLAIMS_0003340 - 3343	04/26/2018		RE: SRRTTF decisions regarding product testing
258	ADD_CLAIMS_0003344 - 3349	04/26/2018		RE: SRRTTF decisions regarding product testing
259	ADD_CLAIMS_0003350 - 3353	04/30/2018		RE: EPA coordination on SRRTTF product testing tasks
260	ADD_CLAIMS_0003354 - 3356	05/01/2018		Re: EPA coordination on SRRTTF product testing tasks
261	ADD_CLAIMS_0003357 - 3358	05/02/2018		Green Chemistry/Product Testing WG Conference Call,
262	ADD_CLAIMS_0003359 - 3359	05/09/2018		RE: Spokane River Regional Toxics Task Force letter on TSCA & PCBs
263	ADD_CLAIMS_0003360 - 3362	05/09/2018		
264	ADD_CLAIMS_0003363 - 3367	05/17/2018		RE: EPA coordination on SRRTTF product testing tasks
265	ADD_CLAIMS_0003368 - 3368	06/01/2018	PCBs in Spokane River Mass Balance Work Group Members, Scope, Status and Future Work	
266	ADD_CLAIMS_0003369 - 3372	06/12/2018		RE: SRHD/SRRTTF Guide for Best Management Practices for Reducing PCBs in Runoff Associated with Demolition and Remodeling Projects - please review
267	ADD_CLAIMS_0003373 - 3375	06/15/2018		RE: Comments on Spokane River bubble proposal

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268	ADD_CLAIMS_0003376 - 3394		Washington Department of Ecology and EPA, PPA Water Quality Program Status Report for Jan 1. – June 30, 2018	
269	ADD_CLAIMS_0003395 - 3396	07/20/2018	2018-07-20 Task Force mass mailer email announcing permit tools workshop	Ecology News: Announcement of Permit Tools Workshop
270	ADD_CLAIMS_0003397 - 3398	07/20/2018	2018-07-20 Task Force mass email concerning Ecology permitting tools workshop	Ecology News: Announcement of Permit Tools Workshop
271	ADD_CLAIMS_0003399 - 3399	07/27/2018		SRRTTF interview questions
272	ADD_CLAIMS_0003400 - 3401	07/27/2018		
273	ADD_CLAIMS_0003402 - 3402	07/31/2018		RE: TSCA Workgroup Meeting Summary and Action Items
274	ADD_CLAIMS_0003403 - 3407	07/31/2018		
275	ADD_CLAIMS_0003408 - 3408	07/31/2018		
276	ADD_CLAIMS_0003409 - 3409	07/31/2018		Agenda for the August 8 Spokane River Water Quality Permitting Tools Workshop
277	ADD_CLAIMS_0003410 - 3411	07/31/2018		
278	ADD_CLAIMS_0003412 - 3413	08/03/2018	August 2018Task Force Mass Mailer re: feedback on Ecology's Draft QAPP for assessing PCBs in biofilms, sediment and invertebrates in the Spokane River	Ecology News: Draft QAPP Available for Review
279	ADD_CLAIMS_0003414 - 3432	08/12/2018		
280	ADD_CLAIMS_0003433 - 3434	08/17/2018	2018-08-17 Task Force mass mailer email concerning report on PCBs in atmospheric deposition	Spokane River PCBs in Atmospheric Deposition Draft Report - request for feedback by 8/31
281	ADD_CLAIMS_0003435 - 3440	08/22/2018	Presentation by the WA Department of Ecology, Environmental Assessment Program, Toxics Studies Unit on Biofilm, Sediment and Invertebrate PCB Monitoring in the Spokane River, August 27-31, 2018	
282	ADD_CLAIMS_0003441 - 3460	08/27/2018	Memorandum from Joyce Dunkin, LimnoTech, to Spokane River Regional Toxics Task Force regarding Groundwater PCB Sources Upgradient of Kaiser Trentwood Facility, Task 5A and 5B Findings	
283	ADD_CLAIMS_0003461 - 3462	09/06/2018		New Ecology Report: PBTs in Lake Sediment Cores, 2016

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284	ADD_CLAIMS_0003463 - 3463	09/11/2018		RE: Field work for biofilm and sediment sampling in Spokane River
285	ADD_CLAIMS_0003464 - 3464	09/11/2018		
286	ADD_CLAIMS_0003465 - 3465	09/11/2018		
287	ADD_CLAIMS_0003466 - 3467	09/20/2018		
288	ADD_CLAIMS_0003468 - 3468	09/28/2018		EPA's Response to Spokane River Regional Toxics Task Force
289	ADD_CLAIMS_0003469 - 3472	09/28/2018		
290	ADD_CLAIMS_0003473 - 3473	10/02/2018		TSCA Workgroup Meeting, October 3rd at 10:00
291	ADD_CLAIMS_0003474 - 3478	10/02/2018		
292	ADD_CLAIMS_0003479 - 3479	10/05/2018		Bibliography
293	ADD_CLAIMS_0003480 - 3481	10/05/2018		
294	ADD_CLAIMS_0003482 - 3484	10/08/2018	Washington Department of Ecology email (Lara Henderson) RE: rough project list	
295	ADD_CLAIMS_0003485 - 3485	10/08/2018		TSCA Meeting Summary
296	ADD_CLAIMS_0003486 - 3491	10/08/2018		
297	ADD_CLAIMS_0003492 - 3492	10/08/2018		
298	ADD_CLAIMS_0003493 - 3493	10/11/2018		Spokane River Permitting Tools Workshop #2: Decoding the Variance Process
299	ADD_CLAIMS_0003494 - 3494	10/11/2018		Spokane River Permitting Tools Workshop #2: Decoding the Variance Process
300	ADD_CLAIMS_0003495 - 3539	10/16/2018	Inadvertent PCBs in Pigments: Market Innovation for a Circular Economy, Final Report Prepared for the Spokane River Regional Toxics Task Force, Submitted by Northwest Green Chemistry	
301	ADD_CLAIMS_0003540 - 3584	10/16/2018	Final Report, Inadvertent PCBs in Pigments: Market Innovation for a Circular Economy, Prepared by Northwest Green Chemistry for the Spokane River Regional Toxics Task Force	
302	ADD_CLAIMS_0003585 - 3585	10/19/2018		2019 Spokane River Central Tendency Study
303	ADD_CLAIMS_0003586 - 3589	10/19/2018		FW: "Number of samples required" calculator

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304	ADD_CLAIMS_0003590 - 3590	10/19/2018		
305	ADD_CLAIMS_0003591 - 3591	10/29/2018		2019 Spokane River Central Tendency Study - next steps?
306	ADD_CLAIMS_0003592 - 3629	10/30/2018	Washington Department of Ecology 2018 TMDL prioritization webinar	
307	ADD_CLAIMS_0003630 - 3665	11/01/2018	NPDES Permit No. WA0000825: Inland Empire Paper Company, Permit Condition S6.B, PCBs Best Management Practices Plan Update, 2018 Report	
308	ADD_CLAIMS_0003666 - 3666	11/02/2018		RE: Spokane -- SRRTTF
309	ADD_CLAIMS_0003667 - 3668	11/02/2018		
310	ADD_CLAIMS_0003669 - 3680	11/08/2018		
311	ADD_CLAIMS_0003681 - 3683	11/16/2018		RE: 2019 Spokane River Central Tendency Study
312	ADD_CLAIMS_0003684 - 3684	11/21/2018		RE: Tech Track work group meeting
313	ADD_CLAIMS_0003685 - 3685	11/21/2018		
314	ADD_CLAIMS_0003686 - 3693	11/21/2018		
315	ADD_CLAIMS_0003694 - 3701	11/21/2018		
316	ADD_CLAIMS_0003702 - 3702	11/21/2018		
317	ADD_CLAIMS_0003703 - 3705	11/26/2018		Comments on MOA orientation guide & spokaneriverpcbfree.org website needed
318	ADD_CLAIMS_0003706 - 3707	11/27/2018	Washington Department of Ecology and EPA, Meeting agenda for 2018 annual PPA discussion meeting with EPA and Ecology	
319	ADD_CLAIMS_0003708 - 3709	11/27/2018	Washington Department of Ecology and EPA, Draft meeting notes from 2018 annual discussion of PPA on 11/27/2018	
320	ADD_CLAIMS_0003710 - 3720		2018 TMDL webinar response to comments	
321	ADD_CLAIMS_0003721 - 3721	12/05/2018		TSCA Meeting Today
322	ADD_CLAIMS_0003722 - 3725	12/10/2018		RE: December 12, 2018 SRRTTF Meeting Information
323	ADD_CLAIMS_0003726 - 3730	12/10/2018		RE: December 12, 2018 SRRTTF Meeting Information
324	ADD_CLAIMS_0003731 - 3745	12/12/2018	Preliminary Mass Balance, August 2018 Synoptic Survey prepared by LimnoTech, presented to the Spokane River Regional Toxics Task Force	

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325	ADD_CLAIMS_0003746 - 3750	12/12/2018	PCB Database Pilot Project Updated, prepared by Spokane County, Washington, presented to the Spokane River Regional Toxics Task Force	
326	ADD_CLAIMS_0003751 - 3751	12/12/2018		RE: TSCA - Economic Analysis pertaining to Inadvertent concentration limits
327	ADD_CLAIMS_0003752 - 3752	12/14/2018		TSCA Workgroup Meeting Minutes
328	ADD_CLAIMS_0003753 - 3760	12/14/2018		
329	ADD_CLAIMS_0003761 - 3762	12/14/2018		
330	ADD_CLAIMS_0003763 - 3819			
331	ADD_CLAIMS_0003820 - 3820	01/04/2019	2019-01-04 Email from Lara Floyd to SRRTTF members concerning review of the 2018 Implementation Summary and 2019 Work Plan	Action required: Review SRRTTF 2018 Implementation Summary & 2019 Work Plan
332	ADD_CLAIMS_0003821 - 3828	01/04/2019	Attachment: SRRTTF Comprehensive Plan Implementation Summary Tables, Year Two, 1/1/2018 -12/31/2018	
333	ADD_CLAIMS_0003829 - 3833	01/04/2019	Attachment: SRRTTF Draft List of Potential 2019 Actions and Beyond	
334	ADD_CLAIMS_0003834 - 3834	01/09/2019		TSCA Workgroup Meeting this Morning
335	ADD_CLAIMS_0003835 - 3842	01/09/2019		
336	ADD_CLAIMS_0003843 - 3844	01/18/2019		
337	ADD_CLAIMS_0003845 - 3847	01/24/2019		RE: NGC draft of memo/white paper on TiO2 and PCBs 2018_12_28 DRAFT.pdf
338	ADD_CLAIMS_0003848 - 3851	01/24/2019		RE: NGC draft of memo/white paper on TiO2 and PCBs 2018_12_28 DRAFT.pdf
339	ADD_CLAIMS_0003852 - 3853	02/01/2019		
340	ADD_CLAIMS_0003854 - 3861	02/01/2019		
341	ADD_CLAIMS_0003862 - 3867	02/01/2019		
342	ADD_CLAIMS_0003868 - 3911	02/01/2019		
343	ADD_CLAIMS_0003912 - 3913	02/01/2019		
344	ADD_CLAIMS_0003914 - 3921	02/01/2019		
345	ADD_CLAIMS_0003922 - 3927	02/01/2019		

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346	ADD_CLAIMS_0003928 - 3971	02/01/2019		
347	ADD_CLAIMS_0003972 - 3974	02/14/2019		Re: TSCA Workgroup request for product testing suggestions
348	ADD_CLAIMS_0003975 - 3995	02/18/2019	The Potential for Generating Inadvertent PCBs through Ti02 Manufacturing Using the Chloride Process, a white paper prepared by Northwest Green Chemistry for the Spokane River Regional Toxics Task Force	
349	ADD_CLAIMS_0003996 - 3997	02/19/2019		ACTION NEEDED - Draft recommendation for planning and conducting PCB data synthesis workshop
350	ADD_CLAIMS_0003998 - 3998	02/19/2019		
351	ADD_CLAIMS_0003999 - 4019	02/27/2019	The Potential for Generating Inadvertent PCBs through Ti02 Manufacturing Using the Chloride Process, a white paper prepared by Northwest Green Chemistry for the Spokane River Regional Toxics Task Force	
352	ADD_CLAIMS_0004020 - 4027	02/27/2019	SRRTTF: Comprehensive Plan Implementation Summary Tables (3), Year Two, 1/1/2018-12/31/2018, Actions Compiled from SFFRRT Comprehensive Plan (FINAL DRAFT February 27, 2019)	
353	ADD_CLAIMS_0004028 - 4111	03/01/2019	Washington Department of Ecology Report on Atmospheric Deposition of PCBs in the Spokane River Watershed	atmospheric PCB deposition, Spokane River watershed, City of Spokane,
354	ADD_CLAIMS_0004112 - 4195	03/01/2019	Atmospheric Deposition of PCBs in the Spokane River watershed	atmospheric PCB deposition, Spokane River watershed, City of Spokane,
355	ADD_CLAIMS_0004196 - 4222	03/04/2019	Spokane River Regional Positive Matrix Factorization (PMF) Analysis: Blank Influence Analysis Conceptual Scope of Work	
356	ADD_CLAIMS_0004223 - 4223	03/04/2019		Action items from 2/27 Task Force meeting
357	ADD_CLAIMS_0004224 - 4225	03/04/2019		

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358	ADD_CLAIMS_0004226 - 4229	03/06/2019	Letter from Washington Department of Ecology Eastern Regional Director, Brook Beeler, to Wally Moon, Chief, Spill Prevention and Removal Section, EPA Region 10 re: Request for EPA assistance to Ecology and Spokane Regional Clean Air Agency in performing an emergency removal action at the former Kaiser Aluminum plant in Mead, Washington.	
359	ADD_CLAIMS_0004230 - 4231	03/08/2019		
360	ADD_CLAIMS_0004232 - 4234	03/08/2019		RE: TSCA Workgroup Meeting Minutes and Agenda for March 6, 2019
361	ADD_CLAIMS_0004235 - 4236	03/09/2019		RE: Spokane Riverkeeper thoughts on SRRTF (funding request letter) moving forward
362	ADD_CLAIMS_0004237 - 4298		NPDES Permit No. WA0045144: Liberty Lake Sewer and Water District, Toxics Management Plan Update, March 2019	
363	ADD_CLAIMS_0004299 - 4311	03/24/2019		
364	ADD_CLAIMS_0004312 - 4346	03/24/2019		
365	ADD_CLAIMS_0004347 - 4348	03/24/2019		
366	ADD_CLAIMS_0004349 - 4365	03/24/2019		
367	ADD_CLAIMS_0004366 - 4369	03/25/2019	Washington Department of Ecology email RE: A-team meeting notes	
368	ADD_CLAIMS_0004370 - 4415	03/27/2019	Spokane River Regional Toxics Task Force 2018 Technical Activities Report: Continued Identification of Potential Unmonitored Dry Weather Sources of PCBs to the Spokane River, Prepared for the Spokane River Regional Toxics Task Force by LimnoTech	
369	ADD_CLAIMS_0004416 - 4461	03/27/2019	2018 Technical Activities Report, Continued Identification of Potential Unmonitored Dry Weather Sources of PCBs to the Spokane River, Prepared by LimnoTech for the Spokane River Regional Toxics Task Force	

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370	ADD_CLAIMS_0004462 - 4507	03/27/2019	LimnoTech 2018 Technical activities report RE: continued identification of potential unmonitiored dry weather sources of PCBs to the Spokane River	
371	ADD_CLAIMS_0004508 - 4509	03/28/2019	email from Ecology to others transmitting report on Atmospheric Deposition of PCBs in the Spokane River Watershed	New Ecology report: Atmospheric Deposition of PCBs in the Spokane River Watershed
372	ADD_CLAIMS_0004510 - 4510	03/28/2019	2019-03-28 email from Ecology transmitting QAPP for measuring PCBs in the Spokane River	New Ecology QAPP: Measuring PCBs in Biofilm
373	ADD_CLAIMS_0004511 - 4512	03/29/2019		Updated Agenda/RM # & Parking -SRRTTF Data Synthesis Workshop
374	ADD_CLAIMS_0004513 - 4514	03/29/2019		
375	ADD_CLAIMS_0004515 - 4515	04/01/2019		Data Synthesis Workshop Preparation Activities Recommendation to TF
376	ADD_CLAIMS_0004516 - 4517	04/01/2019		
377	ADD_CLAIMS_0004518 - 4521	04/05/2019		RE: TSCA Workgroup Meeting April 3, 2019
378	ADD_CLAIMS_0004522 - 4526	04/05/2019		RE: TSCA Workgroup Meeting April 3, 2019
379	ADD_CLAIMS_0004527 - 4601	04/12/2019	Letter from Spokane County Environmental Services, Ben Brattebo, Water Reclamation Engineer, to Diana Washington, Washington State Department of Ecology, Eastern Regional Office, re: NPDES Permit No. WA0093317 Special Condition S12; Submission of the Attached Spokane County Regional Water Reclamation Facility 2019 Annual Toxics Management Report with attachment: 2019 Annual Toxics Management Report, Spokane County Regional Water Reclamation Facility, NPDES Permit No. WA0093317, April 15, 2019	
380	ADD_CLAIMS_0004602 - 4613	04/22/2019	Spokane River Forum and Spokane River Regional Toxics Task Force PCB Media Campaign Report	
381	ADD_CLAIMS_0004614 - 4614	04/25/2019	2019-04-25 E-mail regarding labs accredited to run method 1668C.	Labs accredited to run Method 1668C

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382	ADD_CLAIMS_0004615 - 4616	04/26/2019	2019-04-26 E-mail regarding labs accredited to run method 1668C	RE: Labs accredited to run Method 1668C
383	ADD_CLAIMS_0004617 - 4617	05/17/2019		Updated Agenda/handouts Tech Track conf. call - Data Synthesis Workshop
384	ADD_CLAIMS_0004618 - 4618	05/17/2019		
385	ADD_CLAIMS_0004619 - 4620	05/17/2019		
386	ADD_CLAIMS_0004621 - 4622	05/17/2019		
387	ADD_CLAIMS_0004623 - 4623	05/21/2019	Washington Department of Ecology email RE: TMDL Bean counts	
388	ADD_CLAIMS_0004624 - 4625	05/23/2019		
389	ADD_CLAIMS_0004626 - 4627	05/30/2019	Announcement of the 2019 Spokane River Regional Toxics Task Force Data Synthesis Workshop, including final agenda, meeting notes, and draft workshop presentations	
390	ADD_CLAIMS_0004628 - 4644	06/04/2019		
391	ADD_CLAIMS_0004645 - 4734	06/04/2019		
392	ADD_CLAIMS_0004735 - 4740	06/04/2019		
393	ADD_CLAIMS_0004741 - 4747	06/04/2019		
394	ADD_CLAIMS_0004748 - 4774	06/04/2019		
395	ADD_CLAIMS_0004775 - 4799	06/04/2019		
396	ADD_CLAIMS_0004800 - 4810	06/04/2019		
397	ADD_CLAIMS_0004811 - 4817	06/04/2019		
398	ADD_CLAIMS_0004818 - 4829	06/04/2019		
399	ADD_CLAIMS_0004830 - 4839	06/04/2019		
400	ADD_CLAIMS_0004840 - 4857	06/04/2019		
401	ADD_CLAIMS_0004858 - 4863	06/04/2019		
402	ADD_CLAIMS_0004864 - 4865	06/12/2019	Washington Department of Ecology Preproposal Statement of Inquiry, Subject of Possible Rulemaking to amend Chapter 173-201A of Washington Administrative Code to adopt one or more variances to water quality standards for PCBs for the Spokane River	

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403	ADD_CLAIMS_0004866 - 4867	06/12/2019		
404	ADD_CLAIMS_0004868 - 4869	06/12/2019		RE: Ecology opens rulemaking for PCBs in the Spokane River
405	ADD_CLAIMS_0004870 - 4871	06/16/2019		RE: Tech Track conf. call to discuss 2019 field work
406	ADD_CLAIMS_0004872 - 4878	06/16/2019		
407	ADD_CLAIMS_0004879 - 4978	06/20/2019	Washington Department of Ecology and EPA, PPA for State Fiscal Years 2020-2021 (7/1/19 - 6/30/20)	Publication 19-01-004. This agreement establishes and implements a joint work plan for administering the federal grant dollars that EPA provides Ecology for air quality, water quality, and hazardous waste management.
408	ADD_CLAIMS_0004979 - 5028	06/28/2019	Report on Pigments and inadvertent polychlorinated biphenyls (iPCBs): Advancing no and low iPCB pigments for newsprint, and paper and paperboard packaging, Prepared for the Spokane River Regional Toxics Task Force, Submitted by Northwest Green Chemistry	
409	ADD_CLAIMS_0005029 - 5031	07/03/2019		RE: TSCA Meeting Agenda for July 3, 2019
410	ADD_CLAIMS_0005032 - 5033	07/12/2019	2019-07-12 Task Force mass mailer emailer	Final reports/Ecology & EPA news/EAP sampling schedule/Upcoming mtgs.
411	ADD_CLAIMS_0005034 - 5035	07/31/2019		Revised recommendation summary for review
412	ADD_CLAIMS_0005036 - 5048	07/31/2019		
413	ADD_CLAIMS_0005049 - 5051	08/07/2019		RE: TSCA Meeting Agenda for August 7, 2019
414	ADD_CLAIMS_0005052 - 5058	08/07/2019	Spatial Assessment of PCBs in Fish and Water; Attachment to email	
415	ADD_CLAIMS_0005059 - 5059	08/19/2019	Email from SRRTTF consultant to Task Force Members re June 2019 meeting agenda and August 2019 meeting agenda	Draft SRRTTF Agenda for 8/27 meeting
416	ADD_CLAIMS_0005060 - 5060	08/19/2019	June 2019 SRRTTF Meeting Agenda	
417	ADD_CLAIMS_0005061 - 5062	09/06/2019		RE: slides with overview of PCB product testing results
418	ADD_CLAIMS_0005063 - 5116	09/12/2019	NPDES Permit No. WA0024473: City of Spokane, Riverside Park Water Reclamation Facility, Toxics Management Plan	
419	ADD_CLAIMS_0005117 - 5117	09/23/2019		
420	ADD_CLAIMS_0005118 - 5118	09/25/2019		Atmospheric Deposition inputs to Stormwater in Spokane - estimates from

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421	ADD_CLAIMS_0005119 - 5148	09/25/2019		
422	ADD_CLAIMS_0005149 - 5151		Inadvertently Produced PCBs in Inks and Pigments Workshop Description, Goals, Objectives, Agenda and Presentations	
423	ADD_CLAIMS_0005152 - 5152	10/11/2019		10/15/19 Tech Track Conf. Call mtg. materials
424	ADD_CLAIMS_0005153 - 5155	10/11/2019		
425	ADD_CLAIMS_0005156 - 5161	10/11/2019		
426	ADD_CLAIMS_0005162 - 5167	10/11/2019		
427	ADD_CLAIMS_0005168 - 5169	10/11/2019		October 15, 2019 SRRTTF Tech Track Work Group conf. call
428	ADD_CLAIMS_0005170 - 5296	10/15/2019	Letter from Marc Zemel, Smith & Lowney PLLC, to Chris Hladick, Regional Administrator, US EPA Region 10 re: Request for EPA Review of Spokane River Regional Toxics Task Force Comprehensive Plan and for Review of Constructive Submission of Spokane River PCB TMDL	
429	ADD_CLAIMS_0005297 - 5374	10/15/2019	Washington Department of Ecology 2019 TMDL Webinar	
430	ADD_CLAIMS_0005375 - 5377	10/16/2019		
431	ADD_CLAIMS_0005378 - 5383	10/16/2019		
432	ADD_CLAIMS_0005384 - 5386	10/21/2019		FW: PCB Sniffing Dog for the Spokane River
433	ADD_CLAIMS_0005387 - 5388	10/23/2019		RE: your presentation today
434	ADD_CLAIMS_0005389 - 5398	10/23/2019	Measurable Progress: Process, Analysis and Schedule; Attachment to email	
435	ADD_CLAIMS_0005399 - 5401		Draft 2019 webinar communication plan	
436	ADD_CLAIMS_0005402 - 5403	11/07/2019		FW: Kaiser Trentwood Amended Agreed Order
437	ADD_CLAIMS_0005404 - 5872	11/08/2019	Final 2019 Removal Site Evaluation Report for the Former Kaiser Smelter Site, Mead, Washington sent from Steven G. Hall, Ecology and Environment, Inc., to Brooks Stanfield, On-Scene Coordinator, US EPA Region 10	
438	ADD_CLAIMS_0005873 - 5874	11/14/2019	Washington Department of Ecology Public Workshop on PCB Variances for Spokane River Dischargers: Agenda and Additional Resources	

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439	ADD_CLAIMS_0005875 - 5996	11/14/2019	Washington Department of Ecology Workshop Presentation Slides on PCB Variances for Spokane River Dischargers	
440	ADD_CLAIMS_0005997 - 5997	12/10/2019		SRRTTF 2019 Accomplishments summary review
441	ADD_CLAIMS_0005998 - 6006	12/05/2019	SRRTTF: Comprehensive Plan Implementation Summary Tables; Attachment to email	
442	ADD_CLAIMS_0006007 - 6009	12/30/2019		
443	ADD_CLAIMS_0006010 - 6038		Washington Department of Ecology and EPA, Perforamce Partnership Agreement Water Quality Program Status Report for July 1 - Dec 31, 2019	
444	ADD_CLAIMS_0006039 - 6040	02/01/2020	Washington Department of Ecology Water Quality Program Publication: Focus On Spokane River Variances	
445	ADD_CLAIMS_0006041 - 6041	02/01/2020	Washington Department of Ecology Water Quality Program: Economic Questions to Consider During Rule Development Phase	
446	ADD_CLAIMS_0006042 - 6050	02/03/2020	Spokane River Regional Toxics Task Force, Inland Empire Paper Company and Northwest Green Chemistry Presentation on Recycling of Paper Products Containing PCBs in Inks and Pigments, Presented at OECD Workshop	
447	ADD_CLAIMS_0006051 - 6051	02/03/2020		Confirming Kaiser Mead Removal Coord. Call 2/19/20 @ 1pm
448	ADD_CLAIMS_0006052 - 6053	02/03/2020		FW: 2019 Spokane Workshop: Industry Observations, Outcomes, and Recommendations for 2020
449	ADD_CLAIMS_0006054 - 6055	02/12/2020	Email from Eeva Leinala, OECD, to Doug Krapas, Inland Empire Paper Company, concerning SRRTTF case study on inadvertent PCBs presented to OECD and next steps	
450	ADD_CLAIMS_0006056 - 6059	02/12/2020	Attachment: SRRTTF Draft Meeting Notes from January 22, 2020	
451	ADD_CLAIMS_0006060 - 6061	02/13/2020	Email from Doug Krapas, Inland Empire Paper Company, to Brian Nickel, US EPA Region 10, concerning SRRTTF case study presented to OECD and next steps	
452	ADD_CLAIMS_0006062 - 6064	02/24/2020		RE: ELT Agenda - Feb. 25

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453	ADD_CLAIMS_0006065 - 6073	02/26/2020	SRRTTF: Comprehensive Plan Implementation Summary Tables (3), Year Three, 1/1/2019-12/31/2019, Actions Compiled from SFFRRT Comprehensive Plan (approved February 26, 2020)	
454	ADD_CLAIMS_0006074 - 6075	02/26/2020		AGENDA and Meeting Materials_SRRTTF_ Joint Tech Track and Fish Work Group Meeting
455	ADD_CLAIMS_0006076 - 6076	02/26/2020		
456	ADD_CLAIMS_0006077 - 6105	02/26/2020		
457	ADD_CLAIMS_0006106 - 6112	02/26/2020		
458	ADD_CLAIMS_0006113 - 6162	02/26/2020		
459	ADD_CLAIMS_0006163 - 6163	02/28/2020		Due date March 13 - MOA revisions/summary/codification questions
460	ADD_CLAIMS_0006164 - 6184	02/28/2020		
461	ADD_CLAIMS_0006185 - 6188	02/28/2020		
462	ADD_CLAIMS_0006189 - 6189	02/28/2020		
463	ADD_CLAIMS_0006190 - 6192	02/28/2020	2020-02-28 Task Force mass mailer email concerning Ecology open house on PCB variances for the Spokane River	March open house on PCB Variances for the Spokane River
464	ADD_CLAIMS_0006193 - 6193	03/03/2020		Help with cost estimate for groundwater fingerprinting work
465	ADD_CLAIMS_0006194 - 6194	03/03/2020		Help with cost estimate for groundwater fingerprinting work
466	ADD_CLAIMS_0006195 - 6196	03/04/2020		RE: Biofilm and sediment study
467	ADD_CLAIMS_0006197 - 6199	03/05/2020		RE: Biofilm and sediment study
468	ADD_CLAIMS_0006200 - 6200	03/09/2020		March 11 _ SRRTTF joint Tech Track/Fish work group conference call 11:30 am to 1:30 pm Pacific Time
469	ADD_CLAIMS_0006201 - 6204	03/09/2020		
470	ADD_CLAIMS_0006205 - 6210	03/09/2020		
471	ADD_CLAIMS_0006211 - 6212	03/11/2020	Webpage RE: Information on Ecology actions/programs to reduce toxic chemicals in the Spokane River watershed	
472	ADD_CLAIMS_0006213 - 6216	03/11/2020	Webpage RE: directory of water quality improvement projects	
473	ADD_CLAIMS_0006217 - 6218	03/12/2020	Webpage RE: data summary RE: Spokane River biofilm PCB screening study	

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474	ADD_CLAIMS_0006219 - 6220	03/13/2020		Update: Update: TTWG/Fish WG Remote Meeting
475	ADD_CLAIMS_0006221 - 6222	03/17/2020		Update: TTWG/Fish WG Remote Meeting
476	ADD_CLAIMS_0006223 - 6226	03/17/2020		
477	ADD_CLAIMS_0006227 - 6235	03/17/2020		
478	ADD_CLAIMS_0006236 - 6236	03/17/2020	2020-03-17 email from Ecology sharing QAPP addendum for measuring PCBs in Spokane River	New Ecology QAPP addendum: Measuring PCBs in Biofilm, Sediment, and Invertebrates in the Spokane R.: Screening Study
479	ADD_CLAIMS_0006237 - 6239	03/18/2020		FW: TDSC draft QAPP available for Task Force review - comments due March 18
480	ADD_CLAIMS_0006240 - 6241	03/18/2020		Rescheduling March 24 in-person open house on PCB variances in Spokane River
481	ADD_CLAIMS_0006242 - 6243	03/19/2020		March 25, 2020 SRRTTF WebEx Meeting/Additional Information
482	ADD_CLAIMS_0006244 - 6245	03/19/2020		March 25, 2020 SRRTTF WebEx Meeting/Additional Information
483	ADD_CLAIMS_0006246 - 6249	03/19/2020		RE: TDSC draft QAPP available for Task Force review - comments due March 18
484	ADD_CLAIMS_0006250 - 6251	03/20/2020		TSCA/iPCB Meeting Minutes from 03/0420 & Agenda for next meeting
485	ADD_CLAIMS_0006252 - 6253	03/23/2020		March 25, 2020 SRRTTF WebEx additional info and SPC presentations notice
486	ADD_CLAIMS_0006254 - 6255	03/23/2020		March 25, 2020 SRRTTF WebEx additional info and SPC presentations notice
487	ADD_CLAIMS_0006256 - 6258	03/27/2020		New date for Spokane Open House on PCB Variances/Upcoming SRRTTF meetings
488	ADD_CLAIMS_0006259 - 6261	03/27/2020	March 2020 SRRTTF Mass Mailer on Open House on PCB variances and upcoming meetings	New date for Spokane Open House on PCB Variances/Upcoming SRRTTF meetings
489	ADD_CLAIMS_0006262 - 6263	03/27/2020		FW: Groundwater and surface water fingerprinting for Spokane River PCBs - project questions

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490	ADD_CLAIMS_0006264 - 6265	03/27/2020		RE: Groundwater and surface water fingerprinting for Spokane River PCBs - project questions
491	ADD_CLAIMS_0006266 - 6340		NPDES Permit No. WA0045144: Liberty Lake Sewer and Water District, Toxics Management Plan Update, March 2020	
492	ADD_CLAIMS_0006341 - 6342	03/30/2020		April 8, 2020 Kaiser amended agreement online public mtg. & comment period extension
493	ADD_CLAIMS_0006343 - 6344	04/01/2020		RE: Groundwater and surface water fingerprinting for Spokane River PCBs - project questions
494	ADD_CLAIMS_0006345 - 6346	04/01/2020		RE: Groundwater and surface water fingerprinting for Spokane River PCBs - project questions
495	ADD_CLAIMS_0006347 - 6348	04/06/2020		
496	ADD_CLAIMS_0006349 - 6350	04/07/2020		RE: Solid-phase PCB samplers
497	ADD_CLAIMS_0006351 - 6369	04/07/2020		
498	ADD_CLAIMS_0006370 - 6535	04/07/2020		
499	ADD_CLAIMS_0006536 - 6544	04/08/2020		
500	ADD_CLAIMS_0006545 - 6545	04/08/2020	2020-04-08 email concerning fingerprinting of Spokane River PCBs	Dave Approved "Groundwater and surface water fingerprinting for Spokane River PCBs" to Proceed Forward, Next Steps
501	ADD_CLAIMS_0006546 - 6613	04/13/2020	Letter from Spokane County Environmental Services, Ben Brattebo, Water Reclamation Engineer, to Diana Washington, Washington State Department of Ecology, Eastern Regional Office, re: NPDES Permit No. WA0093317 Special Condition S12; Submission of the Attached Spokane County Regional Water Reclamation Facility 2020 Annual Toxics Management Report with attachment: DRAFT 2020 Annual Toxics Management Report, Spokane County Regional Water Reclamation Facility, NPDES Permit No. WA0093317, April 15, 2020	
502	ADD_CLAIMS_0006614 - 6615	04/13/2020		
503	ADD_CLAIMS_0006616 - 6618	04/14/2020	Current Status of Waterbodies identified as Impaired on Ecology's 1996 list	

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504	ADD_CLAIMS_0006619 - 6640	04/14/2020	EPA Enclosure 1996 Crosswalk Table	
505	ADD_CLAIMS_0006641 - 6647	04/14/2020	TMDLs submitted to EPA by Washington Department of Ecology from February 1, 2013 to April 13, 2020	
506	ADD_CLAIMS_0006648 - 6649	04/16/2020		April 22, 2020 SRRTTF Zoom Meeting
507	ADD_CLAIMS_0006650 - 6651	04/16/2020		April 22, 2020 SRRTTF Zoom Meeting
508	ADD_CLAIMS_0006652 - 6653	04/20/2020		RE: Kickoff Meeting for the Spokane River PCB Fingerprinting project
509	ADD_CLAIMS_0006654 - 6655	04/20/2020		
510	ADD_CLAIMS_0006656 - 6656	04/20/2020		RE: notes from today's kickoff call
511	ADD_CLAIMS_0006657 - 6671	04/20/2020		
512	ADD_CLAIMS_0006672 - 6673	04/22/2020		RE: notes from today's kickoff call
513	ADD_CLAIMS_0006674 - 6676	04/23/2020	2020-04-14 Memo from Laurie Mann to File: current Status of Waterbodies Identified as Impaired on Ecology's 1996 List	
514	ADD_CLAIMS_0006677 - 6698	04/23/2020	Attachment to 2020-04-14 Memo from Laurie Mann to File: current Status of Waterbodies Identified as Impaired on Ecology's 1996 List	
515	ADD_CLAIMS_0006699 - 6705	04/23/2020	2020-04-14 memorandum from Laurie Mann to file regarding TMDLs submitted to EPA by Washington Department of Ecology from February 1, 2013, to April 13, 2020	
516	ADD_CLAIMS_0006706 - 6706	04/23/2020	Attachment to 2020-04-14 memorandum from Laurie Mann to file regarding TMDLs submitted to EPA by Washington Department of Ecology from February 1, 2013, to April 13, 2020	
517	ADD_CLAIMS_0006707 - 6708	04/24/2020	Email chain between EPA and Ecology re Technical Direction for Ground Water Surface Water Fingerprinting for Spokane River PCBs	FW: Technical Direction for "Ground Water Surface Water Fingerprinting for Spokane River PCBs" under TSWAP Contract Tetra Tech EP-C-17-046, Task Order 7
518	ADD_CLAIMS_0006709 - 6721	04/29/2020	State of Washington Department of Ecology Amendment No. 2 to Agreed Order No. 2692, In the Matter of Remedial Action by Kaiser Aluminum and Chemical Corporation Trentwood Site, Spokane Valley, Washington	

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519	ADD_CLAIMS_0006722 - 6723	05/01/2020		Please Review Spokane River PCB Fingerprinting Data Source List & Request for Timeframe for next Call
520	ADD_CLAIMS_0006724 - 6730	05/01/2020		
521	ADD_CLAIMS_0006731 - 6732	05/04/2020		RE: Revised Technical Direction for "Ground Water Surface Water Fingerprinting for Spokane River PCBs" under TSWAP Contract Tetra Tech EP-C-17-046, Task Order 7
522	ADD_CLAIMS_0006733 - 6734	05/04/2020		RE: Spokane River PCB Fingerprinting Project
523	ADD_CLAIMS_0006735 - 6737	05/06/2020		FW: Stop Work on Technical Direction for "Ground Water Surface Water Fingerprinting for Spokane River PCBs" under TSWAP Contract Tetra Tech EP-C-17-046, Task Order 7
524	ADD_CLAIMS_0006738 - 6741	05/07/2020		RE: Stop Work on Technical Direction for "Ground Water Surface Water Fingerprinting for Spokane River PCBs" under TSWAP Contract Tetra Tech EP-C-17-046, Task Order 7
525	ADD_CLAIMS_0006742 - 6743	05/11/2020		RE: PMF and groundwater upgradient of Kaiser
526	ADD_CLAIMS_0006744 - 6814	05/11/2020		
527	ADD_CLAIMS_0006815 - 6815	05/11/2020		
528	ADD_CLAIMS_0006816 - 6818	05/11/2020		RE: PMF and groundwater upgradient of Kaiser
529	ADD_CLAIMS_0006819 - 6819	05/11/2020		
530	ADD_CLAIMS_0006820 - 6822	05/11/2020		RE: PMF and groundwater upgradient of Kaiser
531	ADD_CLAIMS_0006823 - 6825	05/11/2020		RE: PMF and groundwater upgradient of Kaiser
532	ADD_CLAIMS_0006826 - 6826	05/11/2020		Notifications for PCB activities
533	ADD_CLAIMS_0006827 - 6828	05/20/2020		AGENDA_ May Tech Track Work Group (TTWG) Remote Meeting _Thursday May 21 from 10:30 am - 12:30 pm
534	ADD_CLAIMS_0006829 - 6829	05/20/2020		
535	ADD_CLAIMS_0006830 - 6831	05/21/2020		RE: Tech Track Work Group
536	ADD_CLAIMS_0006832 - 6832	05/21/2020		
537	ADD_CLAIMS_0006833 - 6835	05/22/2020		RE: Tech Track Work Group
538	ADD_CLAIMS_0006836 - 6838	05/22/2020		RE: Tech Track Work Group
539	ADD_CLAIMS_0006839 - 6840	05/22/2020		Re: Tech Track Work Group

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540	ADD_CLAIMS_0006841 - 6870	05/28/2020	EPA Action Memorandum from Brooks Stanfield, On-Scene Coordinator, through Calvin Terada, Superfund and Emergency Management Division Director, to Chris Hladick, Regional Administrator re: Request for Approval and Funding for a Time-Critical Removal Action at Former Kaiser Smelter, Mead, Spokane County, Washington	
541	ADD_CLAIMS_0006871 - 6872	05/28/2020		June SRRTTF meetings and OECD workshop report
542	ADD_CLAIMS_0006873 - 6874	05/28/2020		June SRRTTF meetings and OECD workshop report
543	ADD_CLAIMS_0006875 - 6876	05/28/2020		June SRRTTF meetings and OECD workshop report
544	ADD_CLAIMS_0006877 - 6878	06/02/2020		Kaiser Removal Update
545	ADD_CLAIMS_0006879 - 6908	06/02/2020		
546	ADD_CLAIMS_0006909 - 6910	06/03/2020		RE: Kickoff Call to discuss PCB Data analysis for the Kaiser Site
547	ADD_CLAIMS_0006911 - 6912	06/05/2020		Draft water column sampling QAPP & EPA info.
548	ADD_CLAIMS_0006913 - 6957	06/05/2020		
549	ADD_CLAIMS_0006958 - 6964	06/05/2020		RE: Kaiser GW data RE: following up RE: Question about SRRTTF Database
550	ADD_CLAIMS_0006965 - 6965	06/09/2020		
551	ADD_CLAIMS_0006966 - 6968	06/09/2020		RE: Kaiser PCB Fingerprinting analysis call
552	ADD_CLAIMS_0006969 - 6969	06/09/2020		
553	ADD_CLAIMS_0006970 - 6972	06/09/2020		RE: Kaiser PCB Fingerprinting analysis call
554	ADD_CLAIMS_0006973 - 6973	06/09/2020		
555	ADD_CLAIMS_0006974 - 6976	06/10/2020		RE: Kaiser PCB Fingerprinting analysis call
556	ADD_CLAIMS_0006977 - 6978	06/10/2020		RE: Kaiser PCB Fingerprinting analysis call
557	ADD_CLAIMS_0006979 - 6979	06/10/2020	2020-06-10 email from Tetra Tech to EPA concerning first deliverable data source summary for Kaiser Trentwood Spokane River PCB Fingerprinting project	Data Source List

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558	ADD_CLAIMS_0006980 - 6983	06/10/2020	Attachment: Data Sources for Spokane River PCB Fingerprinting Assessment for the Kaiser Trentwood Site, presented by Tetra Tech to US EPA Region 10 and Washington Department of Ecology	
559	ADD_CLAIMS_0006984 - 6985	06/10/2020		RE: Data Source List
560	ADD_CLAIMS_0006986 - 6987	06/12/2020	2020-06-12 Task Force mass mailer email on Ecology's draft variance	Ecology seeks feedback on preliminary plan to reduce PCBs in Spokane River
561	ADD_CLAIMS_0006988 - 6989	06/12/2020		Ecology seeks feedback on preliminary plan to reduce PCBs in Spokane River
562	ADD_CLAIMS_0006990 - 6991	06/12/2020	June 2020 SRRTTF Mass Mailer re Ecology seeking feedback on five discharger variances to WQS for PCBs for the Spokane River	Ecology seeks feedback on preliminary plan to reduce PCBs in Spokane River
563	ADD_CLAIMS_0006992 - 6993	06/17/2020	Email from Tetra Tech to Jayne Carlin, EPA, with attached revisions to the data source list for Kaiser Trentwood-Spokane River PCB Fingerprinting, based on comments received	RE: Data Source List
564	ADD_CLAIMS_0006994 - 6998	06/17/2020	Data Sources for Spokane River PCB Fingerprinting Assessment for the Kaiser Trentwood Site, developed by Tetra Tech and presented to US EPA Region 10 and Washington Department of Ecology	
565	ADD_CLAIMS_0006999 - 7000	06/17/2020		June 24, 2020 SRRTTF Zoom Meeting
566	ADD_CLAIMS_0007001 - 7002	06/17/2020		June 24, 2020 SRRTTF Zoom Meeting
567	ADD_CLAIMS_0007003 - 7003	06/17/2020	2020-06-17 E-mail regarding upgradient Kaiser wells and assessing impacts to river	RE: Sampling upgradient Kaiser wells and assessing impacts to river - EPA funded work to support TF
568	ADD_CLAIMS_0007004 - 7005	06/18/2020	2020-06-18 e-mail regarding upgradient Kaiser wells and assessing impacts to the Spokane River	RE: Sampling upgradient Kaiser wells and assessing impacts to river - EPA funded work to support TF
569	ADD_CLAIMS_0007006 - 7007	06/19/2020		RE: Kaiser Removal SRTTF
570	ADD_CLAIMS_0007008 - 7008	06/19/2020	Draft Talking Point, Former Kaiser Smelter Cleanup, SRTTF briefing; Attachment to email	
571	ADD_CLAIMS_0007009 - 7009	06/19/2020		RE: Kaiser Removal SRTTF
572	ADD_CLAIMS_0007010 - 7012	06/22/2020		RE: Kaiser Removal SRTTF

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573	ADD_CLAIMS_0007013 - 7015	06/22/2020		RE: Kaiser Removal SRTTF
574	ADD_CLAIMS_0007016 - 7018	06/22/2020		RE: Kaiser Removal SRTTF
575	ADD_CLAIMS_0007019 - 7019	06/22/2020	Talking Points (draft), Former Kaiser Smelter cleanup, SRTTF briefing, Attachment to email	
576	ADD_CLAIMS_0007020 - 7022	06/22/2020		RE: Kaiser Removal SRTTF
577	ADD_CLAIMS_0007023 - 7023	06/22/2020		
578	ADD_CLAIMS_0007024 - 7026	06/25/2020		RE: Kaiser Removal SRTTF
579	ADD_CLAIMS_0007027 - 7029	06/30/2020		RE: Timeline of EPA agreements
580	ADD_CLAIMS_0007030 - 7050	07/02/2020	EPA Action Memorandum from Brook Stanfield, On-Scene Coordinator, through Wally Moon, Chief, Spill Prevention and Removal Section and Beth Sheldrake, Chief, Emergency Management Branch to Calvin Terada, Director, Superfund and Emergency Management Division re: Request for Approval and Funding for a Time-Critical Removal Action for KAIC Pond Removal at the Former Kaiser Smelter Site, Mead, Spokane County, Washington	
581	ADD_CLAIMS_0007051 - 7052	07/07/2020	2020-07-07 email from Brooks Stanfield, EPA, to Ecology concerning site cleanup of sediment ponds at Kaiser Aluminum Investments Company	Kaiser Second Action Memo signed
582	ADD_CLAIMS_0007053 - 7055	07/15/2020		July 22, 2020 SRRTTF Zoom Meeting
583	ADD_CLAIMS_0007056 - 7056	07/17/2020		July 21 Tech Track Work Group meeting materials
584	ADD_CLAIMS_0007057 - 7079	07/17/2020		
585	ADD_CLAIMS_0007080 - 7082	07/17/2020		
586	ADD_CLAIMS_0007083 - 7083	07/17/2020		
587	ADD_CLAIMS_0007084 - 7085	07/17/2020		July 21, 2020 Tech Track work group meeting
588	ADD_CLAIMS_0007086 - 7087	07/17/2020		July 21, 2020 Tech Track work group meeting
589	ADD_CLAIMS_0007088 - 7089	07/23/2020		July 21 Tech Track Work Group meeting notes
590	ADD_CLAIMS_0007090 - 7093	07/23/2020		
591	ADD_CLAIMS_0007094 - 7095	07/23/2020	2020-07-23 Task Force mass mailer email concerning cleanup at Kaiser Mead site	EPA to begin time-critical removal work at Kaiser site in Mead

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592	ADD_CLAIMS_0007096 - 7097	07/23/2020		EPA to begin time-critical removal work at Kaiser site in Mead
593	ADD_CLAIMS_0007098 - 7099	07/23/2020		EPA to begin time-critical removal work at Kaiser site in Mead
594	ADD_CLAIMS_0007100 - 7101	07/23/2020		EPA to begin time-critical removal work at Kaiser site in Mead
595	ADD_CLAIMS_0007102 - 7102	07/31/2020		PCB Mass Balance Calculations
596	ADD_CLAIMS_0007103 - 7104	08/04/2020		Data gathering for a PCBs in products testing database
597	ADD_CLAIMS_0007105 - 7106	08/04/2020		Data gathering for a PCBs in products testing database
598	ADD_CLAIMS_0007107 - 7142	08/06/2020	US EPA Region 10 Administrative Settlement Agreement and Order on Consent for Removal Actions; CERCLA Docket No. 10-2020-0152	
599	ADD_CLAIMS_0007143 - 7144	08/06/2020		FW: Pollution Report #1 (Initial) Former Kaiser Smelter - Mobilization & Site Preparation
600	ADD_CLAIMS_0007145 - 7149	08/06/2020		
601	ADD_CLAIMS_0007150 - 7150	08/06/2020		EPA Udates to Action Items for the SRRTTF TSCA/iPCB Workgroup
602	ADD_CLAIMS_0007151 - 7169	08/06/2020		
603	ADD_CLAIMS_0007170 - 7172	08/06/2020		RE: EPA/Ecology: Reminder Comments Due by COB Friday on PCB Loading Analysis for the Kaiser Site Report; TT: Develop Presentation and Set Up Call Early Next Week
604	ADD_CLAIMS_0007173 - 7192	08/06/2020		
605	ADD_CLAIMS_0007193 - 7194	08/10/2020		RE: EPA Udates to Action Items for the SRRTTF TSCA/iPCB Workgroup
606	ADD_CLAIMS_0007195 - 7197	08/12/2020		Final Tasks for Tetra Teach - Ends Friday; Presentation on PCB Loading Analysis for the Kaiser Site
607	ADD_CLAIMS_0007198 - 7237	08/12/2020		
608	ADD_CLAIMS_0007238 - 7242	08/12/2020		RE: PCB mass balance calculations for the Kaiser Trentwood Site
609	ADD_CLAIMS_0007243 - 7245	08/13/2020		RE: EPA/Ecology: Reminder Comments Due by COB Friday on PCB Loading Analysis for the Kaiser Site Report; TT: Develop Presentation and Set Up Call Early Next Week
610	ADD_CLAIMS_0007246 - 7285	08/13/2020	PowerPoint about Kaiser-Trentwood	

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611	ADD_CLAIMS_0007286 - 7287	08/17/2020		RE: EPA Udates to Action Items for the SRRTTF TSCA/iPCB Workgroup
612	ADD_CLAIMS_0007288 - 7289	08/19/2020		August 26, 2020 SRRTTF Zoom Meeting
613	ADD_CLAIMS_0007290 - 7291	08/19/2020		August 26, 2020 SRRTTF Zoom Meeting
614	ADD_CLAIMS_0007292 - 7299	08/24/2020	EPA Action Memorandum Amendment 1 from Brooks Stanfield, On-Scene Coordinator through Calvin Terada, Superfund and Emergency Management Division Director, to Peter C. Wright, Assistant Administrator, EPA Office of Land and Emergency Management re: Request for Approval for a Ceiling Increase to the Time-Critical Removal Action at Former Kaiser Smelter, Mead, Spokane County, Washington	
615	ADD_CLAIMS_0007300 - 7300	08/24/2020	2020-08-24 email between Ecology and EPA concerning Kaiser Trentwood-Spokane River PCB Fingerprinting Analysis Final Report	FW: Final Report of the PCB analysis of the Kaiser Trentwood Facility Area Data
616	ADD_CLAIMS_0007301 - 7331	08/24/2020	Attachment: Spokane River PCB Fingerprinting Assessment for the Kaiser Trentwood Site, presented by Tetra Tech to the US EPA Region 10 and Washington Department of Ecology	
617	ADD_CLAIMS_0007332 - 7334	08/25/2020		RE: Srrttf August meeting
618	ADD_CLAIMS_0007335 - 7338	08/25/2020	Email chain with multiple topics	RE: Srrttf August meeting
619	ADD_CLAIMS_0007339 - 7342	08/25/2020		RE: Srrttf August meeting
620	ADD_CLAIMS_0007343 - 7343	08/27/2020		AOC with KAIC and Tuesday meetings
621	ADD_CLAIMS_0007344 - 7379	08/27/2020		
622	ADD_CLAIMS_0007380 - 7382	08/28/2020		RE: Tetra Tech Report regarding PCBs upgradient of Kaiser
623	ADD_CLAIMS_0007383 - 7386	08/28/2020		RE: Tetra Tech Report regarding PCBs upgradient of Kaiser
624	ADD_CLAIMS_0007387 - 7387	08/31/2020		RE: Tetra Tech Report regarding PCBs upgradient of Kaiser
625	ADD_CLAIMS_0007388 - 7389	08/31/2020		Re: Tetra Tech Report regarding PCBs upgradient of Kaiser
626	ADD_CLAIMS_0007390 - 7393	09/02/2020		Re: Loading from Kaiser Mead/Spokane Recycling site
627	ADD_CLAIMS_0007394 - 7439	09/04/2020		
628	ADD_CLAIMS_0007440 - 7442	09/04/2020		RE: September 15 due date items

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629	ADD_CLAIMS_0007443 - 7498	09/10/2020	NPDES Permit No. WA0024473: City of Spokane, Riverside Park Water Reclamation Facility, Toxics Management Plan	
630	ADD_CLAIMS_0007499 - 7500	09/18/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
631	ADD_CLAIMS_0007501 - 7503	09/21/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
632	ADD_CLAIMS_0007504 - 7510	09/21/2020		
633	ADD_CLAIMS_0007511 - 7511	09/21/2020		
634	ADD_CLAIMS_0007512 - 7512	09/21/2020		
635	ADD_CLAIMS_0007513 - 7513	09/21/2020		
636	ADD_CLAIMS_0007514 - 7514	09/21/2020		
637	ADD_CLAIMS_0007515 - 7515	09/21/2020		
638	ADD_CLAIMS_0007516 - 7516	09/21/2020		
639	ADD_CLAIMS_0007517 - 7517	09/21/2020		
640	ADD_CLAIMS_0007518 - 7521	09/21/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
641	ADD_CLAIMS_0007522 - 7577	09/21/2020		
642	ADD_CLAIMS_0007578 - 7581	09/21/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
643	ADD_CLAIMS_0007582 - 7585	09/22/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
644	ADD_CLAIMS_0007586 - 7589	09/22/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
645	ADD_CLAIMS_0007590 - 7592	09/25/2020		FW: Question about flows used in 2016 Spokane River monthly sampling report
646	ADD_CLAIMS_0007593 - 7595	09/29/2020		RE: WQX Help Desk - WQX Org Id Created
647	ADD_CLAIMS_0007596 - 7596	09/29/2020		
648	ADD_CLAIMS_0007597 - 7597	09/29/2020		
649	ADD_CLAIMS_0007598 - 7601	09/29/2020		RE: Next Steps for TetraTech Upgradient Kaiser Memo
650	ADD_CLAIMS_0007602 - 7602	10/01/2020		October 5th 2020 TTWG Meeting 10 am to noon _ Agenda

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651	ADD_CLAIMS_0007603 - 7603	10/01/2020		
652	ADD_CLAIMS_0007604 - 7608	10/02/2020		FW: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
653	ADD_CLAIMS_0007609 - 7613	10/05/2020		FW: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
654	ADD_CLAIMS_0007614 - 7614	10/05/2020		
655	ADD_CLAIMS_0007615 - 7619	10/05/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
656	ADD_CLAIMS_0007620 - 7623	10/05/2020		RE: Follow Up from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
657	ADD_CLAIMS_0007624 - 7629	10/05/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
658	ADD_CLAIMS_0007630 - 7635	10/05/2020		RE: Mission reach hotspots and 2009-2011 Urban Waters Source Investigation
659	ADD_CLAIMS_0007636 - 7639	10/06/2020		RE: Follow Up from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
660	ADD_CLAIMS_0007640 - 7640	10/06/2020		
661	ADD_CLAIMS_0007641 - 7641	10/06/2020		
662	ADD_CLAIMS_0007642 - 7642	10/06/2020		
663	ADD_CLAIMS_0007643 - 7647	10/06/2020		RE: Follow Up from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
664	ADD_CLAIMS_0007648 - 7649	10/06/2020		RE: Question about flows used in 2016 Spokane River monthly sampling report
665	ADD_CLAIMS_0007650 - 7650	10/06/2020		
666	ADD_CLAIMS_0007651 - 7652	10/07/2020		RE: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda
667	ADD_CLAIMS_0007653 - 7653	10/07/2020		
668	ADD_CLAIMS_0007654 - 7655	10/07/2020		RE: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda

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669	ADD_CLAIMS_0007656 - 7662	10/09/2020		FW: Follow Up from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
670	ADD_CLAIMS_0007663 - 7668	10/09/2020		RE: PCB mass balance calculations for the Kaiser Trentwood Site
671	ADD_CLAIMS_0007669 - 7674	10/12/2020		RE: PCB mass balance calculations for the Kaiser Trentwood Site
672	ADD_CLAIMS_0007675 - 7675	10/12/2020		FW: Spokane River
673	ADD_CLAIMS_0007676 - 7713	10/12/2020		
674	ADD_CLAIMS_0007714 - 7744	10/12/2020		
675	ADD_CLAIMS_0007745 - 7745	10/12/2020		
676	ADD_CLAIMS_0007746 - 7746	10/13/2020	2020-10-13 E-mail regarding Tetra Tech report	RE: Tetra Tech report
677	ADD_CLAIMS_0007747 - 7750	10/14/2020		
678	ADD_CLAIMS_0007751 - 7759	10/14/2020		RE: Follow Up from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
679	ADD_CLAIMS_0007760 - 7760	10/14/2020		
680	ADD_CLAIMS_0007761 - 7761	10/14/2020	2020-10-24 e-mail regarding discussion of Kaiser Mead cleanup at 10/28 Task Force meeting.	10/28 Task Force meeting
681	ADD_CLAIMS_0007762 - 7767	10/14/2020		RE: Question about flows used in 2016 Spokane River monthly sampling report
682	ADD_CLAIMS_0007768 - 7768	10/14/2020		
683	ADD_CLAIMS_0007769 - 7769	10/14/2020		
684	ADD_CLAIMS_0007770 - 7779	10/14/2020		RE: Follow Up from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
685	ADD_CLAIMS_0007780 - 7781	10/14/2020	2020-10-14 E-mail regarding discussion of Kaiser Mead cleanup at 10/28 Task Force meeting	RE: 10/28 Task Force meeting
686	ADD_CLAIMS_0007782 - 7794	10/15/2020		FW: Follow Up from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
687	ADD_CLAIMS_0007795 - 7807	10/15/2020		RE: Follow Up from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
688	ADD_CLAIMS_0007808 - 7811	10/15/2020		RE: 10/28 Task Force meeting

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689	ADD_CLAIMS_0007812 - 7814	10/19/2020		RE: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda
690	ADD_CLAIMS_0007815 - 7816	10/20/2020		FW: Questions about main stem Spokane River individual NPDES permits
691	ADD_CLAIMS_0007817 - 7818	10/20/2020		
692	ADD_CLAIMS_0007819 - 7819	10/20/2020		Notes from Follow Up Call from the PCB Fingerprinting (Upgradient Kaiser/Spokane River) project
693	ADD_CLAIMS_0007820 - 7821	10/20/2020		
694	ADD_CLAIMS_0007822 - 7825	10/21/2020		RE: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda
695	ADD_CLAIMS_0007826 - 7828	10/21/2020		RE: 10/28 Task Force meeting
696	ADD_CLAIMS_0007829 - 7830	10/21/2020		October 28, 2020 SRRTTF Zoom Meeting
697	ADD_CLAIMS_0007831 - 7850	10/28/2020		
698	ADD_CLAIMS_0007851 - 7852	10/28/2020		RE: Kaiser website for TTF follow-up notes
699	ADD_CLAIMS_0007853 - 7854	10/30/2020		Biofilm and stormwater data from Washington's Environmental Information Management (EIM) database
700	ADD_CLAIMS_0007855 - 7855	10/30/2020		
701	ADD_CLAIMS_0007856 - 7856	11/03/2020		FW: NPDES history PCBs Kaiser stormwater
702	ADD_CLAIMS_0007857 - 7858	11/03/2020		RE: NPDES history PCBs Kaiser stormwater
703	ADD_CLAIMS_0007859 - 7864	11/12/2020		RE: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda
704	ADD_CLAIMS_0007865 - 7872	11/14/2020		FW: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda
705	ADD_CLAIMS_0007873 - 7873	11/14/2020		
706	ADD_CLAIMS_0007874 - 7874	11/14/2020		
707	ADD_CLAIMS_0007875 - 7877	11/20/2020		
708	ADD_CLAIMS_0007878 - 7881	11/20/2020		
709	ADD_CLAIMS_0007882 - 7883	11/20/2020		RE: Follow-up PCBs congener toxicity

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710	ADD_CLAIMS_0007884 - 7889	11/23/2020	Memorandum of Understanding Between the US EPA, Region 10 and the Washington Department of Ecology: To allow for undertaking post-removal site controls and other activities at the Former Kaiser Smelter Site follow EPA-led removal actions in 2020	
711	ADD_CLAIMS_0007890 - 7890	11/24/2020		2021 iPCB/TSCA Workgroup Project Proposals
712	ADD_CLAIMS_0007891 - 7893	11/24/2020		
713	ADD_CLAIMS_0007894 - 7896	11/25/2020		
714	ADD_CLAIMS_0007897 - 7898	11/25/2020		FW: Action Needed - Approach 1 vs (new) Approach 2 and Accuracy of Task Descriptions in Spokane PCB Calculation Revisions
715	ADD_CLAIMS_0007899 - 7902	12/02/2020		PCB-011 and PCB-209 in Spokane Fish from 2012
716	ADD_CLAIMS_0007903 - 7906	12/02/2020		RE: PCB-011 and PCB-209 in Spokane Fish from 2012
717	ADD_CLAIMS_0007907 - 7908	12/03/2020		FW: PCB-011 and PCB-209 in Spokane Fish from 2012
718	ADD_CLAIMS_0007909 - 7909	12/03/2020		
719	ADD_CLAIMS_0007910 - 7910	12/03/2020		
720	ADD_CLAIMS_0007911 - 7912	12/05/2020		RE: Final revised MOA & edits summary
721	ADD_CLAIMS_0007913 - 7913	12/09/2020		RE: Please Review Draft Technical Direction: Groundwater and surface water fingerprinting for Spokane River PCBs
722	ADD_CLAIMS_0007914 - 7916	12/11/2020		FW: Action Required: TT's Edit & Responses to Brian's Questions on Draft Technical Direction: Groundwater and surface water fingerprinting for Spokane River PCBs
723	ADD_CLAIMS_0007917 - 7919	12/11/2020		RE: Action Needed - Approach 1 vs (new) Approach 2 and Accuracy of Task Descriptions in Spokane PCB Calculation Revisions
724	ADD_CLAIMS_0007920 - 7920	12/17/2020		Technical Direction for "Ground Water Surface Water Fingerprinting for Spokane River PCBs" under TSWAP Contract Tetra Tech EP-C-17-046, Task Order 1
725	ADD_CLAIMS_0007921 - 7923	12/18/2020		
726	ADD_CLAIMS_0007924 - 7924	12/23/2020		Congener-level results from Spokane's 2015 product testing

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727	ADD_CLAIMS_0007925 - 7933	01/05/2021		RE: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda
728	ADD_CLAIMS_0007934 - 7942	01/05/2021		RE: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda
729	ADD_CLAIMS_0007943 - 7943	01/08/2021		Final State Legislators request letter
730	ADD_CLAIMS_0007944 - 7947	01/07/2021	Spokane River Regional Toxics Task Force Monsanto PCB Settlement Funding Request Letter	
731	ADD_CLAIMS_0007948 - 7948	01/21/2021	response.epa.gov/site/site_profile.aspx?site_id=14546 Webpage - EPA On-Scene Coordinator Site Profile: Former Kaiser Smelter	
732	ADD_CLAIMS_0007949 - 7949	01/21/2021	apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=1082 Webpage - State of Washington Department of Ecology/Toxics Cleanup/Sites/General Electric Company	
733	ADD_CLAIMS_0007950 - 7950	01/21/2021	apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=7093 Webpage - State of Washington Department of Ecology/Toxics Cleanup/Sites/Kaiser Aluminum and Chemical Corporation	
734	ADD_CLAIMS_0007951 - 7951	01/21/2021	apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=4213 Webpage- State of Washington Department of Ecology/Toxics Cleanup/Sites/Spokane River Upriver Dam and Donkey Island	
735	ADD_CLAIMS_0007952 - 7952	01/25/2021	NPDES Permit No. WA0000825: apps.ecology.wa.gov/Paris/FacilityDetails.aspx?FacilityId=81484342 Webpage - Washington Department of Ecology Water Quality Permitting and Reporting Information System (PARIS) Facility Details for Inland Empire Paper Company	
736	ADD_CLAIMS_0007953 - 7953	01/25/2021	NPDES Permit No. WA0000892: apps.ecology.wa.gov/paris/FacilityDetails.aspx?FacilityId+53481373 Webpage - Washington Department of Ecology Water Quality Permitting and Reporting Information System (PARIS) Facility Details for Kaiser Aluminum and Chemical Corporation (formerly Kaiser Trentwood and Kaiser Ali think uminum Was	

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737	ADD_CLAIMS_0007954 - 7954	01/25/2021	NPDES Permit No. WA 0024473: apps.ecology.wa.gov/paris/FacilityDetails.aspx?FacilityId=55385722 Webpage - Washington Department of Ecology Water Quality Permitting and Reporting Information System (PARIS) Facility Details for Spokane City Advanced Wastewater Treatment Plant (formerly Spokane Riverside Park)	
738	ADD_CLAIMS_0007955 - 7955	01/25/2021	NPDES Permit No. WA 0045144: apps.ecology.wa.gov/paris/FacilityDetails.aspx?FacilityId=56477922 Webpage - Washington Department of Ecology Water Quality Permitting and Reporting Information System (PARIS) Facility Details for Liberty Lake Sewer and Water District	
739	ADD_CLAIMS_0007956 - 7956	01/25/2021	NPDES Permit No. WA 0093317: apps.ecology.wa.gov/paris/FacilityDetails.aspx?FacilityId=3192 Webpage - Washington Department of Ecology Water Quality Permitting and Reporting Information System (PARIS) Facility Details for Spokane County Regional Water Reclamation Facility	
740	ADD_CLAIMS_0007957 - 7957	01/25/2021	srrttf.org/?page-id=3189 Webpage - Spokane River Regional Toxics Task Force, 2014 Spokane River Study, Final QAPP/SAP Documents, QA Documentation, Sampling/Field Documents and Final Report, Phase 2 Final Report and Appendices and other related documents	
741	ADD_CLAIMS_0007958 - 7958	01/25/2021	srrttf.org/?page-id=5061 Webpage - Spokane River Regional Toxics Task Force, 2015 Spokane River Study, Final QAPP/SAP Documents, Reports, Comments on the 06/30/16 Draft, Data, and other related documents	

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742	ADD_CLAIMS_0007959 - 7959	01/25/2021	srrttf.org/?page-id=6608 Webpage - Spokane River Regional Toxics Task Force, 2016 Spokane River Monthly Sampling, Scope of Work, QAPP/SAP Documents, Draft Report 5/4/17, Final Report, Field Report, Data from Limno Tech, and other related documents	
743	ADD_CLAIMS_0007960 - 7960	01/25/2021	srrttf.org/?page-id=8862 Webpage - Spokane River Regional Toxics Task Force, 2017 Spokane River Comparison of Homolog-Patterns	
744	ADD_CLAIMS_0007961 - 7961	01/25/2021	srrttf.org/?page-id=10209 Webpage - Spokane River Regional Toxics Task Force, 2018 Spokane River Studies	
745	ADD_CLAIMS_0007962 - 7962	01/25/2021	srrttf.org/?page-id=1283 Webpage - 2012 SRRTTF Year in Review	
746	ADD_CLAIMS_0007963 - 7963	01/25/2021	srrttf.org/?page-id=3293 Webpage - 2013 SRRTTF Year in Review	
747	ADD_CLAIMS_0007964 - 7964	01/25/2021	srrttf.org/?page-id=2965 Webpage - 2014 SRRTTF Year in Review	
748	ADD_CLAIMS_0007965 - 7965	01/25/2021	srrttf.org/?page-id=6532 Webpage - 2015 SRRTTF Year in Review	
749	ADD_CLAIMS_0007966 - 7966	01/25/2021	srrttf.org/?page-id=9469 Webpage - 2016 SRRTTF Year in Review	
750	ADD_CLAIMS_0007967 - 7967	01/25/2021	srrttf.org/?page-id=8366 Webpage - 2017 SRRTTF Year in Review	
751	ADD_CLAIMS_0007968 - 7968	01/25/2021	srrttf.org/?page-id=4280 Webpage - Spokane River Regional Toxics Task Force Projects/Progress, Education and Outreach, PCB Characterization, Stream Flow, Hatcheries, PCBs in Products, Hydroseed, Data Management, Vactor Waste and other documents	
752	ADD_CLAIMS_0007969 - 7969	01/25/2021		Stormwater data?
753	ADD_CLAIMS_0007970 - 7971	01/25/2021		RE: Stormwater data?
754	ADD_CLAIMS_0007972 - 7973	01/25/2021		Measurable Progress Evaluation - Request for Info

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755	ADD_CLAIMS_0007974 - 7975	01/26/2021		FW: Updated Map Files
756	ADD_CLAIMS_0007976 - 7980	01/26/2021		
757	ADD_CLAIMS_0007981 - 7983	01/28/2021		RE: Stormwater data?
758	ADD_CLAIMS_0007984 - 7987	01/28/2021		FW: Stormwater data?
759	ADD_CLAIMS_0007988 - 7988	01/28/2021		
760	ADD_CLAIMS_0007989 - 7993	01/29/2021		RE: Stormwater data?
761	ADD_CLAIMS_0007994 - 7994	01/29/2021		QA for 2017 ERO stormwater study
762	ADD_CLAIMS_0007995 - 7996	01/29/2021		Another cosine similarity calculation
763	ADD_CLAIMS_0007997 - 7997	02/02/2021		RE: Discharger PCB Data Request
764	ADD_CLAIMS_0007998 - 7999	02/08/2021		RE: QA for 2017 ERO stormwater study
765	ADD_CLAIMS_0008000 - 8031	02/08/2021		
766	ADD_CLAIMS_0008032 - 8033	02/11/2021	2021-02-11 Task Force mass mailer email with agenda for upcoming Tech Track meeting	February 16, 2021 Tech Track Zoom Mtg./Other upcoming mtgs.
767	ADD_CLAIMS_0008034 - 8035	02/16/2021		Re: February TTWG Meeting_ meeting materials
768	ADD_CLAIMS_0008036 - 8036	02/16/2021		
769	ADD_CLAIMS_0008037 - 8037	02/17/2021		intern work on correlation between biofilm and stormwater homolog profiles
770	ADD_CLAIMS_0008038 - 8039	02/17/2021		RE: intern work on correlation between biofilm and stormwater homolog profiles
771	ADD_CLAIMS_0008040 - 8041	02/17/2021		FW: Updated Map Files
772	ADD_CLAIMS_0008042 - 8046	02/17/2021		
773	ADD_CLAIMS_0008047 - 8055	02/17/2021		RE: October 5th 2020 TTWG Meeting 10 am to noon _ Agenda
774	ADD_CLAIMS_0008056 - 8056	02/17/2021		
775	ADD_CLAIMS_0008057 - 8057	02/17/2021		
776	ADD_CLAIMS_0008058 - 8058	02/17/2021		Cos Similarity Analysis
777	ADD_CLAIMS_0008059 - 8059	02/17/2021		
778	ADD_CLAIMS_0008060 - 8060	02/17/2021		
779	ADD_CLAIMS_0008061 - 8061	02/17/2021		

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780	ADD_CLAIMS_0008062 - 8063	02/17/2021		Re: intern work on correlation between biofilm and stormwater homolog profiles
781	ADD_CLAIMS_0008064 - 8065	02/18/2021		RE: intern work on correlation between biofilm and stormwater homolog profiles
782	ADD_CLAIMS_0008066 - 8084	02/19/2021	Washington Department of Ecology and EPA, PPA Water Quality Program Status Report for July 1 - Dec 31, 2018	
783	ADD_CLAIMS_0008085 - 8086	02/22/2021	2021-02-22 E-mail regarding intern work on correlation between biofilm and stormwater homolog profiles	RE: intern work on correlation between biofilm and stormwater homolog profiles
784	ADD_CLAIMS_0008087 - 8089	02/23/2021		FW: Draft Meeting Notes_ February TTWG Meeting
785	ADD_CLAIMS_0008090 - 8094	02/23/2021		
786	ADD_CLAIMS_0008095 - 8096	02/24/2021		RE: Tetra Tech MFT: Revised PCB Mass Balance Analysis for Spokane River / Kaiser Site
787	ADD_CLAIMS_0008097 - 8098		Washington Department of Ecology Attachment: Summary of TMDLs in development	
788	ADD_CLAIMS_0008099 - 8099		Washington Department of Ecology Attachment: TMDL deliverables	
789	ADD_CLAIMS_0008100 - 8100		Washington Department of Ecology Attachment: Excel Sheet2 Dropdown menus	
790	ADD_CLAIMS_0008101 - 8101		Washington Department of Ecology email attachment: Excel Sheet List of Projects	
791	ADD_CLAIMS_0008102 - 8110		Washington Department of Ecology Email Attachment: Description of EPA's new WQ-27 and -28 Measures and Ecology's proposed priorities original (undated)	
792	ADD_CLAIMS_0008111 - 8112	03/05/2021		RE: iPCB/TSCA Workgroup Updates?
793	ADD_CLAIMS_0008113 - 8116	03/05/2021		RE: Spokane River PCB Fingerprinting Analysis Arrived - Request for TT Set Up Call to Discuss
794	ADD_CLAIMS_0008117 - 8121	03/08/2021		RE: Comments on Spokane River PCB Fingerprinting Analysis - Ready to Pass Them on to Tetra Tech?
795	ADD_CLAIMS_0008122 - 8123	03/08/2021		RE: Call to review and discuss Draft Revision of the PCB mass balance calculations

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796	ADD_CLAIMS_0008124 - 8124	03/08/2021		
797	ADD_CLAIMS_0008125 - 8125	03/08/2021		
798	ADD_CLAIMS_0008126 - 8126	03/08/2021		
799	ADD_CLAIMS_0008127 - 8163	03/08/2021		
800	ADD_CLAIMS_0008164 - 8164	03/08/2021		
801	ADD_CLAIMS_0008165 - 8165	03/08/2021		
802	ADD_CLAIMS_0008166 - 8166	03/08/2021		
803	ADD_CLAIMS_0008167 - 8167	03/08/2021		
804	ADD_CLAIMS_0008168 - 8168	03/08/2021		
805	ADD_CLAIMS_0008169 - 8169	03/08/2021		
806	ADD_CLAIMS_0008170 - 8170	03/08/2021		
807	ADD_CLAIMS_0008171 - 8171	03/08/2021		
808	ADD_CLAIMS_0008172 - 8172	03/08/2021		
809	ADD_CLAIMS_0008173 - 8173	03/08/2021		
810	ADD_CLAIMS_0008174 - 8174	03/08/2021		
811	ADD_CLAIMS_0008175 - 8175	03/08/2021		
812	ADD_CLAIMS_0008176 - 8176	03/08/2021		
813	ADD_CLAIMS_0008177 - 8177	03/08/2021		
814	ADD_CLAIMS_0008178 - 8182	03/08/2021		RE: Spokane River PCB Fingerprinting Analysis Arrived - Request for TT Set Up Call to Discuss
815	ADD_CLAIMS_0008183 - 8188	03/08/2021		RE: Comments on Spokane River PCB Fingerprinting Analysis - Ready to Pass Them on to Tetra Tech?
816	ADD_CLAIMS_0008189 - 8190	03/08/2021		March 24, 2021 SRRTTF meeting cancellation/Safer Products for WA webinars info.
817	ADD_CLAIMS_0008191 - 8195	03/08/2021		RE: Spokane River PCB Fingerprinting Analysis Arrived - Request for TT Set Up Call to Discuss
818	ADD_CLAIMS_0008196 - 8202	03/10/2021		RE: Comments on Spokane River PCB Fingerprinting Analysis - Ready to Pass Them on to Tetra Tech?
819	ADD_CLAIMS_0008203 - 8204	03/11/2021		RE: Call to review and discuss Draft Revision of the PCB mass balance calculations

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820	ADD_CLAIMS_0008205 - 8243	03/11/2021		
821	ADD_CLAIMS_0008244 - 8246	03/13/2021		RE: Call to review and discuss Draft Revision of the PCB mass balance calculations
822	ADD_CLAIMS_0008247 - 8285	03/13/2021		
823	ADD_CLAIMS_0008286 - 8287	03/14/2021		FW: Proposal to Create a Spokane River PCB TMDL Using Monsanto Settlement Funds
824	ADD_CLAIMS_0008288 - 8292	03/14/2021		
825	ADD_CLAIMS_0008293 - 8294	03/15/2021		RE: Call to review and discuss Draft Revision of the PCB mass balance calculations
826	ADD_CLAIMS_0008295 - 8333	03/15/2021		
827	ADD_CLAIMS_0008334 - 8335	03/16/2021		RE: Call to review and discuss Draft Revision of the PCB mass balance calculations
828	ADD_CLAIMS_0008336 - 8338	03/16/2021		
829	ADD_CLAIMS_0008339 - 8341	03/16/2021		
830	ADD_CLAIMS_0008342 - 8342	03/16/2021		Riverkeeper letter/SRRTTF response letter to Gov. Inslee
831	ADD_CLAIMS_0008343 - 8346	03/03/2021	Letter from Jerry White, Spokane Riverkeeper, to Governor Jay Inslee; attachment to email	
832	ADD_CLAIMS_0008347 - 8351	03/18/2021	Draft Task Force Letter from Task Force to Governor Jay Inslee; Attachment to email	
833	ADD_CLAIMS_0008352 - 8353	03/17/2021		RE: Riverkeeper letter/SRRTTF response letter to Gov. Inslee - ACTION SUSPENDED
834	ADD_CLAIMS_0008354 - 8370	03/18/2021	Washington Department of Ecology and EPA, PPA Water Quality Program Status Report for July 1 - Dec 31, 2017	
835	ADD_CLAIMS_0008371 - 8376	03/22/2021	Washington Department of Ecology Environmental Assessment Program Technical Memo regarding Spokane River Central Tendency for PCBs in accordance with the US EPA schedule (meet 200 pg/L insteam concentration of total PCBs by December 15, 2020)	

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836	ADD_CLAIMS_0008377 - 8377	03/24/2021	Email from Karl Rains, WA Department o fEcology to Brian Nickel, U.S. EPA Region 10 regarding the final Ecology Central Tendency technical memorandum	
837	ADD_CLAIMS_0008378 - 8383			
838	ADD_CLAIMS_0008384 - 8421		2016 TMDL Workload Assessment	TDML workload
839	ADD_CLAIMS_0008422 - 8437		Washington Department of Ecology and EPA, PPA Water Quality Program Status Report for Jan 1. – June 30, 2017	
840	ADD_CLAIMS_0008438 - 8466		Washington Department of Ecology and EPA, PPA Water Quality Program Status Report for for January - June 2019	

Session 2: Fish

Presenters: Dave Dilks – LimnoTech; Cheryl Niemi – Ecology Water Quality Program; Dave McBride – WA State Department of Health; Brandee Era-Miller – Ecology EAP; and Will Hobbs – Ecology EAP

Session Focus: This session will provide an understanding of how concentrations of PCBs in fish from the Spokane River relate to the 303(d) list of Impaired Waterbodies, State water quality criteria for the protection of human health, and the Department of Health's fish consumption advisory process. The outcome of this session will guide how this information can be used to help shape the future goals, studies and endpoints supported by SRRTTF.

Outline:

- General Overview: Fish tissue and water quality standards, fish tissue listings, "How did we get here?" High level explanation of bioconcentration factors (BCFs) vs. bioaccumulation factors (BAFs) as they relate to fish exposure in the Spokane River. Discussion of existing food chain modeling for the Spokane River (**Dave Dilks**) – **20 minute** presentation followed by **10 minutes** for questions. (*1:30 – 2 pm*).
- Policy Presentation: How Ecology uses fish tissue data for the 303(d) Water Quality Assessment and how that relates to Water Quality Standards. Brief update on current rulemaking. (**Cheryl Niemi**) – **30 minute** presentation followed by **30 minutes** for questions. (*2 – 3 pm*).
- Policy Presentation: How the Department of Health uses fish tissue data for fish consumption advisories, cover current information for the Spokane River (**Dave McBride**) – **20 minute** presentation followed by **10 minutes** for questions. (*3 – 3:30 pm*).
- **Break – 15 minutes**
- Data and Future Research: Summary of fish tissue data, general observations and update on upcoming Spokane Hatchery Study (**Brandee Era-Miller**) – **20 minute** presentation followed by **10 minutes** for questions. (*3:45 – 4:15 pm*).
- Time lag in fish response to decreased loading: Examples of other systems, what to expect for the Spokane River. (**Will Hobbs**) – **30 minute** presentation followed by **15 minutes** for questions. (*4:15 – 5 pm*).

Questions to be addressed:

- What is the difference between Bioconcentration factors (BCFs) and bioaccumulation factors (BAFs)? BCFs are based on EPA studies from the 1980's, is this data relevant?
- Why are the 303(d) Listings for PCBs in the Spokane River based on fish tissue and not water column data? Which end point should SRRTTF focus on?
- What will be the impact of rulemaking to the human health-based water quality standards in WA and ID?
- Do the concentrations of PCBs observed in the water column explain the concentrations we are seeing in fish tissue (or do water column concentrations imply a secondary source)?
- Can the congener distribution in the water column and the congener distribution in fish tissue be used to make any inferences about exposure pathways (and hence, relevant BMPs)?
- We know that there is a time lag in how fish respond to decreased loadings of contaminants in a waterbody. What can we reasonably expect for the Spokane River?
- Future goals, and identify additional research and data?

Measurable Progress Notes

Background

- 2011 NPDES permits
  - Include a new comprehensive approach towards addressing point and nonpoint sources of PCBs.
  - Provide the structure of the SRRTTF and specific tasks for 2011-2016.
  - Ecology maintains its regulatory authority to require a TMDL if this approach does not work.
  - Ecology's role is to evaluate Measurable Progress during the permit lifetime.
- 2014 Ecology defined Measurable Progress
- 2015 Ecology evaluated Measurable Progress evaluati

Relationship between Permits and Task Force

- Permittees are required to participate on the Task Force
- Ecology's obligation to pursue a TMDL or other option is triggered if the *Task Force* fails to make measureable progress
- The Memorandum of Agreement outlines the collaborative effort

Measurable Progress Framework

- Inputs: Organizing activities and resources devoted to the effort
- Outputs: Activities and work products completed during the evaluation period.
- Outcomes: Environmental Indicators of progress
  - Trends and/or measured reductions
  - Achievement of water quality standards
  - Achievement of health standards (fish advisories removed)
- Outcomes of higher importance once Task Force capacity is established.

Key Questions

From 1/1/2012 – 12/31/2014

- Is the Task Force still working together collaboratively?
- Is the Task Force moving forward on activities that will
  - Identify sources
  - Reduce PCBs in the river
  - Develop best management practices
  - Create a Comprehensive Plan towards achieving water quality standards?
- Is there environmental evidence of progress?

Evaluation of Inputs: Achieved

- Task Force established its protocols and held regular meetings
- Decisions were made and actions taken
- Contracting entity established
- Financial resources garnered and applied
  - By Task Force
  - By individual members
- Independent third party advisors selected
  - Ruckleshaus Center (meeting facilitation)
  - LimnoTech (technical consultant)

Evaluation of Outputs: Achieved

- The Task Force and individual organizations completed more than
  - 30 reports
  - 12 plans
  - 2 workshops
  - 11 contracts
  - 4 new permits
- Better characterization of amounts, sources, and locations of PCBs
- Semi-quantitative assessment of loading
- Identification of areas on interest for further study
- Characterization of PCB sources in Toxics Management Plans

Evaluation of Outputs: Partially Achieved

- Measurable quantities of PCBs were eliminated
  - Stormwater maintenance
  - Remedial clean up Transformer removal
  - Wastewater treatment plants
- Ambient water quality data shows PCB concentrations are generally below the 170 ppq water quality standard, with some exceptions
- Possible decrease in PCB concentrations in fish since 2005
  - Not statistically significant

Adaptive Management

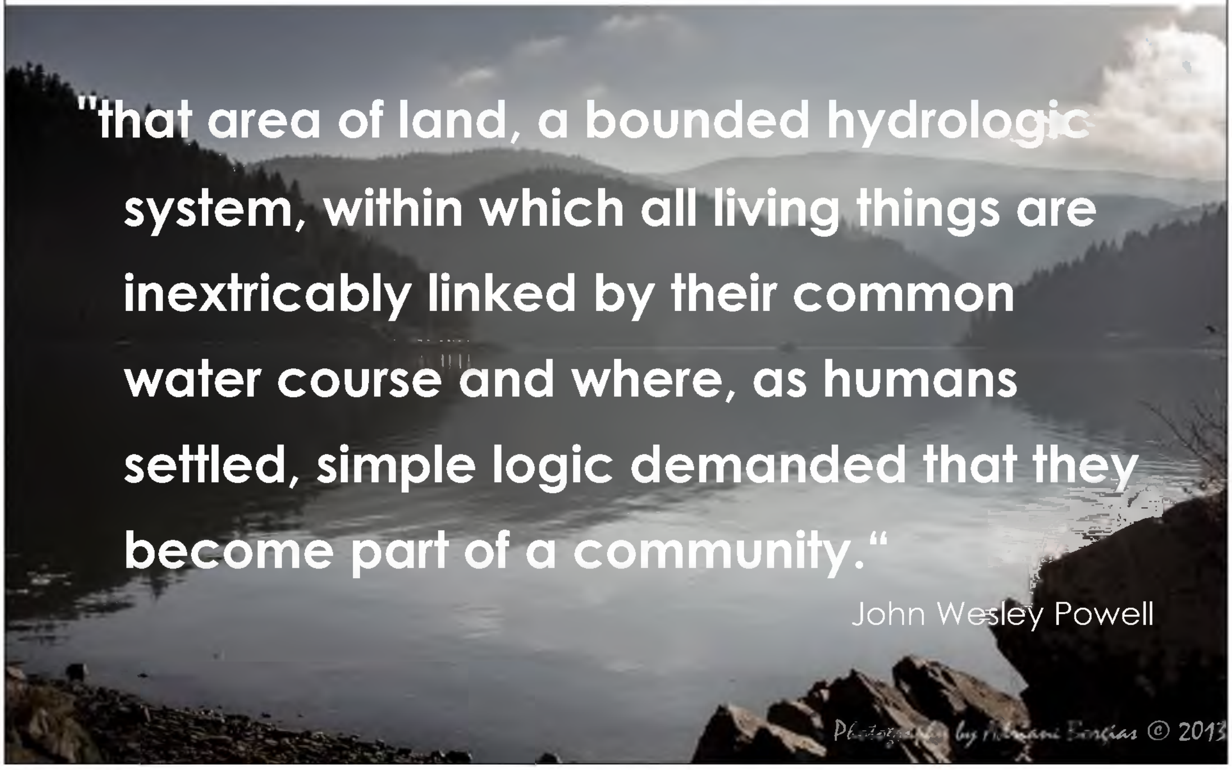
Key Task Force Recommendations

- Complete the Comprehensive Plan by December 2016
  - Include targets and milestones for achieving water quality standards
- Create a 5-year Strategic Plan with
  - Short term goals and strategies
  - Needed financial and technical assistance
  - Adapt Toxics Management Plans towards achieving goals
- NPDES Permits
  - Identify milestones for achieving water quality goals
  - Best Management Practices
- Measure Progress
  - Monitoring program
  - Annual report
  - Adaptive measures

Today I will be talking about the Spokane River and the efforts to find and reduce toxic inputs to the river (specifically PCB).

This will be a very high level overview and the points I would like you to take with you are this:
When it comes to toxics and clean water "end of pipe" are "easy" for regulators but are not sustainable in the long run.
Traditional regulatory tools alone won't get us to the water quality standards: we need to find a better way.
Finite resources means better collaboration, communication, and relationships at all levels.
Don't focus on the end point but the process: identify milestones, measure, and adapt.

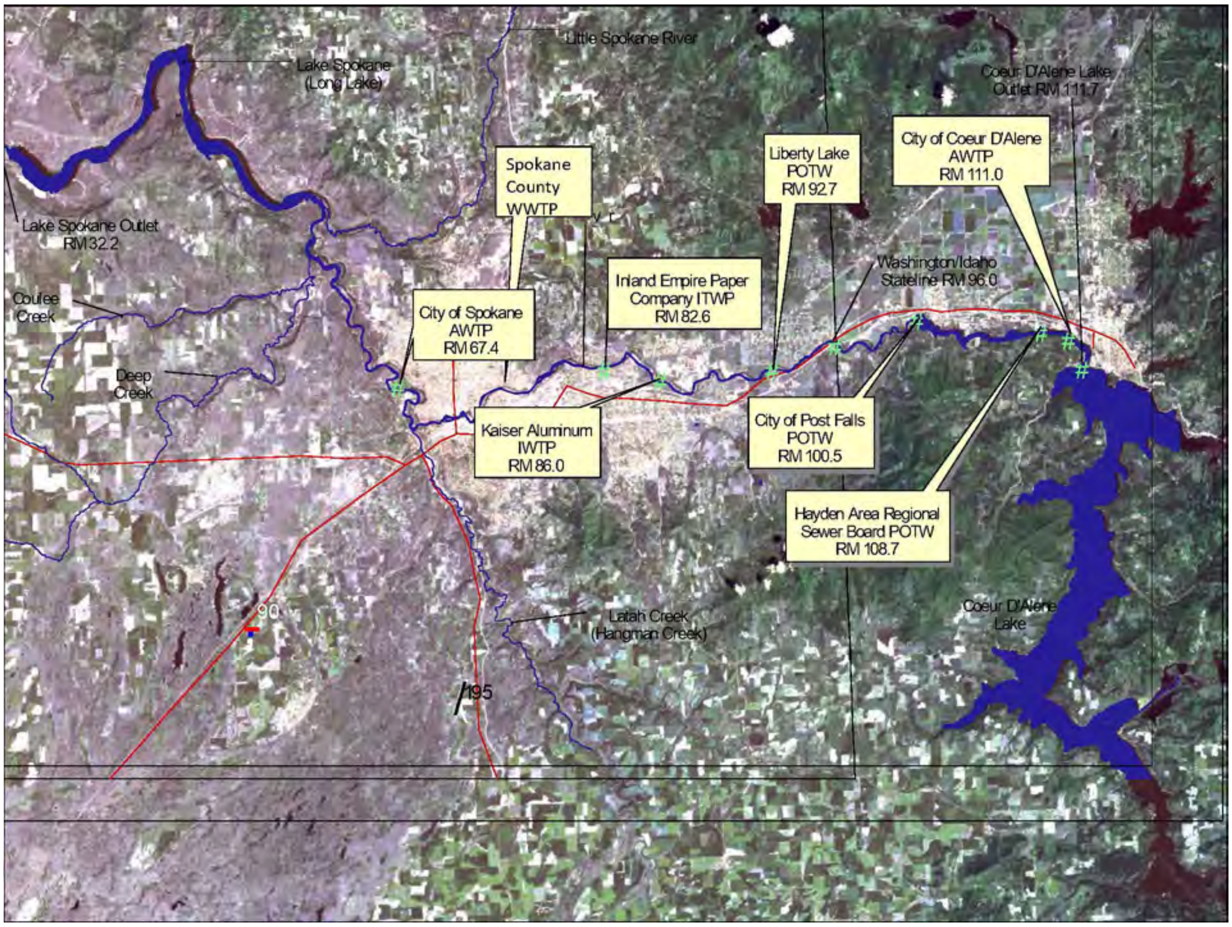
Solutions at the Watershed Level



People ask why the SRRTTF is successful. There are many reasons. One reason this works well in Spokane is that we have a defined watershed.

Although it crosses political boundaries, we are linked ecologically, economically, and culturally by the water that flows above and below ground.

Solutions at the watershed level work because people care about their own geography.



Introduction

Spokane River 111 miles long: river and aquifer system
Flows east to west, starting at the outlet to Lake Coeur d'Alene in Idaho:
3 Washington cities, 3 Idaho cities
7 hydro dams
Flows through the Spokane Indian Reservation and empties into the Columbia River.

Multiple stakeholders
EPA, Washington, Idaho, Tribes, Permittees

Economic Engine for the area (Kaiser Aluminum, Inland Empire Paper, and Avista) are major users of the River.

Maps shows locations of the water permit holders.

Satellite View of Spokane River system from Lake Coeur D'Alene through Long Lake

River headwaters are Lake Coeur D'Alene
Passes through the City of Coeur D'Alene and Post Falls
Post Falls Dam forms a reservoir upstream (hydro)
Idaho/Washington border through Liberty Lake
Run of the river dam called Upriver Dam (hydro)
Downtown Spokane flood gates and Monroe St. Powerhouse (hydro)
Nine Mile Dam
Into Long Lake (formed by another hydro dam)

Spokane River flows through downtown Spokane.
What was once a highly industrialized area is now a park.
Cultural icon currently and for the Spokane Tribe since time immemorial.
Recreational resource: Less than mile from downtown the urban river takes on wilderness characteristics

The Problem

Key
The problem is that the Spokane River does not meet water quality standards for PCBs: Washington = 170 ppq; Spokane Tribe = 1.34 ppq

These low concentrations difficult to characterize and there are no known end of pipe treatments that will remove PCBs to acceptable levels.

To put this in perspective, 1 ppq is the equivalent of looking for a penny in the state of Washington
Can you find the penny?

These low concentrations require an approach that goes beyond traditional water quality regulation.

PCBs, for example can be found in all environmental media: air, water, soil, consumer products, wastes. Preventing and reducing water pollution, therefore requires an all agency approach.

"Every penny counts" in this scenario and as an agency all of our programs play a part in the ultimate solution.

The clean up of toxics from our waters requires Ecology to pursue innovative strategies.

In Spokane this has taken the form of community based problem solving.

Key points:

For PCBs (and also for some of the other toxics), our suite environmental laws--the tools we as an agency use to protect the environment--are not sufficient to protect water quality at the level required by our standards.

For example, many people are not aware that PCBs can be present in electrical equipment and consumer products at allowable levels that are a billion times greater than the water quality standards.

As a persistent substance, PCB is not easily destroyed. This means that when PCBs are present recycling, traditionally thought to good for the environment, actually disperses PCB back into the supply stream, where it is essentially unregulated. This fact applies to other toxics, such as PBDEs although we have less information about them and their pathways to water..

PCBs potentially affect all of the major recycling industries. The most significant industries being newspaper, paint, motor oil, and autoshredder waste.

All of these recycled products had or will have allowable levels of PCB well above the water quality standard. Once in use, they become potential sources of contamination to the Spokane River through permitted discharges, stormwater, and improper management.

Example: Hydroseed

Here is an example of a product that is currently in use and one that needs further attention.

Hydroseed is a recommended best management practice for control of erosion, and an option that is used in hard to reach areas.

It is used after construction, remediation projects, and forest fires to control erosion and prevent sediment from reaching waterways. Hydroseed can be applied adjacent to waterways.

In 2014 the City of Spokane, with the assistance of an Ecology grant, tested a series of products that had the potential to affect stormwater or wastewater.

Hydroseed was one of the products that was tested.

The test revealed that this particular product contained PCB at 2.5 ppm.

This amount of PCB is allowable under TSCA and hazardous waste regulations; but it exceeds MTCA clean up standards and is 1,000,000,000 times more concentrated than our water clean up goal.

The Task Force worked with the major hydroseed manufacturers and retested. Results showed significantly lower concentrations (ppb vs. ppm).
The components include dye and also the tackifier
State of Washington is using its purchasing authority to encourage PCB-free applications.
Final Report: http://srrttf.org/wp-content/uploads/2015/03/Hydroseed-Pilot-Project-Report-FINAL.pdf

This an example of what we are trying to address in Spokane.
Identifying the specific threats
Removing the threats from the environment

Using the tools and process to address the problem
Both within the agency and with other agencies (DOT, DES, etc.)

SPOKANE RIVER
REGIONAL TOXICS TASK FORCE

COLLABORATION INNOVATION PROGRESS

Community Based Problem Solving

AVISTA · DEPARTMENT OF ECOLOGY State of Washington · LAKE SPOKANE ASSOCIATION · KAISER ALUMINUM · UNITED STATES ENVIRONMENTAL PROTECTION AGENCY · CITY OF SPOKANE · Washington State Department of Health · INLAND EMPIRE PAPER COMPANY Papermakers since 1911. · SPOKANE REGIONAL HEALTH DISTRICT · THE LANDS COUNCIL · SPOKANE COUNTY · LIBERTY LAKE SEWER & WATER DISTRICT · Spokane RIVERKEEPER®

[DateTime]

In Spokane, the task of addressing these challenges, was taken on by the local community in 2012.

The Spokane River Regional Toxics Task Force was formed and is governed by a Memorandum of Agreement.

The participants on the Task Force currently include:

5 NPDES permit holders (WA) required to join as a permit condition
3 Environmental groups joined by invitation
Agencies and Sovereigns have an advisory role (WA, ID, EPA, tribes)
The Department of Ecology, Department of Health, and Spokane Regional Health District are signatories to the MOA.

Purpose is to identify and remove sources of toxics (specifically PCB and dioxin) to the Spokane River.

Principles of Collaboration

- Purpose-driven
- Inclusive, Not Exclusive
- Educational
- Voluntary
- Self-Designed
- Flexible
- Egalitarian
- Respectful
- Accountable
- Time Limited
- Achievable

These are the ten principles of the collaborative process. A successful process includes these principles in the rules of engagement.

In Spokane, these principles are incorporated into the SRRTTF MOA.

I will not go through these in detail, but I will offer some observations:

Collaboration works when people want it to.
Leave the past behind: Focus on the vision.
Solve real problems and issues, not "themes."
Appreciate the other party: Don't stereotype.
A partnership is mutually beneficial.
Take appropriate responsibility and expect the same for others.
Respect the timeline.

Additional notes ---
Purpose-Driven. People need a reason to participate in the process.
· Inclusive, Not Exclusive. All parties with a significant interest in the issue should be involved.
· Educational. The process relies on the use of the best available information and allows for collaborative inquiry.
· Voluntary. The parties who are affected or interested participate voluntarily.
· Self-Designed. All parties have an equal opportunity to participate in designing the process.
The process must be explainable and designed to

meet the circumstances and needs of the situation.

· Flexible. Flexibility should be designed into the process to accommodate changing issues, data needs, political environment, and programmatic constraints such as time and meeting arrangements.

· Egalitarian. All parties have equal access to relevant information and the opportunity to participate effectively throughout the process.

· Respectful. Acceptance of the diverse values, interests, and knowledge of the parties involved in the collaborative process is essential.

· Accountable. The participants are accountable both to their constituencies and to the process that they have agreed to establish.

· Time Limited. Realistic deadlines are necessary throughout the process.

· Achievable. Commitments to implementation and effective monitoring are essential parts of any agreement.

http://www.ces.ncsu.edu/depts/agecon/WECO/publication/WatershedCollaborating.PDF

Key points

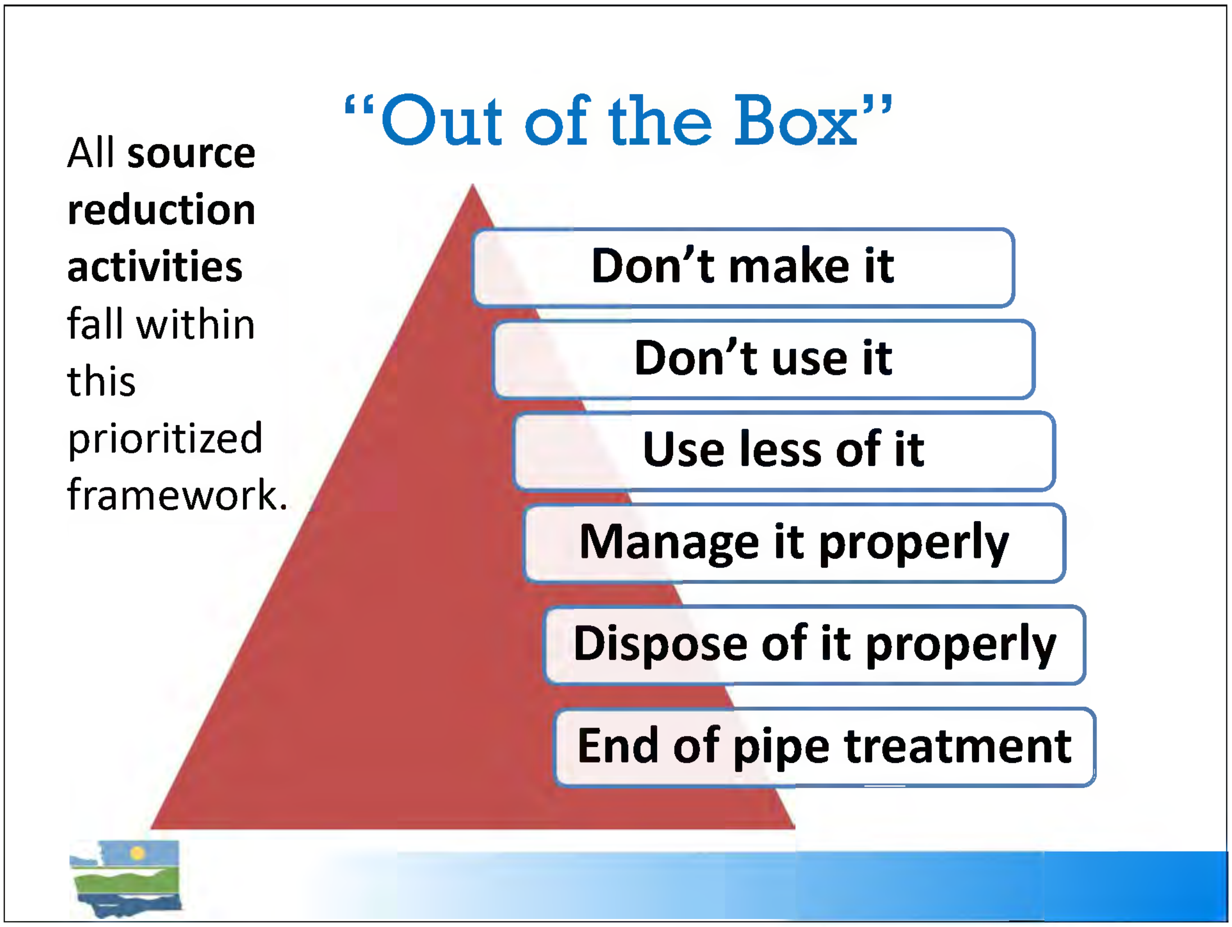
The reality to the situation is that the solutions to the problem are multifaceted.

It is like a set of gears meshed together.

All of these pieces are in play all the time. At some moments, some gears are turning, some help and some work against each other.

"Every penny counts," we work on the areas that are going to give us the best opportunity to make progress.

For example, today the discussion is around the red piece in the middle: how Ecology's regulatory program can help address this problem through
Regulation
Cross media actions
Elimination of new sources.



Key points:

This is another view of the previous diagram.

Every action that we do fits within one of these bullets.

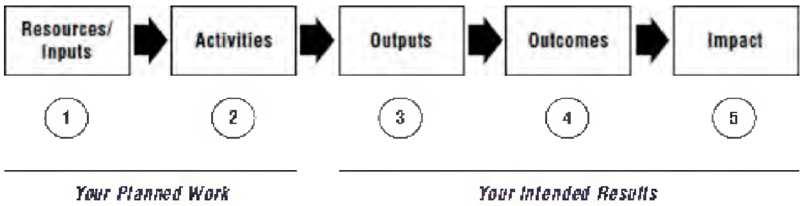
Traditional regulation focuses on the last one: end of pipe treatment.

However, as water quality standards become more restrictive, the need to focus at actions at the top of the list becomes more important.

End of pipe treatment is expensive. Common wisdom says that in the long run the most cost effective actions are at the top of the list.

This is the essence of Ecology's "Prevent and Reduce Toxic Threats" initiative.

How Do We Know it is Working?



Definition of **Measurable Progress**

– Are we working together? (inputs)

– Are we doing things? (outputs)

– Are we seeing results? (outcomes)

We are using an innovative process to achieve clean water

Ecology is required to follow the Clean Water Act.
Our role specified in our MOA is to ensure that the Task Force is making progress (the accountability piece).

In a nutshell, making progress means that the Task Force is working together, doing what they say they will do (as specified in the MOA), and in the long run that we see results (making reductions in sources and ulitmately achieving the water quality standard).

This is, an innovative approach. A lack of measurable progress means that Ecology has a obligation to pursue the traditional regulatory approach towards achieving clean water.

Spokane River
Measurable Progress Evaluation

January 1, 2012 – December 31, 2014

DEPARTMENT OF
ECOLOGY
State of Washington

This is an overview of the Measurable Progress Determination performed by Ecology on the activities of the Spokane River Regional Toxics Task Force.

January 1, 2012 – December 31, 2014.

The time period was chosen to reflect 3 complete years from the point of the previous permit issuance and in preparation for the next permit cycle.

The next evaluation period is expected to be January 1, 2015 through December 31 2019, representing the next permit cycle.

First the good news . . . .

Ecology has determined that the Spokane River Regional Toxics Task Force **has made measurable progress.**

First the good news.

Now let's talk about how we got to this point.

First I want to point out that the details of this talk are in the document that you can find online.

As you recall, the original concept of "Measurable Progress was written into the permits and also the MOA.

The key idea is that permittees are required to participate on the Task Force and the Task Force (collectively) must make "measurable progress" in order for Ecology to support the collaborative process.

This is a new concept and has been a learning experience. The first of which was to come to an understanding of what Measurable Progress means.

After meetings with a variety of stakeholders, Ecology developed the definition; essentially an adaptive management process, which is posted the Task Force Website.

Why Measure Progress?

- Toxics reductions require a new strategy
- Ecology maintains its authority to pursue
  - A traditional TMDL
  - Or other approach
- Ecology's evaluation criteria
  - Inputs, outputs, outcomes
  - Contained in the "Measurable Progress" definition

Toxics reductions require a new strategy
A traditional TMDL establishes limits before action.
The new approach starts with action.

Ecology maintains its TMDL authority
Requires a traditional TMDL if this approach does not work

Ecology measures progress to evaluate effectiveness

Failure to make measurable progress requires Ecology to act

This is not "Business as Usual", But More

What does this mean?

In simple terms, Ecology asks the questions:

Did the Task Force
- Successfully work together?
- Achieve its stated objectives?
- Reduce toxic inputs to the Spokane River?




The Answer is "Yes!"

The Process

1. Establish the definition
2. Collect data
3. Evaluate against criteria
4. Make recommendations

The Findings . . .

We collected information from the website, the permittees, and other sources for this time period, specifically:

From 1/1/2012 – 12/31/2014

We were looking for evidence of the following:
Is the Task Force still working together collaboratively?
Is the Task Force moving forward on activities that will
Identify sources
Reduce PCBs in the river
Develop best management practices
Create a Comprehensive Plan towards achieving water quality standards?
Is there environmental evidence of progress?
We created a set of recommendations to inform the next step in the permits and Task Force activities.

Inputs: Achieved!

- Protocols and regular meetings
- Decisions and actions
- Contracting entity
- Financial resources garnered and applied
- Independent third party advisors selected
  - Ruckleshaus Center (meeting facilitation)
  - LimnoTech (technical consultant)

The Task Force and individual organizations completed more than
30 reports
12 plans
2 workshops
11 contracts
4 new permits
Better characterization of amounts, sources, and locations of PCBs
Semi-quantitative assessment of loading
Identification of areas on interest for further study
Characterization of PCB sources in Toxics Management Plans

Outcomes: Partially Achieved!

The good news:

- Measurable quantities of PCBs eliminated
- Ambient river water generally meets WQS

More work needed:

- Some high concentrations found
- Areas with groundwater inputs
- PCB concentrations in fish require health advisories
  - Decrease since 2005 not statistically significant

For this section of the evaluation we used data that extended previous to the 3 year evaluation period.

One reason is that the data Ecology used to do the 2007 loading assessment is now 20 – 40 years old.

We received information about significant work (specifically clean up activities by Kaiser) that warranted recognition.

Other examples of measurable quantities of PCBs were eliminated
Stormwater maintenance
Remedial clean up Transformer removal
Wastewater treatment plants

Ambient water quality data shows PCB concentrations are generally below the 170 ppq water quality standard, with some exceptions
Possible decrease in PCB concentrations in fish since 2005
Not statistically significant

Task Force Recommendations

- **Complete the Comprehensive Plan by December 2016**
  - Include targets and milestones for achieving water quality standards
- **Create a 5-year Work Plan with**
  - Short term goals and strategies
  - Needed financial and technical assistance

Permitting Recommendations

- **Consider EPA's permitting recommendations**
- **Adapt Toxics Management Plans towards achieving goals**
  - Implement Best Management Practices
  - Evaluate Effectiveness
  - Practice Adaptive Management
- **Measure Progress**
  - Monitor
  - Report Annually

In summary

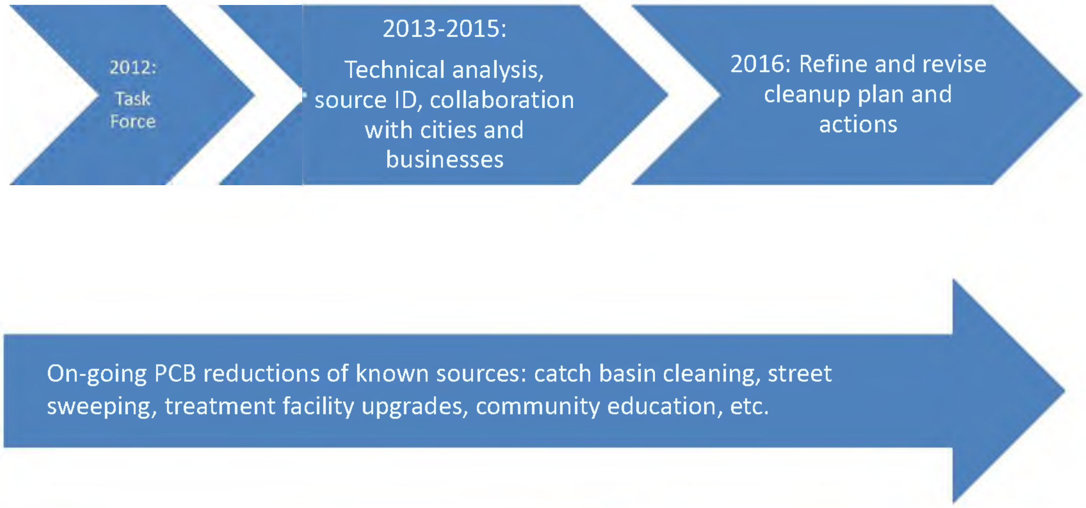
You have probably run into people that say what we are doing is impossible.

The Measurable Progress evaluation is an important accountability piece of this collaborative model.

But this is a good example of how problem solving can occur outside the regulatory environment.

Create the long term vision
Work toward short term goals
Measure and report success
Adapt and improve the process

Timeline


2012:
Task
Force
2013-2015:
Technical analysis, source ID, collaboration with cities and businesses
2016: Refine and revise cleanup plan and actions
On-going PCB reductions of known sources: catch basin cleaning, street sweeping, treatment facility upgrades, community education, etc.

Issue Date:
Effective Date:
Expiration Date:

National Pollutant Discharge Elimination System Waste Discharge Permit No. WA0024473

State of Washington
DEPARTMENT OF ECOLOGY
Eastern Regional Office
4601 North Monroe Street
Spokane, WA 99205-1295

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

City of Spokane Riverside Park Water Reclamation Facility and Combined Sewer Overflows (CSOs)
4401 N. Aubrey L. White Parkway
Spokane, Washington 99205

is authorized to discharge in accordance with the Special and General Conditions that follow.

Plant Location: 4401 N. Aubrey L. White Parkway	Receiving Water: Spokane River CSO Outfalls: 20 Outfalls
Treatment Type: Activated Sludge	

____

James M. Bellatty
Water Quality Section Manager
Eastern Regional Office
Washington State Department of Ecology

Table of Contents

Summary of Permit Report Submittals

Permit Section	Submittal	Frequency	First Submittal Date
All permit required submittals must be submitted electronically through the WQWebPortal.			
S3.A	Discharge Monitoring Report (DMR)	Monthly	XXXX 15, 2016
S3.A	Permit Renewal Application Monitoring Data	1/permit cycle	August 1, 2020
S3.F	Reporting Permit Violations	As necessary	-
S4.B	Plans for Maintaining Adequate Capacity	As necessary	-
S4.D	Notification of New or Altered Sources	As necessary	-
S4.F	Wasteload Assessment	Annually	April 1, 2017
S5.F	Bypass Notification	As necessary	-
S5.G	Operations and Maintenance Manual Update or Review Confirmation Letter	Annually	April 1, 2017
S6.A.2	Accidental Spill Plan Update	1/permit cycle	April 1, 2017
S6.A.5	Pretreatment Report	1/year	April 1, 2017
S6.A.6	Request to Make Changes to Pretreatment Program	As necessary	-
S8.	Application for Permit Renewal	1/permit cycle	Insert date from S8
S9.	Compliance Schedule	Once	March 1, 2021
S10.	Spill Control Plan Submittal "or" Update	As necessary	-
S11.	Receiving Water and Effluent Study of Temperature – Quality Assurance Plan	1/permit cycle	December 1, 2016
S11.	Receiving Water and Effluent Study of Temperature Results	Annually	December 31, 2017
S12.	Receiving Water Study – Quality Assurance Plan	1/permit cycle	December 1, 2017
S12.	Receiving Water Study Results	1/permit cycle	December 31, 2018
S13.	BMP Implementation Plan – Quality Assurance Project Plan	1/permit cycle	November 1, 2016

Permit Section	Submittal	Frequency	First Submittal Date
S13.	BMP Implementation Plan	Annually	April 1, 2017
S13.	Technical Memo for NLT Toxics Influent Loading Design Criteria	1/permit cycle	August 1, 2020
S15.B	Combined Sewer Overflow Report	Annually	May 1, 2017
S15.C	Combined Sewer Overflow Reduction Plan Amendment	As necessary	-
S15.D	Combined Sewer Overflow Reduction Specific Project Milestones/Goals	Once	December 31, 2017
S15.G	Combined Sewer Overflow Control Requirements	Annually	See S15.G
S16.A	Acute Toxicity Effluent Test Results - Submit with Permit Renewal Application	Once	August 1, 2020
S17.A	Chronic Toxicity Effluent Test Results with Permit Renewal Application	Once	August 1, 2020
G1.	Notice of Change in Authorization	As necessary	-
G4.	Reporting Planned Changes	As necessary	-
G5.	Engineering Report for Construction or Modification Activities	As necessary	-
G7.	Notice of Permit Transfer	As necessary	-
G10.	Duty to Provide Information	As necessary	-
G20.	Compliance Schedules	As necessary	-
G21.	Contract Submittal	As necessary	-

Special Conditions

S1. Discharge limits

S1.A. Interim Effluent limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a level in excess of, that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on the effective date of this permit **until February 28, 2021**, the Permittee may discharge treated domestic wastewater **to the Spokane River** at the permitted location subject to compliance with the following limits:

Interim Effluent Limits: Outfall 005 March through October Latitude 47.695278 Longitude 117.473889		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5-day) (BOD_5)	30 milligrams/liter (mg/L) 10,374 pounds/day (lbs/day) 85% removal of influent BOD_5	45 mg/L 15,562 lbs/day
Total Suspended Solids (TSS)	30 mg/L 10,660 lbs/day 85% removal of influent TSS	45 mg/L 15,990 lbs/day
Total Phosphorus (as P)	0.63 mg/L	0.95 mg/L
Total PCB (Interim)	0.0027 µg/L	0.0041 µg/L
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100/100 milliliter (mL)	200/100 mL
Parameter	**Average Monthly**	**Maximum Daily [d]**
Total Residual Chlorine	3.12 lbs/day	14.26 lbs/day
Total Ammonia (as N)	3.1 mg/L	7.5 mg/L
Zinc (Total Recoverable)	52.3 µg/L	61.3 µg/L
Lead (Total Recoverable)	0.76 µg/L	0.95 µg/L
Cadmium (Total Recoverable)	0.094 µg/L	0.12 µg/L

Interim Effluent Limits: Outfall 005 March through October Latitude 47.695278 Longitude 117.473889		
Total PCB (Final) [e]	--	0.00017 µg/L

a	Average Monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.
b	Average Weekly discharge limit means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges' measured during that week. See footnote c for fecal coliform calculations.
c	Ecology provides directions to calculate the monthly and the weekly geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf
d	Maximum Daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.
e	The final PCB effluent limit becomes effective starting with the 2026 permit cycle. The final limit listed applies to effluent at the end of pipe and not at the edge of the chronic mixing zone. Ecology will reassess this final water quality based effluent limit based on the ongoing reduction of PCBs discharged to the River, and the collection of additional data. Ecology may also establish a limit based on loading rather than concentration.

Interim Effluent Limits: Outfall 005 November - February Latitude 47.695278 Longitude 117.473889		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5-day) (BOD_5)	30 milligrams/liter (mg/L) 10,374 pounds/day (lbs/day) 85% removal of influent BOD_5	45 mg/L 15,562 lbs/day
Total Suspended Solids (TSS)	30 mg/L 10,660 lbs/day 85% removal of influent TSS	45 mg/L 15,990 lbs/day
Total PCB (Interim)	0.0019 µg/L	0.0029 µg/L
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units

Interim Effluent Limits: Outfall 005 November - February Latitude 47.695278 Longitude 117.473889		
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100/100 milliliter (mL)	200/100 mL
Parameter	**Average Monthly**	**Maximum Daily [d]**
Total Residual Chlorine	3.12 lbs/day	14.26 lbs/day
Zinc (Total Recoverable)	60.6 µg/L	71.6 µg/L
Lead (Total Recoverable)	0.75 µg/L	0.87 µg/L
Cadmium (Total Recoverable)	0.134 µg/L	0.18 µg/L
Total PCB (Final) [e]	--	0.00017 µg/L

a	Average Monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.
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S1.B Final Effluent Limits for Compliance with the Spokane River DO TMDL

Effective March 1, 2021, the Permittee may discharge treated municipal wastewater subject to compliance with the following limitations from **March 1st through October 31st.**

Final Effluent Limits: Outfall 005 March through October Latitude 47.695278 Longitude 117.473889		
Parameter	**Average Monthly** [a]	**Average Weekly** [b]
Total Suspended Solids (TSS)	30 mg/L 10,660 lbs/day 85% removal of influent TSS	45 mg/L 15,990 lbs/day
Total PCB (Interim)	0.0027 µg/L	0.0041 µg/L
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100/100 milliliter (mL)	200/100 mL
Parameter	**Average Monthly**	**Maximum Daily** [d]
Total Residual Chlorine	3.12 lbs/day	14.26 lbs/day
Zinc (Total Recoverable)	52.3 µg/L	61.3 µg/L
Lead (Total Recoverable)	0.76 µg/L	0.95 µg/L
Cadmium (Total Recoverable)	0.094µg/L	0.12 µg/L
Total PCB (Final) [g]	--	0.00017 µg/L
Parameter	**Seasonal Average** [e]	
Total Ammonia (as NH3-N) [f]	March – May: 351 lbs/day June – September: 89 lbs/day October: 351 lbs/day	
Total Phosphorus	17.8 lbs/day	
Carbonaceous Biochemical Oxygen Demand – 5 day ($CBOD_5$) [f]	1,781 lbs/day	
a	Average Monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.	
b	Average Weekly discharge limit means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges' measured during that week. See footnote c for fecal coliform calculations.	

Final Effluent Limits: Outfall 005 **March through October** **Latitude 47.695278 Longitude 117.473889**	
c	Ecology provides directions to calculate the monthly and the weekly geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf
d	Maximum Daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.
e	Seasonal ammonia loading limits calculated based on design flows listed in 2010 Spokane River DO TMDL and listed concentrations.
f	Compliance with the effluent limitation for $CBOD_5$, NH_3-N, and TP will be based on a running seasonal average reported on a monthly basis for tracking compliance with the allowable mass limit.
g	The final PCB effluent limit becomes effective starting with the 2026 permit cycle. The final limit listed applies to effluent at the end of pipe and not at the edge of the chronic mixing zone. Ecology will reassess this final water quality based effluent limit based on the ongoing reduction of PCBs discharged to the River, and the collection of additional data. Ecology may also establish a limit based on loading rather than concentration.

Final Effluent Limits: Outfall 005 **November – February** **Latitude 47.695278 Longitude 117.473889**		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Carbonaceous Biochemical Oxygen Demand (5-day) ($CBOD_5$)	25 milligrams/liter (mg/L) 11,759 pounds/day (lbs/day) 85% removal of influent BOD_5	40 mg/L 18,815 lbs/day
Total Suspended Solids (TSS)	30 mg/L 10,660 lbs/day 85% removal of influent TSS	45 mg/L 15,990 lbs/day
Total PCB (Interim)	0.0019 µg/L	0.0029 µg/L
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**Weekly Geometric Mean**
Fecal Coliform Bacteria [c]	100/100 milliliter (mL)	200/100 mL

Final Effluent Limits: Outfall 005 **November – February** **Latitude 47.695278 Longitude 117.473889**		
Parameter	**Average Monthly**	**Maximum Daily [d]**
Total Residual Chlorine	3.12 lbs/day	14.26 lbs/day
Zinc (Total Recoverable)	60.6 µg/L	71.6 µg/L
Lead (Total Recoverable)	0.75 µg/L	0.87 µg/L
Cadmium (Total Recoverable)	0.134 µg/L	0.18 µg/L
Total PCB (Final) [e]	--	0.00017 µg/L

[a] Average Monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.

[b] Average Weekly discharge limit means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges' measured during that week. See footnote c for fecal coliform calculations.

[c] Ecology provides directions to calculate the monthly and the weekly geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf

[d] Maximum Daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.

[e] The final PCB effluent limit becomes effective starting with the 2026 permit cycle. The final limit listed applies to effluent at the end of pipe and not at the edge of the chronic mixing zone. Ecology will reassess this final water quality based effluent limit based on the ongoing reduction of PCBs discharged to the River, and the collection of additional data. Ecology may also establish a limit based on loading rather than concentration.

Final Effluent Limits: CSO Outfalls [a] **Latitude Varies per Outfall Longitude Varies per Outfall**	
Parameter	**Seasonal Average**
Total Ammonia (as NH3-N)	1.0 lbs/day
Total Phosphorus	0.95 lbs/day

Final Effluent Limits: CSO Outfalls [a] Latitude Varies per Outfall Longitude Varies per Outfall	
Carbonaceous Biochemical Oxygen Demand – 5 day ($CBOD_5$)	30.0 lbs/day
[a] Limits apply cumulatively to all active CSO outfalls and should be reported as required in S2.B **starting on March 1, 2021.**	

S1.C. Mixing zone authorization

Mixing zone for Outfall 005

The paragraph below defines the maximum boundaries of the mixing zones.

Chronic mixing zone

The width of the chronic mixing zone is limited to a distance of 50 feet. The length of the chronic mixing zone extends 300 feet downstream of the outfall. The mixing zone extends from the bottom to the top of the water column. The concentration of pollutants at the edge of the chronic zone must meet chronic aquatic life criteria and human health criteria.

Acute mixing zone

The width of the acute mixing zone is limited to a distance of 5 feet in any horizontal direction from the outfall. The length of the acute mixing zone extends 30 feet downstream of the outfall. The mixing zone extends from the bottom to the top of the water column. The concentration of pollutants at the edge of the acute zone must meet acute aquatic life criteria.

Available Dilution (dilution factor) March - October	
Acute Aquatic Life Criteria	1.2
Chronic Aquatic Life Criteria	3.1
Human Health Criteria - Carcinogen	11.9
Human Health Criteria - Non-carcinogen	3.6

Available Dilution (dilution factor) November - February	
Acute Aquatic Life Criteria	1.3
Chronic Aquatic Life Criteria	5.7
Human Health Criteria - Carcinogen	19.5
Human Health Criteria - Non-carcinogen	7.0

S2. Monitoring requirements

S2.A. Monitoring schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in **Appendix A.**

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
(1) Wastewater influent			
Wastewater Influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.			
Flow	MGD	Continuous [a]	Metered
pH [f]	Standard Units (S.U.)	Continuous [a]	Metered
Biochemical Oxygen Demand (BOD_5)	mg/L	Daily [i]	24-Hour Composite [c]
Biochemical Oxygen Demand (BOD_5)	lbs/day	Daily [i]	Calculated [e]
$CBOD_5$	mg/L	Daily [i]	24-Hour Composite [c]
$CBOD_5$	lbs/day	Daily [i]	Calculated [e]
Total Suspended Solids (TSS)	mg/L	Daily [i]	24-Hour Composite [c]
Total Suspended Solids (TSS)	lbs/day	Daily [i]	Calculated [e]
Temperature	°C	Daily [i]	Grab [b]
Total Ammonia	mg/L	3/week [j]	24-Hour Composite [c]
Total Ammonia	lbs/day	3/week [j]	Calculated [e]
Total Phosphorus	mg/L	3/week [j]	24-Hour Composite [c]
Total Phosphorus	lbs/day	3/week [j]	Calculated [e]
Aluminum (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Arsenic (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Cadmium (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Copper (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Lead (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Zinc (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Mercury (Total Recoverable)	ng/L	1/month [k]	24-Hour Composite [c]
Silver (Total Recoverable)	µg/L	1/month [k]	24-Hour Composite [c]
(2) Final wastewater effluent			
Final Wastewater Effluent means wastewater exiting the last treatment process or operation. Typically, this is after or at the exit from the chlorine contact chamber or other disinfection process. The Permittee may take effluent samples for the $CBOD_5$/BOD_5 analysis before or after the disinfection process. If taken after, the Permittee must dechlorinate and reseed the sample.			
Flow	MGD	Continuous [a]	Metered/recorded
pH [f]	Standard Units	Daily [i]	Metered
Temperature [q]	Degrees Centigrade (ϒC)	Daily [i]	Grab [b]
7DADMax Temperature [r]	ϒC	Daily [i]	Calculated
Dissolved Oxygen [p]	mg/L	Daily [i]	Grab [b]
Chlorine (Total Residual)	µg/L	Daily [i]	Grab [b]
Chlorine (Total Residual)	lbs/day	Daily [i]	Calculated [e]
Total Ammonia as N	mg/L	Daily [i]	24-Hour Composite [c]
Total Ammonia as N	lbs/day	Daily [i]	Calculated [e]
BOD_5 [h]	mg/L	Daily [i]	24-Hour Composite [c]

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
BOD_5	lbs/day	Daily [i]	Calculated [e]
BOD_5	% removal [d]	Daily [i]	Calculated
$CBOD_5$ [h]	mg/L	Daily [i]	24-Hour Composite [c]
$CBOD_5$	lbs/day	Daily [i]	Calculated [e]
$CBOD_5$	% removal [d]	Daily [i]	Calculated
TSS	mg/L	Daily [i]	24-Hour Composite [c]
TSS	lbs/day	Daily [i]	Calculated [e]
TSS	% removal [d]	Daily [i]	Calculated
Total Phosphorus as P	µg/L	Daily [i]	24-Hour Composite [c]
Total Phosphorus as P	lbs/day	Daily [i]	Calculated [e]
Total Reactive Phosphorus	µg/L	Daily [i]	24-Hour Composite [c]
Total Reactive Phosphorus	lbs/day	Daily [i]	Calculated [e]
Fecal Coliform [g]	MPN/100 mL	3/week [j]	Grab [b]
Aluminum (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Arsenic (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Cadmium (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Copper (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Lead (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Zinc (Total Recoverable)	µg/L	2/month [l]	24-Hour Composite [c]
Mercury (Total Recoverable)	ng/L	1/month [k]	24-Hour Composite [c]

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
Silver (Total Recoverable)	µg/L	1/month [k]	24-Hour Composite [c]
Total Hardness as $CaCO_3$	mg/L	1/month [k]	24-Hour Composite [c]
Total Alkalinity as $CaCO_3$	mg/L	1/month [k]	24-Hour Composite [c]
Total PCB [s]	µg/L	2/year [n]	24-Hour Composite [c]
(3) Toxics Reductions Monitoring – Influent and Final Wastewater Effluent			
Influent and effluent sampling results to be submitted annually with the Best Management Practices Implementation Plan as Specified in Special Condition S13. Effectiveness monitoring must utilize EPA Method 1668 C to generate usable data.			
Total PCB	pg/L	Quarterly [m]	24-Hour Composite [c]
PBDE	pg/L	2/year [n]	24-Hour Composite [c]
2,3,7,8 TCDDs	pg/L	2/year [n]	24-Hour Composite [c]
(4) Permit renewal application requirements – final wastewater effluent			
The Permittee must record and report the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing. Priority pollutant testing results to be submitted with the wastewater discharge permit application **by XX/XX/XXXX**.			
Nitrate plus Nitrite	mg/L as N	3/permit cycle [o]	Grab [b]
Oil and Grease	mg/L	3/permit cycle [o]	Grab [b]
Total Dissolved Solids	mg/L	3/permit cycle [o]	Grab [b]
Cyanide	micrograms/liter (µg/L)	3/permit cycle [o]	Grab [b]
Total Phenolic Compounds	µg/L	3/permit cycle [o]	Grab [b]
Priority Pollutants (PP) – Total Metals	µg/L; nanograms(ng/L) for mercury	3/permit cycle [o]	24-Hour Composite [c] Grab [b] for mercury
PP – Volatile Organic Compounds	µg/L	3/permit cycle [o]	Grab [b]
PP – Acid-extractable Compounds	µg/L	3/permit cycle [o]	24-Hour Composite [c]

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
PP – Base-neutral Compounds	µg/L	3/permit cycle [o]	24-Hour Composite [c]
(5) Whole effluent toxicity testing – final wastewater effluent			
As specified in Special Conditions S16 &S17. Results to be submitted with the permit application **by XX/XX/XXXX**.			
(6) Receiving water temperature study			
As specified in Special Condition S11.			
(7) Receiving water study			
As specified in Special Condition S12.			
(8) Combined sewer overflow (CSO) monitoring			
As specified in Special Condition S2.B.			

a	Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance. The time interval for the associated data logger must not be greater than 30 minutes. The Permittee must sample every 2 hours when continuous monitoring is not possible.
b	Grab means an individual sample collected over a fifteen (15) minute, or less, period.
c	24-Hour Composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
d	% removal = [(Influent concentration (mg/L) – Effluent concentration (mg/L))/ Influent concentration (mg/L)] x 100 Calculate the percent (%) removal of BOD_5 and TSS using the above equation.
e	Calculated means figured concurrently with the respective sample, using the following formula: Concentration (in mg/L) X Flow (in MGD) X Conversion Factor (8.34) = lbs/day
f	The Permittee must report the instantaneous maximum and minimum pH daily. Do not average pH values.
g	Report a numerical value for fecal coliforms following the procedures in Ecology's *Information Manual for Wastewater Treatment Plant Operators*, Publication Number 04-10-020 available at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html . Do not report a result as too numerous to count (TNTC).
h	Take effluent samples for the $CBOD_5$ / BOD_5 analysis before or after the disinfection process. If taken after, dechlorinate and reseed the sample.
i	Daily means five (5) times during each calendar week except weekends and holidays.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
j	3/week means three (3) times during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.		
k	1/month means once every calendar month during alternating weeks.		
l	2/month means twice every calendar month during alternate weeks.		
m	Quarterly sampling periods are January through March, April through June, July through September, and October through December.		
n	2/year (or semiannual) means once in the winter and once in the summer.		
o	3/permit cycle means three discrete sampling events within the permit term.		
p	Report the daily dissolved oxygen concentration and the minimum for the reporting period.		
q	Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which usually occurs in the late afternoon. If measuring temperature continuously, the Permittee must determine and report a daily maximum from half-hour measurements in a 24-hour period. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.		
r	Calculate a 7-DAD Max for each day by averaging the day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date. WAC 173-201A-020		
s	Compliance monitoring for toxics must use EPA Method 608 - Revised.		

S2.B. Combined sewer overflow (CSO) monitoring schedule

The Permittee must monitor all discharges from CSO outfalls listed in Special Condition S15 using the following monitoring schedule. Permittees must use automatic flow monitoring equipment to collect the information required below. Permittee must calibrate flow monitoring equipment according to requirements in Condition S2.D.

Parameter	Units	Minimum Sampling Frequency	Sample Type
CSO discharge is defined as any untreated CSO which will exit or has exited the CSO outfall.			
Volume Discharged	Gallons	Per Event [c]	Measurement/Calculation [a,b]
Discharge Duration	Hours	Per Event [c]	Measurement

Parameter	Units	Minimum Sampling Frequency	Sample Type
Storm Duration	Hours	Per Event [d]	Measurement
Precipitation	Inches	Per Event [c]	Measurement/Calculation [b]
Ammonia [e]	lbs/day	Per Overflow [f]	Measurement/Calculation [a,b]
Total Phosphorus [e]	lbs/day	Per Overflow [f]	Measurement/Calculation [a,b]
$CBOD_5$ [e]	lbs/day	Per Overflow [f]	Measurement/Calculation [a,b]

Footnotes for CSO Monitoring:

a	Flow measurement must be continuous, except for brief lengths of time for calibration, for power failure, or for unanticipated equipment repair or maintenance. During periods of interrupted service, a calculation may be used to estimate the discharge volume. An explanation must be provided in the monthly DMR for all disruptions in flow measurement.
b	"Measurement/Calculation" means the total volume of the discharge or amount of precipitation event as estimated by direct measurement or indirectly by calculation (i.e. flow weirs, pressure transducers, tipping bucket). Precipitation must be measured by the nearest possible precipitation-measuring device and actively monitored during the period of interest.
c	"Per Event" means a unique flow event as defined in the Permit Writer's Manual, p. V-17. Ecology defines the minimum inter-event period (MIET) as 24 hours. A CSO event is considered to have ended only after at least 24 hours has elapsed since the last measured occurrence of an overflow.
d	Storm duration is the amount of total time when precipitation occurred that contributed to a discharge event. It is determined on a case-by-case basis.
e	Pollutant loading reported as a sum from all CSO outfalls. Individual sampling results submitted with the annual CSO report. Pollutant loading reporting begins March 2021 at the end of DO TMDL compliance period. .
f	Per Overflow means any discharge, wet or dry, during March – October.

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S2.C. Sampling and analytical procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit . Ecology may only specify alternative methods for parameters without permit limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

S2.D. Flow measurement, field measurement, and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement, field measurement, and continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard, the manufacturer's recommendation, and approved O&M manual procedures for the device and the wastestream.
3. Calibrate continuous monitoring instruments weekly unless it can demonstrate a longer period is sufficient based on monitoring records. The Permittee:
   a. May calibrate apparatus for continuous monitoring of dissolved oxygen by air calibration.
   b. Must calibrate continuous pH measurement instruments using a grab sample analyzed in the lab with a pH meter calibrated with standard buffers and analyzed within 15 minutes of sampling.
   c. Must calibrate continuous chlorine measurement instruments using a grab sample analyzed in the laboratory within 15 minutes of sampling.
4. Calibrate micro-recording temperature devices, known as thermistors, using protocols from Ecology's Quality Assurance Project Plan Development Tool (*Standard Operating Procedures for Continuous Temperature Monitoring of Fresh Water Rivers and Streams Version 1.0 10/26/2011*). This document is available online at: http://www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP_SOP_Cont_Temp_Mon_Ambient_v1_0EAP080.pdf
5. Calibration as specified in this document is not required if the Permittee uses recording devices certified by the manufacturer.
6. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
7. Establish a calibration frequency for each device or instrument in the O&M manual that conforms to the frequency recommended by the manufacturer.
8. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
9. Maintain calibration records for at least three years.

S2.E. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology for permit specified parameters is prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement.

The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters.

S2.F. Request for reduction in monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. Ecology will review each request and at its discretion grant the request when it reissues the permit or by a permit modification.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

S3. Reporting and recording requirements

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

S3.A. Discharge monitoring reports

The first monitoring period begins on the effective date of the permit (unless otherwise specified). The Permittee must:

1. Summarize, report, and submit monitoring data obtained during each monitoring period on the electronic discharge monitoring report (DMR) form provided by Ecology within the Water Quality Permitting Portal. Include data for each of the parameters tabulated in Special Condition S2 (including CSO outfalls) and as required by the form. Report a value for each day sampling occurred (unless specifically exempted in the permit) and for the summary values (when applicable) included on the electronic form.

To find out more information and to sign up for the Water Quality Permitting Portal go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html.

2. Enter the "No Discharge" reporting code for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate, if the Permittee did not discharge wastewater or a specific pollutant during a given monitoring period.

3. Report single analytical values below detection as "less than the detection level (DL)" by entering < followed by the numeric value of the detection level (e.g. < 2.0) on the DMR. If the method used did not meet the minimum DL and quantitation level (QL) identified in the permit, report the actual QL and DL in the comments or in the location provided.
4. **Not** report zero for bacteria monitoring. Report as required by the laboratory method.
5. Calculate and report an arithmetic average value for each day for bacteria if multiple samples were taken in one day.
6. Calculate the geometric mean values for bacteria (unless otherwise specified in the permit) using:
   a. The reported numeric value for all bacteria samples measured above the detection value except when it took multiple samples in one day. If the Permittee takes multiple samples in one day it must use the arithmetic average for the day in the geometric mean calculation.
   b. The detection value for those samples measured below detection.
7. Report the test method used for analysis in the comments if the laboratory used an alternative method not specified in the permit and as allowed in Appendix A.
8. Calculate average values and calculated total values (unless otherwise specified in the permit) using:
   a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
   b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample from the same monitoring point for the reporting period.
   c. Zero (for values reported below detection) if the lab did not detect the parameter in another sample for the reporting period.
9. Report single-sample grouped parameters (for example: priority pollutants, PAHs, pulp and paper chlorophenolics, TTOs) on the WQWebDMR form and include: sample date, concentration detected, detection limit (DL) (as necessary), and laboratory quantitation level (QL) (as necessary). Include this information when priority pollutant scans accompany the discharge permit application and are not submitted through WQWebDMR.

   The Permittee must also submit an electronic copy of the laboratory report as an attachment using WQWebDMR. The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.
10. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.

11. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, quarterly, annual, etc.) at the reporting schedule identified below. The Permittee must:
    a. Submit **monthly** DMRs by the 15th day of the following month.
    b. Submit permit renewal application monitoring data as a report with the permit renewal application **by XX/XX/XXXX**.

S3.B. Permit Submittals and Schedules

The Permittee must use the Water Quality Permitting Portal – Permit Submittals application (unless otherwise specified in the permit) to submit all other written permit-required reports by the date specified in the permit.

When another permit condition requires submittal of a paper (hard-copy) report, the Permittee must ensure that it is postmarked or received by Ecology no later than the dates specified by this permit. Send these paper reports to Ecology at:

Water Quality Permit Coordinator
Department of Ecology
Eastern Regional Office
4601 North Monroe Street
Spokane, WA 99205-1295

S3.C. Records retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

S3.D. Recording of results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

S3.E. Additional monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Special Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR unless otherwise specified by Special Condition S2.

S3.F. Reporting permit violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.

2. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

a. Immediate reporting

The Permittee must immediately report to Ecology and the Spokane Regional Health District (at the numbers listed below), all:

- Failures of the disinfection system.
- Collection system overflows.
- Plant bypasses resulting in a discharge.
- Any other failures of the sewage system (pipe breaks, etc.).

Eastern Regional Office	509-329-3400
Spokane Regional Health District	509-324-1500

Additionally, for any sanitary sewer overflow (SSO) that discharges to a municipal separate storm sewer system (MS4), the Permittee must notify the appropriate MS4 owner or operator.

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.

2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S5.F, "Bypass Procedures").

3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, "Upset").

4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.

5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

c. Report within five days

The Permittee must also submit a written report by email or through a physical letter to the permit manager within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above.

The report must contain:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. The estimated time the Permittee expects the noncompliance to continue if not yet corrected.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
5. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

d. Waiver of written reports

Ecology may waive the written report required in subpart c, above, on a case-by-case basis upon request if the Permittee has submitted a timely oral report.

e. All other permit violation reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in subpart c, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

S3.G. Other reporting

a. Spills of Oil or Hazardous Materials

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm.

b. Failure to submit relevant or correct facts

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

S3.H. Maintaining a copy of this permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. Facility loading

S4.A. Design criteria

Table 4-2 in *The City of Spokane's Facility Plan Amendment No. 3* lists design criteria for the City's Riverside Park Water Reclamation Facility. Ecology used the 2030 design flows for this proposed permit.

- March 1st through October 31st defines the **critical season**.
- November 1st through the end of February defines the **non – critical season.**

The flows or waste loads for the permitted facility must not exceed the following design criteria:

Critical Season: March through October	
Maximum Month Design Flow (MMDF)	68.1 MGD
Seasonal Average Design Flow	40.4 MGD
Peak Day Design Flow	94.6 MGD

Non – Critical Season: November through February	
Maximum Month Design Flow (MMDF)	56.4 MGD
Seasonal Average Design Flow	43.2 MGD
Peak Day Design Flow	94.2 MGD

Year Round Design Loading	
BOD_5 Influent Loading for Maximum Month	69,164 lbs/day

TSS Influent Loading for Maximum Month	71,067 lbs/day
Ammonia Influent Loading for Maximum Month	6,764 lbs/day
TP Influent Loading for Maximum Month	1,544 lbs/day

S4.B. Plans for maintaining adequate capacity

a. Conditions triggering plan submittal

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

1. The actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.
2. The projected plant flow or loading would reach design capacity within five years.

b. Plan and schedule content

The plan and schedule must identify the actions necessary to maintain adequate capacity for the expected population growth and to meet the limits and requirements of the permit. The Permittee must consider the following topics and actions in its plan.

1. Analysis of the present design and proposed process modifications
2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system
3. Limits on future sewer extensions or connections or additional waste loads
4. Modification or expansion of facilities
5. Reduction of industrial or commercial flows or waste loads

Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by Ecology prior to any construction.

Conditions triggering plan submittal

The Permittee must continue long-term facility planning and submit engineering documents as specified in Special Condition S8 of this permit. The Permittee must also provide a written status update on facility planning and design efforts with any DMR that reports the following conditions:

1. Actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.

2. Actual flow or waste load exceeds 100 percent of any design criteria in S4.A in the reporting month.

S4.C. Duty to mitigate

The Permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

S4.D. Notification of new or altered sources

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the wastewater treatment plant is proposed which:
   a. Would interfere with the operation of, or exceed the design capacity of, any portion of the wastewater treatment plant.
   b. Is not part of an approved general sewer plan or approved plans and specifications.
   c. Is subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.
2. This notice must include an evaluation of the wastewater treatment plant's ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the treatment plant, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

S4.E. Wasteload assessment

The Permittee must conduct an annual assessment of its **influent flow and waste load** and submit a report to Ecology **by April 1, 2017 and annually thereafter**.

The report must contain:

1. A description of compliance or noncompliance with the permit effluent limits.
2. A comparison between the existing and design:
   a. Monthly average dry weather and wet weather flows.
   b. Peak flows.
   c. BOD_5 loading.
   d. Total suspended solids loadings.
   e. Ammonia loading.
   f. Total Phosphorus loading.
3. The percent change in the above parameters since the previous report (except for the first report).
4. The present and design population or population equivalent.
5. The projected population growth rate.

6. The estimated date upon which the Permittee expects the wastewater treatment plant to reach design capacity, according to the most restrictive of the parameters above.

Ecology may modify the interval for review and reporting if it determines that a different frequency is sufficient.

S5. Operation and maintenance

The Permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit. See Section S15 for CSO operation and maintenance requirements.

S5.A. Certified operator

This permitted facility must be operated by an operator certified by the state of Washington for at least a Class IV plant. This operator must be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class III plant must be in charge during all regularly scheduled shifts. The Permittee must notify Ecology when the operator in charge at the facility changes. It must provide the new operator's name and certification level and provide the name of the operator leaving the facility.

S5.B. Operation and maintenance program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire sewage system.
2. Keep maintenance records on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.
3. Make maintenance records available for inspection at all times.

S5.C. Short-term reduction

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out according to the approved O&M manual or as otherwise approved by Ecology.

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, thirty (30) days prior to such activities.
2. Detail the reasons for, length of time of, and the potential effects of the reduced level of treatment.

This notification does not relieve the Permittee of its obligations under this permit.

S5.D. Electrical power failure

The Permittee must ensure that adequate safeguards prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations. Adequate safeguards include, but are not limited to, alternate power sources, standby generator(s), or retention of inadequately treated wastes.

The Permittee must maintain Reliability Class II (EPA 430-99-74-001) at the wastewater treatment plant. Reliability Class II requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions. Vital components used to support the secondary processes (i.e., mechanical aerators or aeration basin air compressors) need not be operable to full levels of treatment, but must be sufficient to maintain the biota.

S5.E. Prevent connection of inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

S5.F. Bypass procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass which is unavoidable, unanticipated, and results in noncompliance of this permit.

This permit authorizes such a bypass only if:

a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

b. No feasible alternatives to the bypass exist, such as:

- The use of auxiliary treatment facilities.
- Retention of untreated wastes.
- Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
- Transport of untreated wastes to another treatment facility.

c. Ecology is properly notified of the bypass as required in Special Condition S3.F of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

- A description of the bypass and its cause.
- An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
- A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
- The minimum and maximum duration of bypass under each alternative.
- A recommendation as to the preferred alternative for conducting the bypass.
- The projected date of bypass initiation.
- A statement of compliance with SEPA.
- A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
- Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during the project planning and design process.

The project-specific engineering report or facilities plan as well as the plans and specifications must include details of probable construction bypasses to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

Once the RPWRF completes the Next Level of Treatment Upgrade, normal operation includes treatment of up to 50 MGD through the membrane filtration process and blending with secondary effluent prior to disinfection/dechlorination and discharge. Ecology agrees that there is a net environmental benefit to operating the facility in this manner and does not consider this normal operation to fall under any bypass conditions. Effluent limits still apply to this combined discharge.

S5.G. Operations and maintenance (O&M) manual

a. O&M manual submittal and requirements

The Permittee must:

1. Review the O&M Manual at least annually and confirm this review by letter to Ecology **by April 1 of each year.**
2. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.
3. Keep the approved O&M Manual at the permitted facility.
4. Follow the instructions and procedures of this manual.
5. Submit all reviews, changes, and updates to Ecology electronically through the WebPortal.

b. O&M manual components

In addition to the requirements of WAC 173-240-080(1) through (5), the O&M Manual must be consistent with the guidance in Table G1-3 in the *Criteria for Sewage Works Design* (Orange Book), 2008. The O&M Manual must include:

1. Emergency procedures for cleanup in the event of wastewater system upset or failure.
2. A review of system components which if failed could pollute surface water or could impact human health. Provide a procedure for a routine schedule of checking the function of these components.
3. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
4. Reporting protocols for submitting reports to Ecology to comply with the reporting requirements in the discharge permit.
5. Any directions to maintenance staff when cleaning or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).
6. The treatment plant process control monitoring schedule.
7. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.

S6. Pretreatment

S6.A. General requirements

The Permittee must implement the Industrial Pretreatment Program in accordance with the legal authorities, policies, procedures, and financial provisions described in the Permittee's approved pretreatment program submittal entitled "Industrial Pretreatment Program" and dated September 30, 1987; any approved revisions thereto; and the General Pretreatment Regulations (40 CFR Part 403). The Ordinance section containing the local limits was last updated March 10, 2016.

On October 20, 2004 the City of Spokane, Spokane County and the City of Spokane Valley met at the Department of Ecology – Eastern Regional Office to discuss the pretreatment program. All parties agreed that the City of Spokane has the authority to administer its delegated Pretreatment Program to their present and future sewer customers located within their designated sewer services areas in City of Spokane Valley, in Spokane County, and in the City of Spokane. For the purpose of this permit and pretreatment program delegation, this applies to the present and future sewer customers who contribute wastewater into the City of Spokane collection system and are located either within or outside of the corporate limits of the City of Spokane.

At a minimum, the Permittee must undertake the following pretreatment implementation activities:

1. Enforce categorical pretreatment standards under Section 307(b) and (c) of the Federal Clean Water Act (hereinafter, the Act), prohibited discharge standards as set forth in 40 CFR 403.5, local limits specified in Section 13.03A.0204 of Chapter 13.03A of the Spokane Municipal Code or state standards, whichever are most stringent or apply at the time of issuance or modification of a local industrial waste discharge permit.

   Locally-derived limits are defined as pretreatment standards under Section 307(d) of the Act and are not limited to categorical industrial facilities.

2. Issue industrial waste discharge permits to all significant industrial users [SIUs, as defined in 40 CFR 403.3(v)(i)(ii)] contributing to the treatment system, including those from other jurisdictions. Industrial waste discharge permits must contain, as a minimum, all the requirements of 40 CFR 403.8 (f)(l)(iii). The Permittee must coordinate the permitting process with Ecology regarding any industrial facility that may possess a State Waste Discharge Permit issued by Ecology. Once issued, an industrial waste discharge permit takes precedence over a state-issued waste discharge permit.

3. Maintain and update, as necessary, records identifying the nature, character, and volume of pollutants contributed by industrial users to the POTW. The Permittee must maintain records for at least a three-year period.

4. Perform inspections, surveillance, and monitoring activities on industrial users to determine or confirm compliance with pretreatment standards and requirements. The Permittee must conduct a thorough inspection of SIUs annually.

   The Permittee must conduct regular local monitoring of SIU wastewaters commensurate with the character and volume of the wastewater but not less than once per year. The Permittee must collect and analyze samples in accordance with 40 CFR Part 403.12(b)(5)(ii)-(v) and 40 CFR Part 136.

5. Enforce and obtain remedies for noncompliance by any industrial users with applicable pretreatment standards and requirements. Once it identifies violations, the Permittee must take timely and appropriate enforcement action to address the noncompliance. The Permittee's action must follow its enforcement response procedures and any amendments, thereof.

6. Publish, at least annually in the largest daily newspaper in the Permittee's service area, a list of all non-domestic users which, at any time in the previous 12 months, were in significant noncompliance as defined in 40 CFR 403.8(f)(2)(vii).

If the Permittee elects to conduct sampling of an SIU's discharge in lieu of requiring user self-monitoring, it must satisfy all requirements of 40 CFR Part 403.12. This includes monitoring and record keeping requirements of Sections 403.12(g) and (o). For SIUs subject to categorical standards (CIUs), the Permittee may either complete baseline and initial compliance reports for the

CIU (when required by 403.12(b) and (d)) or require these of the CIU. The Permittee must ensure that it provides SIUs the results of sampling in a timely manner, inform SIUs of their right to sample, their obligations to report any sampling they do, to respond to non-compliance, and to submit other notifications. These include a slug load report (403.12(f)), notice of changed discharge (403.12(j)), and hazardous waste notifications (403.12(p)).

If sampling for the SIU, the Permittee must not sample less than once in every six-month period unless the Permittee's approved program includes procedures for reduction of monitoring for Middle-Tier or Non-Significant Categorical Users per 403.12(e)(2) and (3) and those procedures have been followed.

7. Develop and maintain a data management system designed to track the status of the Permittee's industrial user inventory, industrial user discharge characteristics, and compliance status.

8. Maintain adequate staff, funds, and equipment to implement its pretreatment program.

9. Establish, where necessary, contracts or legally binding agreements with contributing jurisdictions to ensure compliance with applicable pretreatment requirements by commercial or industrial users within these jurisdictions. These contracts or agreements must identify the agency responsible to perform the various implementation and enforcement activities in the contributing jurisdiction. In addition, the Permittee must develop a Memorandum of Understanding (or Inter-local Agreement) that outlines the specific roles, responsibilities, and pretreatment activities of each jurisdiction.

10. The Permittee must review, change if necessary and submit to Ecology for approval, **an updated Accidental Spill Prevention Program by April 1, 2017.** The program must include a schedule for implementation. The Ecology-approved program becomes an enforceable part of these permit conditions.

11. The Permittee must evaluate, at least once every two years, whether each Significant Industrial User needs a plan to control slug discharges. For purposes of this section, a slug discharge is any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or non-customary batch discharge. The Permittee must make the results of this evaluation available to Ecology upon request. If the Permittee decides that a slug control plan is needed, the plan must contain, at a minimum, the following elements:

    a. Description of discharge practices, including non-routine batch discharges.

    b. Description of stored chemicals.

    c. Procedures for immediately notifying the Permittee of slug discharges, including any discharge that would violate a prohibition under 40 CFR 403.5(b), with procedures for follow-up written notification within five days.

d. If necessary, procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site run-off, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants (including solvents), and/or measures and equipment necessary for emergency response.

Whenever Ecology determines that any waste source contributes pollutants to the Permittee's treatment works in violation of Section (b), (c), or (d) of Section 307 of the Act, and the Permittee has not taken adequate corrective action, Ecology will notify the Permittee of this determination. If the Permittee fails to take appropriate enforcement action within 30 days of this notification, Ecology may take appropriate enforcement action against the source or the Permittee.

12. Pretreatment Report

The Permittee must provide to Ecology an annual report that briefly describes its program activities during the previous calendar year.

The Permittee must submit the first **annual report** to Ecology **by April 1, 2017**. The report must include the following information:

a. An updated non-domestic inventory.

b. Results of wastewater sampling at the treatment plant as specified in S6B. The Permittee must calculate removal rates for each pollutant and evaluate the adequacy of the existing local limits in Section 13.03.0416 of Ordinance 13.03 in prevention of treatment plant interference, pass through of pollutants that could affect receiving water quality, and sludge contamination.

c. Status of program implementation, including:

- Any substantial modifications to the pretreatment program as originally approved by Ecology, including staffing and funding levels.
- Any interference, upset, or permit violations experienced at the POTW that are directly attributable to wastes from industrial users.
- Listing of industrial users inspected and/or monitored, and a summary of the results.
- Listing of industrial users scheduled for inspection and/or monitoring for the next year, and expected frequencies.
- Listing of industrial users notified of promulgated pretreatment standards and/or local standards as required in 40 CFR 403.8(f)(2)(iii). The list must indicate which industrial users are on compliance schedules and the final date of compliance for each.
- Listing of industrial users issued industrial waste discharge permits.
- Planned changes in the approved local pretreatment program. (See Subsection A.7. below)

d. Status of compliance activities, including:

- Listing of industrial users that failed to submit baseline monitoring reports or any other reports required under 40 CFR 403.12 and the Permittee's current Industrial Pretreatment Program Enforcement Plan and Industrial Sampling and Monitoring Guidance Manual.
- Listing of industrial users that were at any time during the reporting period not complying with federal, state, or local pretreatment standards or with applicable compliance schedules for achieving those standards, and the duration of such noncompliance.
- Summary of enforcement activities and other corrective actions taken or planned against non-complying industrial users. The Permittee must supply to Ecology a copy of the public notice of facilities that were in significant noncompliance.

The Permittee must request and obtain approval from Ecology before making any significant changes to the approved local pretreatment program. The Permittee must follow the procedure in 40 CFR 403.18 (b) and (c).

S6.B. Monitoring requirements

The Permittee must:

1. Monitor its influent, effluent, and sludge for the priority pollutants identified in Tables II and III of Appendix D of 40 CFR Part 122 as amended, any compounds identified because of Special Condition S6.B.4, and any other pollutants expected from non-domestic sources using U.S. EPA-approved procedures for collection, preservation, storage, and analysis.
2. Test influent, effluent, and sludge samples for the priority pollutant metals (Table III, 40 CFR 122, Appendix D) on a quarterly basis throughout the term of this permit.
3. Test influent, effluent, and sludge samples for the organic priority pollutants (Table II, 40 CFR 122, Appendix D) on an annual basis. The Permittee may use the data collected for application purposes using Appendix A test methods to meet this requirement.
4. Sample POTW influent and effluent on a day when industrial discharges are occurring at normal-to-maximum levels.
5. Obtain 24-hour composite samples for the analysis of acid and base/neutral extractable compounds and metals.
6. Collect grab samples at equal intervals for a total of four grab samples per day for the analysis of volatile organic compounds. The laboratory may run a single analysis for volatile pollutants (Method 624) for each monitoring day by compositing equal volumes of each grab sample directly in the GC purge and trap apparatus in the laboratory, with no less than 1 ml of each grab included in the composite.

7. Ensure that all reported test data for metals represents the total amount of the constituents present in all phases, whether solid, suspended, or dissolved elemental or combined, including all oxidation states unless otherwise indicated.
8. Handle, prepare, and analyze all wastewater samples taken for GC/MS analysis in accordance with the U.S. EPA Methods 624 and 625 (October 26, 1984).
9. Collect a sludge sample concurrently with a wastewater sample as a single grab of residual sludge. Sludge organic priority pollutant sampling and analysis must conform to U.S. EPA Methods 624 and 625 unless the Permittee requests an alternate method and Ecology has approved. Sludge metals priority pollutant sampling and analysis must conform to U.S. EPA SW 846 6000/7000 Series Methods unless the Permittee requests an alternate method and Ecology has approved.
10. Collect grab samples for cyanide, phenols, and oils. Measure hexane soluble oils (or equivalent) only in the influent and effluent.
11. Make a reasonable attempt to identify all other substances and quantify all pollutants shown to be present by gas chromatograph/mass spectrometer (GC/MS) analysis per 40 CFR 136, Appendix A, Methods 624 and 625, in addition to quantifying pH, oil and grease, and all priority pollutants.
12. The Permittee should attempt to make determinations of pollutants for each fraction, which produces identifiable spectra on total ion plots (reconstructed gas chromatograms). The Permittee should attempt to make determinations from all peaks with responses 5% or greater than the nearest internal standard. The 5% value is based on internal standard concentrations of 30 ∝g/l, and must be adjusted downward if higher internal standard concentrations are used or adjusted upward if lower internal standard concentrations are used.

    The Permittee may express results for non-substituted aliphatic compounds as total hydrocarbon content.
13. Use a laboratory whose computer data processing programs are capable of comparing sample mass spectra to a computerized library of mass spectra, with visual confirmation by an experienced analyst.
14. Conduct additional sampling and appropriate testing to determine concentration and variability, and to evaluate trends for all detected substances determined to be pollutants.

S6.C. Reporting of monitoring results

The Permittee must include a summary of monitoring results in the Annual Pretreatment Report.

S6.D. Local limit development

As sufficient data become available, the Permittee, in consultation with Ecology, must reevaluate its local limits in order to prevent pass through or interference.

If Ecology determines that any pollutant present causes pass through or interference, or exceeds established sludge standards, the Permittee must establish new local limits or revise existing local limits as required by 40 CFR 403.5. Ecology may also require the Permittee to revise or establish local limits for any pollutant discharged from the POTW that has a reasonable potential to exceed the Water Quality Standards, Sediment Standards, or established effluent limits, or causes whole effluent toxicity. Ecology makes this determination in the form of an Administrative Order.

Ecology may modify this permit to incorporate additional requirements relating to the establishment and enforcement of local limits for pollutants of concern. Any permit modification is subject to formal due process procedures under state and federal law and regulation.

S7. Solid wastes

S7.A. Solid waste handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

S7.B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available, and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S8. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit **by XX/XX/XXXX.**

Applications are available online at http://www.ecy.wa.gov/programs/wq/permits/forms.html#state_forms. Submit the application electronically through the Water Quality Permitting Portal under 'Permit Submittal'.

The Permittee must also submit a new application or addendum at least one hundred eighty (180) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

An application for renewal must be received by Ecology at least 180 days prior to permit expiration (WAC 173-220-180). If an application for renewal is received past the permits expiration date, the permit will be formally cancelled and the Permittee will be required to submit an application for a new NPDES permit.

S9. Compliance schedule

By the dates tabulated below, the Permittee must complete the following tasks and submit a report describing, at a minimum:

- Whether it completed the task and, if not, the date on which it expects to complete the task.
- The reasons for delay and the steps it is taking to return the project to the established schedule.

	Tasks	Date Due
1.	Meet WLAs for total ammonia, total phosphorus and $CBOD_5$ as required by the approved 2010 Spokane River DO TMDL.	March 1, 2021
2.	Meet WQBEL for total PCBs. Implement Toxics Reduction Strategy under Condition S13, and annually report results to Ecology. Continue active participation in the Spokane River Regional Toxics Task Force, and provide required reports to Ecology pursuant to Condition S13 & S14.	XXXX 1 , 2026

S10. Spill control plan

S10.A Spill control plan submittals and requirements

The Permittee must:

1. Review the existing plan at least annually and update the spill plan as needed.
2. Send changes to the plan to Ecology.
3. Follow the plan and any supplements throughout the term of the permit.
4. Submit reviews, updates, and changes to Ecology through the WQWebPortal.

S10.B. Spill control plan components

The spill control plan does not include CSO facilities and must include the following:

1. A list of all oil and petroleum products and other materials used and/or stored on-site, which when spilled, or otherwise released into the environment, designate as Dangerous Waste (DW) or Extremely Hazardous Waste (EHW) by the procedures set forth in WAC 173-303-070. Include other materials

used and/or stored on-site which may become pollutants or cause pollution upon reaching state's waters.

2. A description of preventive measures and facilities (including an overall facility plot showing drainage patterns) which prevent, contain, or treat spills of these materials.
3. A description of the reporting system the Permittee will use to alert responsible managers and legal authorities in the event of a spill.
4. A description of operator training to implement the plan.

The Permittee may submit plans and manuals required by 40 CFR Part 112, contingency plans required by Chapter 173-303 WAC, or other plans required by other agencies, which meet the intent of this section.

S11. Receiving water study of temperature

The Permittee must collect information on the effluent and receiving water to determine if the effluent has a reasonable potential to cause a violation of the water quality standards. If reasonable potential exists, Ecology will use this information to calculate effluent limits.

The Permittee must:

1. Submit a **Sampling Quality Assurance Project Plan** for Ecology review and approval **by December 1, 2016.**
2. Conduct all sampling and analysis in accordance with the guidelines given in *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, Ecology Publication 04-03-030 (http://www.ecy.wa.gov/pubs/0403030.pdf)

   A model Quality Assurance Plan specific for temperature is available at http://www.ecy.wa.gov/programs/wq/permits/guidance.html.
3. Measure temperature in the ambient water upstream of the outfall during the months of March through October of each year, beginning March 1, 2017.
4. Use micro-recording temperature devices known as thermistors to measure temperature. Ecology's Quality Assurance Project Plan Development Tool *(Standard Operating Procedures for Continuous Temperature Monitoring of Fresh Water Rivers and Streams)* contains protocols for continuous temperature sampling. This document is available online at http://www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP_SOP_Cont_Temp_Mon_Ambient_v1_0EAP080.pdf.

   Calibrate the devices as specified in this document unless using recording devices certified by the manufacturer. Ecology does not require manufacture-specific equipment as given in this document; however, if the Permittee wishes to use measuring devices from another company, it must demonstrate the accuracy is equivalent.
5. Set the recording devices to record at one-half-hour intervals.

6. Report temperature monitoring data as: daily maximum, seven-day running average of the daily maximums, and the monthly maximum of the seven-day running average. The model Quality Assurance Plan shows an example of these calculations.
7. Use the temperature device manufacturer's software to generate (export) an Excel text file of the temperature data for each March-October period. Submit this file and placement logs for the receiving water monitoring to Ecology via the web portal by December 31 of the monitoring year. The placement logs should include the following information for both thermistor deployment and retrieval: date, time, temperature device manufacturer ID, location, depth, whether it measured air or water temperature, and any other details that may explain data anomalies. An example of a placement log is shown in Attachment D-2 of the document referenced in item 4 above. Temperature monitoring required in Section S2 should be submitted with the monthly data through WQWebDMR.

S12. Receiving water study

The Permittee must collect receiving water information necessary to determine if the effluent has a reasonable potential to cause a violation of the water quality standards. If reasonable potential exists, Ecology will use the study information to calculate effluent limits.

The Permittee must:

1. Submit a sampling and quality assurance plan for Ecology review and approval **by December 1, 2017.** Prepare all quality assurance plans in accordance with the guidelines given in *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, Ecology Publication 04-03-030. This document is available at: https://fortress.wa.gov/ecy/publications/SummaryPages/0403030.html.
2. Conduct all sampling and analysis in accordance with the approved quality assurance project plan.
   a. Locate the receiving water sampling locations outside the zone of influence of the effluent upstream of the outfall.
   b. Use sampling station accuracy requirements of ± 20 meters.
   c. Time the sampling as close as possible to the low flow/ critical period.
   d. Follow the clean sampling techniques (Method 1669: *Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels*, EPA Publication No. 821-R-95-034, April 1995).
   e. Collect at least ten receiving water samples and analyze the samples for total suspended solids, hardness, temperature, pH, mercury, and arsenic, and for both the total and dissolved fractions for the following metals: zinc, copper, lead, silver, cadmium, nickel, and chromium.
   f. Conduct all chemical analysis using the methods and the detection levels identified in Appendix A.

3. Submit sediment, chemical, and biological data to Ecology's Environmental Information Management System (EIM). Data must be submitted to EIM according to the instructions on the EIM website.

   The data submittal portion of the EIM website (http://www.ecy.wa.gov/eim/submitdata.htm) provides information and help on formats and requirements for submitting tabular data. Specific questions about data submittal may be directed to the EIM Data Coordinator.

4. Submit the final report, summarizing the results of the study to Ecology **by December 31, 2018.** The final report must document when the data was successfully loaded into EIM.

Any subsequent sampling and analysis must also meet these requirements. The Permittee may conduct a cooperative receiving water study with other NPDES Permittees discharging in the same vicinity.

S13. Toxics Reduction Strategy

Best management practices (BMPs) must be implemented throughout the City of Spokane by the Permittee to reduce toxicant loading to both the treatment plant and the Spokane River. The Permittee shall use information generated from the most recent Toxics Management Plan developed during the previous permit cycle to continue the reduction strategy.

This proposed permit requires compliance with toxics reduction strategies through the annual submittal of a Best Management Practices Implementation Plan. This BMP Implementation Plan ("The Plan") must quantify toxic reductions in the collection system and treatment plant effluent to the maximum extent practicable. The Plan must detail specific implementation actions used and refine their application annually as based upon monitoring results. The Plan should include figures, maps, and other illustrations depicting BMP placement, use, and implementation. Influent and effluent at the facility must utilize EPA Method 1668C and follow the frequency as specified in Section S2 of this proposed permit.

While the Permittee may use whatever BMPs are appropriate for the sewer shed, the following must be implemented:

1. The continuation of source identification and removal actions for PCBs remaining within the Permittee's municipal wastewater sewer system.
2. A technical memo addressing the design influent loading value for PCBs to the NLT treatment system and subsequent loading evaluations when the influent exceeds the design loading criteria.
3. Year round operation of the NLT upgrade following initiation of operation.
4. Continuation of the public outreach and education effort

Prior to submittal of this annual report, the Permittee must submit a **sampling and quality assurance plan** for Ecology review and approval **by November 1, 2016**. Prepare all quality assurance plans in accordance with the guidelines given in *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, Ecology

Publication 04-03-030. This document is available at: https://fortress.wa.gov/ecy/publications/SummaryPages/0403030.html

All sampling and analysis for **The Plan** shall be in accordance with the approved quality assurance project plan. All lab sheets and a spreadsheet of raw data should accompany submission of The Plan. Ecology will work with the City of Spokane to have data uploaded to the Environmental Information Management System (or other) database as it becomes available.

Submit the first annual BMP Implementation Plan to Ecology **by XX/XX/2017**. The final report must document when the data was successfully loaded into EIM.

The technical memo developed to assess design influent PCB loading shall be submitted to Ecology with the discharge permit application **by XX/XX/XXXX.**

S14. Measurable Progress Determination

Ecology will continue the measurable progress determination through this permit cycle. The permittee must submit data collected during activities required in this proposed permit needed for Ecology's next measurable progress assessment. Information collected and presented in the BMP Implementation Plan will be used in the next assessment period which began on January 1, 2015 and will extend though the 4th year of this proposed permit. Ecology will work with the City to identify and collect additional information as needed to help complete the assessment of inputs, outputs and outcomes. The determination will assess progress toward meeting the State's Water Quality Standards

The City of Spokane must also maintain their active roll on the Spokane River Regional Toxics Task Force as part of the measurable progress effort. Ecology considers continued involvement with the Task Force part of maintaining the comprehensive approach to address point and non-point sources of PCB in the Spokane River. This proposed permit requires the City of Spokane to work with the Task Force in accomplishing the following:

1. Complete the Comprehensive Plan by December 2016, including targets and milestones for achieving water quality standards.
2. Create a 5-year Strategic Plan with short term goal and strategies, needed financial and technical assistance, and adapt BMP Implementation Plans (based on former TMPs) towards achieving these goals.
3. Measure Progress through a monitoring program, annual reports, and adaptive measures.

The Permittee must share data collected through the City's BMP Implementation Plan with the Task Force and other point source dischargers. This includes quantitative data in addition to feedback on which BMPs are found to be most effective and which ones did not perform as anticipated.

S15. Combined sewer overflows

S15.A. Authorized combined sewer overflow (CSO) discharge locations

Beginning on the effective date of this permit, the Permittee may discharge domestic wastewater from the following list of combined sewer overflow (CSOs) outfalls which represent occasional point sources of pollutants as a result of overloading of the combined sewer system during precipitation events. The permit prohibits discharges not caused by precipitation. This permit does not authorize a discharge from a CSO that causes adverse impacts that threaten characteristic uses of the receiving water as identified in the water quality standards, chapter 173-201A WAC. The City must continue to measure fecal coliform in the Spokane River downstream of any CSO outfall discharging during dry weather.

All CSO discharges enter the Spokane River, except for CSO outfalls 19 and 20, which discharge into Latah Creek, a tributary of the Spokane River.

Outfall Number	CSO Outfall Location	Overflow Structure & Regulator Location Description	Latitude	Longitude
002	0.5 miles downstream of WWTP	A.L White @ Hartley (extended)	47.696658	-117.483769
006	0.25 miles upstream of WWTP	Kiernan @ NW Blvd	47.690864	-117.467110
007	0.4 miles upstream of WWTP	Columbia Circle @ Downriver Drive	47.688741	-117.467956
010	At T.J. Meenach Bridge	Cochran @ Buckeye	47.680458	-117.456295
012	0.55 miles upstream of T.J. Meenach Bridge	Nora @ Pettet Dr	47.674954	-117.447294
014	2.0 miles upstream of T.J. Meenach Bridge	Sherwood @ Summit	47.665281	-117.459233
015	2.5 miles upstream of T.J. Meenach Bridge	Ohio @ Nettleton	47.659907	-117.456109
016	1.45 miles downstream of Monroe St. Dam	“A” @ Linton – Geiger	47.656243	-117.454205
019	At High Bridge (East Side) (Latah Creek)	At High Bridge (East Side)	47.649290	-117.446399
020	2.65 miles upstream of Avista Bridge (Latah Creek)	2.65 miles upstream of Avista Bridge	47.649290	-117.426944

Outfall Number	CSO Outfall Location	Overflow Structure & Regulator Location Description	Latitude	Longitude
		Regulator located at 43rd and Garfield Street		
022	0.7 miles downstream of Monroe St. Dam	Main @ Oak	47.659203	-117.439752
023	0.3 miles downstream of Monroe St. Dam	Cedar @ Ide	47.660701	-117.432931
024	0.3 miles downstream of Monroe St. Dam	Cedar Upstream of Maple Street Bridge	47.660047	-117.433043
025	At Monroe St. Bridge	Cedar Downstream of Monroe Street Bridge	47.660360	-117.433154
026	At Monroe St. Bridge	Lincoln @ Spokane Falls Blvd	47.660338	-117.355079
033	0.15 miles upstream of J. Keefe Bridge	Fifth @ Arthur Third @ Perry Third @ Arthur First @ Arthur	47.660473	-117.394346
034	At Trent Bridge	Crestline @ Riverside	47.661348	-117.393200
038	0.15 miles upstream of Mission	Magnolia @ S. Riverton	47.674833	-117.384265
041	0.5 miles upstream of Greene	Rebecca @ Upriver Drive	47.676574	-117.355098
042	1.1 miles upstream of Greene St.	Surro Drive	47.676827	-117.340275

S15.B. Nine minimum controls

In accordance with chapter 173-245 WAC and US EPA CSO control policy (59 FR 18688), the Permittee must implement and document the following nine minimum controls (NMC) for CSOs. The Permittee must document compliance with the NMC in the annual CSO report as required in Special Condition S15.C.

The Permittee must comply with the following technology-based requirements; the Permittee must:

1. Implement proper operation and maintenance programs for the sewer system and all CSO outfalls to reduce the magnitude, frequency, and duration of CSOs.

The program must consider regular sewer inspections; sewer, catch basin, and regulator cleaning; equipment and sewer collection system repair or replacement, where necessary; and disconnection of illegal connections.

2. Implement procedures that will maximize use of the collection system for wastewater storage that can be accommodated by the storage capacity of the collection system in order to reduce the magnitude, frequency, and duration of CSOs.
3. Review and modify, as appropriate, its existing pretreatment program to minimize CSO impacts from the discharges from non-domestic users.
4. Operate the Permittee's wastewater treatment plant at maximum treatable flow during all wet weather flow conditions to reduce the magnitude, frequency, and duration of CSOs. The Permittee must deliver all flows to the treatment plant within the constraints of the treatment capacity of the POTW.
5. Not discharge (prohibited) overflows from CSO outfalls except as a result of precipitation events. The Permittee must report each dry weather overflow to the permitting authority immediately per Special Condition S3.E. When it detects a dry weather overflow, the Permittee must begin corrective action immediately and inspect the dry weather overflow each subsequent day until it has eliminated the overflow.
6. Implement measures to control solid and floatable materials in CSOs.
7. Implement a pollution prevention program focused on reducing the impact of CSOs on receiving waters.
8. Implement a public notification process to inform the citizens of when and where CSOs occur. The process must include (a) mechanism to alert persons of the occurrence of CSOs and (b) a system to determine the nature and duration of conditions that are potentially harmful for users of receiving waters due to CSOs.
9. Monitor CSO outfalls to characterize CSO impacts and the efficacy of CSO controls. This must include collection of data that it will use to document the existing baseline conditions, evaluate the efficacy of the technology-based controls, and determine the baseline conditions upon which it will base the long-term control plan. This data must include:
    a. Characteristics of the combined sewer system, including the population served by the combined portion of the system and locations of all CSO outfalls in the CSS.
    b. Total number of CSO events, and the frequency and duration of CSOs for a representative number of events.
    c. Locations and designated uses of receiving water bodies.
    d. Up and downstream water quality data for receiving water bodies.

e. Water quality impacts directly related to CSO (e.g., beach closing, floatables, wash-up episodes, fish kills).

S15.C. Combined sewer overflow annual report

The Permittee must submit a **CSO Annual Report** to Ecology for review and approval **by May 1st of each year.** The CSO Annual Report must cover the previous calendar year. The report must comply with the requirements of WAC 173-245-090(1) and must include documentation of compliance with the Nine Minimum Controls for CSOs described in Special Condition S15B. The CSO Annual report must include the following information:

1. A summary of the number and volume of untreated discharge events per outfall for that year.
2. A summary of the 20-year moving average number of untreated discharge events per outfall, calculated once annually including past years and the current year. When the period of data collection is less than 20 years, the averaging period will include all past years for which flow monitoring was collected. The Permittee must report the average number of discharge events per controlled outfall per year based on a 20-year moving average to be reported in the annual report. Ecology will assess compliance with this performance standard on an annual basis.
3. An event-based reporting form (provided by Ecology) for all CSO discharges for the reporting period, summarizing all data collected according to the monitoring schedule in Special Condition S2.B.
4. An explanation of the previous year's CSO reduction accomplishments.
5. A list of CSO reduction projects planned for the next year.
6. CSO discharge pollutant load characterization and monitoring plan for ammonia, total phosphorus and $CBOD_5$.

S15.D. Combined sewer overflow reduction plan amendment

The Permittee must submit an amendment of its **CSO Reduction Plan** to Ecology for review and approval **by XX/XX/XXXX** in the event that the City changes the reduction plan as outlined in the 2013/2014 CSO Reduction Plan Amendment. Any revision to this document must comply with the requirements of WAC 173-245-090(2) and contain the following:

1. Information describing which of the permitted CSO outfalls can be categorized as meeting the Performance Standard for Controlled CSOs, defined as no more than an average of one untreated discharge per outfall per year. The Permittee may base this assessment on long-term discharge data (up to years, past and present data), modeling, or other reasonable methods as approved by Ecology.
2. For each CSO Outfall that does not meet the Performance Standard for Controlled CSOs defined above:

   a. Identify CSO control alternatives to achieve an average of no more than one untreated CSO event per year per outfall.

b. Provide an evaluation of each of the alternatives and a selection of a preferred alternative that will ensure compliance with Washington State regulations (WAC 173-245), and
c. The expected compliance date.

S15.E. Engineering Reports and Plans and Specifications for CSO Reduction Projects

In December of 2014, Ecology approved a Memorandum of Agreement (MOA) between the Washington State Department of Ecology and the City of Spokane Division of Utilities. This MOA allows the City of Spokane to internally complete and approve design and bidding documents for their CSO reduction projects based on the requirements of WAC 173-240-060.

Once the City completes an internal review of final design and bidding documents, a courtesy copy should be sent to the Permit Manager. A brief technical memo dictating parameters used in the design process shall also be required.

A letter certifying the documents meet requirements of WAC 173-240-060 should accompany these submissions. The letter must be signed and sealed by a professional engineer employed by the City. This process applies to all CSO reduction construction projects.

S15.F. Compliance schedule

In order to achieve the greatest reasonable reduction of combined sewer overflows at the earliest possible date, the Permittee must complete the elements of the approved 2014 CSO Reduction Plan Amendment identified in the table below by the specified dates.

City of Spokane CSO Reduction		
1.	Complete and submit for review and approval a CSO plan amendment	As needed
2.	Complete draft engineering report for review and comment	Varies per Basin as outlined in the 2014 CSO Reduction Plan Amendment
3.	Complete and submit for approval a final engineering report	
4.	Complete draft plans and specifications for review and comment	
5.	Complete final plans and specifications	
6.	Begin construction	
7.	Finish construction. Ecology will work with the City of Spokane in the event of unforeseen construction delays; however, the City must have complete design documents and be able to provide a justifiable reason delaying substantial completion.	December 31, 2017

S15.G. Requirements for controlled combined sewer overflows

a. CSOs identified as controlled

Based on monitoring data provided in the FY2014 CSO Annual Report, the City of Spokane's CSO outfalls listed below that discharge to the Spokane River meet the requirement of "greatest reasonable reduction" as defined in chapter WAC 173-245-020(22). Frequency of overflow events at these CSO outfalls, as a result of precipitation events, must continue to meet the performance standard.

Discharge No.	Outfall Location	Latitude	Longitude
002	0.5 miles downstream of WWTP	47.696658	-117.483769
010	At Downriver Bridge	47.680458	-117.456295
016	1.45 miles downstream of Monroe St. Dam	47.656243	-117.454205
019	At High Bridge (East Side)	47.649290	-117.446399
038	0.15 miles upstream of Mission	47.674833	-117.384265
042	1.1 miles upstream of Greene St.	47.676827	-117.340275

b. Performance standards for controlled CSO outfalls

The performance standard for each controlled CSO outfall is not more than one discharge event per outfall per year on average, due to precipitation. Ecology evaluates compliance with the performance standard annually based on a 20 year moving average. The Permittee must report the running 20-year average number of overflow events per year during this permit term from these CSO outfalls in the CSO Annual Report required in Section S15.C.

c. CSO post construction monitoring

The Permittee must implement a post construction compliance monitoring program to verify the effectiveness of CSO controls and to demonstrate compliance with water quality standards and protection of designated uses.

d. CSO post construction monitoring plan

The Permittee must submit to Ecology for review and approval a CSO Post Construction Monitoring Plan **no later than November 1, 2016.**

The plan must describe the monitoring protocols to be followed, including effluent monitoring, and as appropriate, other monitoring protocols such as ambient monitoring, biological assessments, whole effluent toxicity testing, and sediment sampling.

The plan should identify instances where uncontrolled outfalls in the system may influence or adversely interfere with the water quality assessment of controlled outfalls.

e. CSO post construction monitoring data report

Following Ecology approval of the CSO Post Construction Monitoring Plan, the Permittee must implement the plan. The Permittee must submit to Ecology a data report containing the results of the monitoring and analysis **no later than May 1, 2017**. The data report must conform to the approved CSO Post Construction Monitoring Plan.

S15.H. Wet Weather Operation of Wastewater Treatment Facility

CSO-related bypass of the secondary treatment portion of the Riverside Park Water Reclamation Facility is authorized when the instantaneous flow rate to the treatment plant exceeds the storage capacity of the reserve storm clarifiers as a result of precipitation events. Bypasses that occur when the instantaneous flow is less than the clarifier storage capacity are not authorized under this condition and are subject to the bypass provisions as stated in Section S5.F of this proposed permit. In the event of a CSO-related bypass authorized under this condition, the Permittee must minimize the discharge of pollutants to the environment. At a minimum, CSO-related bypass flows must receive solids and floatables removal, primary clarification and disinfection. The final discharge must at all times meet the effluent limits of this permit as listed in S1.

The Permittee must maintain records of all CSO-related bypasses at the treatment plant. These records must document the date, duration, and volume of each bypass event, and the magnitude of the precipitation event. The records must also indicate the effluent flow rate at the time with bypassing is initiated. All occurrences of bypassing must be reported on a monthly basis and also included in the annual report as described in this section. The monthly report must be submitted in narrative form with the DMR and include the above information.

S16. Acute toxicity

S16.A. Testing when there is no permit limit for acute toxicity

The Permittee must:

1. Conduct acute toxicity testing on final effluent **once in the last summer** and **once in the last winter** prior to submission of the application for permit renewal.
2. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100% effluent and a control.

3. Use each of the following species and protocols for each acute toxicity test:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*	EPA-821-R-02-012
Rainbow trout 96-hour static-renewal test	*Oncorhynchus mykiss*	EPA-821-R-02-012

4. Submit the results to Ecology **by XX/XX/XXXX** (with the permit renewal application).

S16.B. Sampling and reporting requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in electronic format (CETIS export file preferred) for entry into Ecology's database.
2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Section A or pristine natural water of sufficient quality for good control performance.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.

7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the acute critical effluent concentration (ACEC).
8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing must comply with the acute statistical power standard of 29% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

S17. Chronic toxicity

S17.A. Testing when there is no permit limit for chronic toxicity

The Permittee must:

1. Conduct chronic toxicity testing on final effluent **once in the last winter** and **once in the last summer** prior to submission of the application for permit renewal.
2. Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The critical season (March – October) ACEC equals 83.3% effluent; non-critical ACEC equals 76.9% effluent. The series of dilutions should also contain the CCEC of 32.3% effluent (March – October) or 17.5% (November – February).
3. Compare the ACEC to the control using hypothesis testing at the 0.05 level of significance as described in Appendix H, EPA/600/4-89/001.
4. Submit the results to Ecology **by XX/XX/XXXX** (with the permit renewal application).
5. Perform chronic toxicity tests with all of the following species and the most recent version of the following protocols:

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013
Alga	*Pseudokirchneriella subcapitata* (formerly *Selenastrum capricornutum*)	EPA-821-R-02-013

S17.B. Sampling and reporting requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain toxicity data, bench sheets, and reference toxicant results for test methods. In addition, the Permittee must submit toxicity test data in electronic format (CETIS export file preferred) for entry into Ecology's database.
2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.

5. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Section C. and the Ecology Publication no. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
6. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Subsection C. or pristine natural water of sufficient quality for good control performance.
7. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.

7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control.

   The series of concentrations must include the CCEC and the ACEC. The CCEC and the ACEC may either substitute for the effluent concentrations that are closest to them in the dilution series or be extra effluent concentrations. The critical/non-critical CCECs equals 32.3 / 17.5% effluent. The critical/non-critical ACEC equals 83.3 / 76.9% effluent.

8. All whole effluent toxicity tests that involve hypothesis testing must comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

General Conditions

G1. Signatory requirements

1. All applications, reports, or information submitted to Ecology must be signed and certified.
   a. In the case of corporations, by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
      - A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or
      - The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

   b. In the case of a partnership, by a general partner.

   c. In the case of sole proprietorship, by the proprietor.

   d. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

   Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity shall be submitted by the public entity.

2. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to Ecology.
   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph G1.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G1.2, above, must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section must make the following certification:

   "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. Right of inspection and entry

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

1. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.
2. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.
3. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.
4. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. Permit actions

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 40 CFR 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

1. The following are causes for terminating this permit during its term, or for denying a permit renewal application:
   a. Violation of any permit term or condition.

b. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.

c. A material change in quantity or type of waste disposal.

d. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.

e. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.

f. Nonpayment of fees assessed pursuant to RCW 90.48.465.

g. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

2. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

   a. A material change in the condition of the waters of the state.

   b. New information not available at the time of permit issuance that would have justified the application of different permit conditions.

   c. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.

   d. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.

   e. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.

   f. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.

   g. Incorporation of an approved local pretreatment program into a municipality's permit.

3. The following are causes for modification or alternatively revocation and reissuance:

   a. When cause exists for termination for reasons listed in 1.a through 1,g of this section, and Ecology determines that modification or revocation and reissuance is appropriate.

   b. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G7) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. Reporting planned changes

The Permittee must, as soon as possible, but no later than one hundred eighty (180) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:

1. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).
2. A significant change in the nature or an increase in quantity of pollutants discharged.
3. A significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. Plan review required

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. Compliance with other laws and statutes

Nothing in this permit excuses the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. Transfer of this permit

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

1. Transfers by Modification
   Except as provided in paragraph (2) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.
2. Automatic Transfers
   This permit may be automatically transferred to a new Permittee if:
   a. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.

b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.

c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. Upset

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.
2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Special Condition S3.F.
4. The Permittee complied with any remedial measures required under S3.F of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. Toxic pollutants

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. Penalties for tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment shall be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. Compliance schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

G21. Service agreement review

The Permittee must submit to Ecology any proposed service agreements and proposed revisions or updates to existing agreements for the operation of any wastewater treatment facility covered by this permit. The review is to ensure consistency with chapters 90.46 and 90.48 RCW as required by RCW 70.150.040(9). In the event that Ecology does not comment within a thirty-day (30) period, the Permittee may assume consistency and proceed with the service agreement or the revised/updated service agreement.

APPENDIX A

LIST OF POLLUTANTS WITH ANALYTICAL METHODS, DETECTION LIMITS AND QUANTITATION LEVELS

The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table for permit and application required monitoring unless:

- Another permit condition specifies other methods, detection levels, or quantitation levels.
- The method used produces measurable results in the sample and EPA has listed it as an EPA-approved method in 40 CFR Part 136.

If the Permittee uses an alternative method, not specified in the permit and as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

If the Permittee is unable to obtain the required DL and QL in its effluent due to matrix effects, the Permittee must submit a matrix-specific detection limit (MDL) and a quantitation limit (QL) to Ecology with appropriate laboratory documentation.

When the permit requires the Permittee to measure the base neutral compounds in the list of priority pollutants, it must measure all of the base neutral pollutants listed in the table below. The list includes EPA required base neutral priority pollutants and several additional polynuclear aromatic hydrocarbons (PAHs). The Water Quality Program added several PAHs to the list of base neutrals below from Ecology's Persistent Bioaccumulative Toxics (PBT) List. It only added those PBT parameters of interest to Appendix A that did not increase the overall cost of analysis unreasonably.

Ecology added this appendix to the permit in order to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost.

CONVENTIONAL PARAMETERS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1]** *µg/L unless specified*	**Quantitation Level (QL)[2]** *µg/L unless specified*
Biochemical Oxygen Demand	SM5210-B		2 mg/L
Soluble Biochemical Oxygen Demand	SM5210-B [3]		2 mg/L
Chemical Oxygen Demand	SM5220-D		10 mg/L
Total Organic Carbon	SM5310-B/C/D		1 mg/L
Total Suspended Solids	SM2540-D		5 mg/L
Total Ammonia (as N)	SM4500-NH3-B and C/D/E/G/H		20

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1] µg/L** *unless specified*	**Quantitation Level (QL) [2] µg/L** *unless specified*
Flow	Calibrated device		
Dissolved Oxygen	SM4500-OC/OG		0.2 mg/L
Temperature (max. 7-day avg.)	Analog recorder or Use micro-recording devices known as thermistors		0.2° C
pH	SM4500-H^+ B	N/A	N/A

NONCONVENTIONAL PARAMETERS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1] µg/L** *unless specified*	**Quantitation Level (QL)[2] µg/L** *unless specified*
Total Alkalinity	SM2320-B		5 mg/L as CaCO3
Chlorine, Total Residual	SM4500 Cl G		50.0
Color	SM2120 B/C/E		10 color units
Fecal Coliform	SM 9221E,9222	N/A	Specified in method - sample aliquot dependent
Fluoride (16984-48-8)	SM4500-F E	25	100
Nitrate + Nitrite Nitrogen (as N)	SM4500-NO3-E/F/H		100
Nitrogen, Total Kjeldahl (as N)	SM4500-N_{org}B/C and SM4500NH_3-B/C/D/EF/G/H		300
Soluble Reactive Phosphorus (as P)	SM4500- PE/PF	3	10
Phosphorus, Total (as P)	SM 4500 PB followed by SM4500-PE/PF	3	10
Oil and Grease (HEM)	1664 A or B	1,400	5,000
Salinity	SM2520-B		3 practical salinity units or scale (PSU or PSS)
Settleable Solids	SM2540 -F		100
Sulfate (as mg/L SO_4)	SM4110-B		200
Sulfide (as mg/L S)	SM4500-S^2F/D/E/G		200
Sulfite (as mg/L SO_3)	SM4500-SO3B		2000
Total Coliform	SM 9221B, 9222B, 9223B	N/A	Specified in method - sample aliquot dependent
Total Dissolved Solids	SM2540 C		20 mg/L
Total Hardness	SM2340B		200 as CaCO3
Aluminum, Total (7429-90-5)	200.8	2.0	10
Barium Total (7440-39-3)	200.8	0.5	2.0
BTEX (benzene +toluene + ethylbenzene + m,o,p xylenes)	EPA SW 846 8021/8260	1	2

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)**[2] ***µg/L unless specified***
Boron Total (7440-42-8)	200.8	2.0	10.0
Cobalt, Total (7440-48-4)	200.8	0.05	0.25
Iron, Total (7439-89-6)	200.7	12.5	50
Magnesium, Total (7439-95-4)	200.7	10	50
Molybdenum, Total (7439-98-7)	200.8	0.1	0.5
Manganese, Total (7439-96-5)	200.8	0.1	0.5
NWTPH Dx [4]	Ecology NWTPH Dx	250	250
NWTPH Gx [5]	Ecology NWTPH Gx	250	250
Tin, Total (7440-31-5)	200.8	0.3	1.5
Titanium, Total (7440-32-6)	200.8	0.5	2.5

PRIORITY POLLUTANTS

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)** [2] ***µg/L unless specified***
METALS, CYANIDE & TOTAL PHENOLS			
Antimony, Total (7440-36-0)	200.8	0.3	1.0
Arsenic, Total (7440-38-2)	200.8	0.1	0.5
Beryllium, Total (7440-41-7)	200.8	0.1	0.5
Cadmium, Total (7440-43-9)	200.8	0.05	0.25
Chromium (hex) dissolved (18540-29-9)	SM3500-Cr EC	0.3	1.2
Chromium, Total (7440-47-3)	200.8	0.2	1.0
Copper, Total (7440-50-8)	200.8	0.4	2.0
Lead, Total (7439-92-1)	200.8	0.1	0.5
Mercury, Total (7439-97-6)	1631E	0.0002	0.0005
Nickel, Total (7440-02-0)	200.8	0.1	0.5
Selenium, Total (7782-49-2)	200.8	1.0	1.0
Silver, Total (7440-22-4)	200.8	0.04	0.2
Thallium, Total (7440-28-0)	200.8	0.09	0.36
Zinc, Total (7440-66-6)	200.8	0.5	2.5
Cyanide, Total (57-12-5)	335.4	5	10
Cyanide, Weak Acid Dissociable	SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	SM4500-CN G	5	10
Phenols, Total	EPA 420.1		50

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
ACID COMPOUNDS			
2-Chlorophenol (95-57-8)	625	1.0	2.0
2,4-Dichlorophenol (120-83-2)	625	0.5	1.0
2,4-Dimethylphenol (105-67-9)	625	0.5	1.0
4,6-dinitro-o-cresol (534-52-1) (2-methyl-4,6,-dinitrophenol)	625/1625B	1.0	2.0
2,4 dinitrophenol (51-28-5)	625	1.0	2.0
2-Nitrophenol (88-75-5)	625	0.5	1.0
4-nitrophenol (100-02-7)	625	0.5	1.0
Parachlorometa cresol (59-50-7) (4-chloro-3-methylphenol)	625	1.0	2.0
Pentachlorophenol (87-86-5)	625	0.5	1.0
Phenol (108-95-2)	625	2.0	4.0
2,4,6-Trichlorophenol (88-06-2)	625	2.0	4.0

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
VOLATILE COMPOUNDS			
Acrolein (107-02-8)	624	5	10
Acrylonitrile (107-13-1)	624	1.0	2.0
Benzene (71-43-2)	624	1.0	2.0
Bromoform (75-25-2)	624	1.0	2.0
Carbon tetrachloride (56-23-5)	624/601 or SM6230B	1.0	2.0
Chlorobenzene (108-90-7)	624	1.0	2.0
Chloroethane (75-00-3)	624/601	1.0	2.0
2-Chloroethylvinyl Ether (110-75-8)	624	1.0	2.0
Chloroform (67-66-3)	624 or SM6210B	1.0	2.0
Dibromochloromethane (124-48-1)	624	1.0	2.0
1,2-Dichlorobenzene (95-50-1)	624	1.9	7.6
1,3-Dichlorobenzene (541-73-1)	624	1.9	7.6
1,4-Dichlorobenzene (106-46-7)	624	4.4	17.6
Dichlorobromomethane (75-27-4)	624	1.0	2.0

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1] µg/L** ***unless specified***	**Quantitation Level (QL)[2] µg/L** ***unless specified***
VOLATILE COMPOUNDS			
1,1-Dichloroethane (75-34-3)	624	1.0	2.0
1,2-Dichloroethane (107-06-2)	624	1.0	2.0
1,1-Dichloroethylene (75-35-4)	624	1.0	2.0
1,2-Dichloropropane (78-87-5)	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) (542-75-6) [6]	624	1.0	2.0
Ethylbenzene (100-41-4)	624	1.0	2.0
Methyl bromide (74-83-9) (Bromomethane)	624/601	5.0	10.0
Methyl chloride (74-87-3) (Chloromethane)	624	1.0	2.0
Methylene chloride (75-09-2)	624	5.0	10.0
1,1,2,2-Tetrachloroethane (79-34-5)	624	1.9	2.0
Tetrachloroethylene (127-18-4)	624	1.0	2.0
Toluene (108-88-3)	624	1.0	2.0
1,2-Trans-Dichloroethylene (156-60-5) (Ethylene dichloride)	624	1.0	2.0
1,1,1-Trichloroethane (71-55-6)	624	1.0	2.0
1,1,2-Trichloroethane (79-00-5)	624	1.0	2.0
Trichloroethylene (79-01-6)	624	1.0	2.0
Vinyl chloride (75-01-4)	624/SM6200B	1.0	2.0

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1] µg/L** ***unless specified***	**Quantitation Level (QL)[2] µg/L** ***unless specified***
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)			
Acenaphthene (83-32-9)	625	0.2	0.4
Acenaphthylene (208-96-8)	625	0.3	0.6
Anthracene (120-12-7)	625	0.3	0.6
Benzidine (92-87-5)	625	12	24
Benzyl butyl phthalate (85-68-7)	625	0.3	0.6
Benzo(*a*)anthracene (56-55-3)	625	0.3	0.6
Benzo(b)fluoranthene (3,4-benzofluoranthene) (205-99-2) [7]	610/625	0.8	1.6

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL)[2] *µg/L unless specified***
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)			
Benzo(j)fluoranthene (205-82-3)[7]	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) (207-08-9)[7]	610/625	0.8	1.6
Benzo(r,s,t)pentaphene (189-55-9)	625	0.5	1.0
Benzo(*a*)pyrene (50-32-8)	610/625	0.5	1.0
Benzo(*ghi*)Perylene (191-24-2)	610/625	0.5	1.0
Bis(*2-chloroethoxy)*methane (111-91-1)	625	5.3	21.2
Bis(*2-chloroethyl*)ether (111-44-4)	611/625	0.3	1.0
Bis(*2-chloroisopropyl*)ether (39638-32-9)	625	0.3	0.6
Bis(*2-ethylhexyl*)phthalate (117-81-7)	625	0.1	0.5
4-Bromophenyl phenyl ether (101-55-3)	625	0.2	0.4
2-Chloronaphthalene (91-58-7)	625	0.3	0.6
4-Chlorophenyl phenyl ether (7005-72-3)	625	0.3	0.5
Chrysene (218-01-9)	610/625	0.3	0.6
Dibenzo (a,h)acridine (226-36-8)	610M/625M	2.5	10.0
Dibenzo (a,j)acridine (224-42-0)	610M/625M	2.5	10.0
Dibenzo(a-*h*)anthracene (53-70-3)(1,2,5,6-dibenzanthracene)	625	0.8	1.6
Dibenzo(a,e)pyrene (192-65-4)	610M/625M	2.5	10.0
Dibenzo(a,h)pyrene (189-64-0)	625M	2.5	10.0
3,3-Dichlorobenzidine (91-94-1)	605/625	0.5	1.0
Diethyl phthalate (84-66-2)	625	1.9	7.6
Dimethyl phthalate (131-11-3)	625	1.6	6.4
Di-n-butyl phthalate (84-74-2)	625	0.5	1.0
2,4-dinitrotoluene (121-14-2)	609/625	0.2	0.4
2,6-dinitrotoluene (606-20-2)	609/625	0.2	0.4

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection (DL)[1] µg/L *unless specified*	Quantitation Level (QL)[2] µg/L *unless specified*
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)			
Di-n-octyl phthalate (117-84-0)	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*) (122-66-7)	1625B	5.0	20
Fluoranthene (206-44-0)	625	0.3	0.6
Fluorene (86-73-7)	625	0.3	0.6
Hexachlorobenzene (118-74-1)	612/625	0.3	0.6
Hexachlorobutadiene (87-68-3)	625	0.5	1.0
Hexachlorocyclopentadiene (77-47-4)	1625B/625	0.5	1.0
Hexachloroethane (67-72-1)	625	0.5	1.0
Indeno(*1,2,3-cd*)Pyrene (193-39-5)	610/625	0.5	1.0
Isophorone (78-59-1)	625	0.5	1.0
3-Methyl cholanthrene (56-49-5)	625	2.0	8.0
Naphthalene (91-20-3)	625	0.3	0.6
Nitrobenzene (98-95-3)	625	0.5	1.0
N-Nitrosodimethylamine (62-75-9)	607/625	2.0	4.0
N-Nitrosodi-n-propylamine (621-64-7)	607/625	0.5	1.0
N-Nitrosodiphenylamine (86-30-6)	625	0.5	1.0
Perylene (198-55-0)	625	1.9	7.6
Phenanthrene (85-01-8)	625	0.3	0.6
Pyrene (129-00-0)	625	0.3	0.6
1,2,4-Trichlorobenzene (120-82-1)	625	0.3	0.6

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection (DL)[1] µg/L *unless specified*	Quantitation Level (QL)[2] µg/L *unless specified*
DIOXIN			
2,3,7,8-Tetra-Chlorodibenzo-P-Dioxin (176-40-16) (2,3,7,8 TCDD)	1613B	1.3 pg/L	5 pg/L

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. *(if available)*	**Recommended Analytical Protocol**	**Detection (DL)[1] *µg/L unless specified***	**Quantitation Level (QL) [2] *µg/L unless specified***
PESTICIDES/PCBs			
Aldrin (309-00-2)	608	0.025	0.05
alpha-BHC (319-84-6)	608	0.025	0.05
beta-BHC (319-85-7)	608	0.025	0.05
gamma-BHC (58-89-9)	608	0.025	0.05
delta-BHC (319-86-8)	608	0.025	0.05
Chlordane (57-74-9) [8]	608	0.025	0.05
4,4'-DDT (50-29-3)	608	0.025	0.05
4,4'-DDE (72-55-9)	608	0.025	0.05[10]
4,4' DDD (72-54-8)	608	0.025	0.05
Dieldrin (60-57-1)	608	0.025	0.05
alpha-Endosulfan (959-98-8)	608	0.025	0.05
beta-Endosulfan (33213-65-9)	608	0.025	0.05
Endosulfan Sulfate (1031-07-8)	608	0.025	0.05
Endrin (72-20-8)	608	0.025	0.05
Endrin Aldehyde (7421-93-4)	608	0.025	0.05
Heptachlor (76-44-8)	608	0.025	0.05
Heptachlor Epoxide (1024-57-3)	608	0.025	0.05
PCB-1242 (53469-21-9) [9]	608 - Revised	0.05	0.2
PCB-1254 (11097-69-1)	608 - Revised	0.05	0.2
PCB-1221 (11104-28-2)	608 - Revised	0.05	0.2
PCB-1232 (11141-16-5)	608 - Revised	0.05	0.2
PCB-1248 (12672-29-6)	608 - Revised	0.05	0.2
PCB-1260 (11096-82-5)	608 - Revised	0.05	0.2
PCB-1016 (12674-11-2) [9]	608 - Revised	0.05	0.2
Toxaphene (8001-35-2)	608	0.24	0.5

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

2. Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417).
   ALSO GIVEN AS:

The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

3. Soluble Biochemical Oxygen Demand method note: First, filter the sample through a Millipore Nylon filter (or equivalent) - pore size of 0.45-0.50 um (prep all filters by filtering 250 ml of laboratory grade deionized water through the filter and discard). Then, analyze sample as per method 5210-B.
   1.
4. NWTPH Dx - Northwest Total Petroleum Hydrocarbons Diesel Extended Range – see http://www.ecy.wa.gov/biblio/97602.html
   2.
5. NWTPH Gx - Northwest Total Petroleum Hydrocarbons Gasoline Extended Range – see http://www.ecy.wa.gov/biblio/97602.html

6. 1, 3-dichloroproylene (mixed isomers) - You may report this parameter as two separate parameters: cis-1, 3-dichlorpropropene (10061-01-5) and trans-1, 3-dichloropropene (10061-02-6).

7. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

8. Chlordane – You may report alpha-chlordane (5103-71-9) and gamma-chlordane (5103-74-2) in place of chlordane (57-74-9). If you report alpha and gamma-chlordane, the DL/PQLs that apply are 0.025/0.050.

9. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

Fact Sheet for NPDES Permit WA0000892
Kaiser Aluminum Washington, LLC

Purpose of this fact sheet

This fact sheet explains and documents the decisions the Department of Ecology (Ecology) made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for Kaiser Aluminum Washington, LLC.

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit and accompanying fact sheet for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for Kaiser Aluminum Washington, LLC, NPDES permit WA0000892, are available for public review and comment from June 30, 2016 until August 29, 2016. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement Information**.

Kaiser Aluminum Washington, LLC (Kaiser) reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water prior to publishing this draft fact sheet for public notice.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this fact sheet as **Appendix E - Response to Comments**, and publish it when issuing the final NPDES permit. Ecology generally will not revise the rest of the fact sheet. The full document will become part of the legal history contained in the facility's permit file.

Summary

Kaiser owns and operates an aluminum rolling mill and metal finishing plant at Trentwood, Spokane County, Washington. The facility discharges treated process wastewater, plant sanitary wastewater, and excess groundwater to the Spokane River.

The permit continues the Compliance Schedule established in the previous permit for meeting final water quality based effluent limits (WQBELs) for total phosphorus, ammonia, and carboneous biochemical oxygen demand (CBOD). These WQBELs are necessary to meet requirements of the Spokane River Dissolved Oxygen total maximum daily load (TMDL). The proposed permit also includes an interim performance based limit for PCBs, and a compliance schedule for meeting a water quality based limit for PCBs.

Table of Contents

I. Introduction

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the state of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The Legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to industrial NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC)
- Water quality criteria for ground waters (chapter 173-200 WAC)
- Whole effluent toxicity testing and limits (chapter 173-205 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of plans and reports for construction of wastewater facilities (chapter 173-240 WAC)

These rules require any industrial facility owner/operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for performance requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See **Appendix A - Public Involvement Information** for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit in response to comment(s). Ecology will summarize the responses to comments and any changes to the permit in **Appendix E**.

II. Background Information

Table 1: General Facility Information

Facility Information	
Applicant	Kaiser Aluminum Washington, LLC
Facility Name and Address	Kaiser Aluminum Washington, LLC Trentwood Works 15000 E Euclid Ave, Spokane Valley, WA 99215
Contact at Facility	Mr. Bud Leber, Environmental Engineering Manger (509) 927-6554
Responsible Official	Mr. Scott Endres, VP Flat Rolled Products PO Box 15108, Spokane Valley, WA 99215 (509) 924-1500 FAX #: (509) 927-6095
Industry Type	Aluminum Forming
Categorical Industry	40 CFR Part 467, Aluminum Forming Point Source Category
Type of Treatment	Settling/Filtration for non-contact and contact cooling waters, and stormwater. Oil Removal/Lime Addition/Settling/Filtration for oil and metal contaiminated process wastewaters. Primary Clarification/Secondary Treatment (Trickling Filter)/Secondary Clarification/Disinfection for plant sanitary wastewater.
SIC Codes	3353
NAIC Codes	331315
Facility Location (NAD83/WGS84 reference datum)	Latitude: 47.686048 Longitude: -117.205603
Discharge Waterbody Name and Location (NAD83/WGS84 reference datum)	Spokane River Latitude: 47.6860445517192 Longitude: -117.223793548856

Permit Status	
Issuance Date of Previous Permit	June 23, 2011
Application for Permit Renewal Submittal Date	December 15, 2015
Date of Ecology Acceptance of Application	April 15, 2016

Inspection Status	
Date of Last Non-sampling Inspection Date	June 17, 2015

Figure 1: Facility Location Map

A. Facility description

History

Kaiser Aluminum Washington, LLC (Kaiser) owns and operates an aluminum rolling mill and metal finishing plant at Trentwood, Spokane County, Washington (see Figure 1). The facility produces aluminum sheet, plate and coil through the rolling of aluminum with neat oils and emulsions. Supporting operations include direct chill casting and solution heat treating. Finished products are used mainly in the aerospace industry and for general engineering applications. The plant sits on 512 acres, with over 60 acres under roof.

The U.S. Government Defense Plant Corporation built the Trentwood facility in 1942 to produce aluminum for World War II aircraft. In 1946, Kaiser leased, then later purchased the facility. The Permittee has operated at the site since that time.

Cooling Water Intakes

CWA § 316(b) requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. Ecology started requiring a supplemental application for all applicants using EPA Form 2-C in July 2013. Kaiser selected "Yes" on this form when asked if a cooling water intake is associated with the facility.

Kaiser withdraws water from the Spokane River for use as once through, cooling water. This withdraw averages about 3 million gallons per day, with 95% used exclusively for cooling. The configuration of the intake structure includes a bar screen, followed by a mesh screen, then a moving screen to remove solid debris.

Industrial Processes

Manufacturing operations include remelting and casting of aluminum to form ingots. One or a combination of three hot rolling mills in series then forms the ingots into aluminum sheet, plate, or coil. Cold mills further reduce thickness for coil product. Additional operations consist of annealing (heating the metal and allowing it to cool slowly to remove internal stress and toughen it), inspection, sawing, and final product packaging. The facility operates 24 hours per day, 7 days per week, with current employment of about 650 employees. The

Permittee added additional heat treatment capacity and plate stretching operations at the facility in October 2006. The Trentwood location does not have access to municipal sewers. As a result, the facility has a sanitary wastewater treatment plant to serve the facility employee population.

Historic releases/cleanup activities

Kaiser documented several releases of pollutants related to historical operations at the site. Kaiser conducted independent investigations and remedial actions to address groundwater and soil contamination coming from these releases. Pollutants included PCBs, petroleum product and metals in both soil and groundwater.

Since 1993, Kaiser has taken voluntary interim corrective actions in the Oil House and Wastewater areas to prevent:

- the further movement of PCBs and petroleum floating on groundwater

- prevent further movement of dissolved hydrocarbons in groundwater
- recover petroleum product on groundwater, and
- enhance the breakdown of hydrocarbons.

They use three pumping wells to lower ground water levels thereby enhancing pollutant capture and containment. One well is located at the Oil House and the other two are in the process wastewater treatment area.

Kaiser uses groundwater from wells located at the Oil House and the Wastewater Treatment Plant Areas as process water. These wells also provide containment as a part of site cleanup activities under an Agreed Order with Ecology's Toxics Cleanup Program. The groundwater withdrawal rate for containment has generally exceeded process water demands, but is used as a backup source of water.

If containment withdrawal rates exceed process water demand, the excess groundwater is discharged through internal Outfall 007 which combines with internal Outfall 006 (discharge from the black walnut shell (BWS filters) prior to the effluent monitoring station for Outfall 001, the final outfall.

On August 16, 2005, the Ecology and the Permittee entered into an agreed Order under the Model Toxics Control Act. The Order required the Permittee to perform a Remedial Investigation and Feasibility Study (RI/FS) at the site. In 2010, Kaiser completed the Remedial Investigation of nine areas at the site. The investigation provided a more comprehensive understanding of the location and quantities of contaminants in soil and groundwater.

As part of the cleanup efforts, Kaiser is conducting an interim action consisting of a pilot study for remediation of PCBs in groundwater using ex-situ, black walnut shell filtration system. Activities under this Order are ongoing (see https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=7093 for current information on site cleanup activities).

Wastewater treatment processes

The wastewater discharged from the facility consists of treated stormwater, process wastewater, treated sanitary effluent, and groundwater. All stormwater, process and sanitary wastewater flows through a double lined 4-million gallon settling lagoon (equipped with oil skimming and collection equipment), and a black walnut shell filtration unit prior to discharging to the Spokane River.

The following table summarizes the discharge outfalls and wastewater sources at the facility:

Table 2: Discharge Outfalls

Outfall #	Description	Wastewater Source
001	Final Discharge to Spokane River	Internal Outfalls 006 and 007
002	Internal Outfall to wastewater lagoon	Treated industrial process wastewater
003	Internal Outfall to wastewater lagoon	Treated plant sanitary wastewater

Outfall #	Description	Wastewater Source
004	Internal Outfall to wastewater lagoon.	Noncontact and contact cooling water, and stormwater from north portion of plant site
005	Internal Outfall to wastewater lagoon	Noncontact and contact cooling water, and stormwater from south portion of plant site
006	Internal Outfall to Final Discharge	Treated (black walnut shell filtration system) wastewater lagoon effluent.
007	Internal Outfall to Final Discharge	Excess groundwater remediation flows

The process wastewater from aluminum hot and cold rolling picks up oil and metal contaminants. An industrial wastewater treatment (IWT) plant treats this process wastewater prior to discharge to the settling lagoon via internal Outfall #002. Influent to the IWT contains approximately 5% emulsified oil. The process uses steam and acid to strip the oil from the water and coalesce the oil droplets. The wastewater then flows to a series of oil/water separation tanks. The facility stores recovered oil and then recycles it off-site through a fuels program.

Kaiser routes the effluent from the oil/water tanks to process tanks for more treatment. In the process tanks, they remove additional free oil by skimming it off the surface of the wastewater.

The wastewater then flows to a neutralization tank where they add lime to a pH of about 8.5 to precipitate the aluminum and zinc ions. From the neutralization tank, the wastewater discharges to a clarifier. The solids removed from the clarifier go through a vacuum drum filter system for dewatering. Kaiser ships the dewatered solids offsite for disposal.

Kaiser discharges additional process wastewater streams to the wastewater lagoon via internal Outfalls #004 and #005 (north and south Outfalls, respectively). Both the south and north Outfalls discharge mostly non-contact cooling water to the wastewater lagoon. The wastewater lagoon also receives storm water runoff from approximately 60 acres of roof and other impervious areas

The sanitary wastewater treatment (SWT) plant includes primary settling, trickling filter treatment, secondary settling, and chlorination. Sludge is digested in a storage tank, then shipped off-site for disposal. The SWT effluent flows through internal Outfall 003 to the north Outfall and then mixes with the industrial process wastewater in the wastewater lagoon.

Kaiser filters all effluent from the wastewater lagoon through a black walnut shell (BWS) filtration system (Outfall 006), prior to final discharge to the Spokane River via Outfall 001. They installed the BWS filtration system in 2003 to reduce PCBs discharged from the facility (additional discussion below) to the Spokane River. They send the backwash from the BWS filter system to reclaim oil tanks then to the IWT clarifier.

Kaiser uses Spokane River and onsite groundwater wells to provide source water for the industrial operations. Currently, the process water consist of 60% groundwater. This changes depending on the production volume and need.

Discharge outfall

Wastewater discharges to the Spokane River at River Mile 86.0 via a submerged two open port diffuser. Kaiser located the outfall in approximately the middle of the river channel. The outfall pipe extends approximately 100 feet from the high water mark to the middle of the channel.

B. Description of the receiving water

The Spokane River basin encompasses over 6,000 square miles. The Spokane River headwaters begin at the outlet of Lake Coeur d'Alene in Idaho. The river flows west 112 river miles to the Columbia River in Washington. The river flows through the cities of Post Falls and Coeur d'Alene in Idaho, and through the large urban areas of Spokane Valley and Spokane in Washington.

The flow regime for the Spokane River is dictated largely by freezing temperatures in the winter followed by spring and summer snowmelt. The annual harmonic mean flow is approximately 2,154 cfs as the river crosses the Idaho border. Flow increases to 2,896 cfs downstream of Spokane. This reach of the river includes both losing (where river flows are lost to the Spokane Valley-Rathdrum Prairie Aquifer) and gaining areas (where the aquifer recharges the river).

In Idaho, other point source outfalls to the Spokane River include the City of Coeur d'Alene, Hayden Area Regional Sewer Board POTW, and the City of Post Falls POTW. In Washington, point sources include Liberty Lake Sewer & Water District (upstream from the Permittee); and Inland Empire Paper Company, Spokane County Regional Water Reclamation Facility, and the City of Spokane Advanced Wastewater Treatment Plant (downstream from the Permittee).

Significant nearby non-point sources of pollutants to the Spokane River include stormwater and combined sewer overflows from the City of Spokane; and agricultural pollution sources from Latah Creek (or Hangman Creek), Little Spokane River and Coulee/Deep Creeks.

Section IIIE of this fact sheet describes the known receiving waterbody impairments. The ambient background data includes the pooled data from three of Ecology's long term water quality monitoring stations for the Spokane River: Sullivan Road (57A146), Barker Road (57A148), and Stateline (57A150) from January 1995 to September 2014. The ambient background data also includes results from an August 2015 dry weather PCB survey for the Spokane River at a station at Mirabeau Park (http://srrttf.org/wpcontent/uploads/2015/11/SRRTTF_LimnoTech_TTWG_12_02_2015.pdf).

Table 3: Ambient Receiving Water Background Data

Parameter	Value	Description
Temperature	21.1 °C	90th Percentile
pH	8.0 standard units 7.2 standard units	90th Percentile 10th Percentile
Dissolved Oxygen	7.9 mg/L	10th Percentile
Total Ammonia-N	0.0259 mg/L	90th Percentile
Turbidity	0.6 NTU	10th Percentile

Parameter	Value	Description
Hardness	18.6 mg/L as CaCO3	10th Percentile
Alkalinity	16.4 mg/L as CaCO3	10th Percentile
Arsenic, total	0.56 ug/L	90th Percentile
	0.45 ug/L	Geometric Mean
Cadmium, dissolved	0.32 ug/L	90th Percentile
Chromium, total	0.25 ug/L	90th Percentile
Copper, dissolved	0.71 ug/L	90th Percentile
	0.54 ug/L	Geometric Mean
Mercury, total	0.00252 ug/L	90th Percentile
	0.00122 ug/L	Geometric Mean
Nickel, dissolved	0.51 ug/L	90th Percentile
	0.34 ug/L	Geometric Mean
Total PCBs	16.7 pg/L	Maximum [a]
Lead, dissolved	1.23 ug/L	90th Percentile
Silver, dissolved	<0.02 ug/L	90th Percentile
Zinc, dissolved	87.7 ug/L	90th Percentile

[a] Maximum concentration of river samples collected from August 18, 19, 20, 21, and 22, 2015. Data set included one duplicate value on August 21, 2015. Results blank corrected to account for laboratory contamination at a level of 3X. A "3X" blank correction means PCB congeners that are less than three times the associated method blank result are counted as zero when totaling.

C. Wastewater characterization

Kaiser reported the concentration of pollutants in the discharge in the permit application and in discharge monitoring reports. The tabulated data represents the quality of the wastewater effluent discharged from July 2011 through November 2015. The wastewater effluent is characterized as follows:

Table 4: Wastewater Characterization – Outfall 001

Parameter	Units	# of Samples	Average Value	Daily Maximum Value
Flow	MGD	49 [a]	11.6	18.3
Ammonia	mg/L	49 [b]	0.022	0.35
	lbs/day	49 [b]	2.18	47.9
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	mg/L	49 [b]	2.1	5.2
	lbs/day	49 [b]	205	656
Total Phosphorus	ug/L	49 [b]	9.7	92
	lbs/day	49 [b]	0.94	12.1
Temperature	°F	49 [a]	63.6	92.4
Cadmium	ug/L	49 [b]	0.024	0.13
Lead	ug/L	49 [b]	0.168	10.3
Zinc	ug/L	49 [b]	12.5	81
Total PCBs	pg/L	108	2,261	4,730

Parameter	Units	# of Samples	Average Value	Daily Maximum Value
	mg/day	108	102	291
Antimony	ug/L	1	-	0.28
Arsenic	ug/L	1	-	4.11
Copper	ug/L	1	-	1.32
Iron	ug/L	1	-	11
Manganese	ug/L	1	-	2.74
Mercury	ng/L	1	-	3.6
Nickel	ug/L	1	-	0.34
Radium 226	pCi/L	1	-	0.25

Parameter	Units	# of Samples	Minimum Value	Maximum Value
pH	standard units	49 [a]	5.8	8.9

a	The Permittee continuously monitors for flow, temperature, and pH. The # of samples reflect 49 months of continuous results.
b	The Permittee monitors ammonia, CBOD5, total phosphorus, cadmium, lead, and zinc at a frequency of 8 to 9 daily samples per month. The # of samples reflect 49 months of summarized data.

Table 5: Wastewater Characterization – Outfall 006

Parameter	Units	Average Value	Maximum Value
Flow`	MGD	8.90	15.1
Total Suspended Solids (TSS)	mg/L	1.7	41.3
	lbs/day	107.9	3,346
Aluminum*	mg/L	0.048	0.67
	lbs/day	2.60	19.4
Chromium*	mg/L	0.0016	0.05
	lbs/day	0.098	4.1
Oil and Grease	mg/L	1.26	13.1
	lbs/day	70.8	1,016
Cyanide	mg/L	<0.01	<0.01
* - Ecology used concentrations of aluminum and chromium measured at Outfall 006 for the reasonable potential determination (see Section G)			

Table 6: Wastewater Characterization – Outfall 003

Parameter	Units	Average Value	Maximum Value
Flow	gpd	93,270	210,000
Biochemical Oxygen Demand (BOD_5)	mg/L	6.2	32.3
	lbs/day	4.9	42.4
Total Suspended Solids (TSS)	mg/L	3.3	39
	lbs/day	2.7	48.8

Parameter	Units	Average Value	Maximum Value
Total Phosphorus	mg/L	0.871	1.56
	lbs/day	0.73	1.8

Parameter	Units	Maximum Monthly Geometric Mean	Maximum Weekly Geometric Mean
Fecal Coliforms	#/100 ml	0.093	0.21

Parameter	Units	Minimum Value	Maximum Value
pH	standard units	5.8	9.1

Table 7 Wastewater Characterization – Influent to the Black Walnut Shell Filtration System (BWSI)

Parameter	Units	Average Value	Maximum Value
Flow	MGD	8.90	15.1
Polychlorinated Biphenyls	g/day	0.1725	0.65

Table 8: Characterization – Spokane River Intake

Parameter	Units	Average Value	Maximum Value
Flow	MGD	2.91	6.4
Total Suspended Solids (TSS)	mg/L	0.8	17.4
	lbs/day	19.9	397.5
Aluminum	mg/L	0.035	0.368
	lbs/day	0.88	9.20
Chromium	mg/L	0.0006	0.035
	lbs/day	0.0173	1.22
Oil and Grease	mg/L	0.98	10.6
	lbs/day	23.7	278.9
Total Phosphorus	ug/L	11.2	43
	lbs/day	0.32	1.43
Zinc	mg/L	0.038	0.096
	lbs/day	1.15	2.17

D. Summary of compliance with previous permit issued on June 23, 2011

The previous permit placed effluent limits on Outfall 001 for zinc, lead, cadmium, pH, total phosphorus, ammonia, CBOD, and total PCBs; Outfall 006 for chromium, cyanide, aluminum, oil & grease, and TSS; Outfall 003 for BOD, TSS and fecal coliform bacteria.

Kaiser has complied with the effluent limits and permit conditions throughout the duration of the permit issued on June 23, 2011 with the few exceptions noted below. Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections.

The following table summarizes the effluent violations that occurred during the permit term.

Table 9: Violations

Begin Date	Outfall	Parameter	Statistical Base	Units	Value	Max Limit
11/1/2011	006	TSS	Maximum	lbs/day	1,457.4	1,142.1
1/1/2012	002	Aluminum	Maximum	lbs/day	92.6	20.1
			Average Monthly	lbs/day	10.78	9.93
2/1/2012	006	TSS	Maximum	lbs/day	1,194.1	1,142.1
8/1/2012	006	TSS	Maximum	lbs/day	3,346	1,142.1
6/1/2015	006	Oil & Grease	Maximum	lbs/day	1,016	565.3

Kaiser investigated the November 2011 TSS exceedance at outfall 006, but did not identify a cause. Similarly, Kaiser could not find a cause for the January 2012 aluminum exceedances at Outfall 002. The aluminum levels prior and subsequent to the sampling event were less than 10% of the daily maximum limit.

Kaiser concluded that the high TSS levels at outfall 006 in February and August 2012 resulted from biological growth inside the sample collection equipment. Since that time, Kaiser personnel have implemented routine cleaning/replacement of the sample collection tubes and jugs in order to prevent a recurrence.

For the June 2015 oil and grease exceedance at Outfall 006, Kaiser's follow-up report found that operators did not note any abnormal conditions or observations. However, in reviewing the lab results, a trainee analyst had performed oil and grease testing throughout the month. Kaiser believed carryover of material occurred during sample clean-up and did not reflect actual discharge concentrations.

Kaiser also reported five pH excursions throughout the duration of the permit issued on June 23, 2011 (for the months of August and September 2011, October 2013, July 2013 and August 2015). In three of these incidents, the duration of the pH excursion did not exceed the time allowed for continuous monitoring; and thus are not considered exceedences. The other two reported excursions resulted from power loss to the continuous monitoring equipment.

Kaiser has complied with report submittal requirements over the permit term.

E. State environmental policy act (SEPA) compliance

State law exempts the issuance, reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions that are no less stringent than federal and state rules and regulations (RCW 43.21C.0383). The exemption applies only to existing discharges, not to new discharges.

III. Proposed Permit Limits

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).

Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC), or the National Toxics Rule (40 CFR 131.36).

Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Ecology does not usually develop limits for pollutants not reported in the permit application but may be present in the discharge. The permit does not authorize discharge of the non-reported pollutants. During the five-year permit term, the facility's effluent discharge conditions may change from those conditions reported in the permit application. The facility must notify Ecology if significant changes occur in any constituent [40 CFR 122.42(a)]. Until Ecology modifies the permit to reflect additional discharge of pollutants, a permitted facility could be violating its permit.

A. Design criteria

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. Ecology approved design criteria for the BWS filtration system in the engineering report prepared by CDM in 2002. The table below includes design criteria from the referenced report.

Table 10: Design Criteria for Black Walnut Shell (BSW) Filtration System

Parameter	Design Quantity
Daily Maximum Flow	11.0 MGD
Influent Total PCB Loading	0.78 g/day

B. Technology-based effluent limits

Process Wastewaters

Technology-based limitations for aluminum forming are based on Best Available Technology (BAT) limits for toxic and nonconventional pollutants; and Best Conventional Technology (BCT) limits for conventional pollutants. For Aluminum Forming, BCT limits have not been promulgated. Therefore, Best Practical Technology (BPT) limits are assumed to equal BCT.

New Source Performance Standards (NSPS) also applies to expanded horizontal heat treat production. The Environmental Protection Agency (EPA) have developed these limits, found in the Code of Federal Regulations (CFR), current as of July 1, 2014 as follows:

Table 11: Technology-based Limits for Outfall 006

Subcategory	Technology
Rolling with Neat Oils (40 CFR 467, Subpart A, Core without an annealing furnace scrubber)	BAT/BCT
Rolling with Emulsions (40 CFR 467, Subpart B, Core)	BAT/BCT
Rolling with Neat Oils (40 CFR 467, Subpart A, Solution Heat Treating Contact Cooling Water)	BAT/BCT
Rolling with Emulsions (40 CFR Part 467, Subpart B, Direct Chill Casting Contact Cooling Water)	BAT/BCT
Rolling with Emulsions (40 CFR Part 467, Subpart B, Solution Heat Treating Contact Cooling Water)	BAT/BCT & NSPS

The Permittee also generates non-scope wastewaters (those wastewater generated from processes not covered under the effluent guidelines). Guidance for setting discharge limits for non-scope wastewater is provided by amendments to the original publication of the Development Document for the Aluminum Forming Point Source Category. The amendments with corresponding explanation were published in the Federal Register (Vol. 53, No. 248, December 27, 1988).

For wastewater discharged from the industrial wastewater treatment plant, applicable subcategories (i.e. building blocks) included Rolling with Neat Oils (Core) and Rolling with Emulsions (Core). For wastewaters discharged directly into the wastewater lagoon (via the north and south Outfalls) building blocks include Rolling with Neat Oils (Solution Heat Treatment Contact Cooling Water) and Rolling with Emulsions (Direct Chill Casting Contact Cooling Water and Solution Heat Treatment Contact Cooling Water). Additionally, since the majority of the wastewater discharge to the wastewater lagoon is non-scope wastewater, allowance for non-scope discharge is also applicable.

The guidance for setting discharge limits for non-scope wastewater states that the discharge limits should be determined from the product of the wastewater flow rate and treatment limits as given in Section VII of the Development Document. The resulting quantity can then be added to other process wastewater building blocks to determine the total mass discharge limit.

From the 2015 Permit renewal application data, an estimated average non-scope wastewater flow rate is 7.40 mgd. One day maximum and thirty day average treatment limits for lime settling and filtration (LS&F) provided in Table VII-20, Section VII of the Development Document were used in determining the non-scope allowances. The treatment limits were then multiplied by the average flow rate to give the allowable non-scope mass allowance (non-production based mass allowance). These values were added to the process wastewater building blocks in calculating the total allowable mass discharge limits.

The resulting technology based effluent limits for process wastewater discharged from Outfall 006 are summarized below:

Table 12: Technology-based Limits for Outfall 006

Pollutant	Daily Average	Daily Maximum
Chromium, lbs/day	7.7	26.5
Cyanide, lbs/day	0.99	2.38
Zinc, lbs/day	24.1	74.9
Aluminum, lbs/day	175.3	431.0
Oil and Grease, lbs/day	766.3	860.5
TSS, lbs/day	856.0	1,420.4

Parameter	Daily Minimum	Daily Maximum
pH	6.0 standard units	9.0 standard units

The Permittee has consistently met their existing permit limits at Outfall 006 with a few exceptions. Based on best professional judgement, Ecology also considered the case-by-case technology based effluent limitations for chromium, cyanide, aluminum, oil & grease, and TSS based on existing performance based permit limits:

Table 13: Case-by-Case Technology-based Limits for Outfall 006

Effluent Characteristic	Effluent Limitations	
	Daily Average	Daily Maximum
Chromium, lbs/day	2.1	5.1
Cyanide, lbs/day	0.53	1.27
Aluminum, lbs/day	7.5	14.4
Oil & Grease, lbs/day	374.7	565.3
TSS, lbs/day	406.1	903.9

When the discharger demonstrates certain conditions, Federal rules in 40 CFR Part 122.45(g) allow the adjustment of technology based effluent limits to reflect credit for pollutants in the discharge's intake water. In this instance, the applicable provisions include 40 CFR Part 122.45(g)(1)(ii), the control system would meet the applicable technology-based limitation in the absence of pollutants in the Spokane River intake water; and 40 CFR Part 122.45(g)(2), the generic measure of TSS in the effluent is substantially similar to the generic measure of TSS in the Spokane River intake water. Kaiser demonstrated these conditions during a previous permit renewal.

The proposed permit will specify this intake water credit by allowing Kaiser to calculate discharge quantities of chromium, aluminum, oil & grease, and TSS on a net basis, by subtracting Spokane River intake water loadings from Outfall 006 loadings.

Domestic Wastewater

Federal and state regulations define technology-based effluent limits for domestic wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state).

These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for domestic wastewater.

Domestic wastewater facilities which receive less concentrated influent wastewater are eligible for a lower percent removal effluent limit or a lower mass loading limit based on the lower percent removal provided the facility can demonstrate all of the elements listed below:

- The wastewater facility consistently achieves the effluent concentration limits and mass limits based upon the effluent concentrations.
- That to meet the percent removal requirements the wastewater facility would have to achieve an effluent concentration at least 5 mg/L below the effluent concentration otherwise required.
- The less concentrated influent is not the result of excessive infiltration and/or inflow (I/I).
- The wastewater facility must have developed and implemented an Ecology approved program for ongoing maintenance, repair, and replacement including I/I control.

Ecology may approve a request for alternative limits only if a facility meets all of the following conditions.

- The discharge must not cause water quality violations.
- The facility must identify effluent concentrations consistently achievable through proper operation and maintenance.
- The facility must demonstrate that industrial wastewater does not interfere with the domestic wastewater facility.
- The wastewater facility must be within Ecology approved hydraulic and organic design loading capacity.
- The facility must evaluate whether seasonal alternative limits are more appropriate than year-round.
- The facility must meet all other permit requirements and conditions.

Ecology reviewed the information in the past record and will continue to not include a percent removal requirements for TSS and BODs because of the dilute nature of the Permittee's domestic wastewater. Instead, the proposed permit will contain effluent BOD and TSS loadings based on a limiting design flow through the secondary clarifier of 192,000 gpd (CH2M Engineers, 1970).

The table below identifies technology-based limits for fecal coliform, BOD_5, and TSS, as listed in chapter 173-221-040 WAC, secondary treatment standards. Section III.G of this fact sheet describes the potential for water quality-based limits.

Table 14: Technology-based Limits for Outfall 003

Parameter	Average Monthly Limit	Average Weekly Limit
BOD_5	30 mg/L, 42 lbs/day	45 mg/L, 72 lbs/day
TSS	30 mg/L, 42 lbs/day	45 mg/L, 72 lbs/day

Parameter	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria	200 organisms/100 ml	400 organisms/100 mL

C. Surface water quality-based effluent limits

The Washington State surface water quality standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical criteria for the protection of aquatic life and recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical criteria for the protection of human health

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA, 1992). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210, 2006) in the state of Washington.

Antidegradation

Description - The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

A facility must prepare a Tier II analysis when all three of the following conditions are met:

- The facility is planning a new or expanded action.
- Ecology regulates or authorizes the action.
- The action has the potential to cause measurable degradation to existing water quality at the edge of a chronic mixing zone.

Facility Specific Requirements - This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.
- For waters that do not meet assigned criteria, or protect existing or designated uses, Ecology will take appropriate and definitive steps to bring the water quality back into compliance with the water quality standards.
- Whenever the natural conditions of a water body are of a lower quality than the assigned criteria, the natural conditions constitute the water quality criteria. Where water quality criteria are not met because of natural conditions, human actions are not allowed to further lower the water quality, except where explicitly allowed in chapter 173-201A WAC.

Ecology's analysis described in this section of the fact sheet demonstrates that the proposed permit conditions will protect existing and designated uses of the receiving water.

Mixing zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn't interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART).

Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and must not use more than 25% of the available width of the water body for dilution [WAC 173-201A-400 (7)(a)(ii-iii)].

Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derives any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 4 means the effluent is 25% and the receiving water is 75% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Each aquatic life *acute* criterion is based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Each aquatic life *chronic* criterion is based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two liters/day for drinking water.
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

1. Ecology must specify both the allowed size and location in a permit.

The proposed permit specifies the size and location of the allowed mixing zone in Permit Condition S1.B.

2. The facility must fully apply "all known, available, and reasonable methods of prevention, control and treatment" (AKART) to its discharge.

Ecology has determined that the treatment provided at Kaiser meets the requirements of AKART (see "Technology-based Limits").

3. Ecology must consider critical discharge conditions.

Surface water quality-based limits are derived for the water body's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated waterbody uses). The critical discharge condition is often pollutant-specific or waterbody-specific.

Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html.

Ecology estimated the critical river flows at the Permittee's point of discharge based on data from the USGS gauging station for the Spokane River at Spokane (USGS 12422500). Ecology calculated critical river flows at this gage using data from 1968 to present.

Ecology chose 1968, corresponding to the end of surface water withdraw from the river by the Spokane Valley Project (USBR, 1998). The following table shows critical flows for the Spokane River at Spokane gage (USGS 12422500):

Table 15: Critical Flows for the Spokane River at Spokane (USGS 12422500)

Critical Condition	Flow
Seven-day-average low river flow with a recurrence interval of ten years (7Q10)	607 cubic feet per second (cfs)
Thirty-day low river flow with a recurrence interval of five years (30Q5)	821 cfs
Harmonic mean river flow	2,840 cfs

Ecology then adjusted these critical flows based on measurements taken by Ecology at eleven river stations during August 2005 and 2006 (Covert, 2016). One of these stations included the Centennial Trail bridge below Plantes Ferry Park, about 1.7 miles downstream from the Permittee's outfall. The table below compares measured flows at the Centennial Trail Bridge below Plantes Ferry Park with flows at Spokane River at Spokane:

Table 16: River Flow Measurements at the Centennial Trail Bridge and the Spokane River at Spokane (USGS 12322500)

Date	Measured Flows (cfs)		
	Centennial Trail Bridge	Spokane River at Spokane (USGS 12422500)	Difference
August 2005	492	613	-121
August 2006	579	750	-171

The August 2005 flow for the Spokane River at Spokane approached the 7Q10 value of 607 cfs; while the August 2006 flow at Spokane approached the 30Q5 value of 821 cfs. Ecology used these differences to estimate critical 7Q10 and 30Q5 river flows, respectively, at the point of discharge. Ecology did not have representative flows at the harmonic mean flowrate; therefore, used the 30Q5 difference of 171 cfs for the adjustment.

Table 17: Critical Conditions Used to Model the Discharge at Kaiser

Critical Condition	Spokane River at Spokane (USGS 12422500)	Adjustment	Point of Discharge
Seven-day-average low river flow with a recurrence interval of ten years (7Q10), cfs	607	-121	486
Thirty-day low river flow with a recurrence interval of five years (30Q5), cfs	821	-171	650
Harmonic mean river flow, cfs	2,840	-171	2,669

Critical Condition	Effluent
Maximum average monthly effluent flow for chronic and human health non-carcinogen	17.8 million gallons per day (MGD)
Annual average flow for human health carcinogen	11.6 MGD
Maximum daily flow for acute mixing zone	18.3 MGD

These critical river flows are estimates only, and are likely conservative. In 2009, the Federal Energy Regulatory Commission (FERC) renewed the license regulating Avista's Spokane River Project. The FERC license required a minimum release of 500 cfs at Avista's Post Falls Hydroelectric Development (HED). This requirement will result in higher flows in the Spokane River compared with historic values.

Ecology obtained critical water quality ambient data from Ecology's long term water quality monitoring stations for the Spokane River at Sullivan Road (57A146), at Barker Road (57A148), and at the Stateline (57A150) as listed in Table 2.

4. Supporting information must clearly indicate the mixing zone would not:

- Have a reasonable potential to cause the loss of sensitive or important habitat.
- Substantially interfere with the existing or characteristic uses.
- Result in damage to the ecosystem.
- Adversely affect public health.

Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms and set the criteria to generally protect the species tested and to fully protect all commercially and recreationally important species.

EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic standards assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of discharge.

The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers) because the buoyant plume rises in the water column. Ecology has additionally determined that the effluent will not exceed 33 degrees C for more than two seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

Because this facility includes domestic wastewater as part of its wastestream (at internal Outfall 003), the final effluent at Outfall 001 contains fecal coliform bacteria. Ecology developed the water quality criteria for fecal coliforms (discussed below) to assure that people swimming (primary contact recreation) in water meeting the criteria would not develop gastro enteric illnesses. Ecology has authorized a mixing zone for this discharge; the internal discharge is subject to a technology based limit of 200 colony forming units/100mL. With dilution from process wastewater streams, the final effluent at Outfall 001 meets the water quality criteria at the point of discharge and doesn't need dilution to meet the water quality criteria.

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem, or adversely affect public health if the permit limits are met.

5. The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.

Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met.

6. The size of the mixing zone and the concentrations of the pollutants must be minimized.

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. The plume mixes as it rises through the water column therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving waterbody. When a diffuser is installed, the discharge is more completely mixed with the receiving water in a shorter time. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95th percentile pollutant concentration, the 90th percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

7. Maximum size of mixing zone.

The authorized mixing zone does not exceed the maximum size restriction.

8. Acute mixing zone.

- **The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.**

Ecology determined the acute criteria will be met at 10% of the volume fraction of the chronic mixing zone at the ten year low flow.

- **The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.**

As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

- **Comply with size restrictions.**

The mixing zone authorized for this discharge complies with the size restrictions published in chapter 173-201A WAC.

9. Overlap of Mixing Zones.

This mixing zone does not overlap another mixing zone.

D. Designated uses and surface water quality criteria

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). The table included below summarizes the criteria applicable to this facility's discharge.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species.
- The Aquatic Life Uses for this receiving water are identified below.

Table 18: Freshwater Aquatic Life Uses and Associated Criteria

Salmonid Spawning, Rearing, and Migration	
Temperature Criteria – Highest 7-DAD MAX	17.5°C (63.5°F)
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	8.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas Criteria	Total dissolved gas must not exceed 110 percent of saturation at any point of sample collection.
pH Criteria	The pH must measure within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

- The *recreational uses* for this receiving water are identified below.

Table 19: Recreational Uses and Associated Criteria

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL.

- The *water supply uses* are domestic, agricultural, industrial, and stock watering.
- The *miscellaneous freshwater uses* are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

An additional special condition applies to the Spokane River. From Nine Mile Bridge (river mile 58.0) to the Idaho Border (river mile 96.5), temperature shall not exceed a 1 day maximum (1-DMax) of 20.0°C due to human activities.

When natural condition exceed a 1-DMax of 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases at any time exceed $t=34/(T+9)$; "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

E. Water quality impairments

Ecology routinely assesses available water quality data on a statewide basis. Ecology submits these results to the Environmental Protection Agency (EPA) as an "integrated report" to satisfy Sections 303(d) and 305(b) of the federal Clean Water Act. EPA recommends the listing of water quality for a particular location in one of five categories. Categories one through four represent the 305(b) Report which assesses the overall status of water quality in the State. Category 5 waters represents the 303(d) list which are known polluted waters in the State.

A total daily maximum load (TMDL) is required for each pollutant on the 303(d) list that EPA has determined is suitable for such a calculation. A TMDL is not required if other pollution control requirements result in compliance with the applicable water quality standard(s). A TMDL determines the amount of pollution a water body can receive while still meeting water quality standards. The TMDL sets maximum allowable pollution from various sources as either individual waste load allocations (WLAs) for point sources or load allocations (LAs) for nonpoint sources.

The current (2012) 303(d) list contains multiple segments in the Spokane River. River segments are listed for temperature, dissolved gas, fecal coliform bacteria, PCBs in fish tissue, and dioxin in fish tissue. In the vicinity of the outfall, upstream listings include temperature and PCBs in fish tissue located at the Stateline; downstream listings include dioxin in fish tissue and PCBs in fish tissue located at Trent Bridge/Plantes Ferry Park.

Category 4a waters of the 305(b) report represent polluted waters that have an EPA approved TMDL in place and are actively being implemented. In the Spokane River, this includes the Spokane River Metals TMDL for cadmium, lead, and zinc (Ecology, 1999); and the Spokane River Dissolved Oxygen TMDL for total phosphorus and dissolved oxygen (Ecology, 2010). Specific WLAs applicable to the Permittee are discussed in the next section below.

The previous permit issued on June 23, 2011 included a comprehensive approach toward addressing point and nonpoint sources of PCBs in the Spokane River. The permit required the permitted to participate in formation and funding of the Spokane River Regional Toxics Task Force (Task Force). The goal of the Task Force is to develop a comprehensive plan to bring the Spokane River into compliance with applicable water quality standards for PCBs. The permit included specific tasks for permittee to work with the Task Force to accomplish, including completion of the comprehensive plan by December 2016.

Ecology developed a criteria by which it could assess the measurable progress of the Task Force's efforts in meeting water quality criteria for PCBs (http://srrttf.org/?attachment_id=6029).

Section H discusses specific Best Management Practices (BMPs) and Task Force milestones applicable to the Permittee for the discharge of PCBs.

F. Evaluation of surface water quality-based effluent limits for narrative criteria

Ecology must consider the narrative criteria described in WAC 173-201A-260 when it determines permit limits and conditions. Narrative water quality criteria limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge which have the potential to adversely affect designated uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health.

Ecology considers narrative criteria when it evaluates the characteristics of the wastewater and when it implements all known, available, and reasonable methods of treatment and prevention (AKART) as described above in the technology-based limits section. When Ecology determines if a facility is meeting AKART it considers the pollutants in the wastewater and the adequacy of the treatment to prevent the violation of narrative criteria.

In addition, Ecology considers the toxicity of the wastewater discharge by requiring whole effluent toxicity (WET) testing when there is a reasonable potential for the discharge to contain toxics. Ecology's analysis of the need for WET testing for this discharge is described later in the fact sheet.

G. Evaluation of surface water quality-based effluent limits for numeric criteria

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Some toxic pollutants, for example, are near-field pollutants; their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biological oxygen demand (BOD) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge exceed water quality criteria. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by chapter 173-201A WAC.

The diffuser at Outfall 001 is a submerged two port diffuser located approximately in the middle of the river channel.

Chronic Mixing Zone--WAC 173-201A-400(7)(a) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than 25% of the flow, and not occupy greater than 25% of the width of the water body.

The flow volume restriction resulted in a smaller chronic dilution factor than the distance downstream. The dilution factor below results from the volume restriction.

Acute Mixing Zone - WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10% of the distance towards the upstream and downstream boundaries of the chronic zone, not use greater than 2.5% of the flow and not occupy greater than 25% of the width of the water body.

The flow volume restriction resulted in a smaller chronic dilution factor than the distance downstream. The dilution factor below results from the volume restriction.

Ecology determined the dilution factors that occur within these zones at the critical condition using the effluent/receiving water flow volume restriction. The dilution factors are listed below.

Table 20: Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	1.4	5.4
Human Health, Carcinogen		38.2
Human Health, Non-carcinogen		6.9

Ecology determined the impacts of pH, ammonia, metals, other toxics, and temperature as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

Federal regulations (CFR Part 122.44(d)) require NPDES permits contain limits to control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which Ecology determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality.

Dissolved Oxygen--Total Phosphorus, Ammonia, and CBOD5 Effects - Natural decomposition of organic material in wastewater effluent impacts dissolved oxygen in the receiving water at distances far outside of the regulated mixing zone.

The 5-day carboneaous biochemical oxygen demand (CBOD5) of an effluent sample indicates the amount of carbon-based biodegradable material in the wastewater and estimates the magnitude of oxygen consumption the wastewater will generate in the receiving water. The amount of total phosphorus and ammonia-based nitrogen in the wastewater also provide an indication of oxygen demand in the receiving water.

Ecology has completed a dissolved oxygen TMDL, referenced above, and established effluent limits for total phosphorus, ammonia, and carboneaous biochemical oxygen demand ($CBOD_5$). The proposed permit continues with the schedule of compliance for the final effluent limits for total phosphorus, BOD_5 derived from the completed TMDL established in the previous permit issued on June 23, 2011.

In addition, the proposed permit includes interim effluent limits for total phosphorus, ammonia, and $CBOD_5$ based on effluent data collected from September 2013 through October 2015. Ecology examined this data from a starting date of September 2013 corresponding to a cessation of groundwater remediation flows from Outfall 007.

Ecology selected permit limits as the highest monthly average and daily maximum values with an added 10% compliance buffer. This resulted in the interim limits as shown in **Table 22**.

This compliance schedule requires reductions in the total phosphorus, CBOD, and ammonia discharged to the Spokane River, through a combination of treatment technology and other target pursuit actions. These target pursuit actions include:

- Technology Selection Protocol: NPDES permit holders will prepare, and submit to Ecology for approval, a comprehensive technology selection protocol for choosing the most effective feasible technology for seasonally removing phosphorus, CBOD, and ammonia from their effluent. If pilot testing is a part of the protocol, there will be appropriate provisions for quality assurance and control. The protocol will include a preliminary schedule for construction of the treatment technology.
- Delta Elimination Plan: A dischargers' Delta is the actual pounds of phosphorus, CBOD, or ammonia discharged per day after the implementation of the most effective feasible technology minus the WLA target pounds. A discharger will complete a planned and scheduled group of actions aimed at eliminating their Delta. These actions will be outlined in a Delta Elimination Plan.

  The Delta Elimination Plan will include a schedule for other phosphorus, CBOD, and ammonia removal actions such as conservation, effluent re-use, source control through support of regional phosphorus, CBOD, and ammonia reduction efforts (such as limiting use of fertilizers and dishwasher detergents), and supporting regional non-point source control efforts to be established. The plan, in combination with the pollutant reduction from technology, will provide reasonable assurance of meeting the permit holder's WLAs in ten years (by 2021).
- Engineering Report: After a permit holder implements the Technology Selection Protocol, the permit holder will prepare, and submit to Ecology for approval, an Engineering Report concerning the chosen technology, including any updates to the construction schedule.

- The Engineering Report will also (if necessary) be accompanied by amendments to the schedule and substance of the target pursuit actions (i.e. Delta Elimination) so that in combination with the expected technology performance, there is reasonable assurance of meeting the WLAs in ten years (2021).
- Water Quality Based Limits: The proposed permit sets WQBELs based on the wasteload allocations in the Spokane River and Lake Spokane dissolved oxygen TMDL. The TMDL gives wasteload allocations to Kaiser Aluminum for ammonia, total phosphorus, and CBOD as seasonal average values from March through October.

pH - Ecology modeled the impact of the effluent pH on the receiving water using the calculations from EPA, 1988, and the chronic dilution factor tabulated above. **Appendix D** includes the model results.

Ecology predicts no violation of the pH criteria under critical conditions. Therefore, the proposed permit includes technology-based effluent limits for pH.

Fecal Coliform - Ecology modeled the numbers of fecal coliform by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml, maximum treated sanitary plant wastewater flow of 0.21 MGD, and minimum process water flow (at Outfall 006) of 7.8 MGD. This resulted in a dilution factor of 38, and a fecal coliform concentration of 11 in the final discharge.

Under these critical conditions, modeling predicts no violation of the water quality criterion for fecal coliform. Therefore, the proposed permit includes the technology-based effluent limit for fecal coliform bacteria.

Turbidity - Ecology evaluated the impact of turbidity based on the range of turbidity in the effluent and turbidity of the receiving water. Based on visual observation of the facility's effluent, Ecology expects no violations of the turbidity criteria outside the designated mixing zone.

Cadmium, Lead, and Zinc - The Spokane River dissolved metals TMDL based waste load allocations on the most restrictive permit limits derived by either meeting aquatic life toxicity criteria at effluent hardness at the end-of pipe, or based on maintaining existing concentrations of metals in effluent using performance based limits with an added 10 percent compliance buffer. Whichever method results in the lower limit will be selected for the permit limit and established as the wasteload allocation.

The Permittee withdraws a portion of their supply water from the Spokane River. The levels of lead, cadmium, and zinc in the intake water complicate the development of performance based limits for these parameters. For example, many times the zinc concentrations in the intake water at the facility exceeded those discharged. For this reason, the proposed permit will set limits based on criteria based on end-of-pipe hardness.

These criteria values were calculated using the 10^{th} percentile end-of-pipe hardness (133 mg/L as $CaCO_3$), as recommended by the TMDL. The resulting limits are as follows:

Table 21: Spokane River Dissolved Metals Criteria

Metal	Criteria (end-of-pipe)	
	Monthly Average	Daily Maximum
Cadmium, ug/L	1.2	2.1
Lead, ug/L	3.4	5.9
Zinc, ug/L	73	146

Toxic Pollutants - Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

The following toxic pollutants are present in the discharge: ammonia, aluminum, antimony, arsenic, chromium, copper, iron, manganese, mercury, nickel, and radium. Ecology conducted a reasonable potential analysis (See **Appendix D**) on these parameters to determine whether it would require effluent limits in this permit.

Valid ambient background data were available for ammonia, arsenic, chromium, copper, mercury, and nickel (See Table 2). For antimony, iron, and manganese, Ecology assumed a background of zero. Ecology used all applicable data to evaluate reasonable potential for this discharge to cause a violation of water quality standards.

Ecology determined that these pollutants pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 (**Appendix D**) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

Temperature - The state temperature standards (WAC 173-201A-200-210 and 600-612) include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

- Annual summer maximum and supplementary spawning/rearing criteria

Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1)(c), 210(1)(c), and Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.

The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax).

The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for marine waters and some fresh waters, including the Spokane River, are expressed as the highest 1-Day annual maximum temperature (1-DMax).

- Incremental warming criteria

The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3°C above the naturally warm condition.

Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

- Protections for temperature acute effects

Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C, unless a dilution analysis indicates ambient temperatures will not exceed 33°C two seconds after discharge.

General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.

Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

Reasonable Potential Analysis

Annual summer maximum and incremental warming criteria: Ecology calculated the reasonable potential for the discharge to exceed the annual summer maximum and the incremental warming criteria (See temperature calculations in **Appendix D**).

The discharge is only allowed to warm the water by a defined increment when the background (ambient) temperature is cooler or warmer than the assigned threshold criterion. Ecology allows warming increments only when they do not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

The temperature at the edge of the chronic mixing zone during critical condition(s) appears greater than the allowable amount and may require a limit but is undetermined:

Ecology used upstream receiving water temperature data from three of Ecology's long term water quality monitoring stations for the Spokane River: Sullivan Road (57A146), Barker Road (57A148), and Stateline (57A150). However, this data may not accurately reflect receiving water temperatures in the vicinity of the outfall due to significant groundwater inflows from the Spokane Valley-Rathdrum Prairie Aquifer.

The permit requires additional monitoring of effluent and ambient temperatures. Ecology will reevaluate the reasonable potential during the next permit renewal for annual summer maximum, incremental warming criteria, protections for temperature acute effects.

H. Human health

Washington's water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36).

The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Based on the data submitted by Kaiser, Ecology determined the effluent may contain chemicals of concern for human health. Kaiser data indicated that the discharge from the facility to the river contains regulated chemicals (antimony, arsenic, copper, iron, manganese, mercury, nickel, radium, and PCBs).

Ecology evaluated whether Kaiser discharges these chemicals at a level which have the reasonable potential to cause or contribute to an excursion of the water quality standards as required by 40 CFR 122.44(d) according to the procedures published in the Technical Support Document for Water Quality-Based Toxics Control (EPA/505/2-90-001) and Ecology's Permit Writer's Manual.

Antimony, copper, iron, manganese, mercury, nickel, and radium 226+228 - The evaluation showed that the discharge has no reasonable potential to cause a violation of water quality standards for antimony, copper, iron, manganese, mercury, nickel, and radium 226+228. The proposed permit does not include effluent limits for these parameters.

Arsenic - The evaluation resulted in an ambiguous determination for arsenic because of the uncertainty of the freshwater human health criteria. In 1992, the USEPA adopted risk-based arsenic criteria for the protection of human health for the State of Washington. The current freshwater criterion is 0.018 µg/L, based on exposure from fish and shellfish tissue and water ingestion. In 2015, both the State and EPA have proposed revised human health based criteria for arsenic. The State based their proposal on the drinking water maximum contaminant level (MCL) of 10 µg/L; while EPA proposed a value of 0.0045 ug/L, based on exposure from fish and shellfish tissue and water ingestion.

The current State and proposed EPA criteria (0.018 and 0.0045 ug/L, respectively) have caused confusion in implementation because they differ from the drinking water maximum contaminant level (MCL) of 10 µg/L, which is not risk-based, and because the human health criteria are sometimes exceeded by natural background concentrations of arsenic in surface water and groundwater, including upstream concentrations in the Spokane River.

At this time, the proposed permit defers any permit decisions for arsenic until the regulatory issues with the human health based criteria are resolved.

Total PCBs - Because PCBs are present in the effluent, and because the Spokane River exceeds applicable water quality standards for PCBs, Ecology assumes the discharge has a reasonable potential to contribute to excursions above water quality standards for PCBs.

Because of the reasonable potential to contribute, federal regulations in CFR Part 122.44(d) require this permit contains water quality based limitations to control PCBs. Ecology will set an interim numeric limit based on current levels in the discharge, in order to prevent increases in loading to the Spokane River. Ecology derived this limit by examining effluent data collected beginning in September 2013 which corresponded to a cessation of groundwater remediation flows from Outfall 007; and a reduction in PCB mass loading from Outfall 001.

From September 2013 to August 2015 (a total of 52 data points from twice per month sampling using EPA method 1668), the maximum mass loading of PCB discharged was 145 mg/day (March 18, 2015) with a maximum consecutive two week average of 129 mg/L (March 18 and April 1, 2015). The proposed interm daily maximum and monthly average PCB limits will equal these two values (**Appendix D**).

The proposed permit will also include a compliance schedule to meet an effluent limit set at the State's water quality criteria for PCBs of 170 pg/L. State law limits compliance schedules necessary to meet water quality based effluent limits to no longer than 10 years.

Federal regulations in 40 CFR Part 122.44(k)(4) also allow the use of best management practices (BMPs) to control or abate the discharge of pollutants when the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the Clean Water Act. BMPs are the actions identified to manage, prevent contamination of, and treat wastewater discharges. BMPs include schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs also include treatment systems, operating procedures, and practices used to control plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage.

The proposed permit will require the following BMPs:

- The continuation of source identification and removal actions for PCBs remaining within the Permittee's industrial wastewater sewer system.
- A design influent loading value for PCBs to the black walnut shell (BWS) treatment system. When the influent exceeds this loading value, the proposed permit requires additional analysis and investigation into the elevated PCB levels.
- Purchasing standards that require elimination/substitution of products that may contribute PCBs to the final discharge.
- Surveys of existing site materials and equipment (paints, caulks, building materials, capacitors, light ballasts, electrical equipment, etc.) that may contribute PCBs to the final discharge.

- BMPs used to prevent contributions of PCBs to the final discharge during site demolition and remodeling work.
- A compliance schedule for terminating the discharge of groundwater remediation flows from Outfall 007. The permittee temporarily stopped the discharge of the groundwater remediation flows from Outfall 007 in September 2013. This resulted in an average decrease of PCBs discharged to the Spokane River by about 50 mg/day (**Appendix D**).

The proposed permit also continues the comprehensive approach towards addressing point and nonpoint sources of PCBs in the Spokane River through the Spokane River Regional Toxics Task Force (Task Force). The goal of the Task Force is to develop a comprehensive plan to bring the Spokane River into compliance with applicable water quality standards for PCBs.

In October 2011, the Sierra Club brought a citizen suit under provisions of the Clean Water Act against EPA (Sierra Club, et al. v. McLerran, No. 11-CV-1759-BJR), claiming EPA failed to perform a nondiscretionary duty of establishing a TMDL for PCBs in the Spokane River. In an Order issued by the U.S. District Court on March 16, 2015, the Court directed EPA to consult with Ecology and file a schedule for the measuring and completion of the work of the Task Force, including quantifiable benchmarks, plans for acquiring missing scientific information, deadlines for completed scientific studies, concrete permitting recommendations for the interim, specific standards upon which to judge the Task Force's effectiveness, and a definite endpoint at which time Ecology must pursue and finalize its TMDL.

EPA submitted its plan (http://srrttf.org/wp-content/uploads/2015/07/EPA-plan-for-PCBs-in-response-to-court-order.pdf) to the Court on July 14, 2015. EPA's plan included a December 15, 2020 date for meeting an instream concentration of PCBs in the Spokane River of 200 pg/L; and a December 15, 2024 date for meeting an instream concentration of PCBs of 170 pg/L.

EPA's plan also includes BMP and monitoring recommendations for point sources discharging into the Spokane River. The proposed permit includes recommendations applicable to Kaiser with the following qualifications.

∞ EPA recommended that the permits require receiving water monitoring for PCB congeners upstream and downstream of the outfalls using EPA Method 1668C at a frequency adequate to assess both high and low river flow conditions. Since the Task Force plans to characterize PCB concentrations in the river at both high and low flow conditions, the proposed permit does not include this activity.

∞ Ecology analyzed available effluent TSS and PCB data and determined effluent TSS and PCB concentrations are not positively correlated. However, the proposed permit includes EPA's recommendation to establish all known, available and reasonable treatment (AKART) or performance-based effluent limits for TSS. As discussed above, the performance-based limits already established in this permit are more stringent than applicable EPA effluent guidelines and, in Ecology's best professional judgment, represent AKART.

The proposed permit also includes specific tasks for the permittee to support the Task Force to accomplish:

- Complete the Comprehensive Plan by December 2016, including targets and milestones for achieving water quality standards.
- Create a 5-year Work Plan with short term goals and strategies, needed financial and technical assistance, and adapt Toxics Management Plans towards achieving these goals.
- Measure Progress at meeting targets listed in EPA's plan though a monitoring program, annual reports, and adaptive measures.

Ecology will maintain its regulatory authority to require a TMDL if this approach does not work, and will evaluate whether the Task Force has made Measurable Progress in meeting applicable water quality criteria for PCBs at the next permit renewal.

I. Sediment quality

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website. http://www.ecy.wa.gov/programs/tcp/smu/sediment.html.

The Spokane River in the vicinity of the discharge is not an area of sediment deposition. However, depositional areas do occur downstream from the Permittee at Donkey Island and behind Upriver Dam. Two PCB deposits in river-bottom sediments in these depositional areas were investigated and cleaned up from 2003 to 2007 in accordance with a consent decree Ecology entered into with Avista Development, Inc. (Avista) and Kaiser.

Ecology could not determine the potential for this discharge to cause a violation of sediment quality standards. If in the future Ecology determines a potential for violation of the sediment quality standards, Ecology may issue an order requiring Kaiser to demonstrate either:

- The point of discharge is not an area of deposition, or
- Toxics do not accumulate in the sediments even though the point of discharge is a depositional area.

K. Whole effluent toxicity

The water quality standards for surface waters forbid discharge of effluent that has the potential to cause toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

- *Acute toxicity tests measure mortality as the significant response* to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests find early indications of any potential lethal effect of the effluent on organisms in the receiving water.

- *Chronic toxicity tests measure various sublethal toxic responses*, such as reduced growth or reproduction. Chronic toxicity tests often involve either a complete life cycle test on an organism with an extremely short life cycle, or a partial life cycle test during a critical stage of a test organism's life. Some chronic toxicity tests also measure organism survival.

Laboratories accredited by Ecology for WET testing know how to use the proper WET testing protocols, fulfill the data requirements, and submit results in the correct reporting format. Accredited laboratory staff know about WET testing and how to calculate an NOEC, LC50, EC50, IC25, etc.

Ecology gives all accredited labs the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* (https://fortress.wa.gov/ecy/publications/SummaryPages/9580.html), which is referenced in the permit. Ecology recommends that Kaiser send a copy of the acute or chronic toxicity sections(s) of its NPDES permit to the laboratory.

WET testing conducted during the previous permit term showed the facility's effluent has a reasonable potential to cause acute toxicity in the receiving water. The proposed permit will include an acute toxicity limit. **The effluent limit for acute toxicity is: No acute toxicity detected in a test sample representing the acute critical effluent concentration (ACEC).** The acute critical effluent concentration (ACEC) is the concentration of effluent at the boundary of the acute mixing zone during critical conditions. The ACEC equals 71.4% effluent.

Compliance with an acute toxicity limit is measured by an acute toxicity test comparing test organism survival in the ACEC (using a sample of effluent diluted to equal the ACEC) to survival in nontoxic control water. Kaiser is in compliance with the acute toxicity limit if there is no statistically significant difference in test organism survival between the ACEC sample and the control sample.

WET testing conducted during the previous permit term also showed a reasonable potential for the effluent to cause chronic toxicity in the receiving water. The proposed permit will include a chronic toxicity limit. **The effluent limit for chronic toxicity is: No toxicity detected in a test sample representing the chronic critical effluent concentration (CCEC)**. The CCEC is the concentration of effluent at the boundary of the mixing zone during critical conditions. The CCEC equals 18.5% effluent.

Compliance with a chronic toxicity limit is measured by a chronic toxicity test comparing the test organism response in effluent diluted to the CCEC, to test organism response in nontoxic control water. Kaiser is in compliance with the chronic toxicity limit if there is no statistically significant difference in test organism response between the CCEC sample and the control sample.

L. Comparison of effluent limits with the previous permit modified on November 18, 2014

Table 22: Comparison of Previous and Proposed Effluent Limits – Outfall 001

		Previous Effluent Limits:		Proposed Effluent Limits:	
Parameter	**Basis of Limit**	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Total Zinc, ug/L	Water Quality	75	146	75	146
Total Lead, ug/L	Water Quality	7.0	12.1	7.0	12.1
Total Cadmium, ug/L	Water Quality	1.3	2.2	1.3	2.2
Total PCBs, pg/L	Water Quality	-	-	170	-

Parameter	Basis of Limit	Limit	Limit
pH, s.u.	Technology	6.0 to 9.0	6.0 to 9.0

		Previous Interim Effluent Limits:		Proposed Interim Effluent Limits:	
Parameter	**Basis of Limit**	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Total Phosphorus (as P), lbs/day	Technology	3.8	6.8	1.91	3.96
Ammonia (as N), lbs/day	Technology	-	-	3.85	8.69
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), lbs/day	Technology	-	-	269.5	393.0
Total PCBs, mg/day	Water Quality	Narrative		145	129

Table 23: Comparison of Previous and Proposed Effluent Limits – Outfall 006

		Previous Effluent Limits:		Proposed Effluent Limits:	
Parameter	**Basis of Limit**	**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Chromium, lbs/day	Technology	2.1	5.1	2.1	5.1
Cyanide, lbs/day	Technology	0.53	1.27	0.53	1.27
Aluminum, lbs/day	Technology	7.5	14.4	7.5	14.4
Oil & Grease, lbs/day	Technology	374.7	565.3	374.7	565.3
TSS, lbs/day	Technology	406.1	903.9	406.1	903.9

Table 24: Comparison of Previous and Proposed Effluent Limits – Outfall 003

		Previous Effluent Limits:		Proposed Effluent Limits:	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
BOD_5, mg/L	Technology	30	45	30	45
BOD_5, lbs/day	Technology	48	72	48	72

		Previous Effluent Limits:		Proposed Effluent Limits:	
Parameter	**Basis of Limit**	**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
TSS, mg/L	Technology	30	45	30	45
TSS, lbs/day	Technology	48	72	48	72

Parameter	Basis of Limit	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit	Monthly Geometric Mean Limit	Weekly Geometric Mean Limit
Fecal Coliform Bacteria	Technology	200	400	200	400

IV. Monitoring Requirements

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

If a facility uses a contract laboratory to monitor wastewater, it must ensure that the laboratory uses the methods and meets or exceeds the method detection levels required by the permit. The permit describes when facilities may use alternative methods. It also describes what to do in certain situations when the laboratory encounters matrix effects. When a facility uses an alternative method as allowed by the permit, it must report the test method, detection level (DL), and quantitation level (QL) on the discharge monitoring report or in the required report.

A. Wastewater monitoring

The monitoring schedule is detailed in the proposed permit under Special Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

B. Lab accreditation

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, Accreditation of Environmental Laboratories, to prepare all monitoring data (with the exception of certain parameters). Ecology accredited the laboratory at this facility for:

Table 25: Accredited Parameters

Parameter Name	Category	Method Name	Matrix Description
n-Hexane Extractable Material (O&G)	General Chemistry	EPA 1664A_1_1999	Non-Potable Water
Solids, Total Suspended	General Chemistry	SM 2540 D-97	Non-Potable Water
pH	General Chemistry	SM 4500-H+ B-00	Non-Potable Water
Ammonia	General Chemistry	SM 4500-NH3 D-97	Non-Potable Water
Dissolved Oxygen	General Chemistry	SM 4500-O G-01	Non-Potable Water

Parameter Name	Category	Method Name	Matrix Description
Orthophosphate	General Chemistry	SM 4500-P E-99	Non-Potable Water
Phosphorus, Total	General Chemistry	SM 4500-P E-99	Non-Potable Water
Biochemical Oxygen Demand (BOD)	General Chemistry	SM 5210 B-01	Non-Potable Water
Carbonaceous BOD (CBOD)	General Chemistry	SM 5210 B-01	Non-Potable Water
Aluminum	Metals	SM 3120 B-99	Non-Potable Water
Chromium	Metals	SM 3120 B-99	Non-Potable Water
Zinc	Metals	SM 3120 B-99	Non-Potable Water
Fecal coliform-count	Microbiology	SM 9222 D (m-FC)-97	Non-Potable Water

Kaiser uses an outside accredited laboratory for lead, cadmium, and total PCBs (using EPA methods EPA1668 and EPA8086).

C. Effluent limits which are near detection or quantitation levels

The water quality-based effluent concentration limits for cadmium and lead are near the limits of current analytical methods to detect or accurately quantify. The final effluent concentration limit for total PCBs and effluent concentrations for PCBs used to calculate the interim mass loading limit are below the limits of current analytical methods to detect or accurately quantify.

The method detection level (MDL) also known as detection level (DL) is the minimum concentration of a pollutant that a laboratory can measure and report with a 99 percent confidence that its concentration is greater than zero (as determined by a specific laboratory method). The quantitation level (QL) is the level at which a laboratory can reliably report concentrations with a specified level of error. Estimated concentrations are the values between the DL and the QL. Ecology requires permitted facilities to report estimated concentrations. When reporting maximum daily effluent concentrations, Ecology requires the facility to report "less than X" where X is the required detection level if the measured effluent concentration falls below the detection level. Likewise, Ecology will require the facility to report "less than Y" where Y is the mass loading calculated from a "less than X" concentration level.

D. Total PCB analytical methods

The selection of the appropriate method for a wastewater PCB analysis relates to the anticipated concentration of the toxic in the sample. Method 608, approved by the EPA (40 CFR Part 136) has much higher detection and quantitation limits, DL and QL, respectively, than Method 1668. Method 1668 has not been approved by the EPA for compliance with effluent limits set in NPDES permits.

Laboratories have the ability to modify the analytical procedure for Method 608 to increase its sensitivity. Ecology entered into a laboratory survey in 2015 to understand how the modifications to the laboratory procedure can change the DL and QL.

The following is an excerpt from the investigation and resulting guidance generated by Ecology's Water Quality Program on the method modification:

In May 2016, Ecology worked with Manchester and King County labs to verify or revise the DL and QL values found from the initial lab survey in 2015. Two primary factors caused Ecology WQ HQ staff to reconsider the initially proposed 0.008 DL and 0.016 QL:

- Matrix interferences in effluent, wastewater, and stormwater (typical samples in NPDES permits) will be amplified with the large volume extraction (e.g. 3000 ml to 1 ml) technique initially proposed. The revised proposal is based on a 500 ml to 1 ml extraction. This is the primary factor for revision to a 0.05 µg/L DL.
- Method 608 requires calibration curves for each Aroclor that must pass a statistical test of 10% relative standard deviation (RSD). Method 8082A typically uses 20% RSD for quality control (QC). This is the primary factor for revision to a 0.2 µg/L QL. A comparison between DLs and QLs for unmodified Method 608, modified Method 608 and Method 1668 can be found below:

Table 26: EPA Method Comparison

EPA Method	DL, µg/L	QL, µg/L
608 (unmodified)	0.25	0.5
608 (INITIAL proposal)	0.008	0.016
608 (REVISED proposal)	0.05	0.2
1668C	0.00005	0.0001
Human Health Criteria 0.000170 µg/L		

EPA's proposed revision to Method 608 (anticipated in late 2016) would affect the second primary factor and possibly allow a lower QL, much closer to the DL. Other techniques mentioned by labs surveyed last year like Solid Phase Extraction (SPE) require EPA approval via the alternative test procedure (ATP) process. This can take years to process and may not improve the DL because of matrix interferences.

In short, the initially proposed values are more applicable to "cleaner" ambient water or reagent water samples. Even for these media, they require creative approaches to sample extraction and more flexibility with QC than currently allowed with Method 608. The revised proposal represents a balance between maximizing the effectiveness of 608 at detecting Aroclors while recognizing practical sampling limitations and typical matrices in NPDES permitting.

Laboratories must update their standard operating procedures (SOPs) for use of the 608 modification techniques and submit this documentation to Ecology's Laboratory Accreditation Unit (LAU) for review prior to conducting NPDES permit required analysis. Initial documentation would need to include at least: acceptable proficiency testing (PT) samples results, initial demonstration of capability (IDC) with an alternative source standard (per section 8.2 of Method 608), method detection limit (MDL) summary, and a calibration curve with acceptable quality control (QC).

Ecology has proposed using Method 1668 to evaluate BMP effectiveness in this proposed permit to ensure the return of usable data. While not EPA approved, use of Method 1668 will enable Ecology to continue making measurable progress determinations related to reduction of toxicant loading to the Spokane River. DLs and QLs for Method 1668 are much lower than even the modified Method 608 (see Table 25, above).

Ecology's Water Quality Program reviewed Method 1668 when assessing the application and limitations of analytical methods for toxics. The discussion below details guidance generated by Water Quality Staff regarding background and appropriate use of Method 1668. These conclusions support Ecology's decision to include this method for BMP effectiveness monitoring in the proposed permit.

Method 1668, a very sensitive analytical method, has the capability of detecting 209 different PCB congeners. Costs for this analysis are significantly higher than Method 608. Water quality standards are based on Total PCBs (the sum of all Arochlors, isomers, homologs, or congeners), and have most frequently been measured as a calculated sum of all or a select group of Aroclors found in a sample. The data generated by Method 1668 is far more complex and extensive than data generated by other methods (608 and 8082), and must be carefully managed, assessed and applied.

Data produced from this method must be used in a documented and consistent manner with procedures (e.g. blank correction, calculating total PCBs) specific to the level of certainty required in decision-making. Because these data could be used as the basis for effluent limits, to measure attainment of water quality standards, and other critical measures, the QA/QC must be rigorous.

For example, when PCB concentrations are very low, background contamination in laboratory blanks may interfere with the calculation of total PCB. To address this, a process known as censoring or blank correction is often applied. The choice of a censoring technique is specific to data and project needs and should be spelled out in a Quality Assurance Project Plan (QAPP). The most commonly used technique is described in EPA's *National Functional Guidelines* for the Contract Laboratory Program.

Based on expertise from elsewhere in the U.S. (e.g. Delaware PCB Monitoring), additional data management standard operating procedures that explicitly deal with analytical method QA/QC, column types, blank contamination, raw vs. censored data, and co-eluting PCB congeners are needed to allow for effective wide-spread use of PCB congener data. Ecology's environmental databases (e.g., EIM, PARIS) need to be modified to reflect such standardizations for PCB congener data.

Method 1668 is not currently approved by EPA under 40 CFR Part 136. And, Ecology is not currently proposing to seek EPA approval of this method under 40 CFR 136.5 for the reasons given above. Ecology will continue to use the most sensitive methods approved by EPA for compliance with numeric effluent limits. This permit will require the use of modified method 608 for compliance with numeric effluent limits. However, Ecology will also apply targeted use of Method 1668 in situations as follows:

1. **Evaluating reasonable potential** - Use all valid and applicable data, including data collected using methods not approved under 40 CFR Part 136 (e.g. Method 1668).

a) EPA's *Technical Support Document (TSD), Section 3.2* supports the use of all available information when evaluating reasonable potential, including available data and in some cases the lack of data.

2. **Requiring monitoring to complete a permit application** – Use only 40 CFR Part 136 methods.

   a) 40 CFR 122.21(e)(3) says the application shall not be considered complete unless 40 CFR Part 136 approved methods are used.

3. **Calculating numeric effluent limits** - Use all valid and applicable data, including data collected using methods not approved under 40 CFR Part 136 (e.g. Method 1668).

   a) Effluent limits are required when there is reasonable potential (RP). Numeric effluent limits are required where it is feasible to calculate them (based on data availability, discharge duration, and variability). If valid data collected using a more sensitive but non-Part 136 method make it feasible to calculate limits, those data should be used to calculate the numeric effluent limit.

      ∞ Ecology has previously determined that it is infeasible to calculate a numeric effluent limit based on human health criteria for intermittent wet weather discharges (e.g., stormwater, treated CSOs). See *Permit Writer's Manual, Appendix C, 6.1 Critical Effluent Flow* for detail.

4. **Evaluating compliance with numeric effluent limits** – Use only 40 CFR part 136 methods. This is currently Method 608.

   a) 40 CFR 122.44(i)(1) specifically requires monitoring *to assure compliance with permit limitations* according to Part 136 approved methods. If available data were collected using a congener method (e.g. 1668) and compliance is evaluated using an Aroclor method (e.g. 608), the fact sheet should note the differences between the methods, including a discussion of both the correlation of results between methods and overlap within each method when summing individual compounds to calculate a total value.

5. **Conducting analysis for All Known Available and Reasonable Technology (AKART)** - Use methods appropriate for the facility.

   a) As a toxic pollutant, PCBs are subject to WAC 173-220-130 and RCW 90.48.520, which requires the application of all known, available, and reasonable methods to control toxicants in the applicant's wastewater (also known as AKART).

   b) Methods of control for PCBs may include, but are not limited to, treatment technology, source control, or best management practices.

   c) A general discussion about AKART and how it is applied in wastewater discharge permits is provided in Section 3 of Chapter 4 in Ecology's *Water Quality Program Permit Writer's Manual.*

d) For the purposes of applying AKART, Method 1668 may be required where identification of sources based on congener profile is required, or where expected concentrations are below analytical levels achievable by 608, and where treatment to lower levels is found to be reasonable. Site specific factors must be considered when choosing the appropriate test method.

6. **Evaluating effectiveness of best management practices** - Use methods appropriate for evaluating the effectiveness of the best management practice (BMP).

   a) PCB analytical method selection will depend on expected concentrations in the sampled media, the BMPs required or selected, and the potential sources of PCBs on and to the site. For example:

   - A PCB Aroclor Method (608 or 8082) would typically be required where it is sufficiently sensitive to evaluate the effectiveness of the BMP. For example, a source tracing program aimed at finding and addressing PCB sources at individual properties based on PCB concentrations in catch basin solids which are routinely detectable using Method 8082.

   - Method 1668 would typically be required for source identification when the potential sources are likely to have different congener profiles. Where the sources of PCBs on an individual property are not known, PCB congener data may be useful in identifying sources on and to the site.

   - Method 1668 would typically be required when expected concentrations are below analytical levels achievable by an Aroclor method (608 or 8082). The congener method (1668) is needed to characterize influent or effluent or ambient water quality where PCBs are expected to be below 0.016 ug/L. These data may be used to evaluate trends over time and to quantify reductions in influent, effluent and/or receiving waters.

V. Other Permit Conditions

A. Cooling water intake structures

Thousands of industrial facilities use large volumes of water from lakes, rivers, estuaries, or oceans to cool their machinery. Cooling water intake structures (CWIS) can cause adverse environmental impacts by pulling large numbers of fish and shellfish or their eggs into a power plant's or manufacturing facility's cooling system. The organisms may be killed or injured by heat, physical stress, or by chemicals used to clean the cooling system. Larger organisms may be killed or injured when they are trapped against screens at the front of an intake structure.

Section 316(b) of the Clean Water Act requires EPA to issue regulations for the design and operation of cooling water intake structures to minimize adverse environmental impacts. EPA has finalized standards that apply to existing manufacturing and industrial facilities that are designed to withdraw more than 2 million gallons of cooling water per day and use at least 25% of the water for cooling purposes.

The new requirements for existing facilities are included in the NPDES permit regulations, 40 CFR Parts 122 and 125 (Subpart J). The rule establishes best technology available to minimize impingement and entrainment of all life stages of fish and shellfish. Impingement occurs when fish or shellfish become entrapped on the outer part of intake screens and entrainment occurs when fish or shellfish pass through the screens and into the cooling water system.

The rule gives facilities seven options to reduce impingement. Entrainment standards are either site specific or a reduction of intake flow to a level commensurate with a closed cycle recirculating system.

Ecology must ensure that the location, design, construction, and capacity of Kaiser's intake water structure reflect the best technology available for minimizing adverse environmental impacts. The proposed permit requires Kaiser to properly operate and maintain existing technologies used to minimize impingement and entrainment and report any significant impingement or entrainment observed. In addition, the proposed permit requires the Permittee to submit an information and compliance report that addresses NPDES permit application requirements for cooling water intake structures found in 40 CFR 122.21(r).

Ecology will use this information to assess the potential for impingement and entrainment at the CWIS, evaluate the appropriateness of any proposed technologies or mitigation measures, and determine any additional requirements to place on the facility in the next permit cycle.

B. Reporting and record keeping

Ecology based Special Condition S3 on its authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

C. Non routine and unanticipated wastewater

Occasionally, this facility may generate wastewater which was not characterized in the permit application because it is not a routine discharge and was not anticipated at the time of application. These wastes typically consist of waters used to pressure-test storage tanks or fire water systems or of leaks from drinking water systems.

The permit authorizes the discharge of non-routine and unanticipated wastewater under certain conditions. The facility must characterize these waste waters for pollutants and examine the opportunities for reuse. Depending on the nature and extent of pollutants in this wastewater and on any opportunities for reuse, Ecology may:

- Authorize the facility to discharge the wastewater.
- Require the facility to treat the wastewater.
- Require the facility to reuse the wastewater.

D. Spill plan

This facility stores a quantity of chemicals on-site that have the potential to cause water pollution if accidentally released. Ecology can require a facility to develop best management plans to prevent this accidental release [Section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080].

Kaiser developed a plan for preventing the accidental release of pollutants to state waters and for minimizing damages if such a spill occurs. The proposed permit requires the facility to update this plan and submit it to Ecology.

E. Solid waste control plan

Kaiser could cause pollution of the waters of the state through inappropriate disposal of solid waste or through the release of leachate from solid waste.

This proposed permit requires this facility to develop a solid waste control plan to prevent solid waste from causing pollution of waters of the state. The facility must submit the plan to Ecology for approval (RCW 90.48.080). You can obtain an Ecology guidance document, which describes how to develop a Solid Waste Control Plan, at http://www.ecy.wa.gov/pubs/0710024.pdf.

F. Operation and maintenance manual

Ecology requires industries to take all reasonable steps to properly operate and maintain their wastewater treatment system in accordance with state and federal regulations [40 CFR 122.41(e) and WAC 173-220-150 (1)(g)]. The facility has prepared and submitted an operation and maintenance manual as required by state regulation for the construction of wastewater treatment facilities (WAC 173-240-150). Implementation of the procedures in the operation and maintenance manual ensures the facility's compliance with the terms and limits in the permit.

G. General conditions

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual industrial NPDES permits issued by Ecology.

VI. Permit Issuance Procedures

A. Permit modifications

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for groundwaters, after obtaining new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

B. Proposed permit Issuance

This proposed permit includes all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

VII. References for Text and Appendices

CH2M Engineers

1970. *Engineering Study of Industrial Waste Treatment Facilities for Kaiser Aluminum and Chemical Corporation, Trentwood Works, Spokane, Washington*. Cornell, Howland, Hayes & Merryfield, Inc., November, 1970.

Covert, John

2016. Personal communication. Washington State Department of Ecology, Water Resources Program, Spokane, WA.

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.

1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling*. USEPA Office of Water, Washington, D.C.

1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook*. USEPA Office of Water, Washington, D.C.

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

December 2011. *Permit Writer's Manual*. Publication Number 92-109 https://fortress.wa.gov/ecy/publications/SummaryPages/92109.html)

September 2011. *Water Quality Program Guidance Manual – Supplemental Guidance on Implementing Tier II Antidegradation*. Publication Number 11-10-073 https://fortress.wa.gov/ecy/publications/summarypages/1110073.html

October 2010 (revised). *Water Quality Program Guidance Manual – Procedures to Implement the State's Temperature Standards through NPDES Permits*. Publication Number 06-10-100 https://fortress.wa.gov/ecy/publications/summarypages/0610100.html

Laws and Regulations http://www.ecy.wa.gov/laws-rules/index.html

Permit and Wastewater Related Information http://www.ecy.wa.gov/programs/wq/permits/guidance.html

February 2007. *Focus Sheet on Solid Waste Control Plan, Developing a Solid Waste Control Plan for Industrial Wastewater Discharge Permittees*, Publication Number 07-10-024. http://www.ecy.wa.gov/pubs/0710024.pdf

May 1999. *Spokane River Dissolved Metals Total Maximum Daily Load Submittal Report*, Publication Number 99-49-WQ

February 2004. *Spokane River and Lake Spokane (Long Lake) Pollutant Loading Assessment for Protecting Dissolved Oxygen*, Publication Number 04-03-006.

Wright, R.M., and A.J. McDonnell.

1979. *In-stream Deoxygenation Rate Prediction*. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

Appendix A - Public Involvement Information

Ecology proposes to reissue a permit to Kaiser Aluminum Washington, LLC. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology placed a Public Notice of Application on June 13, 2016 and June 20, 2016 in the Spokesman Review to inform the public about the submitted application and to invite comment on the reissuance of this permit.

Ecology will place a Public Notice of Draft on June 30, 2016 in the Spokesman Review to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice:

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period
- Tells how to request a public hearing of comments about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting* which is available on our website at https://fortress.wa.gov/ecy/publications/SummaryPages/0307023.html.

You may obtain further information from Ecology by telephone at (509) 329-3500 or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Eastern Regional Office
4601 North Monroe Street
Spokane, WA 99205-1295

Appendix B - Your Right to Appeal

You have a right to appeal this permit to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of the final permit. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2) (see glossary).

To appeal you must do the following within 30 days of the date of receipt of this permit:

File your appeal and a copy of this permit with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

Serve a copy of your appeal and this permit on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in chapter 43.21B RCW and chapter 371-08 WAC.

ADDRESS AND LOCATION INFORMATION

Street Addresses	Mailing Addresses
Department of Ecology Attn: Appeals Processing Desk 300 Desmond Drive SE Lacey, WA 98503	**Department of Ecology** Attn: Appeals Processing Desk PO Box 47608 Olympia, WA 98504-7608
Pollution Control Hearings Board 1111 Israel RD SW STE 301 Tumwater, WA 98501	**Pollution Control Hearings Board** PO Box 40903 Olympia, WA 98504-0903

Appendix C - Glossary

1-DMax or 1-day maximum temperature -- The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or 7-day average of the daily maximum temperatures -- The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute toxicity --The lethal effect of a compound on an organism that occurs in a short time period, usually 48 to 96 hours.

AKART -- The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges, which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Alternate point of compliance -- An alternative location in the groundwater from the point of compliance where compliance with the groundwater standards is measured. It may be established in the groundwater at locations some distance from the discharge source, up to, but not exceeding the property boundary and is determined on a site specific basis following an AKART analysis. An "early warning value" must be used when an alternate point is established. An alternate point of compliance must be determined and approved in accordance with WAC 173-200-060(2).

Ambient water quality -- The existing environmental condition of the water in a receiving water body.

Ammonia -- Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual average design flow (AADF) -- average of the daily flow volumes anticipated to occur over a calendar year.

Average monthly (intermittent) discharge limit -- The average of the measured values obtained over a calendar months time taking into account zero discharge days.

Average monthly discharge limit -- The average of the measured values obtained over a calendar month's time.

Background water quality -- The concentrations of chemical, physical, biological or radiological constituents or other characteristics in or of groundwater at a particular point in time upgradient of an activity that has not been affected by that activity, [WAC 173-200-020(3)].

Background water quality for any parameter is statistically defined as the 95% upper tolerance interval with a 95% confidence based on at least eight hydraulically upgradient water quality samples. The eight samples are collected over a period of at least one year, with no more than one sample collected during any month in a single calendar year.

Best management practices (BMPs) -- Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD5 -- Determining the five-day Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD_5 is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass -- The intentional diversion of waste streams from any portion of a treatment facility.

Categorical pretreatment standards -- National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties, which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Chlorine -- A chemical used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic toxicity -- The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean water act (CWA) -- The federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance inspection-without sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance inspection-with sampling -- A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite sample -- A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples.

May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction activity -- Clearing, grading, excavation, and any other activity, which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous monitoring -- Uninterrupted, unless otherwise noted in the permit.

Critical condition -- The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Date of receipt – This is defined in RCW 43.21B.001(2) as five business days after the date of mailing; or the date of actual receipt, when the actual receipt date can be proven by a preponderance of the evidence. The recipient's sworn affidavit or declaration indicating the date of receipt, which is unchallenged by the agency, constitutes sufficient evidence of actual receipt. The date of actual receipt, however, may not exceed forty-five days from the date of mailing.

Detection limit -- The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Dilution factor (DF) -- A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Distribution uniformity -- The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Early warning value -- The concentration of a pollutant set in accordance with WAC 173-200-070 that is a percentage of an enforcement limit. It may be established in the effluent, groundwater, surface water, the vadose zone or within the treatment process. This value acts as a trigger to detect and respond to increasing contaminant concentrations prior to the degradation of a beneficial use.

Enforcement limit -- The concentration assigned to a contaminant in the groundwater at the point of compliance for the purpose of regulation, [WAC 173-200-020(11)]. This limit assures that a groundwater criterion will not be exceeded and that background water quality will be protected.

Engineering report -- A document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal coliform bacteria -- Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab sample -- A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Groundwater -- Water in a saturated zone or stratum beneath the surface of land or below a surface water body.

Industrial user -- A discharger of wastewater to the sanitary sewer that is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial wastewater -- Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated stormwater and, also, leachate from solid waste facilities.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

- Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
- Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local limits -- Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Major facility -- A facility discharging to surface water with an EPA rating score of $>$ 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum daily discharge limit -- The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum day design flow (MDDF) -- The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum month design flow (MMDF) -- The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum week design flow (MWDF) -- The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method detection level (MDL) -- See Detection Limit.

Minor facility -- A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing zone -- An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The permit specifies the area of the authorized mixing zone that Ecology defines following procedures outlined in state regulations (chapter 173-201A WAC).

National pollutant discharge elimination system (NPDES) -- The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH -- The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral and large variations above or below this value are considered harmful to most aquatic life.

Pass-through -- A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

Peak hour design flow (PHDF) -- The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak instantaneous design flow (PIDF) -- The maximum anticipated instantaneous flow.

Point of compliance -- The location in the groundwater where the enforcement limit must not be exceeded and a facility must comply with the Ground Water Quality Standards. Ecology determines this limit on a site-specific basis. Ecology locates the point of compliance in the groundwater as near and directly downgradient from the pollutant source as technically, hydrogeologically, and geographically feasible, unless it approves an alternative point of compliance.

Potential significant industrial user (PSIU) --A potential significant industrial user is defined as an Industrial User that does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

Ecology may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation level (QL) -- Also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1,2,or 5) x 10^n, where n is an integer. (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

Reasonable potential -- A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible corporate officer -- A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Sample Maximum -- No sample may exceed this value.

Significant industrial user (SIU) --

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug discharge -- Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate that may cause interference or pass through with the POTW or in any way violate the permit conditions or the POTW's regulations and local limits.

Soil scientist -- An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3,or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

Soluble BOD_5 -- Determining the soluble fraction of Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of soluble organic material present in an effluent that is utilized by bacteria. Although the soluble BOD_5 test is not specifically described in Standard Methods, filtering the raw sample through at least a 1.2 um filter prior to running the standard BOD_5 test is sufficient to remove the particulate organic fraction.

State waters -- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater -- That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based effluent limit -- A permit limit based on the ability of a treatment method to reduce the pollutant.

Total coliform bacteria -- A microbiological test, which detects and enumerates the total coliform group of bacteria in water samples.

Total dissolved solids -- That portion of total solids in water or wastewater that passes through a specific filter.

Total maximum daily load (TMDL) -- A determination of the amount of pollutant that a water body can receive and still meet water quality standards.

Total suspended solids (TSS) -- Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation.

Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna.

Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset -- An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water quality-based effluent limit -- A limit imposed on the concentration of an effluent parameter to prevent the concentration of that parameter from exceeding its water quality criterion after discharge into receiving waters.

Appendix D - Technical Calculations

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found in the PermitCalc workbook on Ecology's webpage at: http://www.ecy.wa.gov/programs/wq/permits/guidance.html.

Simple Mixing:

Ecology uses simple mixing calculations to assess the impacts of certain conservative pollutants, such as the expected increase in fecal coliform bacteria at the edge of the chronic mixing zone boundary. Simple mixing uses a mass balance approach to proportionally distribute a pollutant load from a discharge into the authorized mixing zone. The approach assumes no decay or generation of the pollutant of concern within the mixing zone. The predicted concentration at the edge of a mixing zone (C_{mz}) is based on the following calculation:

$$C_{mz} = Ca + \frac{(Ce - Ca)}{DF}$$

where: Ce = Effluent Concentration
Ca = Ambient Concentration
DF = Dilution Factor

Reasonable Potential Analysis:

The spreadsheets Input 2 – Reasonable Potential, and LimitCalc in Ecology's PermitCalc Workbook determine reasonable potential (to violate the aquatic life and human health water quality standards) and calculate effluent limits. The process and formulas for determining reasonable potential and effluent limits in these spreadsheets are taken directly from the *Technical Support Document for Water Quality-based Toxics Control*, (EPA 505/2-90-001). The adjustment for autocorrelation is from EPA (1996a), and EPA (1996b).

Calculation of Water Quality-Based Effluent Limits:

Water quality-based effluent limits are calculated by the two-value wasteload allocation process as described on page 100 of the TSD (EPA, 1991) and shown below.

1. Calculate the acute wasteload allocation WLA_a by multiplying the acute criteria by the acute dilution factor and subtracting the background factor. Calculate the chronic wasteload allocation (WLA_c) by multiplying the chronic criteria by the chronic dilution factor and subtracting the background factor.

$$WLA_a = (\text{acute criteria} \times DF_a) - [(\text{background conc.} \times (DF_a - 1)]$$

$$WLA_c = (\text{chronic criteria} \times DF_c) - [(\text{background conc.} \times (DF_c - 1)]$$

where: DF_a = Acute Dilution Factor
DF_c = Chronic Dilution Factor

2. Calculate the long term averages (LTA_a and LTA_c) which will comply with the wasteload allocations WLA_a and WLA_c.

$LTA_a = WLA_a \times e^{[0.5\sigma^2 - z\sigma]}$

where: $\sigma^2 = \ln[CV^2 + 1]$

$z = 2.326$

CV = coefficient of variation = std. dev/mean

$LTA_c = WLA_c \times e^{[0.5\sigma^2 - z\sigma]}$

where: $\sigma^2 = \ln[(CV^2 \sqrt{\ } 4) + 1]$

$z = 2.326$

3. Use the smallest LTA of the LTA_a or LTA_c to calculate the maximum daily effluent limit and the monthly average effluent limit.

MDL = Maximum Daily Limit

$MDL = LTA x e^{(Z\sigma - 0.5\sigma^2)}$

where: $\sigma^2 = \ln[CV^2 + 1]$

z = 2.326 (99th percentile occurrence)

LTA = Limiting long term average

AML = Average Monthly Limit

$AML = LTA x\ e^{(Z\sigma_n - 0.5\sigma_n^2)}$

where: $\sigma^2 = \ln[(CV^2 \div n) + 1]$

n = number of samples/month

z = 1.645 (95th % occurrence probability)

LTA = Limiting long term average

Reasonable Potential Calculation

Facility	Kaiser
Water Body Type	Freshwater
Rec. Water Hardness	Acute=98.6, Chronic=39.7 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	1.4	5.4
Human Health Carcinogenic		38.2
Human Health Non-Carcinogenic		6.9

Pollutant, CAS No. & NPDES Application Ref. No.		AMMONIA, Criteria as Total NH3	ALUMINUM, total recoverable, pH 6.5-9.0 7429905	ANTIMONY (INORGANIC) 7440360 1M	ARSENIC (dissolved) 7440382 2M	ARSENIC (inorganic)	CHROMIUM(TRI) -16065831 5M Hardness dependent	COPPER - 744058 6M Hardness dependent	IRON 7439896	MANGANESE 7439965	MERCURY 7439976 8M	NICKEL - 7440020 9M - Dependent on hardness
Effluent Data	# of Samples (n)	49	49	1	1	1	1	1	1	1	1	1
	Coeff of Variation (Cv)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)	0.35	670	0.28	4.11	4.11	0.49	1.32	11	2.74	0.0036	0.34
	Calculated 50th percentile Effluent Conc. (when n>10)											
Receiving Water Data	90th Percentile Conc., ug/L	0.0259	231		0.56		0.25	0.71	0		0.00252	0.51
	Geo Mean, ug/L			0		0.45		0.54	0	0	0.00122	0.34
Water Quality Criteria	Aquatic Life Criteria, ug/L — Acute	5,615	750	-	360	-	542.6462	16.79912	-	-	2.1	1399.18
	Aquatic Life Criteria, ug/L — Chronic	846	-	-	190	-	83.59358	5.158721	1000	-	0.012	72.0029
	WQ Criteria for Protection of Human Health, ug/L	-	-	14	-	0.018	-	1300	300	50	0.14	610
	Metal Criteria Translator, decimal — Acute	-	-	-	1	-	0.316	0.996	-	-	0.85	0.998
	Metal Criteria Translator, decimal — Chronic	-	-	-	1	-	0.86	0.996	-	-	-	0.997
	Carcinogen?	N	N	N	Y	Y	N	N	N	N	N	N

Aquatic Life Reasonable Potential

		AMMONIA	ALUMINUM	ANTIMONY	ARSENIC (dissolved)	ARSENIC (inorganic)	CHROMIUM(TRI)	COPPER	IRON	MANGANESE	MERCURY	NICKEL
Effluent percentile value		0.950	0.950		0.950		0.950	0.950	0.950		0.950	0.950
s	$s^2=\ln(CV^2+1)$	0.555	0.555		0.555		0.555	0.555	0.555		0.555	0.555
Pn	$Pn=(1\text{-confidence level})^{1/n}$	0.941	0.941		0.050		0.050	0.050	0.050		0.050	0.050
Multiplier		1.05	1.05		6.20		6.20	6.20	6.20		6.20	6.20
Max concentration (ug/L) at edge of…	Acute	0.264	560.585		17.992		0.747	5.915	47.702		0.014	1.625
	Chronic	0.089	318.030		5.163		0.686	2.084	12.596		0.006	0.804
Reasonable Potential? Limit Required?		**NO**	**NO**		**NO**		**NO**	**NO**	**NO**		**NO**	**NO**

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month		
LTA Coeff. Var. (CV), decimal		
Permit Limit Coeff. Var. (CV), decimal		
[illegible]	Acute	
	Chronic	
Long Term Averages, ug/L	Acute	
	Chronic	
[illegible]		
Metal Translator or 1?		
[illegible]		
[illegible]		

Human Health Reasonable Potential

		ANTIMONY	ARSENIC (dissolved)	ARSENIC (inorganic)	CHROMIUM(TRI)	COPPER	IRON	MANGANESE	MERCURY	NICKEL
s	$s^2=\ln(CV^2+1)$	0.554513		0.554513		0.554513	0.55451	0.55451	0.55451	0.55451
Pn	Pn=(1-confidence level)1/n	0.050		0.050		0.050	0.050	0.050	0.050	0.050
Multiplier		2.489527		2.489527		2.489527	2.48953	2.48953	2.48953	2.48953
Dilution Factor		6.901237		38.18264		6.901237	6.90124	6.90124	6.90124	6.90124
Max Conc. at edge of Chronic Zone, ug/L		0.101006		0.706189		9.4E-01	3.9681	0.98842	0.00234	0.41338
Reasonable Potential? Limit Required?		**NO**		**YES**		**NO**	**NO**	**NO**	**NO**	**NO**

Human Health Limit Calculation

	ARSENIC (inorganic)
# of Compliance Samples Expected per month	1
Average Monthly Effluent Limit, ug/L	**-16.0449**
Maximum Daily Effluent Limit, ug/L	**-23.4065**

Reasonable Potential Calculation - Page 2

Facility	Kaiser
Water Body Type	Freshwater
Rec. Water Hardness	Acute=98.6, Chronic=39.7 mg/L

Dilution Factors:	Acute	Chronic
Aquatic Life	1.4	5.4
Human Health Carcinogenic		38.2
Human Health Non-Carcinogenic		6.9

Pollutant, CAS No. & NPDES Application Ref. No.			RADIUM 226 & 228 (note: units are in pCi/L)										
Effluent Data	# of Samples (n)		1										
	Coeff of Variation (Cv)		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Effluent Concentration, ug/L (Max. or 95th Percentile)		0.25										
	Calculated 50th percentile Effluent Conc. (when n>10)												
Receiving Water Data	90th Percentile Conc., ug/L												
	Geo Mean, ug/L		0										
Water Quality Criteria	Aquatic Life Criteria, ug/L	Acute	-										
		Chronic	-										
	WQ Criteria for Protection of Human Health, ug/L		5										
	Metal Criteria Translator, decimal	Acute	-										
		Chronic	-										
	Carcinogen?		Y										

Aquatic Life Reasonable Potential

Effluent percentile value		
s	$s^2=\ln(CV^2+1)$	
Pn	$Pn=(1\text{-confidence level})^{1/n}$	
Multiplier		
Max concentration (ug/L) at edge of…	Acute	
	Chronic	
Reasonable Potential? Limit Required?		

Aquatic Life Limit Calculation

# of Compliance Samples Expected per month		
LTA Coeff. Var. (CV), decimal		
Permit Limit Coeff. Var. (CV), decimal		
Waste Load Allocations, ug/L	Acute	
	Chronic	
Long Term Averages, ug/L	Acute	
	Chronic	
Limiting LTA, ug/L		
Metal Translator or 1?		
Average Monthly Limit (AML), ug/L		
Maximum Daily Limit (MDL), ug/L		

Human Health Reasonable Potential

s	$s^2=\ln(CV^2+1)$	0.55451
Pn	Pn=(1-confidence level)1/n	0.050
Multiplier		2.48953
Dilution Factor		38.1826
Max Conc. at edge of Chronic Zone, ug/L		0.0163
Reasonable Potential? Limit Required?		**NO**

Human Health Limit Calculation

# of Compliance Samples Expected per month	
Average Monthly Effluent Limit, ug/L	
Maximum Daily Effluent Limit, ug/L	

Freshwater Temperature Reasonable Potential and Limit Calculation

Based on WAC 173-201A-200(1)(c)(i)--(ii) and the Water Quality Program Guidance. All data inputs must meet WQ guidelines. The Water Quality temperature guidance document may be found at: https://fortress.wa.gov/ecy/publications/summarypages/0610100.html

	Core Summer Criteria	Supplemental Criteria	
INPUT	July 1-Sept 14	Sept 15-July 1	
1. Chronic Dilution Factor at Mixing Zone Boundary	5.4	5.4	
2. 7DADMax Ambient Temperature (T) (Upstream Background 90th percentile)	21.1 °C		
3. 7DADMax Effluent Temperature (95th percentile)	25.2 °C		77.3 °F
4. Aquatic Life Temperature WQ Criterion in Fresh Water	20.0 °C		
OUTPUT			
5. Temperature at Chronic Mixing Zone Boundary:	21.9 °C	0.0 °C	
6. Incremental Temperature Increase or decrease:	0.8 °C	0.0 °C	
7. Maximum Allowable Incremental Temperature Increase:	0.3 °C	0.3 °C	
8. Maximum Allowable Temperature at Mixing Zone Boundary:	21.4 °C	0.3 °C	
A. If ambient temp is warmer than WQ criterion			
9. Does temp fall within this warmer temp range?	YES	YES	
10. Temperature Limit if Required:	0.3	NO LIMIT	
B. If ambient temp is cooler than WQ criterion but within 28/(T_{amb}+7) and within 0.3 °C of the criterion			
11. Does temp fall within this incremental temp. range?	---	---	
12. Temp increase allowed at mixing zone boundary, if required:	---	---	
C. If ambient temp is cooler than (WQ criterion-0.3) but within 28/(T_{amb}+7) of the criterion			
13. Does temp fall within this Incremental temp. range?	---	---	
14. Temp increase allowed at mixing zone boundary, if required:	---	---	
D. If ambient temp is cooler than (WQ criterion - 28/(T_{amb}+7))			
15. Does temp fall within this Incremental temp. range?	---	---	
16. Temp increase allowed at mixing zone boundary, if required:	---	---	
RESULTS			
17. Do any of the above cells show a temp increase?	**YES**	**NO**	
18. Temperature Limit if Required?	**21.3 °C**	**NO LIMIT**	

Notes:

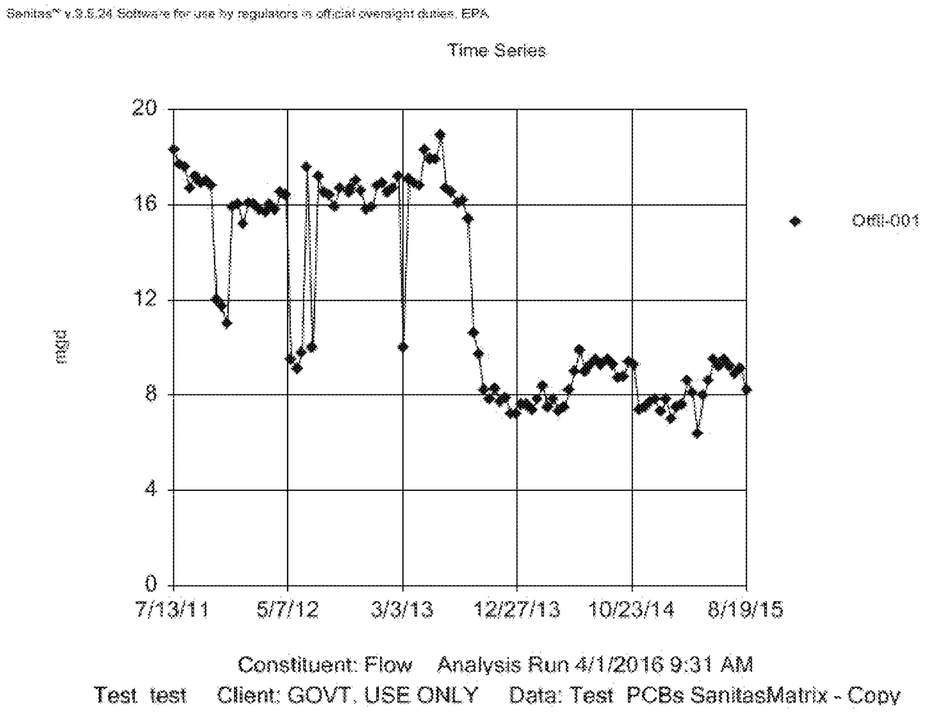
95th percentile effluent temperature of 77.3 °F calculated from daily maximum effluent temperatures reported in discharge monitoring reports from July 2011 to November 2015.

	Flow	Outfall 001 - Total PCBs		
Date	MGD	pg/L	mg/day	Two week average mg/day
9/4/13	10.6	3,470	139	-
9/18/13	9.67	2,420	89	114
10/2/13	8.2	3,780	117	103
10/16/13	7.79	3,480	103	110
10/30/13	8.27	3,360	105	104
11/13/13	7.73	4,730	138	121.5
11/27/13	7.9	1,760	53	95.5
12/11/13	7.2	1,490	41	47
12/27/13	7.2	2,040	56	48.5
1/8/14	7.55	1,890	54	55
1/22/14	7.56	3,100	89	71.5
2/5/14	7.41	3,410	96	92.5
2/19/14	7.77	2,110	62	79
3/6/14	8.39	3,650	116	89
3/18/14	7.47	1,630	46	81
4/3/14	7.81	1,870	55	50.5
4/17/14	7.3	1,550	43	49
4/30/14	7.48	1,460	41	42
5/14/14	8.21	2,070	64	52.5
5/28/14	8.96	1,800	61	62.5
6/11/14	9.86	2,120	79	70
6/25/14	8.98	2,240	76	77.5
7/9/14	9.3	1,930	68	72
7/23/14	9.5	1,540	55	61.5
8/6/14	9.3	1,920	68	61.5
8/20/14	9.5	1,780	64	66
9/3/14	9.3	1,850	65	64.5
9/17/14	8.7	1,590	52	58.5
10/1/14	8.8	2,070	69	60.5
10/15/14	9.4	1,760	63	66
10/29/14	9.3	1,750	62	62.5
11/12/14	7.4	1,820	51	56.5
11/26/14	7.5	2,320	66	58.5
12/10/14	7.73	1,830	54	60
12/23/14	7.84	2,680	80	67
1/7/15	7.33	1,880	52	66

	Flow	Outfall 001 - Total PCBs		
Date	MGD	pg/L	mg/day	Two week average mg/day
1/21/15	7.75	2,590	76	52
2/4/15	7	2,530	67	71.5
2/18/15	7.54	2,580	74	70.5
3/4/15	7.63	3,090	89	81.5
3/18/15	8.61	4,450	**145**	117
4/1/15	8.14	3,640	112	**128.5**
4/15/15	6.41	3,660	89	100.5
4/29/15	8	1,880	57	73
5/13/15	8.61	3,070	100	78.5
5/27/15	9.52	3,280	118	109
6/10/15	9.18	2,080	72	95
6/24/15	9.47	1,850	66	69
7/8/15	9.16	2,290	79	72.5
7/22/15	8.94	2,210	75	77
8/5/15	9.05	2,100	72	73.5
8/19/15	8.24	2,720	85	78.5

Minimum	6.41	1,460	41.0	42.00
Average	8.34	2,426	76.3	75.37
Maximum	10.60	4,730	**145.0**	**128.50**

Daily Maximum	**145.0**
Monthly Average	**128.50**


Sanitas™ v.9.5.24 Software for use by regulators in official oversight duties. EPA
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12
8
4
0
mgd
7/13/11
5/7/12
3/3/13
12/27/13
10/23/14
8/19/15
Otfll-001
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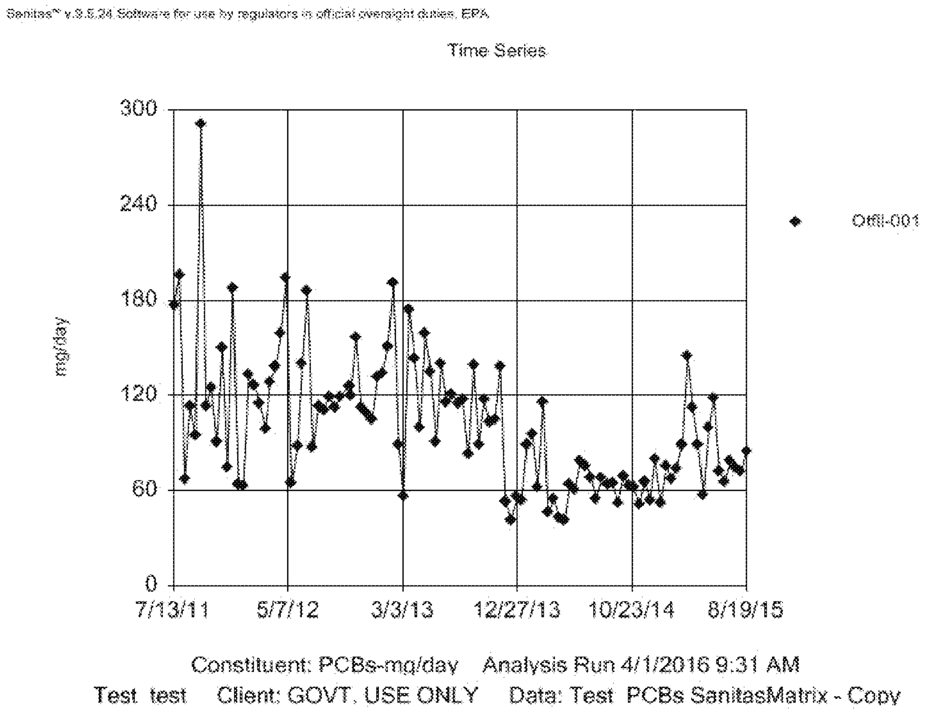
Sanitas™ v.9.5.24 Software for use by regulators in official oversight duties. EPA
Time Series
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0
mg/day
7/13/11
5/7/12
3/3/13
12/27/13
10/23/14
8/19/15
Otfll-001
Constituent: PCBs-mg/day Analysis Run 4/1/2016 9:31 AM
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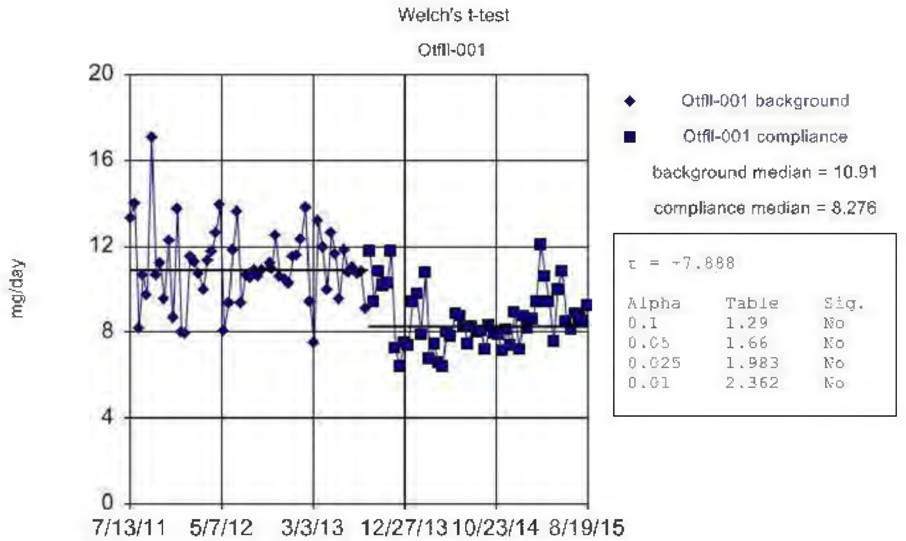
Sanitas™ v.9.5.24 Software for use by regulators in official oversight duties. EPA



Normality test: Shapiro Francia @alpha = 0.05, calculated = 0.9593 after square root transformation, critical = 0.959.

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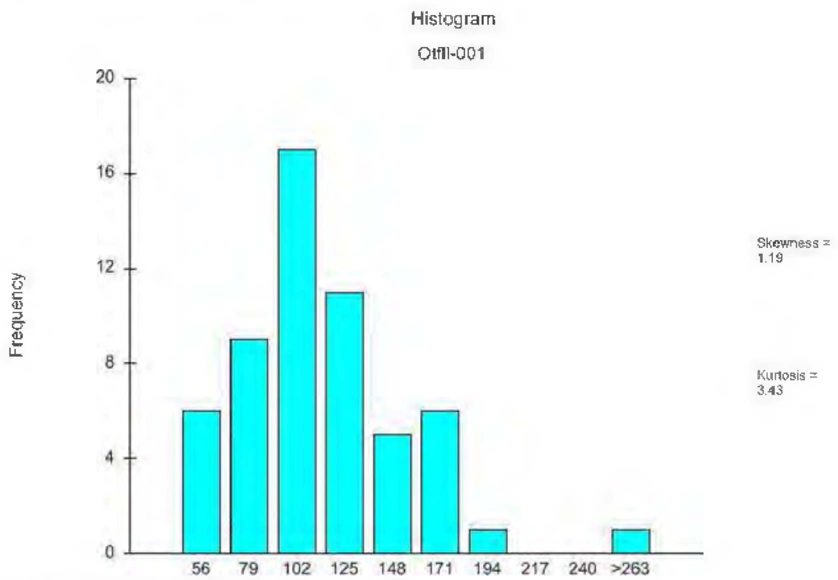
Sanitas™ v.9.5.24 Software for use by regulators in official oversight duties. EPA



Data from 7/13/2011 to 8/21/2013

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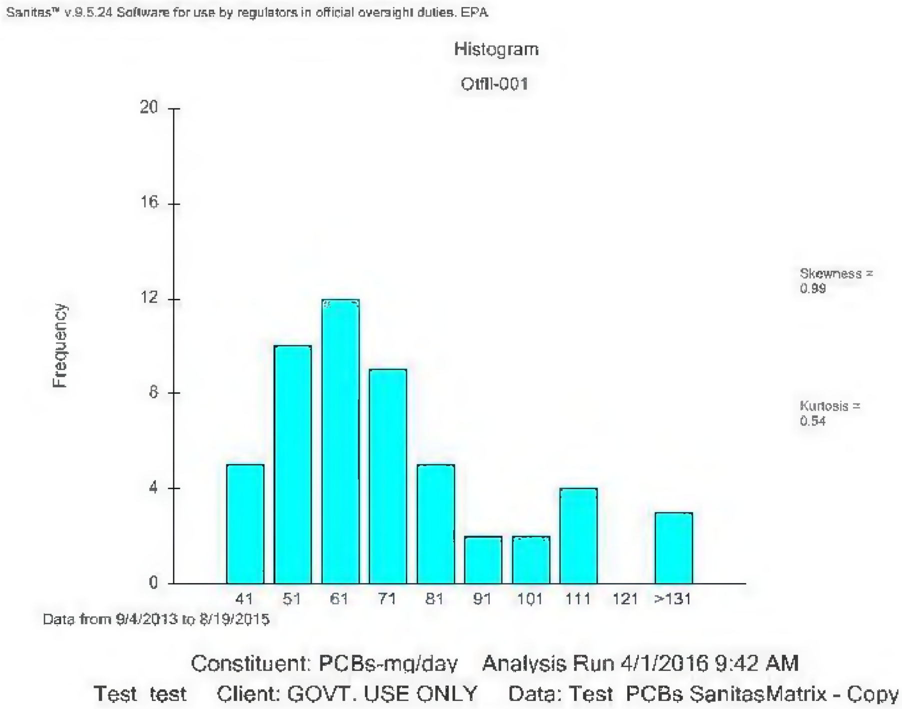
Sanitas™ v.9.5.24 Software for use by regulators in official oversight duties. EPA
Histogram
Otfll-001
Frequency
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16
12
8
4
0
41
51
61
71
81
91
101
111
121
>131
Skewness = 0.99
Kurtosis = 0.54
Data from 9/4/2013 to 8/19/2015
Constituent: PCBs-mg/day Analysis Run 4/1/2016 9:42 AM
Test test Client: GOVT. USE ONLY Data: Test PCBs SanitasMatrix - Copy

Appendix E - Response to Comments

[Ecology will complete this section after the public notice of draft period.]

2016 Comprehensive Plan to Reduce Polychlorinated Biphenyls (PCBs) in the Spokane River

Prepared for:
Spokane River Regional Toxics Task Force

Plan Accepted by the Task Force
November 16, 2016

LimnoTech

Water Environment | Scientists Engineers

Cover photograph courtesy of Adriane Borgias

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Water | Scientists
Environment | Engineers

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2016 Comprehensive Plan to Reduce Polychlorinated Biphenyls (PCBs) in the Spokane River

Prepared for:

Spokane River Regional Toxics Task Force

November 29, 2016

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LIST OF FIGURES

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List of Acronyms

BMP	Best Management Practice
BPA	Bonneville Power Administration
BWS	Black Walnut Shell
CFL	Compact Fluorescent Light Bulb
CFR	Code of Federal Regulations
CLAM	Continuous Low-Level Aqueous Monitoring
CPMA	Color Pigments Manufacturers Association
CSO	Combined Sewer Overflow
DOH	Department of Health
DOT	Department of Transportation
EPA	Environmental Protection Agency
FDA	Food and Drug Administrations
FTE	Full Time Equivalent
FTEC	Fish Tissue Equivalent Concentration
GI	Green Infrastructure
GIS	Geographic Information System
HARSB	Hayden Area Regional Sewer Board
IDDE	Illicit Discharge Detection and Elimination
IDEQ	Idaho Department of Environmental Quality
LID	Low Impact Development
MG	Milligram
MICHTOX	Mass Balance and Bioaccumulation Model for Toxic Chemicals in Lake Michigan
MOA	Memorandum of Agreement
MS4	Municipal Separate Storm Sewer System
MTCA	Model Toxics Control Act
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
ORD	Office of Research and Development
PAS	Passive Air Sampler
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PCDD/F	Polychlorobenzodioxin and Polychlorodibenzofuran
POTW	Publically Owned Treatment Works
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCW	Revised Code of Washington
RM	River Mile
SFEI	San Francisco Estuary Institute
SFEP	San Francisco Estuary Project
SRRTTF	Spokane River Regional Toxics Task Force
TCP	Toxics Cleanup Program
TMDL	Total Maximum Daily Load
TMP	Toxics Management Plan
TSCA	Toxic Substances Control Act
TSS	Total Suspended Solids
UGA	Urban Growth Area
UIC	Underground Injection Control
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WAC	Washington Administrative Code
WBD	Watershed Boundary Dataset
WQS	Water Quality Standards
WRF	Water Reclamation Facility
WRIA	Water Resource Inventory Area
WWTP	Wastewater Treatment Plant

Executive Summary

The Spokane River begins in northern Idaho at the outlet of Coeur d'Alene Lake and flows west 112 miles to the Columbia River. Sections of the Spokane River and Lake Spokane have been placed on Washington's EPA-approved 303(d) list of impaired waters for polychlorinated biphenyls (PCBs). The impairments are based on concentrations of PCBs measured in fish tissue that exceeded a fish tissue equivalent concentration for applicable water quality standards. The impairments have never been based on concentrations of PCBs measured in the water column. Ambient surface water quality data collected by the Task Force between 2014 and 2016 at eight SRRTTF river monitoring locations show that the central tendencies of the water column data range from 17 pg/L to 154 pg/L total PCB as compared to the current Washington Water Quality Standard of 170 pg/L.

The Spokane River Regional Toxics Task Force (SRRTTF) was formed with the goal to develop a comprehensive plan to bring the Spokane River into compliance with applicable water quality standards for PCBs (SRRTTF, 2012b). This document presents that Comprehensive Plan. This Plan is based on data drawn from studies by the Washington State Department of Ecology (Ecology) and recent monitoring efforts by the Task Force. The Task Force analyzed these data to estimate the mass of PCBs currently present in various source areas throughout the watershed, as well as the loading rate of PCBs to the Spokane River from various delivery mechanisms.

PCBs produced intentionally through 1979, termed legacy PCBs, in buildings (i.e., small capacitors, sealants) and legacy soil contamination are estimated to be the largest source areas of PCBs in the watershed. The primary delivery mechanisms of PCBs to the Spokane River were determined to be cumulative loading across all wastewater treatment plants, contaminated groundwater, and stormwater/combined sewer overflows (see Section 3.2, Table 5 for details). PCB loading from Lake Coeur d'Alene and Spokane River tributaries are of similar magnitude to the other primary delivery mechanisms, due to much higher flow rates but with much lower concentrations of PCBs.

A range of Control Actions (defined as "any activity which prevents, controls, removes or reduces pollution") will be needed to reduce PCB levels and ultimately attain water quality standards. The Task Force identified 45 Control Actions considered potentially applicable to address PCBs in the Spokane River, and assessed them in terms of costs and effectiveness. The specific Control Actions to be included in the Comprehensive Plan were determined at a Task Force workshop held in Spokane on July 27, 2016. Discussion of Control Actions at that workshop was divided into tiers of: 1) Control Actions already being implemented, some of which are addressed by existing regulatory mechanisms, and 2) Potential new Control Actions. Existing Control Actions were placed by the group into one of two categories. The first category contained the following Control Actions, where the group decided to maintain current efforts, and document those efforts in the Plan:

- Wastewater Treatment
- Remediate Known Contaminated Sites
- Stormwater Controls
- Low Impact Development Ordinance
- Street Sweeping
- Purchasing Standards

The second category contained existing Control Actions where the group identified improvements that could be made to current efforts. These consisted of:

- Support of Green Chemistry Alternatives
- PCB Product Testing
- Waste Disposal Assistance
- Regulatory Rulemaking
- Compliance with PCB Regulations
- Emerging End-of-Pipe Stormwater Technologies

Potential new Control Actions were reviewed next, with two actions identified for inclusion in the Comprehensive Plan and a commitment to implementation:

- Identification of Sites of Concern for Contaminated Groundwater
- Building Demolition and Renovation Control

Finally, eleven other new Control Actions were identified as being worthy of consideration in the future.

The Implementation Plan portion of this document lists milestones, timelines, and metrics to assess effectiveness for each of the new or expanded Control Actions. The effectiveness of SRRTTF's implementation of Control Actions will be assessed, in part, via an annual Implementation Review Summary that will compare actions conducted over the prior year to the timelines and effectiveness metrics spelled out in the Implementation Plan. The annual Implementation Review Summary will provide flexibility to adapt strategies, phase out actions that are not working, and phase in new Control Actions as appropriate. In addition to annual review of the implementation of individual Control Actions, the Comprehensive Plan includes a five-year Implementation Assessment Report that will assess overall PCB loading and system response in terms of observed PCB concentrations in the river.

The Comprehensive Plan concludes with a section on Future Studies, which describes additional Control Actions worthy of future consideration, as well as potential studies to be conducted to fill known data gaps about continuing PCB sources, delivery mechanisms, and environmental response.

This Comprehensive Plan does not constitute an agreement by any agency or member of the Task Force to fund or participate in implementation of the Control Actions or Future Studies. The Memorandum of Agreement under which the Task Force operates has a set term through the termination date of the Washington NPDES permits in 2016. Implementation of this Plan will be addressed in any amendment to the Memorandum of Agreement that provides for an extension of the Task Force.

1 Introduction

The goal of the Spokane River Regional Toxics Task Force (SRRTTF, referred to herein as "Task Force") is to develop a comprehensive plan to bring the Spokane River into compliance with applicable water quality standards for PCBs (SRRTTF, 2012b). This document presents that Comprehensive Plan, and this introductory section provides background information on the Task Force and the content of the Comprehensive Plan.

1.1 Creation and Membership of the Task Force

Washington NPDES wastewater discharge permits issued in 2011 by the Washington State Department of Ecology (Ecology) for facilities discharging into the Spokane River included the requirement for the creation of a Regional Toxics Task Force. The permits state that the goal of the Task Force is to "develop a Comprehensive Plan to bring the Spokane River into compliance with applicable water quality standards for PCBs." Should the Task Force fail to make measurable progress towards this goal, then Ecology is "obligated to proceed with a TMDL in the Spokane River for PCBs or determine an alternative to ensure that water quality standards are met." Ecology conducts the measurable progress evaluation at the end of the permit cycle. Actions taken in this Comprehensive Plan would be one aspect of Ecology's evaluation for measurable progress. These permits also stated that the Task Force membership should include the NPDES permittees in the Spokane River Basin, conservation and environmental interests, the Spokane Tribe of Indians, Spokane Regional Health District, Ecology, and other appropriate interests. NPDES permittees who discharge to the Spokane River in Idaho subsequently agreed to participate in the Task Force, and their participation is now similarly required in their NPDES permits.

The organization and governance of the Spokane River Regional Toxics Task Force was created under and is governed under a 2012 Memorandum of Agreement (MOA). The MOA guides participation in a regional effort to make measurable progress toward meeting applicable water quality criteria for PCBs. It provides an organizational structure, identification of the roles and responsibilities of the membership, and governance structure for formation of the Task Force. The Task Force includes voting members representing NPDES permittees, agencies other than Ecology, and environmental groups. Ecology, tribal sovereigns, and EPA participate in the Task Force as non-voting advisory members. The Task Force membership is listed in the MOA (SRRTTF, 2012a). Many parties were invited to participate from the beginning of the process, and additional parties have joined since 2012. The Task Force welcomes the participation of all other entities interested in contributing to this effort.

This Comprehensive Plan (Plan) describes the data, analytical process, and outcome of the analytical process regarding sources of PCBs to the Spokane River. In addition, the Plan identifies potentially applicable PCB Control Actions, assesses the effectiveness of potential Control Actions to reduce PCBs, and recommends a plan for implementation of Control Actions to reduce PCB loading to the Spokane River watershed.

1.2 Comprehensive Plan

The Comprehensive Plan is divided into sections describing:

- **Watershed Characterization:** Describes the environmental setting, available data, and impairment status of the Spokane River and its contributing watershed.
- **PCB Source Assessment:** Defines all known PCB sources and pathways and their respective magnitudes, the analyses used to determine these magnitudes, and key data gaps.
- **PCB Control Actions:** Defines the management practices under consideration to control PCBs, and the expected costs and removal efficiency of each option.
- **Implementation Plan:** Defines the specific PCB management practices recommended for implementation, the recommended schedule for their implementation, and measurable milestones to assess implementation effectiveness.
- **Future Studies:** Describes future activities designed to assess implementation effectiveness, identify additional Control Actions worthy of future consideration, and fill identified data gaps. The five-year Implementation Assessment Report will estimate pollutant loading into the watershed and the estimated load reductions and time frames for achieving those reductions.

2
Watershed Characterization

Development of a Comprehensive Plan requires an understanding of the environmental setting, available data, and impairment status. This section presents that information, divided into subsections of:

- Study Area
- Hydrology
- Land Use and Population
- Available Data
- Impairment Status

2.1 Study Area

The Spokane River begins in northern Idaho at the outlet of Coeur d'Alene Lake and flows west 112 miles to Franklin D. Roosevelt Lake, a reservoir in the Columbia River (Figure 1). The watershed covers more than 6,000 square miles (15,500 km^2) in Washington and Idaho. This Comprehensive Plan focuses on a Study Area comprising the portion of the watershed draining to the Spokane River downstream of Coeur d'Alene Lake and upstream of Long Lake Dam (Figure 2). This segment of the watershed and river has been chosen to be the focus of the Task Force's initial efforts for several reasons:

- Discharges from all of the major municipal and industrial sources in the watershed are located in this section of the river;
- Virtually all urban area storm runoff in the watershed enters the river in this section;
- This section of the river contains numerous river flow gaging stations, which allow for the determination of in-stream loadings at multiple locations through semi-quantitative mass balance calculations;
- The vast majority of the aquifer/river interchange occurs in this section of the river, and the impact of this interchange on PCB concentration has not been quantified by previous studies;
- The likelihood of making near-term source contribution reductions is greatest in this section of the river, given the concentration of point source and storm runoff locations and the significant level of unidentified source contribution; and
- The ability to monitor and assess the effectiveness of PCB reductions is enhanced by the ability to track in-stream loadings with the infrastructure present (gaging stations) in this section of the river.

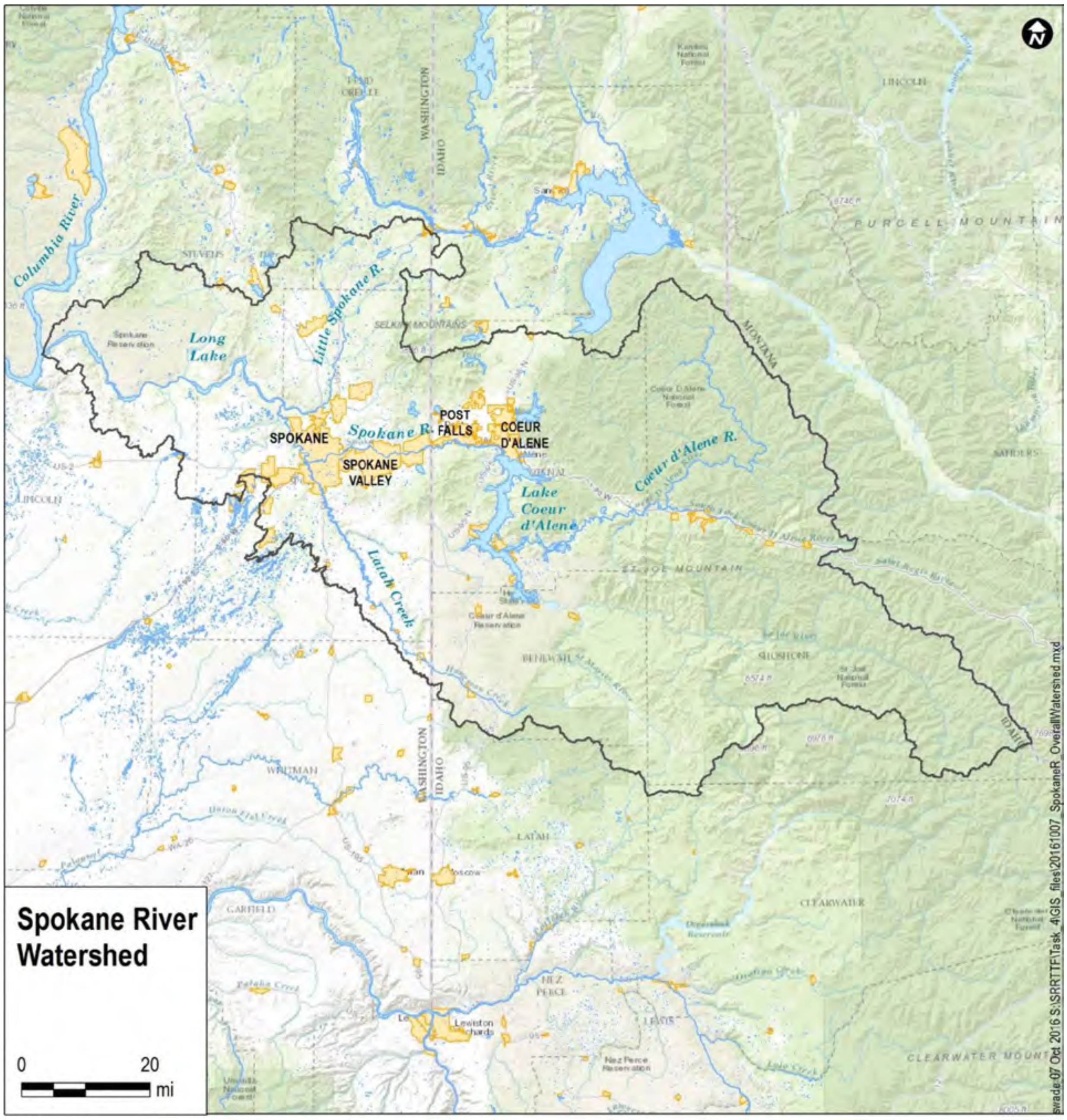

Figure 1. Spokane River Watershed

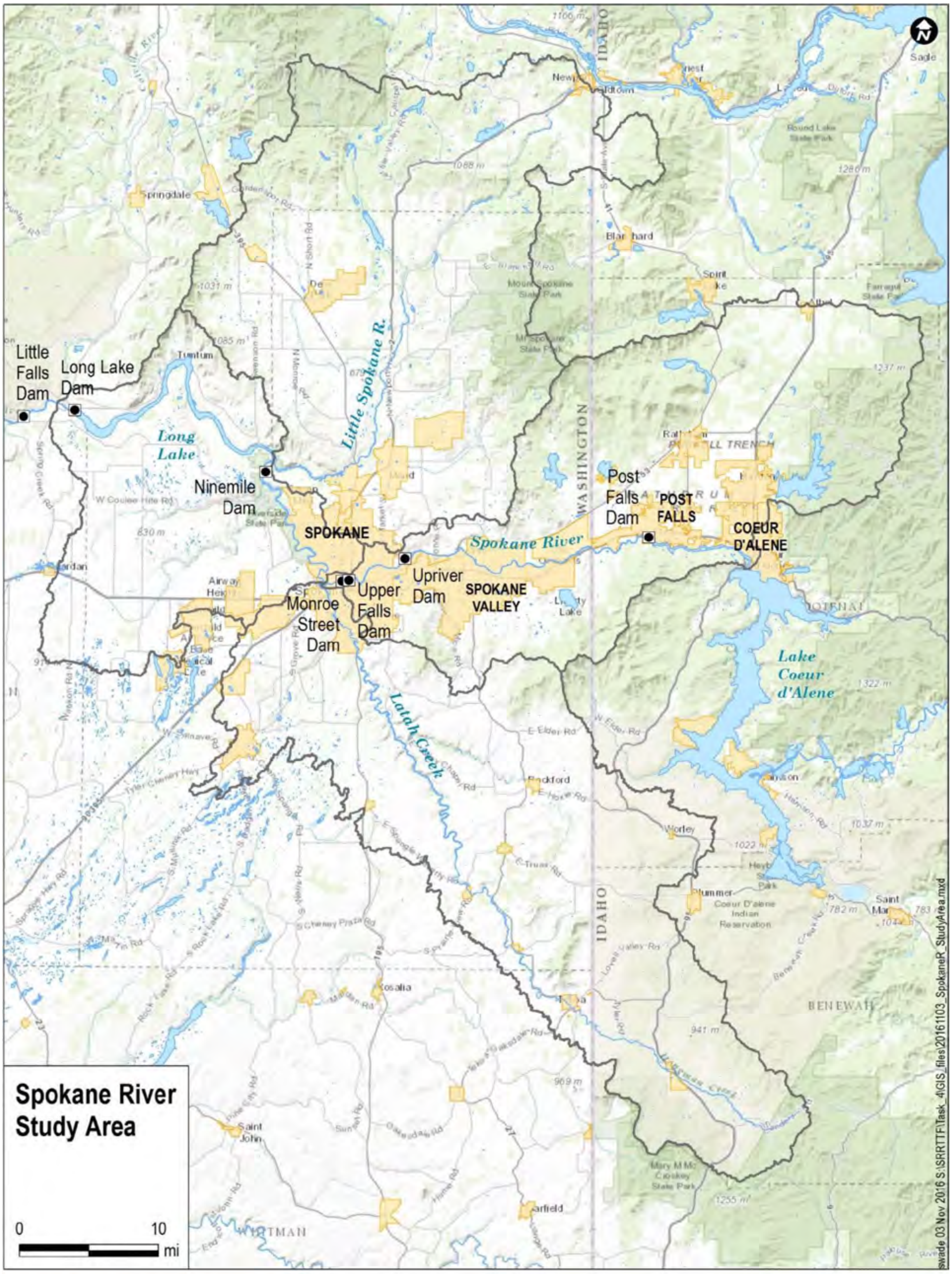

Figure 2. Spokane River Study Area

2.2 Hydrology

The hydrologic characteristics of the Spokane River watershed were described by Ecology (Serdar et al., 2011), which serves as the basis for the following description. The flow regime in the Spokane River is dictated largely by precipitation and freezing temperatures in the winter followed by spring snowmelt, and is also partially controlled by Post Falls Dam for approximately half of the year. The annual mean flow for the years 1969-2016 was 175,933 L/sec (6,213 cfs) at Post Falls. Average flows increased to 181,738 L/sec (6,418 cfs) at the Spokane Gage, reflecting the influx of groundwater through this river reach. Prior to 1969 there were unquantified agricultural diversions for irrigation from the Spokane River near Post Falls.

There are seven dams along the Spokane River (Figure 2):

1. Post Falls Dam (RM 102), which controls the level of Lake Coeur d'Alene for approximately half of the year;
2. Upriver Dam (RM 80.2);
3. Upper Falls Dam (RM 74.24 and 74.7);
4. Monroe Street Dam (RM 74.0);
5. Nine Mile Dam (RM 58.1);
6. Long Lake Dam (RM 33.9), which controls the level of Lake Spokane; and
7. Little Falls Dam (RM 29.3).

The dams create a series of pools which vary in length, the largest being 23-mile-long Lake Spokane (also known as Long Lake). Downstream from Lake Spokane, the Spokane River forms the southern boundary of the Spokane Tribe of Indians reservation from Chamokane Creek (RM 32.5) to the Columbia River at RM 639.0.

The Spokane River is largely underlain by, and significantly interacts with, the Spokane Valley-Rathdrum Prairie Aquifer. Nearly one billion gallons of water per day flows into and out of the aquifer, with roughly half of this amount due to exchange with the Spokane River. The aquifer also serves as the sole source of water for most people in the study area (Spokane Valley-Rathdrum Prairie Aquifer Atlas, 2009)

2.3 Land Use and Population

The Study Area contains a diverse mixture of land uses (Figure 3). Approximately 11% of the focus area is in developed land use; 39% of the area is forested; 23% of the area is in agricultural use; and the remainder is primarily in shrub/herbaceous cover, wetlands, or water. The river flows through the smaller cities of Post Falls and Coeur d'Alene in Idaho and large urban areas within the cities of Spokane Valley and Spokane in Washington.

Total population in the Study Area watershed was estimated from 2011 census block group data obtained in GIS data format from the U.S. Census Bureau (https://www.census.gov/geo/maps-data/data/tiger-data.html). Population per acre was calculated for each census block group. The block groups were intersected with known watershed boundary delineations, with the area of each block group portion located inside a basin multiplied by the population density. Those products were summed for each basin to obtain total population. The overall 2011 population for the Study Area watershed was estimated to be 571,045. Of this total, 401,976 people lived in watershed areas draining directly to the Spokane River; 57,669 people lived in watershed areas draining to Latah Creek; and 111,400 people lived in watershed areas draining to the Little Spokane River.

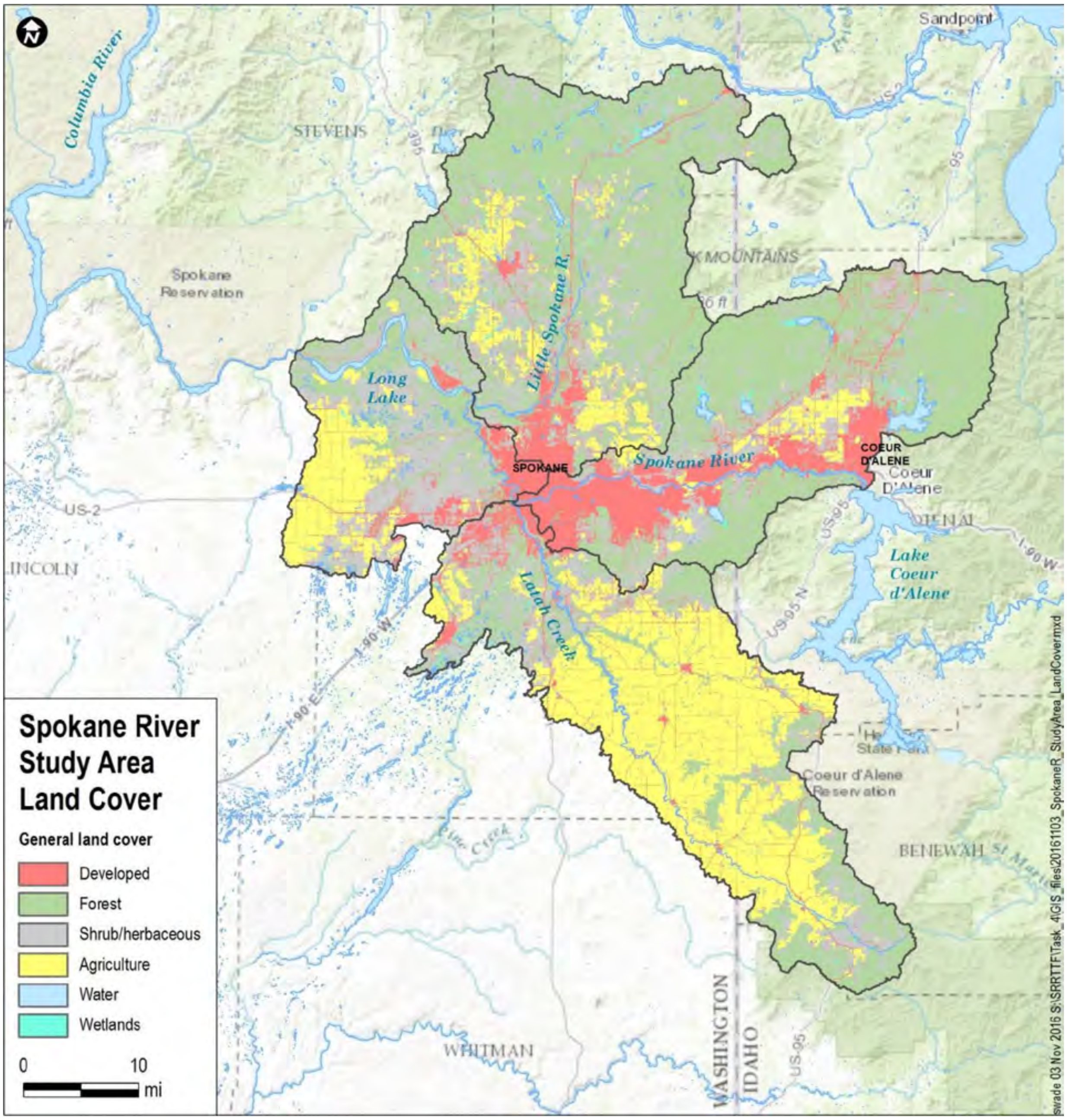

Figure 3. Land Use in the Study Area

2.4 Available Data

The available data for development of the Comprehensive Plan are summarized here, in separate sections discussing data compiled by the Task Force in 2013 and data collected after that compilation.

2.4.1 2013 Data Compilation

Initial Task Force efforts included identification and collection of available data to define existing PCB sources and sinks. The intent of that work was to evaluate the quality and credibility of the available data relative to satisfying identified data needs, and to store the resulting data in a database facilitating its use later in the project. Approximately 45 data sets were obtained. All data were reviewed to determine whether they met data quality objectives, as the data that were gathered were collected under a wide range of QA/QC procedures. A graded approach was taken with the data review, with data quality divided into categories ranging from "highest quality, fully acceptable for subsequent use" to "lesser quality, suitable only for supporting 'weight of evidence' approaches." Information was collected for the following categories:

- Climate
- Commercial buildings constructed between 1950 and 1980
- Identified contaminated sites
- Illegal dumping/spills
- Number and size of smelters and incinerators
- Number of Vehicle Registrations
- Numbers and sizes of auto dismantlers, computer and electronics recyclers, transfer stations, landfills, metal recyclers, and white goods recyclers
- PCB and PCDD/F emissions from incineration activities
- Measurements of PCB and PCDD/F concentrations
- PCBs and PCDD/Fs in Combined Sewer Overflows
- PCBs in fish tissue
- PCBs in groundwater
- PCBs in sediment
- PCBs in soil
- PCBs and PCDD/Fs in stormwater
- Spokane River and tributary water column measurements (e.g., temperature)
- Stormwater loads
- Stream flow information for Spokane River and tributaries
- Wastewater treatment plant loads
- Water column

All relevant data collected were evaluated and stored in a Microsoft Access database, which was provided to the Task Force. A more complete description of the data collected and the evaluation process is provided in LimnoTech (2013).

2.4.2 Data Collected After 2013

Several additional studies providing data relevant to the Comprehensive Plan were conducted after the 2013 data compilation discussed above. These studies are:

- SRRTFF 2014 Monitoring (LimnoTech, 2015): This report documents Task Force Phase 2 technical activities, which focused on carrying out a synoptic survey to identify potential unmonitored dry weather sources of PCBs to the Spokane River. The survey was conducted between August 12 and 24, 2014. Sampling locations included seven Spokane River stations between Lake Coeur d'Alene and Nine Mile Dam, one station in Latah Creek, and seven point source discharges. Analysis of the data identified a likely large (i.e., as large as any other single dry weather source) incremental PCB load entering the Spokane River between Barker Road and the Trent Avenue Bridge near Plante's Ferry. There is also the possibility of an incremental PCB load entering the Spokane River between Greene Street and the Spokane USGS gage (near N. Cochran St. in Spokane). This report also provides PCB concentration data collected at two locations in the Spokane River in May, 2014.
- Task Force 2015 Monitoring (LimnoTech, 2016d): This report documents a follow-up survey designed to confirm the findings of the 2014 survey and provide greater detail on the location of the unmonitored PCB source. The follow-up survey was conducted from August 18 to 22, 2015. Sampling locations included five Spokane River stations between Barker Rd. and the Spokane USGS Gage, and three point source discharges. The presence of a large incremental PCB load entering the Spokane River between Barker Road and the Trent Avenue Bridge near Plante's Ferry was confirmed, with the location of where the majority of the load enters the river narrowed down to between Mirabeau Point (upper end of Mirabeau Park, downstream of Sullivan Road) and the Trent Avenue Bridge near

Plante's Ferry. Homolog-specific mass balance analyses indicated the potential presence of another groundwater loading source entering the river downstream of the Trent Avenue Bridge.

- Spokane River Toxics Sampling 2012-2013 – Surface Water, CLAM and Sediment Trap Results (Era-Miller, 2014): Ecology conducted a study to evaluate several types of sample collection and analytical methods for toxics monitoring in the Spokane River during fall 2012 through spring 2013. Surface water composite grab samples were not a good monitoring tool for low-level PCBs in the Spokane River, as the PCB congener sample data in general did not give a clear environmental signal above the analytical background noise. The CLAM collection method was judged to be a good surrogate for grab sampling for PCB congeners in the Spokane River; however, more recent studies by Ecology have shown that the CLAM collection method may be problematic for low-level analyses of PCBs in surface water. Sediment trap sampling was rated "good" for PCB analysis.
- PCBs in Municipal Products (City of Spokane, 2015a): More than 40 product samples were collected and analyzed for PCBs using EPA Method 1668C. The majority of the samples were composed of roadway, pipe, and vehicle maintenance products. Because PCBs are also ubiquitously detected in sanitary wastewater samples, five personal care products were sampled as well. PCBs were detected in 39 of the 41 product samples, with a wide range of congener patterns. PCB-11 was one of the most frequently detected congeners. Because it is generally found in pigments and not found in Aroclor mixes, pigments are likely a common source of inadvertently produced PCBs in the products sampled.
- PCBs in General Consumer Products (Ecology, 2014b): Ecology evaluated the presence of PCBs in general consumer products, with particular emphasis placed on products likely to be contaminated with PCBs due to the inadvertent production of PCBs in the manufacturing process (e.g., paints, newspapers, glossy magazines, cereal boxes, and yellow plastic bags). Sixty-eight products were tested for PCBs. PCB-11 was found in a wide range of product types and at measurable concentrations, indicating that consumer products are a continuing source of PCB contamination and that generation of PCB-11 is mostly an unregulated source of PCB contamination.
- Hydroseed Pilot Project (SRRTTF, 2015): In response to high levels of PCBs in Hydroseed identified during initial product testing by the City of Spokane (2015a), the Task Force undertook a Hydroseed Analysis and Reformulation PCB Removal Pilot Project. The purpose of this study was to confirm the elevated levels observed from the City's original analysis and to identify specific component(s) that may be contributing to these elevated levels. Results from this analysis are intended to be used to assist manufacturers of Hydroseed to develop specifications and/or reformulations with reduced levels of PCBs.
- PCB Characterization of Spokane Regional Vactor Waste Decant Facilities (City of Spokane, 2015b): Stormwater runoff has been identified as a contributor of PCBs to the Spokane River. The Eastern Washington Phase II Municipal Permit requires that stormwater catch basins be periodically cleaned out to remove buildup of solids. Previous testing by the City of Spokane had shown that catch basin sediment can contain orders of magnitude greater PCBs content than the stormwater itself. Stormwater sediment is removed from catch basins in the Spokane area by using vacuum eductor trucks (vactors). Environmental concerns were raised in recent years about how this material was being handled. The primary goal of this project was to characterize the PCB content of the material at regional decant facilities.
- Screening Survey of PCBs in Little Spokane River Water, Sediment, and Fish Tissue (Ecology, 2016a): The lower section of the Little Spokane River has been listed as being water quality-impaired for PCBs in fish tissue. The objectives of this study were to verify the level of PCB contamination in fish tissue fillets in 2014-2015, and to attempt to spatially characterize the extent of potential PCB contamination in the Little Spokane River. Three fish species—rainbow trout, mountain whitefish, and northern pikeminnow—were analyzed as fillet composites at three sites. Although PCB levels were lower than those measured in 1994 and 1996, most fish tissue samples still exceeded the fish

tissue equivalent concentration in the National Toxics Rule human health criterion for PCBs that is applicable to the State of Washington.

- 2012 Freshwater Fish Contaminant Monitoring Program (Ecology, 2014a): This report summarizes results from Ecology's Freshwater Fish Contaminant Monitoring Program in 2012 for three areas in Washington: the Spokane River, Pend Oreille River, and North Cascades National Park. The sampling goals were to: (1) characterize contaminant levels in fish, and (2) determine spatial and temporal patterns in contaminant levels in Spokane River fish. Results showed that levels of PCBs in fish from the Spokane River remain elevated compared to most areas in Washington. Tissue concentrations show a general decrease between 2005 and 2012, but statistically significant decreases were only observed for 2 of 11 (18%) pairs of matched fish species and locations.
- Long Term Monitoring at the Spokane River Spokane Tribal Boundary (Ecology, 2016d): This progress report provides a summary of surface water monitoring at the Spokane Tribal boundary (just upstream of Chamokane Creek) during three hydrologic periods in 2015 – 2016. The final report for this study is slated for publication in early 2017, with only preliminary results available at this time (Era-Miller, 2016).
- Task Force 2016 Monitoring: In progress sampling of river locations to obtain data on other than low flow river conditions. Sampling events were completed in March, April, May, June, and October. An additional sampling event is scheduled for December.
- PCBs in Lake Spokane Carp (Ecology, 2015b): Ecology conducted a study to characterize PCB concentrations in common carp, intended to support estimation of the mass of PCBs removed from Lake Spokane as a part of Avista Utilities' proposed carp population reduction project.

2.4.3 Current River Status

Based upon sampling events conducted by the Task Force in 2014, 2015, and through June 2016, Table 1 provides a summary of the central tendencies (arithmetic and geometric mean) of the ambient surface water PCB concentration data collected during these sampling events (after appropriate blank correction) at the eight monitoring locations on the Spokane River. Table 1 also provides the number of samples taken during each sampling event, as well as the average concentration during the event. The arithmetic and geometric means utilize all individual data points. Average PCB concentrations are consistently below 50 pg/L throughout Idaho and in Washington downstream to Mirabeau Point, then increase to above 100 pg/L at Trent Bridge/Plante's Ferry and remain in the 110 to 150 pg/L range downstream to Nine Mile Dam. Average concentrations at all stations show compliance with the current Washington State Water Quality Standard of 170 pg/L. Upstream in Idaho the current State Water Quality Standard for total PCBs is 190 pg/L. Downstream, where the Task Force has not conducted sampling, the Spokane Tribe of Indians currently has a Water Quality Standard of 1.34 pg/L. As of November 15, 2016, the EPA Administrator has signed a rule establishing a Water Quality Standard of 7 pg/L for Washington's waters.

Table 1 . Summary of Existing Spokane River Water Column PCB Concentrations

Lake Coeur d'Alene (SR-15)		
Sample Month	Samples	Concentration
May 2014	6	23 pg/L
August 2014	7	13 pg/L
August 2015		
March 2016	2	14 pg/L
April 2016	1	15 pg/L
May 2016	1	72 pg/L
June 2016	1	3 pg/L
Arithmetic Mean – 17 pg/L **Geometric Mean - 14 pg/L**		

Trent Bridge/Plante's Ferry (SR-7)		
Sample Month	Samples	Concentration
May 2014		
August 2014	8	172 pg/L
August 2015	6	148 pg/L
March 2016	1	51 pg/L
April 2016	2	16 pg/L
May 2016	1	112 pg/L
June 2016	1	65 pg/L
Arithmetic Mean – 133 pg/L **Geometric Mean – 107 pg/L**		

Post Falls (SR-12)		
Sample Month	Samples	Concentration
May 2014		
August 2014	8	21 pg/L
August 2015		
March 2016		
April 2016		
May 2016		
June 2016		
Arithmetic Mean – 21 pg/L **Geometric Mean - 18 pg/L**		

Greene Street Bridge (SR-4)		
Sample Month	Samples	Concentration
May 2014		
August 2014	8	128 pg/L
August 2015	5	153 pg/L
March 2016	1	67 pg/L
April 2016	1	76 pg/L
May 2016	2	57 pg/L
June 2016	1	78 pg/L
Arithmetic Mean – 118 pg/L **Geometric Mean – 105 pg/L**		

Greenacres/Barker Rd. (SR-9)		
Sample Month	Samples	Concentration
May 2014		
August 2014	8	19 pg/L
August 2015	6	32 pg/L
March 2016		
April 2016		
May 2016		
June 2016		
Arithmetic Mean – 24 pg/L **Geometric Mean – 14 pg/L**		

Spokane Gage (SR-3)		
Sample Month	Samples	Concentration
May 2014		
August 2014	8	202 pg/L
August 2015	5	175 pg/L
March 2016	1	65 pg/L
April 2016	1	57 pg/L
May 2016	1	50 pg/L
June 2016	2	57 pg/L
Arithmetic Mean – 154 pg/L **Geometric Mean – 131 pg/L**		

Mirabeau Point (SR-8a)		
Sample Month	Samples	Concentration
May 2014	10	33 pg/L
August 2014		
August 2015	6	44 pg/L
March 2016		
April 2016		
May 2016		
June 2016		
Arithmetic Mean – 37 pg/L **Geometric Mean - 18 pg/L**		

Nine Mile Dam (SR-1)		
Sample Month	Samples	Concentration
May 2014		
August 2014	8	163 pg/L
August 2015		
March 2016	1	100 pg/L
April 2016	1	68 pg/L
May 2016	1	187 pg/L
June 2016	1	62 pg/L
Arithmetic Mean – 144 pg/L **Geometric Mean – 132 pg/L**		

2.5 Impairment Status

Nineteen waterbody segments within the Study Area on the Spokane River, Lake Spokane and the Little Spokane River are currently listed as impaired under section 303(d) of the Clean Water Act for exceeding human health water quality criteria for PCBs, based on fish tissue concentrations of PCBs. The fish tissue equivalent concentration (FTEC) for total PCBs on which the 303(d) listings are based represents the concentration of PCB contaminant in fish tissue that is equivalent to the applicable PCB criterion in Washington for the protection of human health. FTECs are a basis for 303(d) listing under Department of Ecology Policy 1-11, but they are not water quality standards. A range of fish tissue collection studies were used as the basis of the current listing. Some segments are listed based on fish tissue data as old as 1993, while others include are based on data as recent as 2005 (http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html).

3
PCB Source Assessment

The intent of a PCB source assessment is to define the magnitudes of PCB sources and pathways to identify key sources that can be reduced via the implementation of Control Actions. The source assessment is also designed to identify key data gaps contributing to uncertainty in estimates of these sources and pathways, to help guide future monitoring efforts. The source assessment for PCBs in the Spokane River was conducted in two steps:

- Define the range of potentially important sources of PCBs in the Spokane River watershed and the pathways by which these PCBs are delivered to the river.
- Define the magnitude of the sources and pathways identified above, along with key data gaps.

Determination of the sources and pathways of PCBs in the Spokane River Watershed is described in detail in LimnoTech (2016a). The calculation of the magnitude of these sources and pathways is described in detail in LimnoTech (2016c). Much of the discussion in those memoranda is excerpted below.

Sources and pathways were represented using conceptual models. A conceptual model is a graphic depiction of all of the processes believed to be potentially significant in affecting pollutant concentrations. Conceptual models provide a means to convey complicated processes and relationships in a simplified manner to a wide audience, and allows non-technical reviewers to understand and provide input on the sources and pathways to be considered. As an example, a conceptual model of PCB sources and pathways for San Francisco Bay is shown in Figure 4.

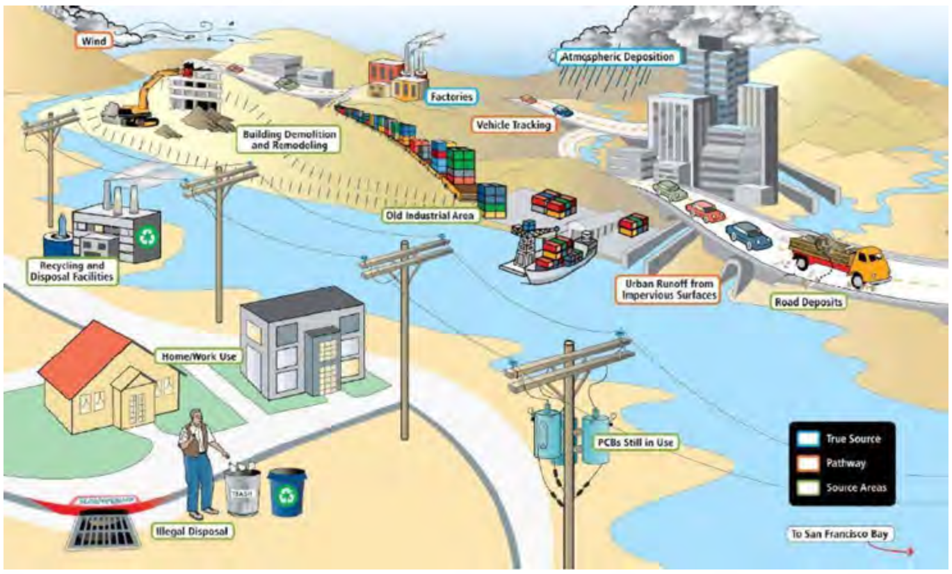

Figure 4. Example Conceptual Model of PCB Sources and Pathways (from SFEI, 2010)

Conceptual models can also be drawn as "box and arrow" diagrams, with boxes representing environmental compartments and arrows representing processes that transfer PCBs between compartments. An example box and arrow diagram summarizing PCB fate processes in the Spokane River and its sediments is shown in Figure 5.

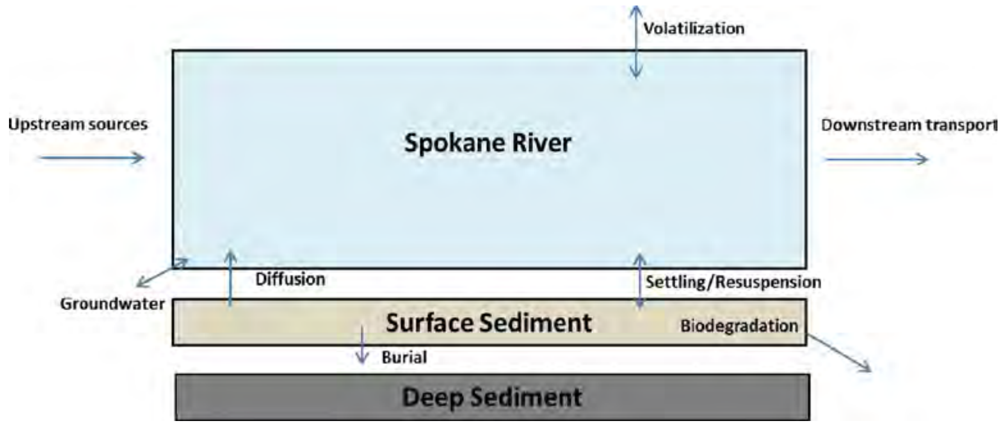

Figure 5. Example Box and Arrow Conceptual Model

The remainder of this section summarizes how these sources and pathways were determined, and how their magnitudes were estimated. It is divided into three subsections, corresponding to:

- PCBs source areas
- Delivery mechanisms of PCBs to the Spokane River
- Transport pathways between sources and delivery

Proposed actions and studies needed to fill data gaps are described in Section 6, "Future Actions."

3.1 PCBs Source Areas

It is important to use proper nomenclature when discussing PCB sources, as the term "sources" when referring to other pollutants commonly refers to the true origin of the contaminant. In the case of PCBs, the dominant source was intentional production by Monsanto through 1979. Although this source no longer exists, those legacy PCBs now exist throughout the environment. The Comprehensive Plan follows the nomenclature of the San Francisco Estuary Institute (SFEI, 2010) and uses the term "source areas" to represent those environmental compartments containing PCBs. Source areas are defined as the places where PCBs were used, inadvertently released, systematically discarded or accumulated. Source areas of PCBs are divided into three broad categories in this Plan, based on refinement of earlier PCB source characterization done for San Francisco Bay (SFEI, 2010) and Spokane (LimnoTech, 2013):

- Legacy source areas of PCBs currently present in the Spokane watershed.
- Ongoing source areas of PCBs continuing to be introduced to the watershed via inadvertent production in commercial products.
- Environmental transport of non-local PCBs into the watershed study area.

3.1.1 Legacy Source Areas

Legacy source areas correspond to PCBs that were brought into the Spokane watershed in the past, but are no longer produced. "Legacy PCBs," as defined in this Plan, were produced by Monsanto and marketed as Aroclors, which were used in machine oils, transformers, etc. As shown in Table 2, legacy source areas can be further divided into categories of buildings, environmental, and industrial equipment. Building source areas can either be fixed to the building itself (e.g., paint, caulk) or non-fixed and removable (e.g., light ballasts). Legacy environmental source areas of PCBs correspond to contaminated surface soils, contaminated subsurface soils/groundwater, and in-place aquatic sediments in the Spokane River and Lake Spokane. Historically produced PCBs are also still contained in various forms of electrical equipment such as transformers and hydraulic equipment.

Table 2. Categories of Legacy Source Areas of PCBs in the Spokane Watershed

Buildings	Environmental	Industrial Equipment
• Fixed • Non-Fixed	• Surface soils • Subsurface soil/ groundwater • Aquatic Sediments	• Electrical Equipment • Hydraulic Equipment

3.1.2 Building Source Areas

Building source areas are subcategorized as either fixed to the building itself (e.g., paint, caulk), or non-fixed and removable (e.g., lamp ballasts).

3.1.2.a Fixed Building Source Areas

PCBs were commonly used in building sealants such as caulks from the 1950s to the 1970s (Robson et al., 2010), to improve the flexibility of the material, increase the resistance to mechanical erosion, and improve adherence to other building materials (Andersson et al., 2004). As such, building constructed from the 1950s to the 1970s may still contain caulks with elevated levels of PCBs. Positive matrix factorization analysis has shown that a significant fraction of the influent loading to the Spokane County Regional WRF has a congener profile consistent with legacy PCBs in building materials. No Spokane-specific data exist defining the quantity of PCBs still present in fixed building source areas. However, many studies have been conducted estimating this magnitude for other communities, and these studies can provide a template for Spokane estimates. The methods used vary in terms of complexity, as demonstrated below. Shanahan et al. (2015) used the most rigorous approach, estimating the mass of PCBs present in Chicago-area building source areas by:

- Examining the building footprint, age, number of stories for each individual land parcel;
- Calculating the volume of all buildings constructed between 1940 and 1979 from the building footprint and height data;
- Assuming the mass of sealants per unit building volume from literature sources;
- Assuming the PCB concentrations in caulk for buildings built between 1940 and 1979 from literature sources; and
- Assuming the percentage of buildings constructed from 1940 to 1979 contained PCB sealants from literature sources.

Ecology (2011) estimated the quantity of PCBs in building sealants in the Puget Sound Basin based upon:

- Reviewing the available literature for information on the types and ages of buildings most likely to contain caulking with PCBs.
- Sampling available county assessor's information to estimate the volume of candidate buildings, and developing an inventory of caulking material likely to contain PCBs within the Study Area.
- Reviewing the available literature for data on PCB concentrations in caulking material.
- Applying literature values to estimate the mass of PCBs contained in caulk.

Diamond et al. (2010), used a range of calculation methodologies, including providing estimates for PCBs in caulk on a per capita basis, calculated as 5.2 metric tons per million people of population. Lacking readily available information on volume of structures in the Spokane watershed built during the time of PCB use, the Diamond et al. (2010) per capita will be used in conjunction with the Spokane watershed population. Population in census block groups was obtained in GIS data format from the U.S. Census Bureau estimates for 2011 (https://www.census.gov/geo/maps-data/data/tiger-data.html). Population per acre was calculated for each block group, and this information merged with watershed boundary delineations obtained from the Watershed Boundary Dataset (WBD). This results in a population estimate for the contributing watershed of 571,045, leading to an estimate of PCBs in caulk throughout the watershed of 2969 kg. This number should be considered very uncertain. The literature sources used to support this calculation cited a factor of ten uncertainty in their calculations. Because the Spokane calculation in based on a per capita estimate rather than actual building age, it is likely that this estimate is only accurate with a factor of fifty, resulting in an uncertainty range of 60 to 130,000 kg.

3.1.2.b Non-Fixed Building Source Areas

Non-fixed and removable PCBs are contained in small capacitors in several non-fixed building-related items, such as appliances and lamp ballasts. PCB-containing ballasts were commonly used in public schools, and EPA (2001) recommends removal of all pre-1979 fluorescent light ballasts in schools to prevent accidental exposure of students, teachers, and other school personnel to PCBs. No Spokane-specific data are available defining the mass of PCBs in this category, but the method applied by Ecology (2011) to estimate the mass of PCBs contained in small capacitors in the Puget Sound watershed can be applied to Spokane. Ecology (2011) described their approach as follows:

> A typical small capacitor unit contains 0.1-0.6 pound (45 - 270 grams) of PCB oil, with lamp ballasts typically containing about 45 - 70 grams per ballast (EPA, 1982). Globally, one-third of all PCB production may have gone into lamp ballasts (Panero et al., 2005). In 1992 the University of Illinois estimated that 10-25% of U.S. household white goods (major appliances) contained capacitors with PCBs (Panero et al., 2005). Though it is known that many small PCB capacitors were manufactured prior to 1978, estimates of the number still in use vary. EPA (1982) estimated that historically there were 870 million small capacitors in use throughout the U.S. in 1977 in industrial machines and small appliances. EPA (1987) also estimated a 10% annual disposal rate in 1982.
>
> Estimates for PCB lamp ballasts currently in use are an order of magnitude higher than the 1982 EPA estimate for small capacitors. These estimates place the number of ballast units remaining in use nationally between roughly 300 million (U.S. Army, 2001) and 500 million (Missoula County, 2010). In 1998, the EPA cited an unnamed industry source that estimated one billion ballasts were currently in use (EPA, 1998). The EPA (1998) reference suggests that the current number of PCB-containing ballasts in use nationally would be somewhere between 280 million, assuming a mean annual disposal rate of 10% from 1998 to 2010, and 69 million, assuming a mean annual disposal rate of 20% from 1998 to 2010.

Applying annual disposal rates of 10% and 20% to the national estimates and scaling to the Spokane study area by local population yields, a range of 1,000 to 500,000 total small capacitors (including ballasts) remain in use. This information, combined with an assumed PCB concentration of 45 – 75 g PCB per capacitor, results in total PCB mass in the Spokane watershed of 50 – 40,000 kg.

3.1.3 Environmental Source Areas

3.1.3.a Contaminated Surface Soils

Meijer et al. (2003) concluded that soil may be one of the largest global PCB repositories, due to deposition from manufacturing, leaching from building materials or landfills, and the application of wastewater treatment plant biosolids. Insufficient site-specific data are available defining PCB concentrations in soils throughout the Spokane River watershed. An estimate of the total stock of PCBs in Spokane-area soils was made following the approach used by Shanahan et al. (2015), who estimated the soil PCB mass reservoir in the Chicago area from:

- The amount of urban area, based upon parcel data
- A literature-based soil:air exchange depth of 0.12 m
- An average PCB concentration in urban soils estimated from 15 cities of 50 ng/g dry weight (from a range of 3–220 ng/g)
- The average bulk density of urban soils

Applying that approach to the Spokane watershed results in an estimate of the PCB mass reservoir of 5,500 kg. Given that the range of observed PCB concentration in urban soils varies by approximately a factor of plus or minus ten, it is reasonable to assume that the Spokane-specific mass estimate is also only accurate to a factor of ten, resulting in an estimated range of 550 to 55,000 kg.

3.1.3.b Contaminated Subsurface Soils

Marti and Maggi (2015) searched Ecology databases for sites that could be contributing PCB contamination to the Spokane River via groundwater, and identified 31 cleanup sites. Soils at 27 of the sites had been analyzed for PCBs using method SW8082, with 23 of these sites having had confirmed releases to soils. Of these 23 sites, 13 have undergone cleanups and received No Further Action (NFA) designation, although they may still have detectable PCB concentrations using method 1668. Contaminated soils were removed at twelve of the sites. On-site containment was used at one site. Of the ten remaining sites with confirmed releases of PCB, six are undergoing cleanups, two are in performance monitoring status, and two are awaiting cleanups. Marti and Maggi (2015) prioritized these sites in terms of: 1) confirmed or suspected release of PCBs to the environment, and 2) site status with regard to cleanup activities. While an extensive database exists defining soil PCB concentrations at these sites, this information has not been compiled in a manner that provided a quantitative estimate of the total mass of PCBs across the sites.

3.1.3.c River and Lake Sediments

The bottom sediments of the Spokane River and Lake Spokane provide another potential reservoir of PCB contamination. An estimate of the total mass associated with this category was made using data from Serdar et al (2011), Ecology (2015a), Golder (2005), Ecology (2005), Johnson and Norton, (2001) and Era-Miller (2014). Separate estimates were made for the Spokane River and Lake Spokane, further subdivided into estimates for surface and deep sediments in each system.

Serdar et al (2011) discussed the general lack of bottom sediments in the Spokane River:

> One particular macro-characteristic of the Spokane River is the general lack of fine depositional sediments in most of the river. Lake Coeur d'Alene acts as a settling basin for sediments transported in the upper watershed, and there are no tributaries to the river between the outlet of the Lake and Latah Creek. Spokane River is essentially a free-stone stream environment. Although the dams break the river into a series of pools, there are few areas of placid water above Lake Spokane. The river velocities are high enough and the sediment load low enough to scour the bed or prevent settling of significant fine particulate matter, even immediately behind the dams. As a result, almost the entire riverbed upstream of Lake Spokane (the largest reservoir) is composed of gravel, cobble, and boulders, with the finer sediment reserved for limited locations behind the dams, interstitial spaces within the river bed, isolated shoreline deposits, and certain fluvial bar

features. One notable exception is the narrow band of fine, organic carbon rich sediments found near the Upriver Dam reservoir.

Calculation of surface sediment PCB mass in the Spokane River was based upon measured PCB and sediment concentrations, and modeled fraction of river containing depositional sediment. Serdar et al (2011) reported surface sediment PCB concentrations above Monroe St. of 6.7 ng/g. Era-Miller (2014) reported PCB concentrations from sediment traps at Upriver Dam of 25.4 to 28.5 ng/g and 13.7 to 17.2 ng/g at Nine Mile Dam. Ecology (2015b) reported surface sediment PCB concentrations at undetectable levels (detection limit ~10 ng/g) in their reassessment of the Upriver Dam and Donkey Island PCB sediment site. The solids concentrations of the bed sediments were taken from measurements reported by Johnson and Norton (2001), and an assumed sediment solids density of 2.6. Golder (2005) reports that approximately 20% of the Spokane River above Nine Mile Dam is considered depositional. The Spokane River is unique in this regard, as most systems with known PCB contamination (e.g., Delaware River, San Francisco Bay) are dominated by depositional areas. Combining the above information and assuming an average of the observed PCB concentrations (15 ng/g) results in a mass estimate of 0.032 kg.

The Spokane River also contains historical PCB contamination in deep sediments at the Upriver Dam and Donkey Island PCB Sediment Site. The mass of PCB buried in deep sediments was calculated from the PCB concentration depth profiles provided in Ecology (2005), surface area provided in Ecology (2015b), and bed sediment solids concentrations provided in Johnson and Norton (2001). Combining the above information and assuming an average of the observed PCB concentrations (6587.5 ng/g) results in a mass estimate of 19.2 kg. Serdar et al (2011) also reported sediment PCB concentrations at two locations in Lake Spokane. Concentrations in the upper 10 cm ranged from 8 to 33 ng/g in the upper portion of the Lake to 28 to 75 ng/g in the lower portion of the Lake. Johnson and Norton (2001) provided solids concentrations of the bed sediments and three locations in the Lake, upper mid-lake, and lower. Combining the observed concentration data at each location (18 ng/g in the upper lake, 41 ng/g in the lower lake), an assumed concentration at mid-lake as the average of the upper and lower lake concentrations 29 ng/g), and an assumed sediment solids density of 2.6 results in a mass estimate of 2.24 kg in surficial Lake Spokane sediments.

The mass of PCB buried in deep Lake Spokane sediments was calculated from the PCB concentration depth profiles provided in Serdar et al (2011), and bed sediment solids concentrations provided in Johnson and Norton (2001). Combining the observed concentration data at each location (37 ng/g in the upper lake, 4442 ng/g in the lower lake), assumed concentration at mid-lake as the average of the upper and lower lake concentrations (240 ng/g), and an assumed sediment solids density of 2.6, results in a mass estimate of 40.6 kg. Because estimates of the system-wide mass reservoir are based on a relatively small number of discrete measurements, it is reasonable to assume from best professional judgment that these estimate are only accurate within a factor of five, resulting in an uncertainty range of 8 to 200 kg. Ecology (2016e) is collecting additional core samples of sediments that should add to better understanding sediments in Lake Spokane.

3.1.4 Industrial Equipment Source Areas

The primary source areas of legacy PCBs contained in industrial equipment correspond to transformers and large (over three pounds total) capacitors. In addition, hydroelectric dams have been identified as a potential ongoing source of PCBs in the Columbia River, due to historical leaks and spills of PCB-contaminated oils. Information on the presence and PCB content of these sources was gained by direct contact with the utilities who are responsible for the generation and transmission of electricity in the Spokane region. These consisted of Avista Utilities, Inland Power and Light Company, Modern Electric Water Company, Vera Water and Power, Kootenai Electric Cooperative, and Bonneville Power Administration. Avista operates approximately 24,754 overhead transformers within the Spokane region, with a total oil content of approximately 117,000 gallons. By the end of 2016, Avista will have no detectable levels (using EPA test method 8082) of PCBs in its overhead transformers. Using an assumed PCB concentration of 0.5 ppm (half the detection limit of 1 ppm for EPA test method 8082), this corresponds to an estimated maximum potential PCB mass of 0.20 kg. Inland Power and Light Company operates approximately 30,000 transformers, and has replaced all transformers that had 45 ppm or more PCBs. Using 22.5 ppm (half the replacement concentration), this corresponds to a PCB mass of 10.8 kg. Vera Water and Power operates 137 transformers containing PCB concentration between 2 ppm and 43 ppm, with an average concentration of 8 ppm. These transformers contain approximately 3430 gallons of oil. This corresponds to a total PCB mass of 0.09 kg. Kootenai Electric Cooperative has 1,926 transformers in its system that potentially contain PCBs. Kootenai does not have an estimate of PCB content, but does have a two-year plan to remove all transformers with PCBs. in them. Using average values for quantity of oil and PCB content results in a total mass of 1.7 kg. Modern Electric Water Company operates 2,665 transformers, and in the past 20 years has replaced all transformers with PCB concentrations greater than 10 ppm. They estimate roughly 10% of the transformers contain PCBs at a concentration less than 10 ppm. Using an average of 25 gallons oil/transformer and 5 ppm to provide an average PCB concentration, this corresponds to a mass of 0.11 kg. Bonneville Power Administration (BPA) has no high voltage PCB capacitors in its system. No other information is available from them.

The estimated maximum potential sum of transformer PCB mass across all utilities is approximately 12.8 kg. This estimate should be accurate within a factor of two, as the volume of oil is well known and the concentration values are specified as a midpoint between zero and the maximum possible value. This results in an uncertainty range of 6.4 to 25 kg, which is specified below in Table 4.

None of the utilities continue to use PCB-containing capacitors over three pounds, so the estimated PCB content for this source area category is zero.

Hydroelectric facilities were identified as another potential source of PCBs to the Spokane River, based on past releases of PCB-containing electric oil from Army Corps of Engineers' hydroelectric facilities in the Columbia River basin. With the exception of Upriver Dam (which is operated by the City of Spokane), Avista Utilities operates all hydroelectric facilities in the Spokane River study area. Neither Avista nor the City of Spokane use PCB-containing oil in these facilities. The PCB mass contained in hydropower facilities was therefore considered negligible.

Even though EPA banned production of PCBs in 1979, EPA still allows PCBs to be inadvertently produced in the chemical synthesis of many commercial products. These sources are divided into categories in Table 3. Pigments in printed materials/fabrics (Guo et al., 2013) and paints (Hu and Hornbuckle, 2010) have been identified as a primary category of inadvertent production. It is recognized that inadvertent PCB production occurs in other categories of products as well, although the magnitude of these other sources is largely unknown.

Table 3. Categories of Ongoing Sources of PCB Production

Pigments in Printed Materials/Fabrics	Paints	Other
• Newsprint • Commercial Packaging • Colored Clothing	• Architectural paint • Road paint	• Motor oil • Agricultural chemicals

Studies have been conducted that test the levels of PCBs in a wide range of products (e.g., City of Spokane, 2015a; Ecology, 2014b; Hu and Hornbuckle, 2010.) The number of products tested, however, in conjunction with a lack of information on the quantity of goods being imported into the watershed by category, prevent calculation of category-specific magnitude estimates. Work conducted as part of the Ecology and DOH (2015) PCB Chemical Action Plan provides a template for estimating the overall magnitude of all inadvertent sources being imported into the watershed:

> The U.S. market consumes approximately 20% of global organic pigments (Guo et al., 2014). Washington is approximately 2% of the U.S. population, which leads to an estimate for Washington's share of PCB-11 from yellow pigment of 0.02 and 31 kg per year. This is the amount of PCB-11 in products, with an unknown amount entering the environment. The Color Pigments Manufacturers Association (CPMA) estimated that the total annual amount of these pigments (phthalocyanine and diarylide) imported or manufactured in the U.S. is about 90 million lbs. (41,000 metric tons). They further estimated inadvertently generated PCBs in these pigments with an upper bound of 1.1 tons per year and a more reasonable estimate of 1000 lbs. per year (CPMA 2010). Using the lower annual estimate of 1000 lbs. (450 kb) leads to an estimate of 9 kg per year in Washington, which is within the range of the estimate above.

Scaling the above estimate to the population of the Spokane watershed leads to a loading estimate for Spokane of 0.86 kg/yr. To convert this rate into a mass, an assumption needs to be made regarding how long these inadvertently produced PCBs remain in the watershed before leaving either via the atmosphere or being transported downstream by the Spokane River. A lower-bound estimate of a residence time of one year results in a mass estimate of 0.86 kg, while an upper-bound estimate of a residence time of 20 years results in a mass estimate 17.2 kg. The mid-point of these values is 9 kg/yr. The overall uncertainty in this estimate reflects uncertainty in both the rate of PCBs being imported to the watershed as well as their residence time, such that this value is likely accurate only within a factor of fifty, resulting in a range from 0.2 – 450 kg.

3.1.5 Environmental Source Areas Located Outside the Study Focus Area

PCBs also enter the Spokane watershed study area via environmental source areas located outside the Study Area. These non-local source areas can either be delivered via the atmosphere or enter the river from Lake Coeur d'Alene. The term "non-local" is used to distinguish source areas that originate outside the watershed from atmospheric sources that originate from the volatilization of PCBs in the Spokane watershed. LimnoTech (2016a) divided non-local environmental source areas into categories of:

- Atmospheric: Atmospheric sources originating outside of the watershed
- Up-watershed: Entering the river from Lake Coeur d'Alene.

3.1.5.a Atmospheric

No definitive information exists on the specific amount of PCBs delivered to the Spokane area from atmospheric sources, regardless of origin. Era-Miller (2011), in a literature review of toxics atmospheric deposition in eastern Washington State, found no data available for atmospheric PCBs in eastern Washington. The closest relevant reference site with atmospheric PCB data was from Summerland, British Columbia, with a measured annual PCB concentration of 4.4 ng/PAS (Passive Air Sampler). Era-Miller's review showed a range of reported significance of non-local sources compared to local sources. An atmospheric deposition model of PCBs in the Willamette River Basin suggested that PCBs came primarily from non-local sources and local soil sources, while a second source in that review (Simonich, cited as personal communication) suggested that the contribution of trans-Pacific sources to PCB, PBDE, and PCDD/F deposition in eastern Washington was less than 2%. Ecology's Environmental Assessment Program is currently undertaking a study that will provide information on this source area category.

3.1.5.b Up-Watershed

PCB loading from Lake Coeur d'Alene represents the aggregate contributions of PCBs from the upper watersheds after travelling through the lake. An estimate of PCB load currently present in Lake Coeur d'Alene was calculated by multiplying the volume of the lake (2.79 km^3) by the average PCB concentration in the lake, represented by data collected by the SRRTTF during confidence testing and synoptic surveys. It is recognized, however, that the analytical results utilized to estimate this concentration are below concentrations at which PCBs can be measured with confidence in the environment. The average total PCB concentration of 17 pg/L is less than the average of field blanks from the same confidence testing and synoptic survey, corrected in the same manner (27 pg/L). In addition, available PCB concentration data are dominated by summer measurements, although no significant difference in concentrations was observed between seasons. To account for this uncertainty in lake concentrations, the mass calculation was conducted for a range of PCB concentrations from near zero to 17 pg/L. The resulting mass estimate is from near zero to 0.047 kg.

3.1.6 Summary of Mass in Each Source Area Category

The amount of mass contained in each PCB source area described above is provided in Table 4 and Figure 6 specified as ranges, sometimes covering an order (or orders) of magnitude, because of the extensive reliance on literature values. Although uncertain, these estimates are still worthwhile in distinguishing between source areas as likely significant or relatively unimportant in developing the Comprehensive Plan. For example, legacy PCBs in buildings (e.g., small capacitors, caulks) and legacy soil contamination are estimated to be the largest source areas of PCBs in the watershed.

Table 4. Mass of PCB Estimated in each Source Area Category

Source Area Category	PCB Mass (kg)
Legacy	
Building sources	
Non-fixed[1]	50 – 40,000
Fixed[2]	60 - 130,000
Environmental	
Watershed soils	550 - 55,000
Subsurface soils – cleanup sites	Not currently estimated
Spokane R. deep sediments	4 -100
L. Spokane deep sediments	8 - 200
L. Spokane shallow sediments	0.4 - 10
Spokane R. shallow sediments	0.06 – 0.15
Industrial equipment	6.4 - 25
Ongoing	
Inadvertent production	0.2 – 450
Environmental Source Areas Located outside the Study Area	
Lake Coeur d'Alene	~0 – 0.047
Atmospheric	Unknown

[1] PCBs in small capacitors in items such as appliances and lamp ballasts.
[2] Building materials such as paints and sealants (e.g. caulks).

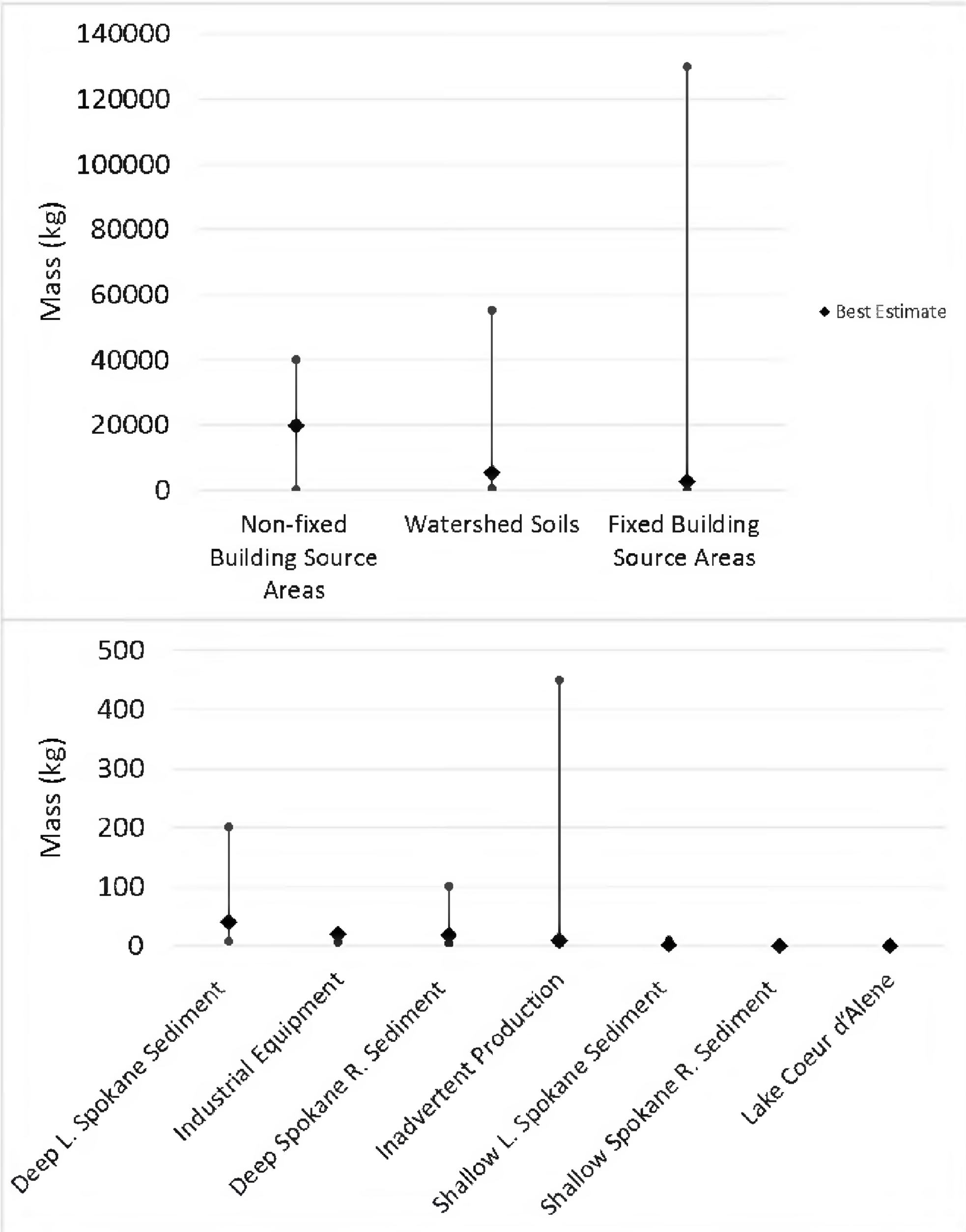

Figure 6. Estimated Range of Mass of PCBs in each Source Area Category (Note the large difference in scale between the two embedded graphs)

3.2 Delivery Mechanisms of PCBs to the Spokane River

PCBs were determined by LimnoTech (2016a) to be delivered to the Spokane River study area via a number of mechanisms, as depicted in Figure 7. Categories of delivery consist of:

- Transport of PCBs from upstream sources through Lake Coeur d'Alene
- Atmospheric deposition
- Groundwater loading
- Stormwater runoff, either as part of an MS4 stormwater system or via direct drainage
- Combined sewer overflows (CSOs)

- Tributaries
- Discharge from municipal and industrial wastewater treatment plants
- Discharge of wastewater and stocking of fish from fish hatcheries
- Diffusion or resuspension of PCBs from bedded sediments in the Spokane River and Lake Spokane

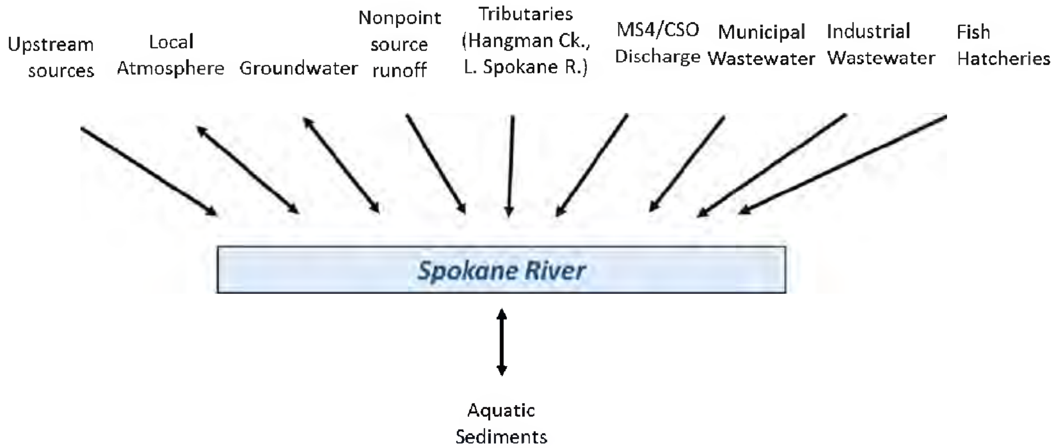

Figure 7. Categories of Delivery of PCBs to the Spokane River

The mass loading rate for PCBs estimated in each source category was estimated using available data and literature values, with the specific calculations provided in LimnoTech (2016c) and results provided below in Table 5. The primary delivery mechanisms of PCBs to the Spokane River were determined to be cumulative loading across all wastewater treatment plants, contaminated groundwater, and stormwater/combined sewer overflows. PCB loading from Lake Coeur d'Alene and Spokane River tributaries is of similar magnitude to the primary delivery mechanisms listed above. The loading from Lake Coeur d'Alene and the Spokane River is relatively large because they have much higher flow rates than other delivery mechanisms, albeit with much lower concentrations of PCBs.

Table 5. PCB Loading Rates Estimated for Each Delivery Mechanism

Delivery Mechanism	PCB Loading Rate (mg/day)
Upstream sources (Lake Coeur d'Alene)	33 - 444
Groundwater loading	60 - 300
Tributaries	
Latah Creek	~0 - 215
Little Spokane River	15-200
WWTPs[3]	
Total Industrial	126 - 165
Total Municipal	51 - 125
Idaho	4-10
Washington	47-115
MS4 stormwater/CSOs	15 - 94
Bottom sediments	0.2 - 20
Fish hatcheries	Unknown
Atmospheric deposition to surface water	<0

The remainder of this section describes how each of these estimates was determined.

3.2.1 Transport of PCBs from Upstream Sources through Lake Coeur d'Alene

Transport of PCBs from upstream sources through Lake Coeur d'Alene was estimated using the observed distribution of PCB concentrations measured during Task Force confidence testing and synoptic surveys, in conjunction with the observed distribution of flow out of the lake to produce estimates of the 25th and 75th percentile loading rates, which were calculated to be 33 to 444 mg/day.

3.2.2 Atmospheric Deposition Directly to Water Bodies

PCBs can be delivered directly to surface waters from atmospheric sources via three mechanisms: wet deposition, dry deposition, and gas deposition. Wet deposition consists of PCBs contained in precipitation. Dry deposition consists of PCBs attached to airborne particulate matter that settle onto the surface water. Gas deposition occurs as a transfer across the air-water interface when atmospheric gas-phase PCB concentrations exceed the equivalent dissolved phase PCB concentrations in the water column. Research (Miller et al., 2001) has shown that the primary mechanism for atmospheric PCBs to enter surface waters is through gas-phase exchange, so the calculations that follow focus solely on gas deposition as the dominant component of atmospheric PCB loading.

The magnitude of gas deposition is determined by three primary factors, the atmospheric gas phase PCB concentration, the water column PCB concentration, and the mass transfer coefficients that control the rate at which PCB concentrations pass through the air-water interface. Screening-level calculations of gas-phase PCB exchange for Spokane focused on Lake Spokane itself, which provides the large majority of overall surface area. Gas-phase atmospheric PCB concentrations were estimated from a population-based regression of Venier and Hites (2010) as 0.121 ng/m^3. The water column PCB concentration was specified as 163.2 pg/L, based upon the average concentration observed at Nine Mile Dam during the 2014 synoptic survey. These values lead to a net movement of PCBs out of the water column and into the atmosphere, i.e., no net loading of PCBs from the atmosphere to the water column. Other values used in the

[3] Advanced treatment technologies are currently being installed for the Dissolved Oxygen TMDL that will likely result in reductions of PCB loads to the Spokane River.

calculation, including representative mass transfer coefficients taken from Chapra (1996), are shown in Table 6.

Table 6. Inputs Used in Calculating Gas Phase Deposition

Description	Value	Units
Molecular Weight	288	g/mol
Henry's Constant	5.60E-04	atm m3/mol
Gas Law Constant	8.206E-05	atm m3/(K mol)
Air Temperature	4.11	Celsius
Oxygen Transfer Coefficient	0.8655	m/day
Wind Speed	10	mph

These values were input into Equation 1 (where the net transfer velocity is a function of air temperature, the oxygen transfer coefficient, the ratio of PCB molecular weight to oxygen molecular weight, the ratio of PCB molecular weight to water molecular weight, and wind speed):

Mass Flux = Net Transfer Velocity x (Partial Pressure in air / Henry's Constant – Concentration in water) (1)

Application of Equation 1 results in a net movement of PCBs out of the water column and into the atmosphere, i.e., no net loading of PCBs from the atmosphere to the water column.

3.2.3 Groundwater Loading

The synoptic water quality survey conducted by the SRRTTF in August 2014 identified a significant groundwater loading source entering the river between Greenacres (Barker Rd.) and the Trent Avenue Bridge, with an estimated loading rate of 170 mg/day. A second synoptic survey conducted in August 2015 confirmed the presence of this load, and estimated its magnitude at 130 mg/day. Uncertainty analyses conducted in conjunction with the loading assessment (LimnoTech, 2015) indicate that this loading estimate can range between 60 and 300 mg/day.

3.2.4 MS4 Stormwater Runoff/Combined Sewer Overflows (CSOs)

Stormwater/CSO loading estimates are based solely on available data for the City of Spokane. Consistent with the assumptions of Serdar et al (2011), direct stormwater runoff draining to the Spokane River from areas other than the City of Spokane's MS4 system is assumed to be small. It is noted, however, that one percent (28.6 acres) of Post Falls' impervious surface area contributes to MS4 discharges to the Spokane River, and the City of Coeur d'Alene has five MS4 outfalls to the Spokane River and seven to Lake Coeur d'Alene. Stormwater runoff drainage to tributaries will be reflected in the tributary loading estimates for Latah Creek and the Little Spokane River.

Initial sampling of the City of Spokane stormwater/CSO discharges for PCBs first occurred for a single event in 2004 by the City of Spokane, followed in 2007 by more extensive sampling by Ecology and Parsons (Parsons, 2007). Serdar et al (2011) used these concentration data in conjunction with average annual stormwater flow predicted by the Simple Method to generate an annual average loading estimate of 691 mg/day.

From 2012 through 2014, the City of Spokane monitored three MS4 stormwater basins (Cochran, Union, Washington) and two CSO basins (CSO34 and CSO06) on a near-monthly basis. Hobbs (2015) reviewed the available data and calculated mass loading of PCBs to the river for individual storms.

Donovan (2015) generated annual loading estimates for MS4 and CSO sources based upon:

- Annual rainfall of 18 inches
- Site-specific regression of discharge from the Cochran basin to rainfall
- Ratio of impervious area in other basins to impervious area in Cochran basin
- Average stormwater PCB concentration observed in Cochran basin to represent all basins except Union and Washington
- Average stormwater PCB concentration observed in Union basin
- Average stormwater PCB concentration observed in Washington basin
- 2005 actual CSO flow
- Average CSO 6 PCB concentration to represent CSO 6
- Average CSO 34 PCB concentration to represent CSO 34
- Average of CSO 34 and CSO 6 PCB concentration to represent all other CSOs

The above information resulted in an annual loading rate of 29.9 mg/day for MS4 stormwater, 7.6 mg/day for CSO, and a total of 37.6 mg/day. The estimate of Donovan (2015) is believed to be the most accurate value available. There is still uncertainty in this estimate, due primarily to uncertainty in stormwater flow. Based on best professional judgement, the loading estimate is accurate within a factor of 2.5. This results in an estimated loading rate range of 15 to 94 mg/day.

3.2.5 Tributaries

Two tributaries enter the Spokane River within the study area, Latah Creek and the Little Spokane River. Each is discussed below.

3.2.5.a Latah Creek

An annual PCB loading estimate for Latah Creek was obtained using long-term average observed creek flow (6.5 m^3/sec) and the average concentration observed during the 2014 SRRTTF synoptic survey (89 pg/L), resulting in an annual loading estimate of 50 mg/day. This loading estimate was calculated by excluding one observed concentration measurement of 2444 pg/L observed during the 2014 Synoptic Survey, due to the fact that no indication of concentrations of that magnitude were seen in the composite sample taken during that same synoptic period. Repeating the analysis with that one potentially unrepresentative sample from the calculation results in an average concentration of 383 pg/L and a loading estimate of 215 mg/day. Serdar et al. (2011), based upon the absence of detectable levels of PCBs in Latah Creek sediments, assumed that the PCB contribution to the Creek was negligible. The range of estimated loading is based upon the range of these reported and calculated values, and is set as being from near zero to 215 mg/day.

3.2.5.b Little Spokane River

A PCB loading estimate for the Little Spokane was originally provided by Serdar et al. (2011), based upon an average Little Spokane PCB concentration data from 2003-2004 (199 pg/L) and harmonic mean at the USGS Station 12431000 at Dartford. Their concentration was derived from sampling with a semi-permeable membrane device (SPMD), which is an indirect measurement of water column PCB concentrations. Data collected in 2013-2014 reported by Friese and Coots (2016) suggest much lower river concentrations, with all observed River concentrations being less than 30 pg/L. Blank contamination issues prevented Friese and Coots (2016) from providing a quantitative estimate of concentration. Assuming a concentration of 114 pg/L, representing the average of the observed Serdar et al (2011) concentrations and Friese and Coots (2016) reported concentrations for the Painted Rocks station, in conjunction with the reported long term average flow (11.8 m^3/sec) results in a loading estimate of 116 mg/day. Because the average flow from the river is much better understood than average river concentration, the uncertainty in this estimate is likely driven by the uncertainty in the average river concentration estimated above. Using 15 pg/L as a lower bound and 200 pg/L as an upper bound results in a load range of 15 to 120 mg/day.

3.2.6 Discharge from Municipal and Industrial Wastewater Treatment Plants

Loading estimates for municipal and industrial wastewater treatment plants were calculated from effluent data collected by the plants during routine monitoring, along with data obtained during the Task Force synoptic surveys to assist in source identification. Observed concentrations are shown in Figures 9 through 11. These concentrations are presented in multiple formats due to differences in objectives, blank correction methodology, and monitoring design between the Task Force synoptic surveys and routine discharger effluent monitoring. The Task Force recognizes that the selection of blank correction methodology is dependent on the use of the data and conducted synoptic effluent monitoring with the objective of collecting the necessary data to conduct a semi-quantitative PCB mass balance assessment in the Spokane River. For the purposes of calculating total PCB concentrations for this study, the Task Force did not use any individual congener in a field sample that was less than three times the concentration of that congener in the method blank associated with the field sample (LimnoTech, 2014). This is commonly referred to as "3x blank correction." For routine effluent monitoring, the majority of dischargers currently exclude any individual congener in a sample that is less than ten times the concentration of that congener in the method blank associated with the sample, a "10x blank correction." Differences in reported concentrations between the synoptic surveys and routing monitoring may also be explained by the sampling methods used, as routine monitoring is primarily conducted with composite samples while the synoptic surveys used grab samples. The number of samples available also differ between routine monitoring and the synoptic surveys.

Figure 8 presents PCB concentrations from municipal and industrial WWTPs calculated from synoptic survey data, which used a 3x blank correction. Figure 9 presents PCB concentrations from municipal and industrial WWTPs calculated from routine monitoring data using a 3x blank correction. Figure 10 presents PCB concentrations from municipal and industrial WWTPs calculated from routine monitoring data using a 10x blank correction. The figures show minimum, median, and maximum concentrations, as well as interquartile (i.e., 25th and 75th percentile) values. This presentation is useful in identifying the influence of anomalously high individual concentrations, such as a single concentration from the City of Spokane that is an order of magnitude higher than all other measurements.

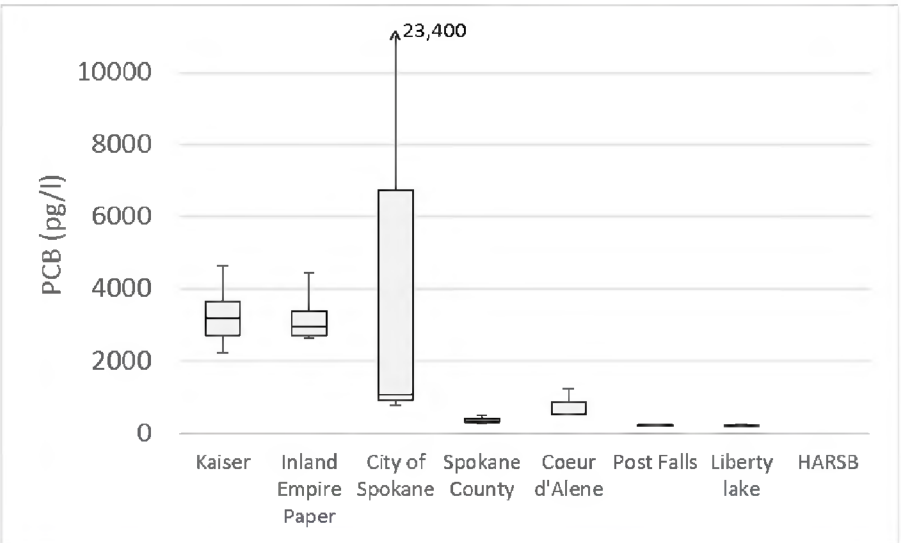

Figure 8. PCB Concentrations from Municipal and Industrial WWTPs Calculated from Synoptic Survey Data, Using 3x Blank Correction

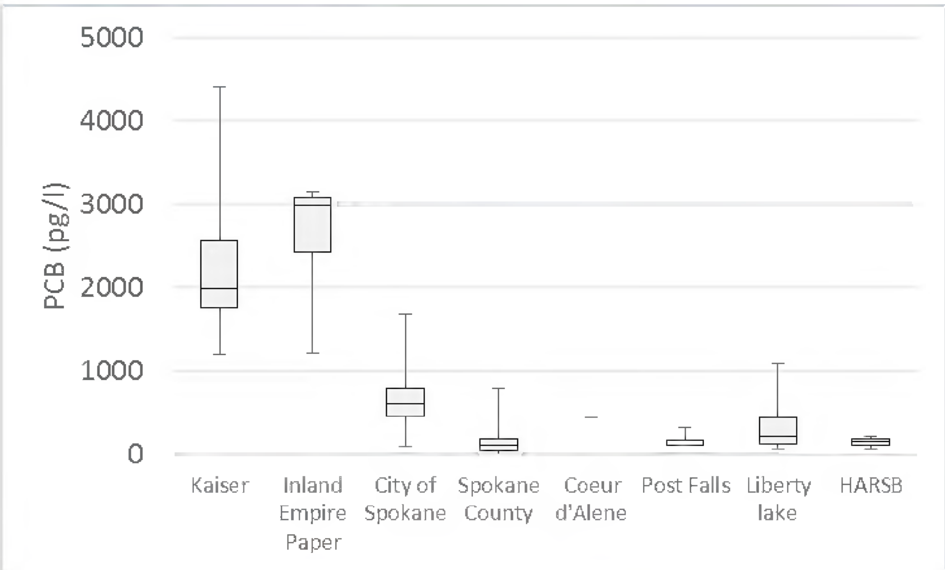

Figure 9. PCB Concentrations from Municipal and Industrial WWTPs Calculated from Routine Monitoring Data, Using 3x Blank Correction

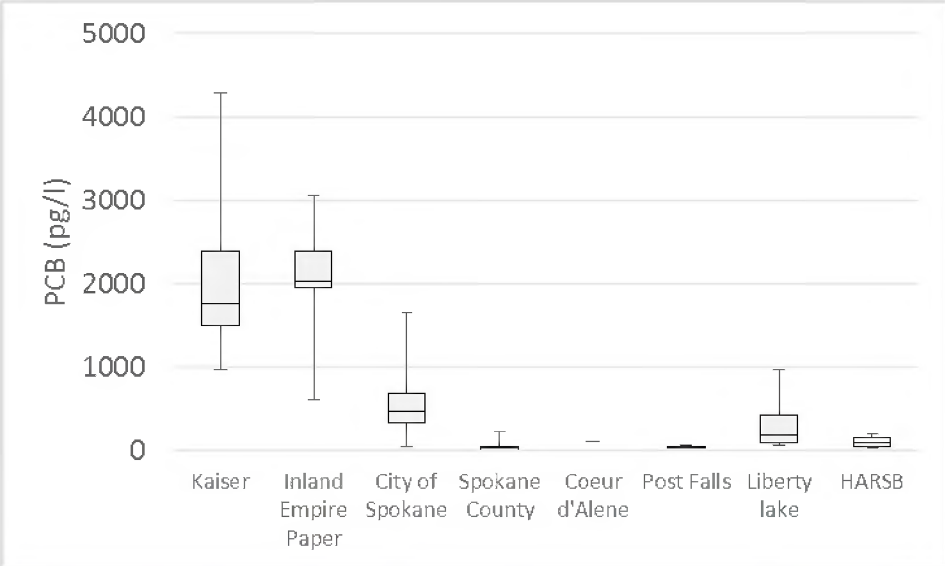

Figure 10. PCB Concentrations from Municipal and Industrial WWTPs Calculated from Routine Monitoring Data, Using 10x Blank Correction

The loading rate was calculated for each discharge by combining estimated total PCB concentration using 3x blank correction with observed discharge flow. Uncertainty in loading estimates was represented using the calculated 25th and 75th percentile values. Results are presented below in Table 7. The estimated total loading rate ranges from 126 to 165 mg/day for the industrial discharges and 51 to 125 mg/day for the municipal discharges. These loading rates were derived for the purposes of a semi-quantitative loading analysis to support the Comprehensive Plan. They do not reflect with any certainty the mass loadings from these facilities, and these loading rates would not be appropriate for consideration in developing NPDES permits for any of the facilities or waste load allocations for the facilities under a TMDL.

Table 7. Calculated 25th and 75th Percentile Loading Rates from all Municipal and Industrial Wastewater Treatment Plants Using 3x Blank Correction

WWTP	25th Percentile Value	75th Percentile Value
Industrial		
Kaiser	55.12	83.58
Inland Empire Paper	70.86	81.41
Total	125.98	164.99
Municipal		
City of Spokane	44.78	105.14
Spokane County	2.62	9.41
Coeur d'Alene	2.15	6.98
Post Falls	1.04	2.07
Liberty lake	0.42	0.99
HARSB	0.43	0.80
Total	51.44	125.4

3.2.7 Discharge of Wastewater and Stocking of Fish from Fish Hatcheries

PCB contributions to Spokane River from fish hatcheries can arise from the stocking of PCB-contaminated fish and discharge of effluent from the Washington Department of Fish and Wildlife's Spokane Fish Hatchery to the Little Spokane River. Approximately 170,000 rainbow trout are planted annually to Lake Spokane and the Spokane River. The fish raised are in two different hatcheries, Troutlodge in Soap Lake, and the Spokane Fish Hatchery. Serdar et al. (2006) found PCB concentrations of 6.5 ug/kg in hatchery trout from the Spokane Fish Hatchery and 14.4 ug/kg in fish fillets from the Troutlodge facility. Fish feed from the Spokane hatchery was analyzed by Serdar et al. (2006) with a result of 16.4 ug/kg. No quantitative data exist for PCB loading from discharge of wastewater and stocking of fish from these hatcheries. Ecology (2016b) is conducting a study to provide specific estimates of loading from fish hatcheries.

3.2.8 Diffusion or Resuspension of PCBs from Bedded Sediments in the Spokane River and Lake Spokane

No site-specific data were available to define the magnitude of pore water diffusion and/or resuspension of PCBs into the study areas from bed sediments. Given that the calculations above show that the mass of PCB in lake sediments is more than 100x greater than river sediments, it can be reasonably assumed that overall flux from bedded sediments is dominated by flux from lake sediments. The magnitude of pore water diffusion from lake bed sediments was estimated based on a combination of physical-chemical properties taken from the development of the MICHTOX Lake Michigan Mass Balance Project (USEPA, 2006; Endicott, 2005; and Endicott et al., 2005) with study area-specific measurements of sediment PCB concentrations. The resulting gross PCB diffusive flux from the lake sediments was estimated at 1.01 mg/day. Lake Spokane is known to have a significant carp population (Avista and Golder, 2012), and carp feeding mechanisms are known to churn bottom sediments and increase the flux of sediment-bound pollutants such as PCBs via bioturbation (Canfield and Farquhar, 2009.) No quantitative data exist describing the effect of carp bioturbation on sediment flux, such that the actual rate of flux could be significantly higher or lower than typical literature values. Conversely, much of the carp bioturbation activities occur in the shallower headwaters of Lake Spokane (Avista, 2015), where sediment PCB concentrations are lower than the sediments near the dam. Given this uncertainty, the estimate of the flux rate from Lake Spokane sediments is assumed to be accurate only within a factor of twenty, resulting in a range of 0.05 to 20 mg/day.

3.3 Transport Pathways between Source Areas and Delivery

It is recognized that there are a number of intermediate pathways by which the pollutant sources listed above get transported to the delivery mechanisms shown above in Figure 7. The primary transport pathways linking PCB source areas to delivery mechanisms are depicted in Figure 11 under the broad categories of:

- Mobilization in the watershed
- Volatilization to the atmosphere
- Delivery to sewer infrastructure
- Contribution to groundwater

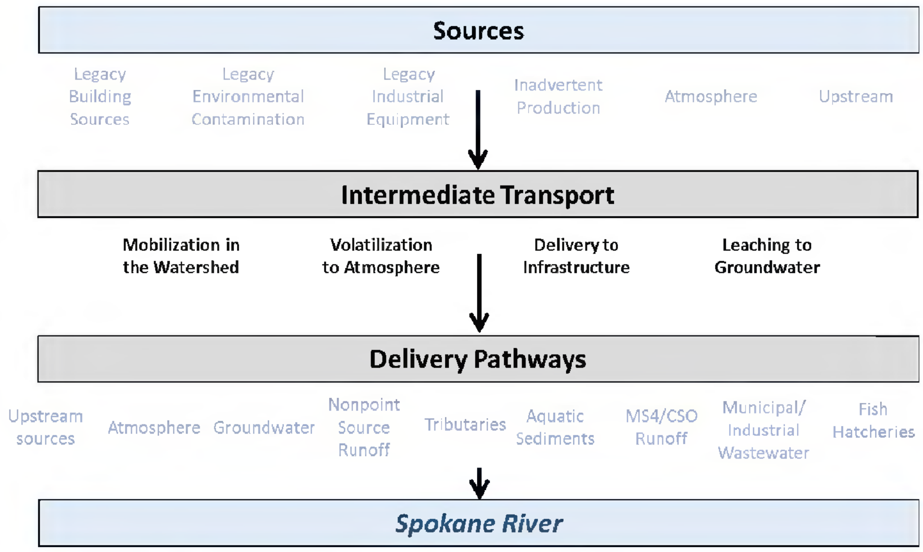

Figure 11. Intermediate Transport Pathways for Delivery of PCBs

Each of these pathways contains multiple components, which are described below.

3.3.1 Mobilization in the Watershed

Many of the watershed source areas of PCBs are not immediately available for transport to the river, and must first undergo a mobilization step. Mobilization in the watershed occurs via several mechanisms. These sources, and the routes in which they are mobilized, are depicted in Figure 12. Fixed building sources can be released to surface soil during building demolition, or transferred to recycling facilities. The primary routes of watershed mobilization for non-fixed building sources are transfer to recycling facilities. PCBs contained in industrial sources can be mobilized via spills to surrounding soils, or through delivery to recycling facilities. PCBs in consumer products can be mobilized in surface soils via littering or processing at recycling facilities. Local atmospheric sources can contribute to watershed contamination via deposition and gas transfer. Finally, inadvertently produced PCBs can be directly applied to watershed soils via hydro-seed, deicer, herbicides and pesticides, and biosolids or fertilizer applications.

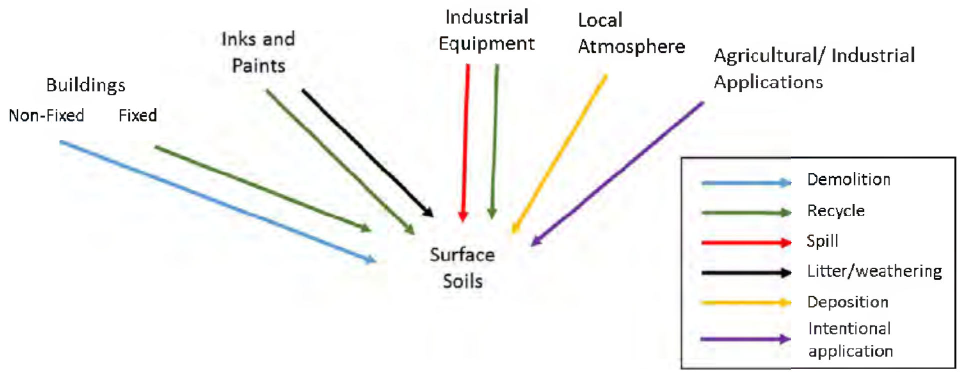

Figure 12. Mobilization of Sources in the Watershed

3.3.2 Mobilization to the Atmosphere

Numerous sources contribute to local atmospheric concentrations of PCBs via volatilization, i.e., conversion into a gas phase. Most of these pathways consist of volatilization directly from one of the previously listed source categories (i.e., buildings, surface soils, industrial equipment). Combustion sources include internal combustion engines, incinerators, used oil burning and residential burning. Shanahan et al. (2015) also identified volatilization of PCBs from sludge drying at wastewater treatment plants as an important source of atmospheric PCBs. The final source of local atmospheric sources is transport of PCBs generated outside the watershed (Figure 13).

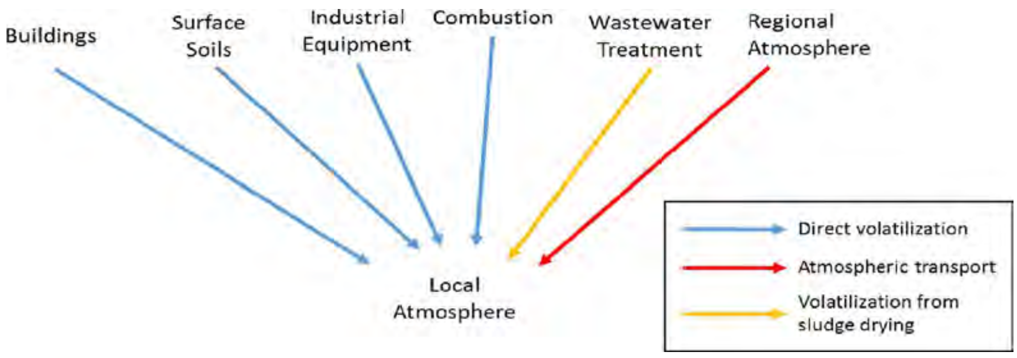

Figure 13. Mobilization of Sources to the Atmosphere

3.3.3 Delivery to Sewer Infrastructure

The Spokane watershed contains a range of sewer infrastructure capable of delivering PCBs, either directly or indirectly, to the river. This infrastructure can be broadly divided into categories of stormwater and wastewater. Stormwater infrastructure can be further divided into categories of systems that directly discharge to the river and those that do not directly discharge (e.g., dry wells). Wastewater infrastructure can be divided into categories of municipal wastewater and industrial/other (i.e., Kaiser Aluminum, Inland Empire Paper, and the Spokane fish hatchery) and private septic systems. The mechanisms by which PCBs are delivered to the infrastructure are depicted in Figure 14.

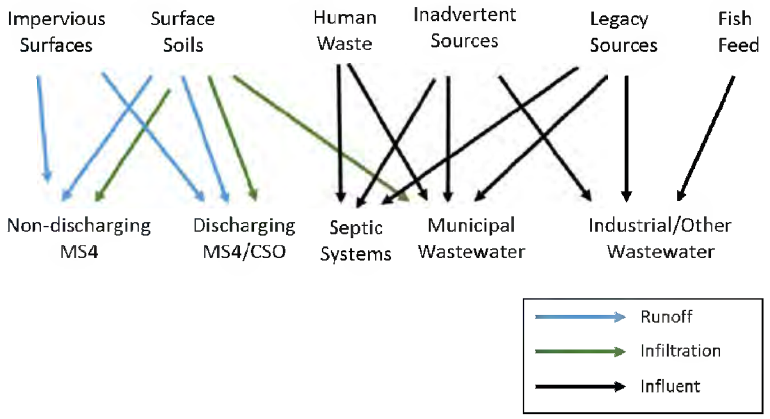

Figure 14. Delivery of Sources to Sewer Infrastructure

Potential sources of PCBs to the stormwater network are erosion of contaminated surface soils and infiltration of contaminated subsurface flow. Municipal wastewater treatment plants can get PCBs from human waste, infiltration of contaminated surface soils, as well as from printed materials/fabrics and legacy sources in their influent. Septic systems can receive PCBs from human waste, infiltration of contaminated surface soils, printed materials/fabrics, and legacy sources. The industrial/other wastewater treatment plants receive PCBs in their influent, with the specific nature of the PCB source depending upon the facility.

3.3.4 Contribution to Groundwater

The final intermediate transport pathway is contribution to groundwater, with specific transport mechanisms shown in Figure 15. Subsurface soils can contribute to groundwater either via legacy contamination, landfill disposal of PCB-containing products or private septic systems. Surface soils can also contribute to groundwater contamination via infiltration. A special case is included in Figure 15 to consider detention of stormwater in the non-discharging system such as drywells, as this mechanism has the potential to be a larger source of PCBs than infiltration from other soil areas.

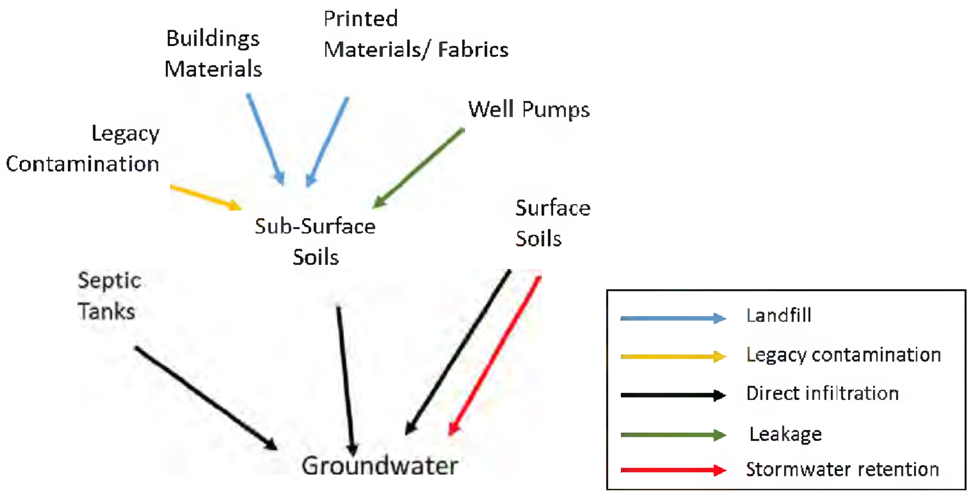

Figure 15. Delivery of Sources to Groundwater

The magnitudes of these individual mobilization pathways were estimated to the extent possible, with calculated magnitudes discussed below. Mobilization from fixed building sources appears to be a significant transport pathway, and mobilization from non-fixed building sources, consumer product, and land application were also identified as potentially important pathways. Insufficient data exist to define the magnitude of pathways between this initial mobilization step and delivery to the Spokane River.

Numerous sources contribute to local atmospheric concentrations of PCBs via volatilization, i.e., conversion into a gas phase. Most of these pathways consist of volatilization directly from one of the previously listed source categories (i.e., buildings, surface soils). Volatilization from contaminated surface soils was determine to be the dominant pathway of PCBs to the atmosphere, with an estimated volatilization load of 16-1600 kg/yr. Potential combustion sources (e.g., incinerators, residential burning) were estimated to contribute an atmospheric load of 17 kg/yr. Volatilization of land-applied wastewater treatment sludge was determined to be negligible. Little definitive information exists on the specific amount of PCBs delivered to the Spokane area from atmospheric source areas. Ecology's Environmental Assessment Program (Ecology, 2016c) is currently undertaking a study that will provide information on this transport pathway.

The Spokane watershed contains a range of sewer infrastructure capable of delivering PCBs, either directly or indirectly, to the river. This infrastructure can be broadly divided into categories of stormwater and wastewater. Stormwater infrastructure can be further divided into categories of systems that directly discharge to the river and those that do not directly discharge (e.g., dry wells). No quantitative estimate exists defining the quantity of PCBs being delivered to the stormwater system A lower bound estimate of loading to the City of Spokane's MS4 system can be obtained from the stormwater loading estimate from that stormwater system provided above in Table 5 (15 mg/day, or 0.01 kg/year). No information exists to estimate PCB loading to non-discharging stormwater systems (e.g. dry wells). An estimate of PCBs delivered to municipal wastewater systems was derived from observed influent PCB concentrations, and calculated at 0.77 kg/yr.

The final intermediate transport pathway is contribution to groundwater. Subsurface soils can contribute to groundwater via legacy contamination, landfill disposal of PCB-containing products, leaking submersible well pumps, or private septic systems. The Magnitude of Source Areas section above concluded that insufficient data exist to estimate the total mass of legacy subsurface PCB contamination; correspondingly, insufficient data are available to estimate the rate at which this legacy subsurface contamination contributes to groundwater. A lower bound estimate can be gained from the groundwater loading calculation presented above in Section 3.2, Delivery Mechanisms of PCBs to the Spokane River, which estimated the groundwater loading in the river section between Mirabeau Point (upper end of Mirabeau Park, downstream of Sullivan Road) and the Trent Avenue Bridge near Plante's Ferry at 60 to 300 mg/day (0.022 to 0.11 kg/year). This is considered a lower bound estimate because it only considers legacy contamination loading from a portion of the aquifer. A search for data describing groundwater PCB loading from landfills provided no results, although modern landfills are designed and operated to prevent any adverse effects to groundwater. No quantitative information was available describing the rate of leakage from submersible well pumps or the rate at which private septic systems are delivering PCBs to the groundwater.

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4
PCB Control Actions

As discussed above, PCBs are introduced to the Spokane River from a number of different source areas, transport pathways, and delivery mechanisms. This diversity of sources and pathways requires the application of a diverse range of Control Actions to reduce PCB levels and ultimately attain water quality standards. In the context of the Spokane River Comprehensive Plan, Control Actions are defined consistent with SFEI (2010) as "any activity, technology, process, operational method or measure, or engineered system, which when implemented prevents, controls, removes or reduces pollution." These Control Actions have commonly been referred to as Best Management Practices (BMPs) in other studies.

The specific Control Actions to be included in the Comprehensive Plan were determined at a Task Force workshop help in Spokane on July 27, 2016. This section describes how these Control Actions were identified, evaluated, and selected for inclusion in the Comprehensive Plan. It is divided into three subsections, corresponding to:

- Inventory of Control Actions to be evaluated
- Evaluation of Control Action cost and effectiveness
- Selection of Control Actions for inclusion in the Comprehensive Plan

In addition, there are a wide range of PCB Control Actions that have been applied elsewhere for various source areas and pathways that may or may not be applicable for Spokane.

The inventory of Control Actions to be evaluated in the Spokane River watershed is described in detail in LimnoTech (2016b), while the evaluation of the cost and effectiveness of each of the PCB Control Actions under consideration is described in detail in LimnoTech (2016e). The content of both documents is excerpted below.

4.1 Inventory of Control Actions to Be Evaluated

Identification of the universe of Control Actions that have the potential to reduce PCB loading to the Spokane River is a necessary first step in the development of the Comprehensive Plan. The Control Actions identified for consideration in the Comprehensive Plan were obtained from several sources:

- BMP Toolbox for the San Francisco Bay Area (SFEI, 2010)
- Stormwater Management Manual for Eastern Washington (Washington Department of Ecology, 2004)
- Spokane Regional Stormwater Manual (Spokane County, City of Spokane, and City of Spokane Valley, 2008)
- Spokane River Regional Toxics Task Force February 6-8, 2016 Workshop
- PCB Chemical Action Plan (Washington Department of Ecology, 2015a)
- Discussions within the Task Force BMP subgroup

For purposes of initial assessment, Control Actions were divided into the following four groups based upon discussions of the Task Force BMP planning group.

- Institutional
- Stormwater Treatment
- Wastewater Treatment
- Site Remediation

Institutional Control Actions include information sharing/educational campaigns and governmental practices to help businesses and the general public identify, avoid, clean up and/or properly dispose of products containing PCBs. These control actions require the least amount of infrastructure, engineering work, maintenance, and disturbance of existing land because their intent is to avoid the continued use, inadvertent production, or release of PCBs. Institutional Control Actions can be further broken down into two sub-groups, government practices and educational control actions. Governmental practices can include regulatory actions that restrict the use or disposal of PCB-containing items, as well as providing incentives for voluntary programs such as hazardous waste take-back programs. Educational control actions consist of activities that will indirectly reduce loading of PCBs, by altering public behavior and/or providing information to help direct future PCB reduction efforts. Stormwater treatment Control Actions are engineered options to be installed or built with the existing storm sewer infrastructure to capture soil and water containing PCBs and prevent it from being discharged to the Spokane River. Wastewater treatment Control Actions are those intended to reduce the loading of PCB from municipal and industrial wastewater treatment plants (WWTPs), either by actions to reduce the amount of PCBs being delivered via influent to the WWTP or increasing the rate of PCB removal with the WWTP itself. Site remediation Control Actions involve: 1) identifying, and 2) cleaning up soil/groundwater that have been contaminated from past use of PCBs, before they can be mobilized and transported to the river.

A total of 45 Control Actions considered potentially applicable to address PCBs in the Spokane River were identified. Each Control Action ultimately considered is listed by group in Table 8. Summary descriptions of each of these Control Actions are provided in Appendix A of this Plan.

Table 8. Menu of Control Actions Identified as Potentially Applicable for Reducing PCB Loads to the Spokane River and Lake Spokane

Group	Sub-Group	Control Action
Institutional	Governmental Practices (Regulatory Actions and/or Incentivized Voluntary Programs)	Waste disposal assistance
		Low Impact Development (LID) Ordinance
		Leaf removal
		Street sweeping
		Catch basin/pipe cleanout
		Purchasing standards
		Survey of local electrical equipment
		Regulation of waste disposal
		Removal of carp from Lake Spokane
		Building demolition and renovation control actions
		PCB product labeling law
		Leak prevention/detection in electrical equipment
		Accelerated sewer construction
		PCB identification during inspections
		Regulatory rulemaking
		Compliance with PCB regulations
		Support of green chemistry alternatives
	Educational	Survey schools/public buildings
		Education/outreach about PCB sources
		Education on septic systems disposal
		Education on filtering post-consumer paper
		PCB product testing

Table 8 (continued). Menu of Control Actions Identified as Potentially Applicable for Reducing PCB Loads to the Spokane River and Lake Spokane

Group	Sub-Group	Control Action
Stormwater Treatment	Pipe Entrance and Pipe System	Infiltration control actions
		Retention and reuse control actions
		Bioretention control actions
		Isolation of contaminated source areas from the MS4
		Filters
		Screens
		Wet vault
		Hydrodynamic separator
	End of Pipe	Constructed wetlands
		Sedimentation basin
		Discharge to ground/dry well
		Diversion to treatment plant
		Fungi (mycoremedation) or biochar incorporated into stormwater treatment
Wastewater Treatment		Development of a Toxics Management Action Plan
		Implementation of a source tracking program
		Chemical fingerprinting or pattern analysis
		Remediation and/or mitigation of individual sources
		Elimination of PCB-containing equipment
		Public outreach and communications
		Review of procurement ordinances
		Pretreatment regulations
Site Remediation		Identification of contaminated sites
		Clean up of contaminated sites

4.2 Evaluation of Control Action Cost and Effectiveness

The second step in identifying those Control Action that may be most appropriate for inclusion in the Comprehensive Plan consisted of a detailed review of the inventory of Control Actions listed above. This section summarizes that review, and is divided into sections of Review Factors and Findings.

4.2.1 Review Factors

Each Control Action was reviewed with respect to the following factors:

- Magnitude of pathway
- Reduction efficiency
- Cost
- Implementing entity
- Pollution prevention hierarchy
- Potential overlap with existing efforts

- Ancillary benefit
- Timeframes for implementation and results

The information gathered for this review indicated that many of the reviewed Control Actions have no quantitative information available on costs or effectiveness. In addition, the magnitude of the transport pathways between many source areas and delivery mechanisms had been determined to be either highly uncertain, or unknown. Because quantitative information was lacking or highly uncertain for many aspects of this review, a qualitative or semi-quantitative scoring system was used. The definition of each aspect of the review, as well as the ranking system used, is described below.

"Magnitude of Pathway" describes the importance of the pathway in terms of delivering PCBs to the river or lake from the source area or pathway being targeted by the Control Action. Control Actions that interrupt significant pathways may be very effective in preventing PCB sources from contributing PCBs to the system. Even though many intermediate transport pathways are uncertain or not quantified, sufficient information exists to allow at least a qualitative understanding of the importance of many pathways. As such, Control Actions were rated as follows:

- Highly suitable: Pathway provides >1% of the total PCB load delivered to the system
- Moderately suitable: Pathway provides 0.1- 1% of the total PCB load delivered to the system
- Less suitable: Pathway provides <0.1% of the total PCB load delivered to the system

"Reduction Efficiency" is a primary consideration in terms of prioritizing Control Actions, as it describes the extent to which a given action is expected to reduce PCB movement from its targeted source area or pathway. Although quantitative information defining reduction efficiency was not available for many Control Actions, sufficient information exists to allow the majority of Control Action to be rated as follows:

- Highly suitable: >50% reduction in targeted source area or pathway
- Moderately suitable: 10-50% reduction in targeted source area or pathway
- Less suitable: <10% reduction in targeted source area or pathway

"Cost" describes the expected long-term cost of implementing the Control Action, considering both capital and operating costs. Control Actions that remove PCBs at lower costs will be preferred over Control Actions that remove similar amounts of PCBs at greater costs. Even in the absence of quantitative data, a qualitative understanding exists regarding the costs of many Control Actions, and they are rated as follows:

- Highly suitable: <$100,000
- Moderately suitable: $100,000-$1,000,000
- Less suitable: >$1,000,000

"Implementing Entity" describes the extent to which there is a clearly identified responsible party for implementing the control action due to their enrollment in a regulatory or voluntary program, along with an assessment of their willingness to do so. It is rated as follows:

- Highly suitable Entity identified and willing to implement
- Moderately suitable: Entity identified, willingness uncertain
- Less suitable: No willing entity identified

Experience with a wide range of pollutants has shown that preventing the creation or release of a pollutant is far more effective than controlling it once released. "Pollution Prevention Hierarchy" describes where the Control Action is located on the spectrum from limiting production and use of PCBs to treating PCBs prior to their release to the river or lake. It is rated as follows:

- Highly suitable: Controls production or use of PCBs
- Moderately suitable: Manages the mobility of PCBs in the environment
- Less suitable: Performs "end-of-pipe" treatment of PCBs prior to discharge

"Existing Efforts" describes the extent to which a given Control Action relates with existing PCB control efforts that are required by state or federal law or currently being conducted under voluntary programs. It is rated as follows:

- Highly suitable: Addresses a source area or pathway that is not currently being addressed
- Moderately suitable: Expands upon existing controls of a source area or pathway
- Less suitable: Redundant with existing efforts

"Ancillary Benefit" describes the extent to which a given Control Action provides benefits beyond removal of PCBs from the system. It is rated as follows:

- Highly suitable: Provides significant additional benefits beyond reduction of PCB loads
- Moderately suitable: Provides some additional benefits beyond reduction of PCB loads
- Less suitable: Provides minimal additional benefit beyond reduction of PCB loads

"Timeframe for implementation and results" assesses the amount of time it will take for a given Control Action to be implemented, as well time for a system response to be observed. It is rated separately for implementation and results as follows:

- Highly suitable: Expected within two-year timeframe
- Moderately suitable: Expected within five-year timeframe
- Less suitable: Expected after more than five years

4.2.2 Review Findings

Table 9 summarizes the findings of the above review, using a simple shading scheme to identify whether each aspect of each Control Action is:

- Highly suitable
- Moderately suitable
- Less suitable
- Unable to be evaluated, due to a lack of information

Table 9. Initial Summarization of Control Actions

Control Action	Magnitude of Pathway	Reduction Efficiency	Cost	Implementing Entity	Pollution Prevention Hierarchy	Ancillary Benefit	Overlap w/Existing Efforts	Time frame for Implementation	Timeframe for Response
Waste disposal assistance									
LID ordinance									
Leaf removal									
Street sweeping									
Catch basin/pipe cleanout									
Purchasing standards									
Survey of local electrical equipment									
Regulation of waste disposal									
Removal of carp from L. Spokane									
Building demolition and renovation									
PCB product labeling law									
Leak prevention/detection									
Accelerated sewer construction									
PCB Identication during inspections									
Regulatory rulemaking									
Compliance with PCB regulations									
Support of green chemistry alternatives									
Survey schools and public buildings									
Education/outreach on PCB sources									
Education on septic discharge									
Education on filtering post-consumer									
PCB product testing									
Stormwater - pipe entrance									
Stormwater - pipe system									
Stormwater - end of pipe									
Wastewater treatment									
Identication of contaminated sites									
Clean up of contaminated sites									

Key
Unknown
Magnitude of Pathway
>1% of total load
0.1 - 1% of total load
<0.1% of total load
Reduction Efficiency
>50% reduction
10-50% reduction
<10% reduction
Cost
<$100k
$100k-$1M
>$1M
Implementing Entity
Identified and willing
identified
None identified
Pollution Prevention Hierarchy
Controls production or use
Manages mobility
End of pipe control
Ancillary Benefit
Significant
Some
Minimal
Existing Controls
Not currently being addressed
Expands upon existing controls
Redundant
Time Frame
W/in two years
W/in five years
> five years

One key observation made from this review was that the most significant delivery mechanisms of PCBs all have existing Control Actions in various phases of development. Specific PCB-related Control Actions underway in Spokane are:

- Most wastewater treatment plants discharging to the Spokane River are required to develop and install treatment systems to reduce nutrient loading that will likely concurrently result in reductions of PCB loading. In addition, each wastewater facility has developed a Toxics Management Action Plan that includes a PCB source identification study and associated control actions. These treatment plants are operated by:
  - City of Coeur d'Alene
  - City of Spokane
  - Kaiser Aluminum
  - Spokane County
  - City of Post Falls
  - Liberty Lake Sewer and Water District
  - Inland Empire Paper
  - Hayden Area Regional Sewer Board
- Remediation activities for known contaminated sites in Washington are being implemented and managed under the jurisdiction of the Model Toxics Control Act (MTCA). Marti and Maggi (2015) searched for sites in Spokane that could be contributing PCB contamination to groundwater in the area of the Spokane River. They identified 31 cleanup sites, three of which have confirmed release of PCBs and are subject to MTCA remediation. They are:
  - Spokane River Upriver Dam and Donkey Island
  - Kaiser Aluminum
  - General Electric Company, E. Mission Ave.

Contamination at the Spokane River Upriver Dam and Donkey Island sites was the result of PCBs in the river and they were not "new" sources like the others.

- The City of Spokane is actively addressing stormwater and CSO loading of PCBs as part of its Integrated Clean Water Plan. Other entities are also controlling their stormwater loads under NPDES stormwater permits, including:
  - Idaho Transportation Department
  - City of Post Falls
  - Spokane County
  - Washington Department of Transportation
  - City of Coeur d'Alene
  - Post Falls Highway District
  - City of Spokane Valley
  - Lakes Highway District
- The large majority of stormwater in the remainder of the watershed (including Spokane County and the City of Spokane Valley) is being diverted to groundwater, as opposed to direct surface discharge to the River. This activity is consistent with many of the PCB Control Actions discussed previously under the sub-group of "Stormwater Treatment--Pipe Entrance," and is regulated under the State of Washington's and the Idaho Department of Water Resources' Underground Injection Control Programs for UIC wells (e.g., drywells).
- Local electric utilities have replaced their transformer oils with essentially PCB-free oils, and eliminated the use of large capacitors.

4.3 Selection of Control Actions for Inclusion in the Comprehensive Plan

The results of the evaluation of Control Actions presented above were discussed at a Task Force workshop held in Spokane on July 27, 2016. The objective of this workshop was to define, in a consensus-based manner among Task Force members, the specific Control Actions to be included in the Comprehensive Plan. A summary of the Control Actions under consideration were presented in spreadsheet format as shown in Table 10. The 45 Control Actions originally identified were condensed into 27 categories, primarily by grouping individual stormwater controls into categories corresponding to their location (i.e., pipe entrance, in the pipe system, or end of pipe). Discussion of Control Actions at the workshop was divided into tiers of:

- Control Actions already being implemented
- Potential new Control Actions

Table 10. Summary of Control Options Presented at July 27, 2016 Workshop

PCB Control Action	Magnitude of Source Area	Magnitude of Delivery Mechanism	Magnitude of Pathway Being Controlled	Ongoing? Action?	by Whom?	Actionable Recommendation	by Whom?	Time to Implement	Time to Noticeable System Response	Outcome	Cost & Possible $ Sources	Ancillary Benefit
Already Being Implemented												
Wastewater Treatment	Unknown	54 - 2923 mg/day	54 - 2923 mg/day	Toxics Mgt Plans, source tracking, public outreach, pretreatment regs, etc.	Permits (EPA/ Ecology); dischargers	-	-	-	-	-	-	-
Remediate Known Contaminated Sites	Unknown	60 - 300 mg/day	60 - 300 mg/day	Ongoing	Ecology, w/responsible parties	-	-	-	-	-	-	-
LID Ordinance	Unknown	15 - 94 mg/day	Unknown	Create and implement land use/development standards encouraging low impact development	City of Spokane	-	-	-	-	-	-	-
Stormwater Pipe Entrance	Unknown	15-94 mg/day	15-94 mg/day	Infiltration controls (trenches, basins, dry-wells), bio-retention	City of Spokane	-	-	-	-	-	-	-
Stormwater Pipe System	Unknown	15-94 mg/day	15-94 mg/day	Screens, filters, wet vaults, hyrodynamic separators	City of Spokane	-	-	-	-	-	-	-
Catch Basin/Pipe Cleanout	Unknown	15 - 94 mg/day	Unknown	Partial; removal of sediments from catch basins, pipes	City of Spokane	-	-	-	-	-	-	-
Support green chemistry	0.2 to 450 mg/day	Unknown	Unknown	Ongoing	Ecology	Outreach/education	SRRTTF members	Within 5 years	More than five years	Reduced import of PCBs to watershed	$100K-$1M	Marginal
Street sweeping	Unknown	15-94 mg/day	Unknown	Ongoing	Many communities	Increased frequency	Municipal public works	Within 2 years	More than five years	Fewer particulates contributing to stormwater	$100K-$1M	Significant
Leaf Removal	Unknown	15 - 94 mg/day	Unknown	Ongoing	City of Spokane, Spokane County, Coeur d'Alene	Enhance current municipal leaf removal programs	Municipal public works	Within 2 years	More than five years	Less leaf litter contributing to stormwater	$100K-$1M	Marginal
ID New Contaminated Sites	Unknown	Unknown	Unknown	Ongoing	Ecology	Mining of existing data, targeted monitoring	Ecology, SRRTTF	Within 5 years	More than five years	Identify sites for remediation	$100K-$1M	Marginal
Purchasing Standards	0.2 to 450 mg/day	Unknown	Unknown	In place in Washington	Ecology, City of Spokane, Spokane County	Expansion to Idaho?	State of Idaho, DEQ, municipalities	Within 5 years	More than five years	Reduced import of PCBs to watershed	$100K-$1M	Marginal

Potential New Actions												
PCB Product-Labeling Law	0.2 to 450 mg/day	Unknown	Unknown	-	-	Lobby for development of ordinance	All SRRTTF members (potentially)	Within 5 years	More than five years	Reduced import of PCBs to watershed	<$100K	Marginal
PCB Product Info	0.2 to 450 mg/day	Unknown	Unknown	-	-	Lobby for development of ordinance	All SRRTTF members (potentially)	Within 5 years	More than five years	Reduced import of PCBs to watershed	<$100K	Marginal
Survey Electrical Equipment	5.5 to 22 kg	0.001 – 0.02 mg/day	0.001 – 0.02 mg/day	-	-	Regulatory requirement or voluntary action	States, utilities, industries	Within 5 years	More than five years	Better source area identification	<$100K	Marginal
Leak Prevention/ Detection	5.5 to 22 kg	0.001 – 0.02 mg/day	0.001 – 0.02 mg/day	-	-	Regulatory requirement or voluntary action	States, utilities, industries	Within 5 years	More than five years	Reduced leaks/spills	<$100K	Marginal
PCB ID During Inspections	50 – 40,000 kg	Unknown	Unknown	-	-	Training inspectors to identify materials and what to do next	Municipalities	Within 5 years	More than five years	Better source area identification	<$100K	Marginal
Survey Schools & Public Buildings	Unknown	Unknown	Unknown	-	-	Survey PCB-containing materials in schools/public buildings	Ecology; Regional Health Districts	Within 5 years	More than five years	Better source area identification	<$100K	Marginal
Building Demolition Control	60 - 130,000 kg	Unknown	Unknown	-	-	Establish regulations/ordinances requiring mgmt. of PCB-containing materials during building demolition and renovation	EPA, States, local governments	Within 5 years	More than five years	Under investigation	<$100K	Marginal
Waste Disposal Assistance	Unknown	Unknown	Unknown	-	-	Develop programs to accept and dispose of PCB-containing items	Numerous organizations	Within 5 years	More than five years	Reduced illegal disposal	<$100K	Marginal
Carp Removal	Unknown	N/A	1.5 – 4.1 g PCBs per 1000 carp removed	Pilot study	Avista/Ecology	Remove carp from Lake Spokane	Avista/Ecology	Within 2 years	More than five years	Reduced human exposure	?	Significant
Educational on Septic Disposal	Unknown	Unknown	Unknown	-	-	Educate on-site septic system owners located over the aquifer recharge area on proper disposal of wastes	Local governments	Within 2 years	More than five years	Less disposal of PCB containing material into septics	<$100K	Marginal
Educational on Filtering Post-consumer Paper	Unknown	Unknown	Unknown	-	-	Educate on separating paper recycling materials w/yellow inks/ pigments into the garbage stream	Local governments	Within 2 years	More than five years	Less PCB-containing trash sent to recycling	<$100K	Marginal
Accelerated Sewer Construction	Unknown	Unknown	Unknown	-	-	Accelerate sewer construction to replace septic systems	Local municipalities	Within 5 years	More than five years	Reduced load to aquifer	>$1M	Marginal
Regulatory Rulemaking	0.2 to 450 mg/day	Unknown	Unknown	-	-	Engage with federal agencies to reform TSCA and FDA packaging regs	SRRTTF members	More than five years	More than five years	Reduced import of PCBs to watershed	$100K-$1M	Marginal
Compliance with PCB Regulations	0.2 to 450 mg/day	Unknown	Unknown	-	-	Engage with agencies to require stricter accountability for compliance with existing rules	SRRTTF members	More than five years	More than five years	Reduced import of PCBs to watershed	$100K-$1M	Marginal
Regulation of Waste Disposal	Unknown	Unknown	Unknown	-	-	Review laws regulating waste disposal and revise as necessary	Local governments	More than five years	More than five years	Reduction in improper disposal	<$100K	Marginal
Emerging End of Stormwater Pipe Technologies	Unknown	15-94 mg/day	15-94 mg/day	Research fungi, bio-char, activated carbon	City of Spokane	Support additional research	Municipal public works	More than five years	More than five years	Reduced import of PCBs to watershed	?	Marginal

Existing Control Actions were discussed first, and placed by the group into one of two categories. The first category (called Category A) contained Control Actions where the group decided to maintain current efforts, and document those efforts in the Plan. The following Control Actions were identified as Category A:

- Wastewater Treatment
- Remediate Known Contaminated Sites
- Stormwater Controls
- Low Impact Development Ordinance
- Street Sweeping
- Purchasing Standards

The second category (called Category B) contained Control Actions where the group identified improvements that could be made to existing efforts. The following Control Actions were identified as Category B:

- Support of Green Chemistry Alternatives
- PCB Product Testing Information
- Waste Disposal Assistance
- Regulatory Rulemaking
- Compliance with PCB Regulations
- Emerging End of Pipe Stormwater Technologies

Potential new Control Actions were reviewed next, and placed into one of three categories by the group:

C. Include in Comprehensive Plan and commit to implementation
D. Include in Comprehensive Plan as an activity worth exploring in the future
E. Do not include in Comprehensive Plan

Two Control Actions were identified as Category C for inclusion in the Comprehensive Plan with a commitment to implementation: Identification of Sites of Concern for Contaminated Groundwater and Building Demolition and Renovation Control. The following nine Control Actions were identified as Category D, to be included in the Comprehensive Plan as an activity worth exploring in the future:

- Survey Schools and Public Buildings
- Accelerated Sewer Construction
- Emerging Wastewater Technology
- Survey of Local Electrical Equipment
- Leak Prevention/Detection in Electrical Equipment
- Regulation of Waste Disposal
- Removal of Carp from Lake Spokane
- PCB Identification during Inspections
- Compliance with PCB Regulations for Imported Products
- Education on Septic Disposal
- Stormwater Source Tracing

Three Control Actions were identified as Category E, and not considered for future implementation:

- Leaf Removal
- PCB Product Labeling Law
- Education on Filtering Post-Consumer Paper

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5
Implementation Plan

This section discusses the specific Control Actions selected to be undertaken to reduce PCBs in the Spokane River. It contains sections corresponding to each of the Category A, B, and C Control Actions identified in the previous section, then follows with the recommended schedule for their implementation and measurable milestones to assess their implementation effectiveness. Category D Control Actions (i.e., ones intended for future consideration) are discussed later in this document. Long-term effectiveness in reducing PCBs in the river and fish tissue is addressed in Section 6.

5.1 Category A: Wastewater Treatment

Category A Control Actions consist of existing actions where the group decided to maintain current efforts, and document those efforts in the Plan. The first Category A Control Action corresponds to wastewater treatment. NPDES permits regulate discharges from wastewater and industrial facilities in Washington and Idaho, as well as fish hatcheries (under a general permit). The Washington and Idaho (EPA) NPDES permits require most wastewater facilities discharging to the Spokane River to develop and install treatment systems to reduce nutrient loading that will concurrently result in reductions of PCB loading. Additional permit requirements that relate to the monitoring and reduction of PCB loads are described for the following categories of permits: Idaho Municipal Permits, Washington Municipal Permits, Washington Industrial Permits, and the Fish Hatchery/Aquaculture Permits. The information that follows is based on the most current permits as of September 2016, and does not include information in draft permits that have not yet been approved.

5.1.1 Idaho Municipal Permits

The City of Coeur d'Alene (ID0022853), City of Post Falls (ID0025852), and Hayden Area Regional Sewer Board (ID0026590) all have NPDES permits with numerous PCB-related requirements. These permits were all made effective as of December 1, 2014, and all expire on November 30, 2019. They all have very similar, if not identical requirements to monitor PCB congeners at influent, effluent and instream locations, and participate in the Task Force under the terms of the 2012 Memorandum of Agreement under which the Task Force was created. Other requirements that are common to these three permits and which will reduce PCB loads to the Spokane River are:

- Submit a Toxics Management Plan to EPA and IDEQ, with the goal of reducing loadings of PCBs to the Spokane River to the maximum extent practicable. The Toxics Management Plan must address source control and elimination as follows:
  - From contaminated soils, sediments, stormwater and groundwater entering the POTW collection system via inflow and infiltration.
  - From industrial and commercial sources, including compliance with pretreatment regulations for industrial users indirect discharges of PCBs that cause pass through or interference.
  - From any person discharging PCBs to the POTW water in excess of applicable pretreatment local limit established by the POTW, or 3 ug/L, whichever is less.
  - By means of eliminating existing sources that are within direct control of the permittee.
  - By means of changing the permittee's procurement practices, control and minimize the future generation and release of PCBs that are within the direct control of the permittee, including preferential use of PCB free substitutes for those products containing PCBs below the regulated level of 50 ppm

  - Develop and implement a public education program to educate the public about the difference between products free of PCBs and those labeled non-PCB, but which contain PCBs below the TSCA regulatory threshold of 50 ppm; and proper disposal of waste products that may contain PCBs including those containing PCBs below the TSCA regulatory threshold of 50 ppm and the hazards associated with improper disposal.
  - Distribute appropriate educational materials to target audiences at least once per year.
  - At least once a year, prepare and distribute information relevant to the TMP to a newspaper, and make all relevant TMP documents available to the public.
- Submit an annual report to EPA and IDEQ that contains PCB monitoring results, copies of educational materials, ordinances, inventories, guidance materials or other products produced as part of the TMP.
  - Description and schedule for implementation of additional actions that may be necessary, based on monitoring results, to ensure compliance with applicable water quality standards.
  - Summary of actions taken to reduce discharges of PCBs during the previous 12-month period, and a separate summary of actions planned for the next reporting cycle.

5.1.2 Washington Municipal Permits

There are three Washington municipal permits. Permit WA-002447-3, which covers the City of Spokane Riverside Park WRF and CSOs, and Spokane County Pretreatment Program, was effective as of July 1, 2011, with an expiration date of June 30, 2016 (administratively extended). Permit WA-0045144, which covers the Liberty Lake Sewer and Water District, was also effective as of July 1, 2011, with an expiration date of June 30, 2016 (administratively extended). The third permit (WA-0093317) covers the Spokane County Regional WRF, and was effective as of December 1, 2011, with an expiration date of November 31 (sic), 2016 (administratively extended). These permits are similar to each other with regard to PCBs, and are also similar to the Idaho municipal permits. Requirements common to the three Washington municipal permits are listed below with a few differences noted.

Each permit includes requirements to monitor PCB congeners at minimum specified frequencies in raw sewage and final effluent and participate in the Task Force. PCB sampling and analysis must be in accordance with the quality assurance plan and scope of work submitted to the Department of Ecology. The quality assurance plan will be reviewed annually and revised if needed. (The QAPP language is slightly different for the County permit.) The effluent monitoring results will be compiled and analyzed by Ecology for the purpose of establishing a performance-based PCB effluent limitation in the following permit cycle. The Spokane County and City of Spokane permits additionally require biosolids PCB monitoring.

A report[4] must be submitted to Ecology annually, containing a summary of the sampling results. Annually, the permittee and Ecology will review the data, including pattern analysis of homologs, detection limits, QA/QC procedures and a draft action plan (The Toxics Management Plan) listing identified sources, potential sources suggested by data analysis, and future source identification activities. Annually the permittee and Ecology will confer and revise locations and frequency of raw sewage PCB sampling in the collection system.

Similar to the Idaho municipal permits, the goals of the Toxics Management Plan are to reduce loadings of PCBs to the Spokane River to the maximum extent practicable realizing statistically significant reductions in the influent concentration of toxicants to the treatment plants over the next 10 years, and reduce PCBs in the effluent to the maximum extent practicable to bring the Spokane River into

[4] The Spokane City and Liberty Lake Sewer and Water District permits refer to this report as a "Receiving Water and Effluent Study," whereas the Spokane County permit refers to it as a "Toxics Management Report."

compliance with WQS for PCBs. The Toxics Management Plan must address source control and elimination of PCBs from:

- Contaminated soils and sediments.
- Stormwater entering the wastewater collection system.
- Industrial and commercial sources. As an element of the Spokane City and Spokane County permitted pretreatment programs (not Liberty Lake), the scope of their inspections and monitoring will be expanded to include PCBs. The PCB monitoring must follow a QAPP.
- By means of eliminating active sources such as older machinery, older electrical equipment and components, construction material content, commercial materials.
- By means of changing procurement practices and ordinances, control and minimize toxics, including preferential use of PCB-free substitutes for those products containing PCBs below the regulated level of 50 ppm, in sources such as construction material content, commercial materials, soaps and cleaners.
- The Permittee must also prepare public media educating the public about the difference between products free of PCBs, and those labeled non-PCB but which contain PCBs below the TSCA regulatory threshold of 50 ppm.

5.1.3 Washington Industrial Permits

There are two Washington industrial permits, the Inland Empire Paper Company permit (WA-000082-5) and the Kaiser Aluminum permit (WA0000892).

The Inland Empire Paper Company permit contains monitoring requirements for PCB congeners, but does not contain PCB effluent limits. After Inland Empire Paper Company collects total PCB data according to the initial testing frequency, Ecology intends to modify the permit to set an interim numeric effluent limit for total PCBs.

This permit also includes requirements to submit a scope of work for a PCB Source Identification Study, and completion of that study after approval by the Department. The scope of work for the PCB Source Identification Study should include raw materials used at the facility that may contain PCBs, a site review where PCB-containing equipment was/may have been used, a sampling plan with proposed sampling locations, quality control protocols, sampling protocols, and PCB text methods.

Following approval of the scope of work, Inland Empire Paper Company shall submit a report of the results and incorporate findings into the PCB BMP Plan. The PCB BMP plan shall include:

- A list of members of a cross-functional team responsible for developing the BMP plan, including the name of a designated team leader.
- A description of current and past source identification, source control, pollution prevention, and wastewater reduction efforts and their effectiveness.
- Identification of technical/economical evaluation of new BMPs. BMPs should include, but are not limited to, modification of equipment, facilities, technology, processes, and procedures; source control; remediation of any contaminated areas; etc.
- A schedule for implementation of economically feasible BMPs.
- Methods used for measuring progress towards the BMP goal and updating the BMP plan.
- Results from testing of any waste streams for PCBs taken in support of the PCB BMP plan and PCB Source Identification Study.

Following initial submission of the PCB BMP plan, an annual report is due to the Department and shall include: a) all BMP plan monitoring results for the year; b) a summary of effectiveness of all BMPs implemented to meet the BMP plan goal; and c) any updates to the BMP plan.

The Kaiser Aluminum permit requires use of a walnut shell filtration system to aid in removing PCBs from the process wastewater. This system was constructed in response to an Agreed Order issued by Ecology, that was subsequently amended in October 2005 to require influent sampling to the BWS to verify that the design PCB loadings to the filters were being maintained (among other requirements). The permit specifies PCB influent sampling and loading limits for the walnut shell filtration system inlet, to verify that the design PCB loadings to the filters are being maintained. This permit also requires continued PCB source identification and cleanup actions that were initiated under Amended Order No. 2868, to reduce PCBs in the effluent to the maximum extent practicable to bring the Spokane River into compliance with applicable water quality standards for PCBs. Among other things, the Amended Order required Kaiser Aluminum to investigate the high levels of PCBs discharged in 2002 and identify and remove PCBs still remaining in the wastewater treatment and collection systems. In addition, Kaiser Aluminum is required to prepare a scope of work for additional source identification efforts that utilizes information from a 2012 report, and which includes a sampling plan with proposed sampling locations, sampling protocols, PCB test methods and a work schedule. A report summarizing the status of the PCB source identification and cleanup must be provided semiannually to Ecology.

5.1.4 Fish Hatchery/Aquaculture Permits

Two general NPDES permits apply to facilities located in the Spokane River watershed, the Upland Fin-Fish Hatching and Rearing General Permit, and the general NPDES permit (WAG130000) for Federal Aquaculture Facilities and Aquaculture Facilities located in Indian Country.

Upland Fin-Fish Hatching and Rearing General Permit: The general NPDES permit (WAG137007), Upland Fin-Fish Hatching and Rearing General Permit, has an effective date of April 1, 2016, and an expiration date of March 31, 2021. This permit applies to upland aquaculture facilities or operations that discharge fish rearing water to a surface water body or a system that drains to a surface water body, which meet specific coverage requirements described in the permit. This permit applies to the Washington Department of Fish and Wildlife's Spokane Fish Hatchery, which discharges to the Little Spokane River. The permit also applies to the Troutlodge hatchery in Soap Lake, which provides fish to be stocked in the Spokane River.

The permit describes PCB Reduction Activities and BMPs to eliminate, to the maximum extent possible, the release of PCBs from any known sources in the facility, including paint, caulk, or feed that come in contact with water. New and existing facilities have different timelines, but the same requirements. These requirements are summarized below.

The permittee must assess the facility for the presence of paint or caulk manufactured prior to 1980, and evaluate if any of these sources come in contact with water and could contribute to a discharge of PCBs to surface waters. A copy of the assessment report must be submitted to Ecology and include information regarding pre-1980 caulk and paint usage and location in the facility, amounts of stored caulk or paint at the facility, and PCB material removed from hatchery use but still on-site. The permittee must then submit a plan that is consistent with USEPA guidance for the proper removal and disposal of all pre-1980 paint and caulk that comes in contact with water or occurs as waste on-site, and also submit documentation to Ecology. The paint and caulk removal plan may contain documentation that paint or caulk onsite does not contain PCBs as an alternative to their removal, or has no chance of coming in contact with water and being discharged to surface water.

The Permittee is required to use any available product testing data to preferentially purchase paint, caulk, and construction materials with the lowest practicable total PCB concentration.

The permittee must develop, implement, and submit a plan to Ecology to reduce PCBs in the facility discharge from fish feed and feeding activities. The plan must contain purchasing procedures that give preference for fish food that contains the lowest amount of PCBs that is economically and practically feasible, fish feeding practices that minimize the discharge of unconsumed food, and methods to reduce and remove accumulated fish feed regularly to keep feed out of the discharge. Additionally, permittees must request PCB content information from fish food suppliers and include this in the Best Management Practices Plan.

State-run facilities must comply with RCW 39.26.280(2) that prohibits a state agency of knowingly purchasing products containing PCBs above quantitation levels unless it is not cost-effective or feasible to do so.

Within the site-specific Pollution Prevention Plan, which is submitted to Ecology, permittees must address ongoing PCB reduction activities as they relate to food, construction, and operational and equipment purchases, including paint and caulk.

NPDES permit (WAG130000) for Federal Aquaculture Facilities and Aquaculture Facilities located in Indian Country: The general NPDES permit (WAG130000) for Federal Aquaculture Facilities and Aquaculture Facilities located in Indian Country has permit requirements related to PCBs. Within the Spokane watershed, this permit applies to the Ford State Fish Hatchery and Spokane Tribal Hatchery. Some requirements apply to all permittees, and a subset applies only to permittees that discharge to waters in WRIA 54 (Lower Spokane) and WRIA 57 (Middle Spokane). These are generally described below.

All facilities that discharge to waters in the Lower Spokane and Middle Spokane watersheds must:

- Monitor their effluent for PCB congeners. This currently applies to the Ford State Fish Hatchery and Spokane Tribal Hatchery. Total concentration of dioxin-like PCB congeners and a complete congener analysis must be reported.
- Use any available product testing data to preferentially purchase paint and caulk with the lowest practicable total PCB concentrations.
- Facilities in the Spokane River area must also request PCB content information from fish food suppliers and include documentation of that request in their files.

All facilities must develop and implement a BMP plan (and annually review the plan) that meets specific requirements, including the following that apply to PCBs:

- Implement procedures to eliminate the release of PCBs from any known sources in the facility.
- Implement purchasing procedures that give preference for fish food that contains the lowest amount of PCBs that is economically and practically feasible.

5.2 Category A: Remediate Known Contaminated Sites

Ecology's Toxics Cleanup Program (TCP) is responsible for overseeing the remediation of known contaminated sites, working under regulatory authority from Washington's Model Toxics Control Act (MTCA). Four contaminated sites with potential to contribute PCBs to the Spokane River are in various stages of remediation:

- Spokane River Upriver Dam and Donkey Island
- General Electric Co.
- City Parcel
- Kaiser Aluminum

The status of each site is discussed below.

5.2.1 Spokane River Upriver Dam and Donkey Island

Historical discharges of PCBs to the Spokane River upstream of the Upriver Dam and Donkey Island led to contamination of river sediments. Two PCB deposits in river-bottom sediments were investigated and cleaned up from 2003 to 2007 in accordance with a consent decree Ecology entered into with Avista. The remedy involved the removal and containment of PCB-contaminated sediments. Due to the design of the selected remedy to cap contaminated sediments in place, PCBs remain in sediments at concentrations exceeding the selected cleanup level for the site. Post-remediation surface and subsurface sediment sampling were required to be performed as part of the Cleanup Action Plan. Surface grab samples were collected from material on top of the cap, and subsurface sediment profile cores were collected from the cap extending into the material below the cap. In addition, a bathymetric survey was conducted prior to each sampling event to evaluate cap thickness and help select locations for the surface and subsurface sediment samples. Avista completed the scheduled monitoring of the engineered cap during Year 2 (2008) and Year 4 (2010) following cap construction. Bathymetric comparisons, visual observations, and chemical analyses performed during the monitoring events verified the integrity and protectiveness of the cap, including through a 25-year flood event.

Ecology has determined, based upon review of the collected data, that: 1) the cleanup remedy implemented at the Site is currently protective of human health and the environment; and 2) monitoring of the effectiveness of the remedial action and the integrity of the cap should continue in the future at a rate of once every five years to ensure long-term protectiveness (Ecology, 2015a). It is noted that there were some other smaller identified sediment deposits not remediated, since the PCB concentrations of these deposits are lower than 48 ug/Kg, which Ecology recently described as the "most stringent sediment value protective of human health and the environment," including surface water standards. These sediments are not a significant source of concern.

5.2.2 General Electric Co.

The General Electric Co. site is approximately 1200 feet south of the Spokane River in Spokane, and less than two acres in size. The site was used by General Electric to operate a transformer service shop from 1961 to 1980. Oils containing PCBs were released to soils during service operations. Investigations in the mid to late 1980s confirmed the presence of PCBs in soils and groundwater. Cleanup actions began in 1991. Remedies accepted as complete in 1999 included vitrification, removal, containment, groundwater monitoring, and institutional controls. Institutional controls include fencing the General Electric property, inspecting and maintaining an asphalt cap, and recording of restrictive covenants. Cleanup is now considered complete and monitoring continues to ensure protection of human health and the environment. Periodic reviews have been conducted in 2003, 2008, and 2013, and have included the evaluation of groundwater data, inspection of the reports on the asphalt cap, and existing institutional controls. The most recent review concludes that the site cleanup continues to be protective of human health and the environment. Groundwater monitoring in seven of eight monitoring wells is in compliance with specified cleanup levels of 0.1 ug/l, with concentrations at the remaining well observed at up to 0.21 ug/l (Ecology, 2013). As discussed in the Future Actions section below, these cleanup levels are more than 500 times larger than the current PCB water quality criterion.

5.2.3 City Parcel

The City Parcel site covers just over half an acre. Spokane Transformer, Inc., repaired and recycled transformers at the site from 1961 through 1979. In 1979, the site was sold to City Parcel, Inc., a package delivery service. Soil samples collected between 1976 and 1997 consistently contained PCB contamination at concentrations exceeding both residential and industrial standards. Groundwater has been sampled multiple times, and no contamination was detected after 2002. Ecology conducted a state-funded feasibility study and developed a cleanup action plan in 2004 that included removing the building, contaminated soil, all drain lines and dry wells and an underground storage tank. In 2009, the building was demolished, and contaminated debris were removed. Contaminated soil was also excavated and disposed off-site at this time. Soil samples taken following this revealed PCB contamination along the northern and western fence lines surrounding the property. The fence on the northern edge was removed, and PCB-contaminated soil was excavated and backfilled with clean soil in 2014. Similar work to clean up the contamination on the western boundary of the property was completed in 2015. Ecology will conduct periodic reviews at least every five years to ensure that site uses continue to protect human health and the environment (Ecology web site).

5.2.4 Kaiser Aluminum

The Kaiser Aluminum Fabricated Products facility had in the past used hydraulic oils containing high concentrations of PCBs for aluminum casting operations. Kaiser's past use and storage of PCB-contaminated oils contaminated the soil and underlying groundwater with PCBs. Since 2005, Kaiser has conducted a series of investigation and cleanup activities for soil and groundwater under the authority and requirements of Ecology's cleanup regulations, the state's MTCA. In 2012, Ecology issued an Amended Agreed Order requiring excavation of shallow soils and capping of deeper soil to address PCB contamination; these actions have been completed, resulting in the removal of 540 tons of soil that contained elevated levels of PCBs. The 2012 order also required Kaiser to initiate a PCB groundwater treatment pilot study by October 30, 2015. The contamination of groundwater underlying the Kaiser facility is primarily associated with the Casting Area of the facility, with PCB levels exceeding 500,000 pg/L (Hart Crowser, 2012). After completion of this pilot study, Ecology will issue a cleanup action plan that will specify the actions that Kaiser must take to remediate the PCB-contaminated groundwater. Cleanup levels in the plan will likely be guided by applicable surface water quality standards, although contribution from up-gradient PCB sources (discussed subsequently in Section 5.14) may be a confounding factor. Ecology estimates that this groundwater treatment system will be operational by 2020 (EPA, 2015).

5.2.5 Schedule and Monitoring Program

Because this is a Category A Control Action (maintain existing activities) with defined schedules and monitoring requirements, this Comprehensive Plan is not specifying additional scheduling or monitoring requirements beyond the long-term implementation effectiveness monitoring discussed in Section 6 of this Plan.

5.3 Category A: Stormwater Controls

Many of the communities in the Spokane River watershed are regulated by Municipal Separate Storm Sewer System (MS4) permits that will restrict discharges of PCBs to the river. While most of these regulations are not PCB-specific, the practices they require will indirectly reduce PCB loads via reduction in stormwater volume and/or reduction in suspended solids (a known carrier of PCBs) concentrations in stormwater. In addition to MS4 permits, the City of Spokane has committed to an Integrated Clean Water Plan. These existing stormwater control actions are described below.

5.3.1 NPDES Stormwater Permits for MS4s

The Washington communities of City of Spokane, City of Spokane Valley and Spokane County are covered under the Eastern Washington general MS4 Phase 2 stormwater permit. This permit has an effective date of August 1, 2014, and expires July 31, 2019. Washington State Department of Transportation (DOT) has a separate MS4 permit that was effective as of August 1, 2013. The Idaho communities and highway districts

(City of Post Falls, City of Coeur d'Alene, Post Falls Highway District, Lakes Highway District, and Idaho Transportation Department, District 1) will all be covered under the forthcoming general permit for all regulated MS4s in Idaho. The preliminary draft permit and fact sheet were issued in April 2016.

The Eastern Washington general permit requires permittees to allow Low Impact Development (LID) stormwater management techniques in new development and redevelopment projects, where feasible. Second, the permit features new requirements for permittees to cooperatively develop and conduct Ecology-approved studies to assess effectiveness of permit-required stormwater management program activities and "best management practices" (City of Spokane, 2014). Other components of existing MS4 permits that will lead to reduction of PCBs in stormwater include (from Ecology, 2012):

- All new development and redevelopment projects meeting a specified threshold must preserve natural drainage systems to the extent possible at the site.
- Stormwater collection and conveyance system, including catch basins, stormwater sewer pipes, open channels, culverts, structural stormwater controls, and structural runoff treatment and/or flow control facilities. The Operation and Maintenance (O&M) Plan shall address, but is not limited to, regular inspections, cleaning, proper disposal of waste removed from the system in accordance with street waste disposal requirements, and record-keeping. No later than 180 days prior to the expiration date of this permit, Permittees shall implement catch basin cleaning, stormwater system maintenance, scheduled structural BMP inspections and maintenance, and pollution prevention/good housekeeping practices. Decant water shall be disposed of in accordance with street waste disposal requirements.
- The O&M Plan shall address, for roads, highways, and parking lots, deicing, anti-icing, and snow removal practices; snow disposal areas and runoff from snow storage areas; material (e.g., salt, sand, or other chemical) storage areas; and all-season BMPs to reduce road and parking lot debris and other pollutants from entering the MS4. No later than 180 days prior to the expiration date of this permit, Permittees shall implement all pollution prevention/good housekeeping practices established in the O&M Plan for all roads, highways, and parking lots with more than 5,000 square feet of pollutant generating impervious surface that are owned, operated, or maintained by the Permittee.
- A minimum of 95% of all known stormwater treatment and flow control facilities (except catch basins) owned, operated or maintained by the Permittee shall be inspected at least once every two years before the expiration date of this permit, with problem facilities identified during inspections to be inspected more frequently.
- All catch basins and inlets owned or operated by the Permittee shall be inspected at least once by December 31, 2018, and every two years thereafter. Catch basins must be cleaned if the inspection indicates cleaning is needed to comply with maintenance standards.

The Idaho general MS4 permit (EPA, 2016) lists low-impact development as a topic to consider when permittees are developing their education and outreach programs. More specific to PCBs, there is required monitoring of stormwater discharges and catch basin sediments for PCBs at least twice per year for the Idaho permittees in the Spokane River watershed listed above. Permittees must report the total concentration of dioxin-like PCB congeners and use EPA method 1668C for analysis. Two or more permittees may cooperate to conduct any of the required monitoring.

5.3.2 City of Spokane's Integrated Clean Water Plan

The City of Spokane (2014) Clean Water Plan included the following measures that will reduce PCB loads to the Spokane River:

- The Cochran basin project "focuses on reducing the discharge of stormwater through infiltration, potentially using centralized bioinfiltration facilities located either near the TJ Meenach Bridge and/or near the existing Downriver Disc Golf Course. Estimated to cost $34 million, it will include an infiltration pond, piping, disc golf infiltration, near river biofiltration, and 1.25 MG storage tank. Estimated average load of PCBs removed in the treatment layer of the facility is 4.688 g/yr and estimated PCB load diverted (pollutants that are not removed in the facility and enter the vadose zone) is 0.29 g/yr. (City of Spokane, 2014)

- Section 6.2 of the plan describes the City's "Long-Term Approach to Reduce Stormwater Pollution" and focuses on the implementation of green infrastructure (GI) to intercept stormwater before reaching the combined sewer system. "Because of the multiple benefits provided by GI, the City of Spokane has adopted a long-term approach to implementing GI by coupling these improvements with other public infrastructure projects, and by encouraging use of its LID ordinance on private projects" (City of Spokane 2014).
- The City is also working to reduce or eliminate CSOs for their 20 NPDES-permitted outfalls, and has a performance standard that it is required to meet by 2017. Of the 20 outfalls, six have been addressed through implementation of CSO storage facilities. Additional efforts to control CSOs include elimination of one outfall and construction of storage tanks at three other outfalls. Additional CSO construction activities are scheduled for 2017 (City of Spokane 2014).

5.4 Category A: Low Impact Development Ordinance

Low-impact development (LID) describes a land planning and engineering design approach to manage stormwater runoff. LID uses on-site natural features to replicate the predevelopment hydrologic regime of watersheds through infiltrating, filtering, storing, evaporating, and detaining runoff close to its source. By reducing runoff volume, implementation of LID will ultimately lead to reduction in stormwater PCB load. The City of Spokane enacted a low-impact development ordinance in 2013 as part of the requirements of a consent decree entered into with the Spokane Riverkeeper as part of commitments made to improve water quality. It does not have any firm requirements, but simply encourages the use of these stormwater practices: "Low-impact development is encouraged for site development and redevelopment" (ORD C35021 Section 11). The ordinance also officially adopts the Eastern Washington Low Impact Development Guidance Manual as a technical reference for developers. There is a financial incentive for developers, as they will be granted a 10% discount on their stormwater fee for implementing LID practices into new or redeveloped projects.

5.5 Category A: Street Sweeping

Street sweeping is designed to remove debris and particulate matter from street surfaces for subsequent disposal, thus preventing these materials from being washed into the stormwater system during wet weather and delivered to the river. Because PCBs are strongly associated with particulate material, street sweeping can reduce PCB loading from stormwater. Several communities in the Spokane River watershed conduct regular street sweeping.

The City of Spokane primarily conducts street sweeping during summer through fall with a priority on arterial roads, followed by residential areas. The downtown business district is swept every other Thursday morning. To pick up the heavy and fine debris and dust, each crew has a mechanical broom, regenerative air broom, a street flusher and a hauling truck. Street sweeping in Spokane Valley is done by a contractor with frequency determined by specified priority areas. Highest priority areas are authorized to be swept twice a month. Priority two areas are authorized to be swept once during the month. All other areas will be authorized by the City as determined necessary. The Contractor uses regenerative air type sweepers for arterial sweeping. Sweeping along curbs is done using a high-efficiency vacuum sweeper. Residential streets in Coeur d'Alene are swept an average of four times yearly and all arterials are swept twice monthly. Two sweepers are employed at a time and they work from spring to fall. Street sweeping in

Post Falls is accomplished by rotating the sections of City four days a week from May through September. Liberty Lake cleans arterial roads once monthly and residential roads twice yearly. Spokane County conducts street sweeping in the spring and early summer to remove the gravel that has been applied to icy roads. Street sweeping waste is disposed of either through transfer to decant facilities or transport to landfill.

5.6 Category A: Purchasing Standards

The State of Washington enacted legislation in 2014 that directed the Washington Department of Enterprise Services to "establish purchasing and procurement policies that provide a preference for products and products in packaging that does not contain polychlorinated biphenyls" (RCW 39.26.280). The legislation also precluded other State agencies from knowingly purchasing "products or products in packaging containing polychlorinated biphenyls above the practical quantification limit except when it is not cost-effective or technically feasible to do so." This legislation was adopted, in part, as a result of Task Force efforts to discourage use of products containing PCBs. In June of 2014, the City of Spokane enacted a similar municipal ordinance providing a preference in City purchases for products and products in packaging that do not contain PCBs. Spokane County passed an almost identical resolution (#2014-1022) in December 2014. Implementation of the municipal ordinances should reduce the introduction of materials containing PCBs, and also facilitate the development of an economic market with reduced amounts of PCBs (EPA, 2015).

5.7 Category B: Support of Green Chemistry Alternatives

Category B Control Actions consist of those actions where the group identified improvements that could be made to existing efforts. The first Category B Control Action corresponds to Support of Green Chemistry Alternatives, which is designed to reduce inadvertent PCB production through the development of alternative (non-chlorinated) products or products with reduced levels of PCBs.

5.7.1 Existing Actions

The Washington State Department of Ecology provides a range of technical support and expertise to educators (http://www.ecy.wa.gov/greenchemistry/edumain.html) looking to incorporate green chemistry into teaching materials, manufacturers looking to understand the potential impacts of the ingredients (http://www.ecy.wa.gov/greenchemistry/chazassess.html) in their products, and to the general public who want to know which are safer choices (http://www.ecy.wa.gov/greenchemistry/saferchoice.html) for products such as the EPA "Safer Choice" label. Ecology also provides training and other educational resources about safer chemical alternatives and green chemistry (http://www.ecy.wa.gov/programs/hwtr/shoptalkonline/current_issue/story_three.html).

Ecology has partnered with Northwest Green Chemistry (http://www.northwestgreenchemistry.org/) on some of these information resources and tools, including organization of a session called "Green Chemistry Design for a Rainbow of Colorants," at the Green Chemistry and Engineering Conference held in Portland (OR) on June 2016. EPA also supports Green Chemistry, via funding of research and support of activities such as the Presidential Green Chemistry Challenge (https://www.epa.gov/greenchemistry).

5.7.2 New Actions

The Task Force will provide additional support to existing Green Chemistry efforts as follows:

- Provide guidance and feedback to Ecology related to current and potential ongoing Green Chemistry efforts

- Assist Ecology in its Green Chemistry efforts to contact other parties, including EPA and universities, to provide feedback on existing efforts and/or solicit participation in future Green Chemistry efforts.

5.8 Category B: PCB Product Testing

This Control Action consists of further study of the extent to which commercial products contain inadvertently produced PCBs, as well as creation of a database to store the collected information. This Control Action also includes public education on products containing PCBs, providing consumers the opportunity to select products with lower PCB content.

5.8.1 Existing Actions

As discussed above in the section on Available Data, many projects have been conducted and/or are ongoing related to testing of PCBs in commercial or consumer products. The City of Spokane (2015a) collected and analyzed nearly 50 product samples to determine PCB content in various municipal products. The SRRTTF (2015) Hydroseed Pilot Project analyzed specific component(s) of hydroseed that may be contributing to elevated PCB levels. Ecology (2014b) evaluated the presence of PCBs in 68 general consumer products and is preparing a forthcoming PCB product testing report analyzing 201 consumer products.

5.8.2 New Actions

The Task Force will provide additional support to existing Product Testing efforts as follows:

- Provide guidance and feedback to Ecology, including comments on the forthcoming PCB product testing report.
- Support Ecology in its development of a centralized clearinghouse containing PCB product testing information.
- Conduct public education on products containing PCBs.

5.9 Category B: Waste Disposal Assistance

This Control Action consists of programs (targeted at household consumers and businesses that generate small quantities of PCBs) designed to accept and properly dispose of PCB-containing items, thus preventing legacy non-fixed building sources such as small appliances and lamp ballasts from potentially being disposed of improperly.

5.9.1 Existing Actions

Several voluntary programs currently exist to assist consumers and businesses in properly disposing waste materials. The Spokane River Forum sponsors a Waste Directory (http://spokaneriver.net/wastedirectory/) that provides information describing which waste products may contain PCBs, as well as providing information on proper methods for disposing these materials. Spokane EnviroStars (http://spokaneenvirostars.org/) is a voluntary program that certifies local small businesses having practices and policies in place demonstrating proper management and reduction of hazardous and other waste.

In addition, the State of Washington has established a Mercury-Containing Lights Product Stewardship Program (Chapter 173-910 WAC) to collect and properly dispose of mercury-containing lights. While this program is currently targeted towards control of mercury, it could be adapted to also consider PCB-containing wastes. The States of Washington (http://www.ecy.wa.gov/programs/swfa/eproductrecycle/)

and Idaho (http://www.deq.idaho.gov/waste-mgmt-remediation/hazardous-waste/electronic-waste/) also support programs to recycle electronic waste, which could address PCBs in small capacitors.

5.9.2 New Actions

The Task Force will provide additional support to existing Waste Disposal Assistance efforts as follows:

- Provide recommendation to implementing organizations on how they can better control PCB-containing wastes
- Raise public awareness on how to identify and dispose of PCB-containing items

5.10 Category B: Regulatory Rulemaking

This Control Action consists of regulatory reform of Federal TSCA and FDA's food packaging regulations to: 1) revisit currently allowed concentration of PCBs in chemical processes; 2) eliminate or reduce the creation of inadvertently generated PCBs; and 3) reassess the current use authorizations for PCBs.

5.10.1 Existing Actions

The Task Force and individual members have had continuing engagement with State and federal agencies to lobby for reform of existing regulations, including providing evaluation and comment on rulemaking activities.

5.10.2 New Actions

Paint manufacturers providing road paint to transportation agencies are currently required to use pigments compliant with a strictly controlled "color box." These color box requirements can only be met through the use of PCB-containing diarylide pigments. The Task Force will seek to attain State/federal level changes to color box requirements for road paints, allowing the use of PCB-free (or essentially PCB-free) pigments in these paints.

5.11 Category B: Compliance with PCB Regulations

This Control Action consists of requiring stricter accountability for compliance with existing rules. Potential activities include enforcement of existing TSCA rules to ensure imported and manufactured products are complying with allowable PCB levels, and enforcement of rules related to used oil burning.

5.11.1 Existing Actions

The Task Force and individual members have had continuing engagement with State and federal agencies providing comments related to draft NPDES permits (e.g., the recent general hatchery permit), Clean Water Act compliance activities, and waterbody assessments such as 303(d) lists.

5.11.2 New Actions

Ecology's Environmental Assessment Program (Ecology, 2016c) is currently undertaking a study that will provide information on atmospheric transport of PCBs. The Task Force will review results of this study when it becomes available to assess the need for regulatory control of atmospheric PCB sources such as used oil burning.

5.12 Category B: Emerging End of Pipe Stormwater Technologies

While many options currently exist for controlling stormwater PCB loads, they typically focus on activities to capture PCBs, but not destroy them. Newer technologies, such as mycoremediation, are being investigated that could lead to actual PCB destruction.

5.12.1 Existing Actions:

The Lands Council has begun an innovative mycology project that uses a native species of fungi, called white rot fungi, to break down persistent PCBs from stormwater. Because PCBs are chemically similar to the wood that these fungi naturally eat, the fungi can break down these chemicals without experiencing toxic effects. White rot fungi have been shown to break down PCBs under laboratory conditions, and The Lands Council is seeking to test this utility on a much larger scale in the field to identify the potential for WRF to be used to prevent PCBs from entering the Spokane River. If successful, this novel method could have broad implications for cost-effective cleanup at contaminated sites. The Lands Council currently has a contract with the City of Spokane for an initial mycoremediation experiment, which is looking at 'fungal treatment' of vactor waste on a small scale. This experiment is ongoing, with results expected in early spring of 2017.

5.12.2 New Actions:

The existing experiment could be considered Phase 1 of a larger study. Specific activities to be conducted in upcoming phases will depend upon results of Phase 1. The Task Force will review Phase 1 findings and identify and/or support additional phases of research projects that meet Task Force goals. The specific nature of this support will be determined after Phase 1, and could include identification of grant opportunities, support to the Lands Council of pursuit of these grant opportunities, and/or other funding.

5.13 Category C: Building Demolition and Renovation Control

Category C Control Actions consist of news actions. The first Category C Control Action corresponds to building demolition and renovation control. Fixed building sources have been identified as one of the largest source areas of PCBs in the Spokane watershed. Building demolition and renovation activities provide the potential to mobilize these fixed PCBs, making them more amenable to transport to the Spokane River. This Control Action consists of providing educational materials that inform contractors of proper methods of management of PCB-containing materials and waste during building demolition and renovation.

The San Francisco Estuary Institute (SFEI) conducted a study to estimate the total content of PCBs in caulk in buildings throughout the Bay Area and the potential load of PCBs from demolition and remodeling sources to San Francisco Bay (Klosterhaus et al., 2011). A companion project was led by the San Francisco Estuary Project (SFEP) and focused on how to reduce this load of PCBs (SFEP, 2011). They developed descriptions of several different management practices for managing PCBs in caulk during building demolition or remodeling, related to:

- Building Occupant Notification: communication of health and safety goals prior to beginning a project
- Worker Training: proper identification, handling and disposal of PCB-contaminated materials
- Personal Protective Equipment (PPE): protection of human health and limit the spread of contaminated materials
- Work Area Containment: prevention of the spread of contaminated dust
- Tools and Equipment: selection of appropriate tools that minimize dust generation

- Demolition: includes dust management, discharge of wastewater, and removal of other hazardous materials
- Site Erosion and Sediment Controls
- Work Area Housekeeping and End of Project
- Transport and Disposal

5.13.1 Actions

The specific actions to be implemented by the Task Force relative to Building Demolition and Renovation Control are:

1. Adapt the SFEP document to make it suitable for use as a guidance document for Spokane-area building contractors.
2. Work with relevant local government agencies responsible for permitting to ensure that the guidance document be distributed as part of all building permits related to building demolition and renovation.

5.14 Category C: Identification of Sites of Concern for Contaminated Groundwater

As discussed above in the section Remediate Known Contaminated Sites, Ecology has identified and initiated remediation activities on several sites believed to be contributing PCBs to the Spokane River. Activities conducted on behalf of the Task Force have identified the potential for additional sites of potential concern; specifically:

- Assessment of groundwater PCB data collected up-gradient of the known Kaiser groundwater contamination indicates the potential for a significant groundwater loading source independent of the Kaiser remediation (LimnoTech, 2016f)
- Homolog-specific mass balance analyses conducted with the 2015 and 2016 synoptic river survey data indicate the potential presence of a groundwater PCB loading source entering the river downstream of the Trent Avenue Bridge (LimnoTech, 2016d).
- Cleanup targets for many TCP sites are based on levels necessary to protect groundwater as a drinking water supply (adjusted for the Practical Quantitation Limit), and are not necessarily protective of river water quality standards. For example, the groundwater cleanup target concentration at the City Parcel and GE sites (0.1 ug/L) is approximately 600 times higher than the river water quality standard of 170 pg/l. Given that sites that have received No Further Action (NFA) designation may still contain groundwater PCB concentrations orders of magnitude higher than safe river concentrations, these sites have the potential to contribute to water quality standard violations in the Spokane River. Marti and Maggi (2015) identified 23 TCP sites with confirmed releases of PCBs to soil and/or groundwater that may merit further investigation in terms of potential to contribute problematic levels of PCBs to the Spokane River. There is also an EPA Superfund site consisting of a former oil recycling facility in Kootenai County, Idaho, near Rathdrum, where PCBs were a contaminant. Post-removal (1991) concentrations of PCBs (Aroclor 1260) in surface soil samples were generally non-detect, but there was one detection at 0.075 mg/kg.

Because these additional sites have the potential to cause or contribute to PCB impairment of the Spokane River, it is important to: 1) Determine whether they have the potential to be significant contributors of PCBs, and 2) Develop a plan for additional follow-up actions related to any source determined to be a potential contributor.

5.14.1 Actions

The Task Force will implement the following three-step process to identify sites of concern for contaminated groundwater:

1. Mine existing data
2. Consult with TCP
3. Determine next action (e.g., targeted monitoring)

5.14.1.a Mine Existing Data

Initial activities will consist of compiling and reviewing available data to assess the potential significance of new groundwater sites to contributing PCBs to the Spokane River. Separate activities will be conducted for each of the three categories of sites described immediately above.

With respect to the potential source up-gradient of Kaiser, existing data have largely been mined to the extent necessary to define that a source exists and that its magnitude is potentially of concern. Recent evaluations of hydrogeological and groundwater quality information collected by Kaiser show that there likely is an up-gradient source of PCBs entering via groundwater within the gaining portion of the river from just downstream of Sullivan Road to Kaiser monitoring well MW-15 (approximately 1.1. miles). This conclusion is based on available PCB homolog data collected from Kaiser monitoring wells, which show a difference between the PCB homolog patterns between the Kaiser site related monitoring well data and up-gradient and cross-gradient monitoring well data collected outside these areas (LimnoTech, 2016f). The Kaiser site related data are dominated by the tri- and tetra-homolog groups, while the up-gradient/cross-gradient PCB data are dominated by the tetra-, penta- and hexa-homolog groups (data shown in Figure 17 for locations shown in Figure 18).

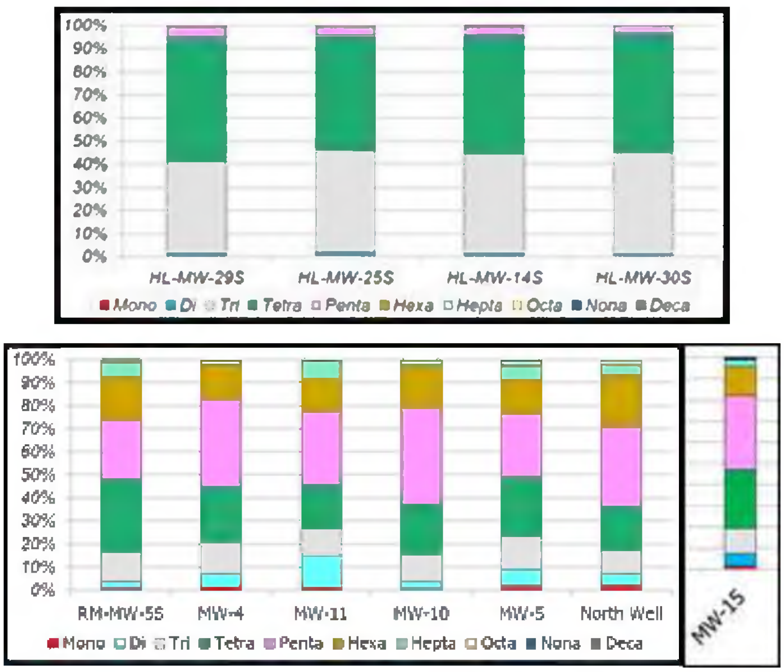

Figure 16. Homolog Distribution of Groundwater Monitoring Data Collected from Kaiser Plume (top) and Up-Gradient/Cross-Gradient Wells (bottom)

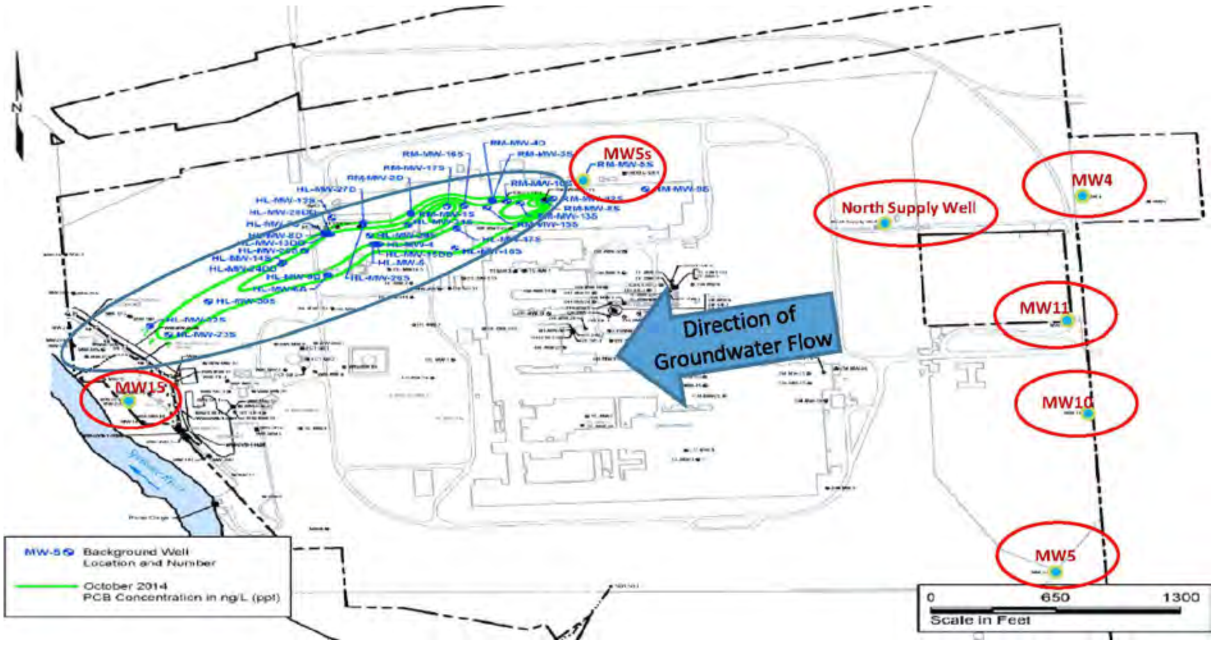

Figure 17. Kaiser Site Map Showing Location of Kaiser Plume (Blue Circle) and Up-Gradient/Cross-Gradient Wells (Red Circles)

For this stretch of the river, an initial up-gradient PCB loading estimate of 14 to 55 mg/day was calculated, assuming a representative seepage rate of 0.01 cfs per linear foot of river (Kahle and Bartolina, 2007), and representative average up-gradient PCB concentrations ranging from 0.1 to 0.384 ng/L. Although this analysis is not rigorous enough to prove that a significant up-gradient source exists, it is rigorous enough to show that up-gradient sources merit additional consideration.

The source of the up-gradient PCB groundwater loads is unknown, but the Spokane Industrial Park area may be one contributor. This observation is based on:

- The up-gradient location of the Industrial Park relative to the Kaiser boundary monitoring wells. These wells historically have shown detectable concentrations of PCBs up to 6 ng/L (median = 0.1 ng/L).
- Ecology's Urban Waters Initiative has identified the Industrial Park as a likely source of PCBs prior to 1994 (http://www.ecy.wa.gov/urbanwaters/spokaneriver.html).
- Past use of the area as a Naval Supply Depot.
- The presence of approximately 500 Underground Injection Control (UIC) wells registered in the UIC database as non-municipal stormwater wells that generally are 7 to 10 feet deep (Marti and Maggi, 2015).

With respect to the suspected source downstream of the Trent Avenue Bridge, data mining activities will consist of more detailed homolog-specific mass balance assessments to estimate the magnitude of the load. The mass balance assessments conducted to date at this site have only considered river concentration data and stream flow to determine that a net loading of penta- through hepta-chloro PCB homologs occurs. The specific magnitude of this potential loading source was not assessed further due to the confounding effects of groundwater exchange mechanisms that are more complex than assumed in the original mass balance assessment. Data mining activities to be conducted under the Comprehensive Plan will consist of:

- Estimating groundwater gains and losses for the stream reach from available hydrogeologic data. Data related to this have been provided by Spokane County.
- Conducting a mass balance analysis for 2014 and 2015 synoptic survey data, using the gross gaining and losing flow estimates for this reach. This is in contrast to the prior mass balance assessment that only considered net groundwater flow to the reach.
- Calculate estimated loading rate and congener distribution of the potential source.
- Review existing TCP site information to identify potential contributing sites.

With respect to other TCP sites, data mining activities will consist of estimating the potential magnitude of loading from the 23 TCP sites with confirmed releases of PCBs identified by Marti and Maggi (2015). This will be done by:

- Calculating the amount of area potentially containing PCB concentrations at the cleanup target concentration, both in soil and groundwater.
- Reviewing existing hydrogeologic information to estimate groundwater seepage rates and flow paths for each site. Existing groundwater models from the USGS and the City of Spokane can be used to support this assessment.
- Merging areal extent, seepage rate and concentration estimates to calculate a potential loading contribution for each site.

5.14.1.b Package Information for and Consult with TCP

The results of the above data mining activities will be documented in a technical report, and shared with Ecology TCP staff. The Task Force will schedule a meeting (or meetings) with TCP to present and discuss results. Findings will be compared to those obtained by TCP (e.g., TCP will be conducting a separate assessment of the magnitude of the loading up-gradient of the Kaiser site). Result of the meeting(s) will feed directly in to the next step, determining subsequent actions.

5.14.1.c Determine next action

Based on the above findings and discussions, the Task Force will work with TCP to determine appropriate next steps, and the party (or parties) responsible for conducting them. Depending on findings from the data mining, next steps could include:

- Determining that certain sites are contributing to the impairment of the river, and identifying potential remediation actions.
- Targeted monitoring to better define the contribution of sites determined to be potentially important.
- Exclusion of certain sites that are determined to be insignificant contributors to the impairment of the river.

Should previously identified sites be determined to be contributing to impairment in the Spokane River, it is important to note that Ecology staff have indicated that TCP will not re-open activities at a site if the site has settled its liability, met cleanup levels and a remedy has not failed. EPA, however, may be able to provide assistance if this situation occurs.

5.15 Schedule and Monitoring Program

This section presents the schedule by which each of the Category B (expansion of existing action) and Category C (new actions) Control Actions will be implemented, and lists specific milestones and metrics for measuring effectiveness. This Comprehensive Plan is not specifying additional scheduling or monitoring requirements for Category A Control Actions (maintain existing activities), beyond the long-term implementation effectiveness monitoring discussed in Section 6 of this Plan.

For purposes of scheduling, the Task Force divided the implementation activities into tiers of:

- Actions that can begin being implemented in the short term
- Actions that will require development of new work plans

5.15.1 Actions that Can Begin Being Implemented in the Short Term

The Task Force determined that the following control actions can begin implementation in the short term:

- PCB Product Testing
- Compliance with PCB Regulations
- Emerging Stormwater Technologies

Milestones, timelines, effectiveness metrics, and parties who will serve in a leadership role for each of these Control Actions are provided below in Table 11.

For the Control Action PCB Product Testing, the first milestone consists of the provision of comments on Ecology's PCB product testing report within the public comment period of the draft report. The second milestone consists of demonstrated support to Ecology, regarding development of a PCB product testing clearinghouse. This support will consist of three steps: 1) Initial outreach to Ecology to determine if/how the Task Force can provide support; 2) Definition of the specific support to be provided; and 3) Provision of support. Initial outreach will be conducted within one year of issuance of the Comprehensive Plan, and future schedules assessed as part of the Implementation Review report. Initial public education efforts will be conducted within one year of issuance of the Comprehensive Plan, and could consist of activities such as disseminating information when tabling at events, educating youth at outreach events, and/or presentations at social civic groups. More detailed effectiveness metrics for public education will be defined below in Section 5.15.2 on Actions That Require Development of New Work Plans.

For the Control Action Compliance with PCB Regulations, the first milestone consists of maintaining existing activity in terms of providing comments on recurring regulatory issues. Comments will be provided on an ongoing, as-needed basis, and assessed as part of the Implementation Review report. The second milestone consists of review of the Ecology atmospheric transport study, and a determination made regarding the need for more regulatory control of atmospheric sources such as used oil burning. Should atmospheric sources be identified as a contributor of PCBs worthy of additional controls, the final milestone consists of providing support to agencies on regulatory revisions regarding the relevant sources.

For the Control Action Emerging End of Pipe Stormwater Technologies, the first milestone consists of the Task Force reviewing the Phase 1 results of the Lands Council work and providing feedback on next steps. The second milestone consists of identification of the appropriate level of Phase 2 support, and provision of that support. Review and comment of the Phase 1 report will be accomplished within one year of completion of the Phase 1 report, while identification/provision of support will be provided within three months of the submittal of comments.

Table 11. Milestones, Timelines and Effectiveness Metrics for Actions that Can Begin Being Implemented in the Short Term

Control Action	Milestone	Action Timeline	Measurement Metric	Lead Group
PCB Product Testing	Provide comments on the PCB product testing report	Within public comment period for draft report	Were comments provided?	Full Task Force
	Provide input to Ecology in support of its efforts towards development of a clearinghouse	Initial effort within one year of issuance of Comprehensive Plan; evaluate effort needed annually	Was input provided? (see text for discussion)	Full Task Force or individual members as appropriate
	Provide public education on PCB containing products	Annual review of outreach activity	Has outreach been conducted? (see text for discussion)	Education and Outreach Work Group
Compliance with Existing PCB Regulations	Provide comments on identified regulatory issues	Within public comment period for issues that are identified	Were comments provided on identified issues?	TSCA Work Group or full Task Force as appropriate
	Review Ecology's atmospheric deposition study results	Within public comment period for draft report	Was report reviewed and input provided?	Technical Track Work Group
	Support agencies on regulatory revisions that are driven by Ecology's atmospheric deposition study	Within public comment period for draft report	Was input on regulatory revisions provided?	TSCA Work Group or full Task Force as appropriate
Emerging Stormwater Technologies	Review of Phase 1 results	Within twelve months of receiving Phase 1 results report	Was report reviewed and comments provided?	Technical Track Work Group
	Support Phase 2 if Phase 1 results warrant	Within three months of reviewing Phase 1 results report	Was support defined and provided if appropriate?	Technical Track Work Group

5.15.2 Actions That Require Development of New Work Plans

The Task Force determined that the following Control Actions were important to implement, but will require additional consideration and development of specific work plans before schedules can be developed for them.

- Support of Green Chemistry Alternatives: Specific actions to be undertaken were discussed in Section 5.7.2 above. Potential milestones include demonstrated tangible outreach to Ecology, EPA, and/or universities, as well as tangible improvement in Green Chemistry efforts due to Task Force actions.
- Waste Disposal Assistance: Specific actions to be undertaken were discussed in Section 5.9.2 above. Potential milestones include providing specific recommendations to implementing organizations and raised public awareness on how to identify and dispose of PCB-containing items.

- Regulatory Rulemaking: Specific actions to be undertaken were discussed in Section 5.10.2 above. Potential milestones include continuing the existing ongoing dialogue with EPA and legislators regarding reform of TSCA and FDA's food packaging regulations; outreach to governmental agencies and paint manufactures regarding color box requirement; and ultimately to have the color box requirement changed to allow the use of PCB-free pigments..
- Building Demolition and Renovation Control: Specific actions to be undertaken were discussed in Section 5.13.2 above. Potential milestones include adaptation of the SFEP (2001) report to provide guidance relevant to Spokane; coordination with local governments to have the guidance document routinely distributed with relevant permits; and ultimately a demonstrated change in contractor behavior in response to the guidance provided.
- Identification of Sites of Concern for Contaminated Groundwater: Specific actions to be undertaken were discussed in Section 5.14.2 above. Potential milestones include an assessment document describing data mining activities; coordination with TCP, resulting in a consensus plan for future action; determination of whether each site under consideration is a sufficient contributor of PCBs to the Spokane River to merit remediation activities; and initiation of remedial activities on sites determined to be significant.

Work plans containing milestones, timelines, and effectiveness metrics for each of these Control Actions will be developed within one year of issuance of the Comprehensive Plan.

While not technically a Control Action, a work plan will also be developed within one year of issuance of the Comprehensive Plan pertaining to education and outreach. Because the connections between sources of PCBs and their potential eventual arrival in the water column and aquatic food web often involve human behaviors, education will be a key aspect in controlling their transport and fate. SRRTTF outreach and education will focus on effectively changing behaviors to reduce toxics in the Spokane River. An ongoing Education and Outreach work group will explore additional funding to enhance existing member educational efforts. The group will implement a comprehensive outreach strategy with measurable targets to assess implementation and outreach effectiveness. To that end, the SRRTTF will also optimize existing opportunities (events/media) to change behaviors and reduce PCB loading to the Spokane River.

6 Future Activities

In addition to the Implementation Activities described above, the Task Force intends to conduct additional activities in the future to assess implementation effectiveness, and to consider additional Control Actions and studies to fill identified data gaps.

6.1 Implementation Effectiveness Assessment

The Implementation Plan section above contains effectiveness metrics specific to each Control Action, designed to assess whether each action is being implemented and performing as planned. The effectiveness of the Task Force's implementation of Control Actions will be assessed through the preparation of an annual Implementation Review Summary. The report will determine the extent to which each individual milestone listed in this section was attained, and will provide flexibility to adapt strategies, phase out actions that are not working, and phase in new Control Actions as appropriate.

In addition to the annual Implementation Review Summary, the Task Force will also conduct a broader implementation effectiveness assessment (Implementation Assessment Report) within five years designed to review all available data to assess:

- PCB loading to the Spokane River from the primary delivery mechanisms, and changes in loading over the evaluation period.
- Spokane River PCB concentrations, and changes in concentration over the evaluation period.

PCB loading in the five-year Implementation Assessment Report will be evaluated for the primary delivery mechanisms described previously as follows. PCB loading from wastewater treatment plants will be assessed via review of all effluent monitoring data collected by each plant as part of its NPDES permit requirements. Groundwater loading near Kaiser will be assessed via review of data collected by Kaiser as part of its ongoing remediation efforts. Stormwater/CSO loading will be assessed via review of post-implementation performance data to be collected by the City of Spokane as part of its Integrated Clean Water Plan. Changes in loading from Lake Coeur d'Alene will be assessed via review of observed Spokane River PCB concentrations in Idaho being collected as a requirement of NPDES permits in Idaho.

In-river concentrations will be assessed via review of long-term river monitoring data to be collected by the Task Force and/or Ecology. Statistical tests will be applied as appropriate to determine if statistically significant reductions have occurred in loads and in-river concentrations. In addition to assessment of the change in River concentrations, river concentrations will also be compared to existing water quality standards.

The above assessment will be conducted five years after the issuance of this Comprehensive Plan. If PCB loads and/or concentrations are not decreasing, the Task Force may identify, evaluate, and select new Control Actions (or modify existing Control Actions) in an adaptive manner to ensure that reductions occur in the future. It is expected that the implementation effectiveness assessment will be repeated on a five-year basis.

6.2 Consideration of Additional Control Actions

As discussed above, numerous Control Actions were placed in Category D, defined as "Include in Comprehensive Plan as an activity worth exploring in the future." The commitment to these actions is to give them future consideration, but with no specific commitment towards implementation at this time. This section describes the following Control Actions identified as Category D:

- Education on Septic Disposal
- Survey Schools and Public Buildings
- Accelerated Sewer Construction
- Emerging Wastewater Technology
- Survey of Local Electrical Equipment
- Leak Prevention/ Detection in Electrical Equipment
- Regulation of Waste Disposal
- Stormwater Source Tracing
- Removal of Carp from Lake Spokane
- PCB Identification during Inspections
- Compliance with PCB Regulations for Imported Products

Each is described below. The Task Force will consider the need to implement any of these Control Actions as part of their annual Implementation Review Summary. It needs to be recognized that the Task Force does not have the authority to impose requirements, but can make recommendations to the appropriate jurisdictions or agencies on the following control actions.

6.2.1 Education on Septic Disposal

This Control Action is designed to educate on-site septic system owners located over the aquifer recharge area on proper disposal of wastes (e.g., not "down the drain") and on the environmental and functional benefits of regular tank pumping.

6.2.2 Survey Schools and Public Buildings

This action consists of programs designed to survey PCB-containing materials in schools/public buildings and enact a program to dispose of them properly or implement encapsulation.

6.2.3 Accelerated Sewer Construction

This action consists of acceleration of sewer construction to replace septic systems. Spokane County has completed its mandatory septic tank elimination program for septic tanks within the Urban Growth Area (UGA) in areas that have sewer available, requiring connection within a year of notification and enforcement through the Prosecutor's office. There is currently no planned effort to eliminate every septic system within the UGA, due to reasons such as:

- Installation of sewers in low-density areas is not cost-effective.
- Certain land uses are exempt by state law from the requirement to connect to sewer, even when available (e.g., manufactured home parks).

There are still areas in Kootenai County where septic tanks located over identified Critical Aquifer Recharge Areas could theoretically be connected to sewers.

6.2.4 Emerging Wastewater Technology

This action consists of regular outreach to researchers/contractors in the field of wastewater treatment to stay abreast of potential new technologies for PCB removal.

6.2.5 Survey of Local Electrical Equipment

This action would conduct a survey of local utilities and other owners of electrical equipment to document the presence/amount of PCBs in transformers. Identify PCB-containing equipment (nominal 1 ppm concentration) that has a reasonable pathway to the river, if spilled, and target for removal.

6.2.6 Leak Prevention/ Detection in Electrical Equipment

This action consists of implementation of State and/or local ordinance to require a leak prevention/detection system for any PCB-containing transformer or capacitor.

6.2.7 Regulation of Waste Disposal

This action consists of programs designed to review local/regional laws regulating waste disposal (including used oil burning) and illegal dumping, and revise as necessary (e.g., enforcing fines/other penalties for improperly disposing of PCBs.)

6.2.8 Stormwater Source Tracing

Through Ecology's Urban Waters Initiative, a team of Ecology staff and specialists from the Spokane Regional Health District have sampled water and visited businesses along the river to identify sources of toxic chemicals, including PCBs (Ecology, 2012). These studies are designed to identify potential hot spots (i.e., areas contributing an inordinately high amount of PCBs) that could be controlled in the future. This action consists of considering these source tracing activities to identify significant sources of PCBs to the Spokane stormwater system.

6.2.9 Removal of Carp from Lake Spokane

This action involves removing carp from Lake Spokane. Carp in the lake are known to be contaminated with PCBs, and removing them would prevent further cycling in the watershed. This Control Action was suggested as a complement to existing studies conducted by Avista regarding removal of carp from Lake Spokane for the purposes of phosphorus removal.

6.2.10 PCB Identification during Inspections

This action consists of identifying PCB-containing materials as part of other regular inspections (e.g., building permits, IDDE, facility inspections). It involves training inspectors to identify materials and what to do next (safe disposal, encapsulation, etc.).

6.2.11 Compliance with PCB Regulations

This control action consists requiring stricter accountability for compliance with existing rules, specifically enforcement of existing TSCA rules to ensure imported and manufactured products are complying with allowable PCB levels.

6.3 Studies to Address Data Gaps

Due to the diffuse nature of PCB source area, poorly defined pathways between source areas and delivery mechanisms, and uncertain environmental response, the Task Force will contemplate additional studies to address some key data gaps. The Task Force will consider the need to conduct any of these studies as part of their annual Implementation Review Summary. It is noted that some of these studies may be conducted by Ecology's Environmental Assessment Program, in which case the Task Force will provide review and comment.

6.3.1 Key Data Gaps

Key data gaps identified by the Task Force correspond to bioaccumulation of PCBs in fish and assessment of sediment PCB concentrations. Measured water column PCB concentrations in the Spokane River are currently at levels similar to, and often below, the listed water quality standard. Fish tissue concentrations, however, remain well above target levels.

There is also a commonly held assumption that legacy bottom sediments are not a significant contributor to PCB impairment of the Spokane River because: 1) The River is viewed as sediment-poor, with many non-depositional zones, and 2) Remediation activities have been conducted at areas of known legacy sediment contamination. This assumption may not be accurate, however, as there are known areas of sediment deposition in impounded sections of the river that have not been sufficiently sampled to provide a clear understanding of sediment PCB contributions. Furthermore, assessment of congener patterns in PCB sources, bottom sediments, and fish may provide insight on the sources most responsible for existing fish tissue levels.

6.3.2 Study Plan

The Task Force intends to address these key data gaps in a three step process, consisting of: 1) Screening-level mining of existing data, 2) Formatting of data, 3) More rigorous assessment. Results of the screening analyses will inform understanding of the importance of water column vs. sediment sources in contributing to fish tissue contamination, and likely sources of PCBs to sediments and fish. These high-level results will also help target areas where more rigorous assessment is needed. Rigorous assessment of PCB congener patterns require the data to be stored in a particular format that is different from the format currently used to store the data. The second phase of work will consist of compiling and formatting all relevant data into a database into the required format. The final phase of work will consist of the implementation of more rigorous studies that are identified as part of the screening level assessment. Details regarding the specific scope and schedule for this work will be developed by the Task Force's Technical Track Work Group.

7 References

Avista, 2015. Lake Spokane Dissolved Oxygen Water Quality Attainment Plan. 2014 Annual Summary Report. May 19, 2015.

Avista and Golder, 2012. Lake Spokane Dissolved Oxygen Water Quality Attainment Plan. Spokane River Hydroelectric Project FERC Project No. 2545 Washington 401 Certification. Section 5.6. October 5, 2012.

Canfield D. E. and J. Farquhar, 2009. Animal Evolution, Bioturbation and the Sulfate Concentration of the Oceans. Proceedings of the National Academy of Sciences of the United States of America 106:20 8123-8127 pp.

Chapra, S. C., 1996. Surface Water Quality Modeling, Edition 1. McGraw-Hill Higher Education. New York, New York.

City of Spokane, 2014. Integrated Clean Water Plan Final. December 2014. https://static.spokanecity.org/documents/publicworks/wastewater/integratedplan/integrated-spokane-clean-water-plan.pdf

City of Spokane, 2015a. PCBs in Municipal Products Revised. July 21, 2015. City of Spokane Wastewater Management Department. Grant No. G1400545

City of Spokane, 2015b. Report: PCB Characterization of Spokane Regional Vactor Waste Decant Facilities. September, 2015

CPMA (Color Pigments Manufacturers Association), 2010. Comments of the Color Pigments Manufacturers Association, Inc. on the Advanced Notice of Proposed Rulemaking Regarding Reassessment of Use Authorizations for Polychlorinated Biphenyls, 75 Fed. Reg. 17645, April 7, 2010, Docket Control No. EPA-HQ-OPPT-2009-0757.

Diamond, M. A., L. Melymuk, S. A. Csiszar and M. Robson, 2010. Estimation of PCB Stocks, Emissions, and Urban Fate: Will our Policies Reduce Concentrations and Exposure? Environ. Sci. Technol. 2010, 44, 2777–2783.

Donovan, J. 2015, Excel Spreadsheet "City of Spokane Stormwater Flow and PCB load Estimate JeffD 11-12-2015.xlsx" transmitted in November 19, 2015 email "RE: City of Spokane Stormwater Flow"

Era-Miller, B., 2011. Memo: Toxics Atmospheric Deposition in Eastern Washington State - Literature Review. Prepared for Elaine Snouwaert, November 15, 2011. Project code 10-124. 29 p.

Era-Miller, B., 2014. Spokane River Toxics Sampling 2012-2013 – Surface Water, CLAM and Sediment Trap Results. Washington Department of Ecology, Environmental Assessment Program. May 30, 2014.

Era-Miller, B., 2016. Project: Spokane River – PCBs and other Toxics – Long Term Monitoring at the Spokane Tribal Boundary, July 2016: Summary of Preliminary Findings to Date. Presentation to Spokane River Regional Toxics Task Force, July, 2016. http://srrttf.org/wp-content/uploads/2016/07/Spokane-LT-Prelim-data-update-for-7-8-16.pdf

Ecology, 2004. Stormwater Management Manual for Eastern Washington. September 2004. Washington Department of Ecology. Publication Number 04-10-076

Ecology, 2004. Stormwater Management Manual for Eastern Washington. Publication No. 04-10-076. https://fortress.wa.gov/ecy/publications/documents/0410076.pdf

Ecology, 2005. Draft Cleanup Action Plan Spokane River Upriver Dam PCB Site Spokane, WA. Prepared by Washington State Department of Ecology Toxics Cleanup Program. March 2005.

Ecology, 2011. Control of Toxic Chemicals in Puget Sound, Phase 3: Primary Sources of Selected Toxic Chemicals and Quantities Released in the Puget Sound Basin. Publication No. 11-03-024. November 2011.

Ecology, 2012. Eastern Washington Phase II Municipal Stormwater Permit. August 1, 2012. Washington Department of Ecology.

Ecology, 2012. Spokane River Urban Waters Source Investigation and Data Analysis Progress Report (2009-2011). Publication No. 12-04-025. https://fortress.wa.gov/ecy/publications/documents/1204025.pdf

Ecology, 2013. Third Periodic Review (Draft Final) General Electric Spokane Site. March 2013. Washington Department of Ecology Eastern Regional Office, Spokane, WA.

Ecology, 2014a. Freshwater Fish Contaminant Monitoring Program. May 2014. Washington Department of Ecology. Publication No. 14-03-020

Ecology, 2014b. Polychlorinated Biphenyls (PCBs) in General Consumer Products. June 2014. Washington Department of Ecology. Publication No. 14-04-035.

Ecology, 2015a. PCB Chemical Action Plan. Publication 15-07-002. February, 2015. https://fortress.wa.gov/ecy/publications/documents/1507002.pdf

Ecology, 2015b. Lake Spokane: PCBs in Carp. July 2015. Publication No. 15-03-022.

Ecology, 2015c. Periodic Review: Spokane River Upriver Dam and Donkey Island PCB Sediment Site. Eastern Regional Office, Toxics Cleanup Program, Spokane, WA, December 2015.

Ecology, 2016a. Little Spokane River PCBs Screening Survey of Water, Sediment, and Fish Tissue. March 2016. Washington Department of Ecology. Publication No. 16-03-001.

Ecology, 2016b. Quality Assurance Project Plan, Spokane and Troutlodge Fish Hatchery PCB Evaluation. March 2016. Washington Department of Ecology. Publication No. 16-03-104.

Ecology, 2016c. Quality Assurance Project Plan Spokane River Atmospheric Deposition Study for PCBs. June 2016. Washington Department of Ecology. Publication No. 16-03-112.

Ecology, 2016d. Project: Spokane River – PCBs and other Toxics – Long Term Monitoring at the Spokane Tribal Boundary. July 2016. Washington Department of Ecology.

Ecology, 2016e. Quality Assurance Project Plan Long-Term Monitoring of Persistent, Bioaccumulative, and Toxic Chemicals using Age-Dated Lake Sediment Cores. Publication No. 16-03-118. September 2016.

Ecology and DOH, 2015. PCB Chemical Action Plan. Prepared by Washington State Department of Ecology and Washington State Department of Health, Publication no. 15-07-002. February 2015.

Endicott, D.D., 2005. 2002 Lake Michigan Mass Balance Project: modeling total polychlorinated biphenyls using the MICHTOX model. Part 2 in Rossmann, R. (ed.), MICHTOX: A Mass Balance and Bioaccumulation Model for Toxic Chemicals in Lake Michigan. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Laboratory, Mid-Continent Ecology Division, Large Lakes and Rivers Forecasting Research Branch, Large Lakes Research Station, Grosse Ile, Michigan. EPA/600/R-05/158, 140 pp.

Endicott, D.D., W.L. Richardson, and D.J. Kandt, 2005. 1992 MICHTOX: A Mass Balance and Bioaccumulation Model for Toxic Chemicals in Lake Michigan. Part 1 in Rossmann, R. (ed.), MICHTOX: A Mass Balance and Bioaccumulation Model for Toxic Chemicals in Lake Michigan. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Laboratory, Mid-Continent Ecology Division, Large Lakes and Rivers Forecasting Research Branch, Large Lakes Research Station, Grosse Ile, Michigan. EPA/600/R-05/158, 140 pp.EPA, 1982. 40 CFR Part 761 Polychlorinated Biphenyls (PCBs); Use in Electrical Equipment, Proposed Rule. Federal Register 47 (78), April 22.

EPA, 1982. 40 CFR Part 761 Polychlorinated Biphenyls (PCBs); Use in Electrical Equipment, Proposed Rule. Federal Register 47 (78), April 22.

EPA, 1998. Implementing the Binational Toxics Strategy, Polychlorinated Biphenyls (PCBs) Workgroup: Background Information on PCB Sources and Regulations. Proceedings of the 1998 Stakeholder Forum.

EPA, 2001. Removing PCBs from Light Fixtures: Protecting Students from Hidden Dangers. EPA Region 9. EPA 909B-00-003. May 2001.

EPA, 2015. EPA's Plan for Addressing PCBs in the Spokane River. July 14, 2015 Case 2:11-cv-01759-BJR

EPA, 2016. Preliminary Draft Idaho MS4 General Permit #IDR040000. USEPA Region 10, Seattle, WA. April 8 2016. https://www3.epa.gov/region10/pdf/permits/stormwater/Idaho-MS4GP-Preliminary-Draft-FactSheet-04082016.pdf

Friese, M. and R. Coots, 2016. Little Spokane River PCBs, Screening Survey of Water, Sediment, and Fish Tissue. Washington State Department of Ecology, Environmental Assessment Program. Publication No. 16-03-001. March 2016.

Golder Associates, Inc., 2005. Report of Coeur d'Alene Lake and Spokane River Sediment Routing. Prepared for Avista Utilities. May 12, 2005.

Guo, J., P. Praipipat, and L. A. Rodenburg, 2013. PCBs in Pigments, Inks, and Dyes: Documenting the Problem. 17th Annual Green Chemistry & Engineering Conference. June 18-20, 2013.

Guo J., S. L. Capozzi, T. M. Kraeutler, and L.A. Rodenburg, 2014. Global Distribution and Local Impacts of Inadvertently Generated Polychlorinated Biphenyls in Pigments. Environmental Science and Technology, 48, 8573-8580

HartCrowser, 2012. Final Site-Wide Groundwater Remedial Investigation, Kaiser Trentwood Facility, Spokane Valley, Washington, Volume I, prepared for Kaiser Aluminum Washington, LLC. May 2012.

Hu, D., and K. C. Hornbuckle. 2010. Inadvertent Polychlorinated Biphenyls in Commercial Paint Pigments. Environ. Sci. Technol. 2010, 44, 2822–2827.

Johnson, A. and D. Norton, 2001. Chemical Analysis and Toxicity Testing of Spokane River Sediments Collected in October 2000. Washington State Department of Ecology, Olympia, WA. Publication No. 01-03-019.

Kahle, S. C. and J. R. Bartolino, 2007. Hydrogeologic Framework and Ground-Water Budget of the Spokane Valley-Rathdrum Prairie Aquifer, Spokane County, Washington, and Bonner and Kootenai Counties, Idaho. U.S. Geological Survey, Prepared in cooperation with the Idaho Department of Water Resources and the Washington State Department of Ecology. Scientific Investigations Report 2007–5041.

Klosterhaus. S. D. Yee, A. Wong, L. Mckee, 2011. Polychlorinated Biphenyls in Sealants in San Francisco Bay Area Buildings: Estimated Stock in Currently Standing Buildings and Releases to Stormwater during Renovation and Demolition, October.

LimnoTech, 2013. Identification of Data Gaps - Final. Prepared for: Spokane River Regional Toxics Task Force, November 14, 2013.

LimnoTech, 2014. Quality Assurance Project Plan, Final, Spokane River Toxic Reduction Strategy. July 23, 2014. http://srrttf.org/wp-content/uploads/2013/05/QAPP_FINAL_081114.pdf.

LimnoTech, 2015. Spokane River Regional Toxics Task Force Phase 2 Technical Activities Report: Identification of Potential Unmonitored Dry Weather Sources of PCBs to the Spokane River Prepared for: Spokane River Regional Toxics Task Force. August 12, 2015. http://srrttf.org/wp-content/uploads/2015/08/SRRTTF_Phase_2_Final_Report_2015_08_12_without-appendices.pdf.

LimnoTech, 2016a. Sources and Pathways of PCBs in the Spokane River Watershed. Prepared for: Spokane River Regional Toxics Task Force, March 16, 2016.

LimnoTech, 2016b. DRAFT: Inventory of Control Actions to Be Evaluated for the Spokane River. Prepared for: Spokane River Regional Toxics Task Force, May 18, 2016.

LimnoTech, 2016c. DRAFT: Magnitude of Source Areas and Pathways of PCBs in the Spokane River Watershed. Prepared for: Spokane River Regional Toxics Task Force, June 22, 2016.

LimnoTech, 2016d. DRAFT: Spokane River Regional Toxics Task Force 2015 Technical Activities Report: Continued Identification of Potential Unmonitored Dry Weather Sources of PCBs to the Spokane River. Prepared for: Spokane River Regional Toxics Task Force, June 30, 2016.

LimnoTech, 2016e. Memorandum DRAFT: Cost/Effectiveness of PCB Control Actions for the Spokane River. Prepared for: Spokane River Regional Toxics Task Force, July 6, 2016.

LimnoTech, 2016f. Updated High Level Scoping for Groundwater Contamination Up-gradient of Kaiser. Presentation by: Dave Dilks and Joyce Dunkin. August 3, 2016 Presented to: SRRTTF Technical Track Work Group.

Marti, P. and M. Maggi, 2015. Assessment of PCBs in Spokane Valley Groundwater. Project Completion Memo. Washington Department of Ecology, Environmental Assessment Program. September 16, 2015.

Meijer, S. N., W. A. Ockenden, A. Sweetman, K. Breivik,; J. O. Grimalt, and K. C. Jones, 2003. Global distribution and budget of PCBs and HCB in background surface soils: Implications or sources and environmental processes. Environ. Sci. Technol., 37 (4), 667–672.

Miller, S.M., M.L. Green, J. V. DePinto, and K.C. Hornbuckle, 2001. Results from the Lake Michigan Mass Balance Study: Concentrations and Fluxes of Atmospheric Polychlorinated Biphenyls and trans-Nonachlor. Environmental Science and Technology. 35: 278-285.

Missoula County, 2010. Missoula Valley Water Quality District Disposal Guide: Ballasts and Capacitors. Missoula County Water Quality District.

Panero, M., Boheme, S., and Muñoz, G., 2005. Pollution Prevention and Management Strategies for Polychlorinated Biphenyls in the New York/New Jersey Harbor. February 2005. New York Academy of Sciences, New York, NY. Available at: http://www.nyas.org/WhatWeDo/Harbor.aspx.

Parsons, 2007. Spokane River PCB TMDL Stormwater Loading Analysis Final Technical Report. Prepared by Parsons Inc. for USEPA Region 10 and Washington State Department of Ecology, Olympia, WA. www.ecy.wa.gov/biblio/0703055.html.

San Francisco Estuary Institute (SFEI), 2010. A BMP Tool Box for Reducing Polychlorinated Biphenyls (PCBs) and Mercury (Hg) in Municipal Stormwater. San Francisco Estuary Institute, Oakland, CA.

http://www.sfei.org/sites/default/files/biblio_files/A_BMP_toolbox__FINAL_04-04-10.pdf

San Francisco Estuary Partnership (SFEP), 2011.Best Management Practices for Reducing PCBs in Runoff Associated with Demolition and Remodeling Projects. November, 2011.

Serdar, D., K. Kinney, M. Mandjikov, and D. Montgomery, 2006. Persistent Organic Pollutants in Feed and Rainbow Trout from Selected Trout Hatcheries. Washington State Department of Ecology. Publication No. 06-03-017.

Serdar, D., B. Lubliner, A. Johnson, and D. Norton, 2011. Spokane River PCB Source Assessment, 2003-2007. Washington Department of Ecology, Toxics Studies Unit, Environmental Assessment Program. Department of Ecology Publication No. 11-03-013.

Shanahan, C.E., S. N. Spak, A. Martinez, and K. C. Hornbuckle, 2015. Inventory of PCBs in Chicago and Opportunities for Reduction in Airborne Emissions and Human Exposure. Environ. Sci. Technol., 2015, 49 (23), pp 13878–13888.

Spokane County, City of Spokane, and City of Spokane Valley, 2008. Spokane Regional Stormwater Manual. https://www.spokanecounty.org/DocumentCenter/View/1640

Spokane River Regional Toxics Task Force, 2012a. Memorandum of Agreement Regarding Spokane River Regional Toxics Task Force January 23, 2012

Spokane River Regional Toxics Task Force, 2012b. First Draft Work Plan Adopted 10-24-2012

Spokane River Regional Toxics Task Force, 2015. Hydroseed Pilot Project Summary Report. July 31, 2015.

Spokane Valley-Rathdrum Prairie Aquifer Atlas, 2009. 2009 Update. http://www.spokaneaquifer.org/wp-content/uploads/2012/05/AquiferAtlas.pdf

Spokane Tribe of Indians, 2010. Surface Water Quality Standards, Resolution 2010-173. February 25, 2010.

U.S. Army, 2001. Fact Sheets and Information Papers: Disposal of PCB Capacitors from Light Ballasts. U.S. Army, Center for Health Promotion and Preventive Medicine. Aberdeen, MD.

USEPA, 2006. Results of the Lake Michigan Mass Balance Project: Polychlorinated Biphenyls Modeling Report. Rossmann, R. (Ed.) United States Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division-Duluth, Large Lakes and Rivers Forecasting Research Branch, Large Lakes Research Station, Grosse Ile, Michigan. EPA-600/R-04/167, 579 pp.

Venier, M. and Hites, R. A., 2010.Regression Model of Partial Pressures of PCBs, PAHs, and Organochlorine Pesticides in the Great Lakes' Atmosphere, Environmental Science & Technology, 44 (2), 618–623.

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Appendix A: Control Action Fact Sheets

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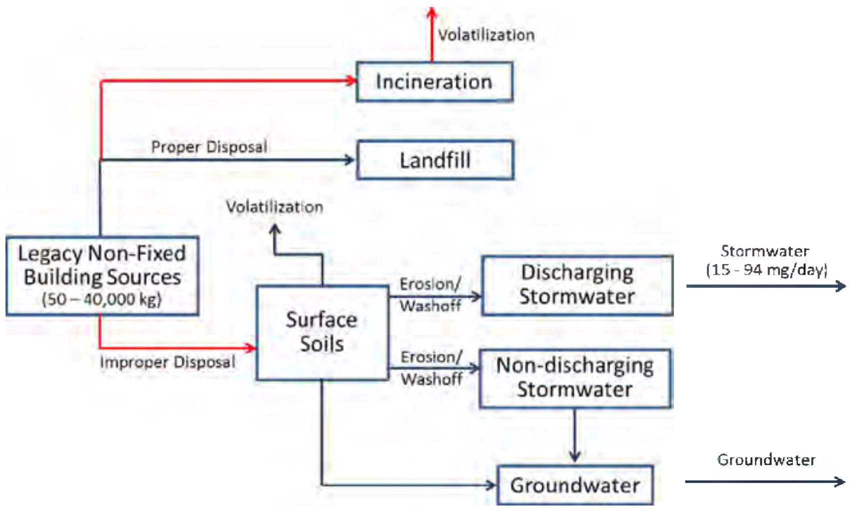
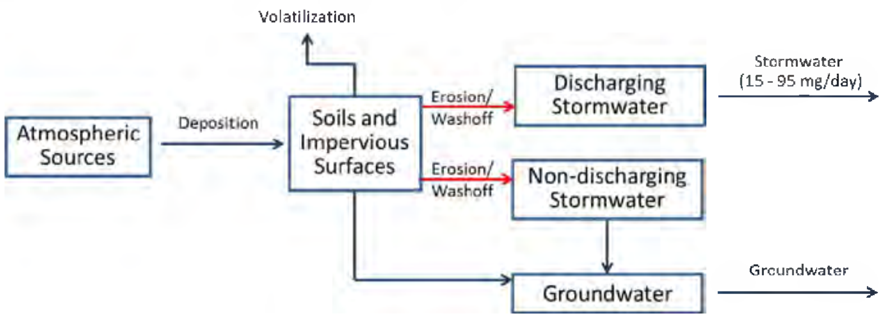
Waste Disposal Assistance

Description:	This action consists of programs (targeted at household consumers and businesses that generate small quantity hazardous waste) designed to accept and properly dispose of PCB-containing items, preventing legacy non-fixed building sources such as small appliances and lamp ballasts from potentially being disposed of improperly.
Group:	Institutional – governmental practices.
Significance of Pathway:	This control action targets legacy non-fixed building sources, which have been identified as one of the largest source areas of PCBs with an estimated mass range of 50 to 40,000 kg. The primary mechanisms delivering this source area to the river are stormwater and atmospheric deposition following waste incineration, both through improper disposal. The total stormwater load is 15 to 94 mg/day and the atmospheric load is not currently known. The specific portion of the total stormwater and atmospheric load contributed by legacy non-fixed building sources is also unknown, due to uncertainty in the number of appliances in the watershed, the percentage that may be improperly disposed, and the ultimate fate of those PCBs. 
Reduction Efficiency:	This control action is theoretically 100% effective in controlling the release of PCBs from items that would otherwise be improperly disposed. The overall efficiency is of this control action is unknown. However, increasing public education and awareness of existing recycling and household hazardous waste facilities would increase the number of PCB-containing items that are properly disposed.
Cost:	The infrastructure for this program largely exists in Washington via take-back programs for mercury-containing lights, such that costs to include PCB-containing products would consist largely of: 1) outreach and education programs for the general consumer and business community, and 2) additional costs associated with managing PCB wastes. Efforts to initiate such a program in Idaho would be greater. Because the cost of the statewide mercury take-back program was $8.7 million dollars for five years, the cost for application to the Spokane watershed (including Idaho) would be a fraction of that, likely more than $100,000 and less than $1 million.
Implementing Entity:	This action is currently being implemented by a number of organizations in Washington: Department of Ecology Hazardous Waste and Toxics Reduction program – Urban Waters Initiative; Spokane County Regional Health District; Spokane River Forum – Envirostars; local waste disposal vendors and local businesses that accept fluorescent lamps for recycling. Specific activities that that the Task Force could undertake include: 1) Making recommendations to organizations currently providing waste disposal assistance as to how they can help achieve their goals, and 2) Raise public awareness on how to identify and dispose of PCB-containing items.

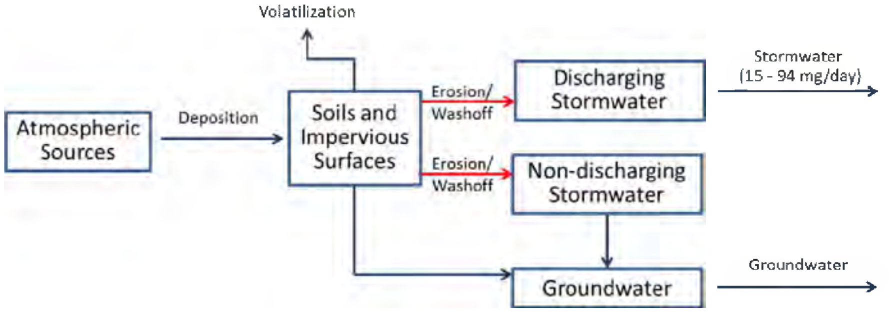
PP Hierarchy:	This control action is intermediate in the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	As discussed above, this action is available and could be better integrated with existing Control Actions targeted toward CFL lamp recycling and household hazardous waste collection.
Ancillary Benefit:	This action provides some ancillary benefits because PCB light ballasts and small capacitors are often associated with other items that have harmful materials in them (mercury containing lights). Outreach on this topic also promotes proper disposal of these items, and preventing environmental release of other harmful materials contained in them.
Time Frame:	Programs can likely be developed within two years, although it is not expected that measurable reductions in PCB loads will be observed with five years.

Low Impact Development (LID) Ordinance

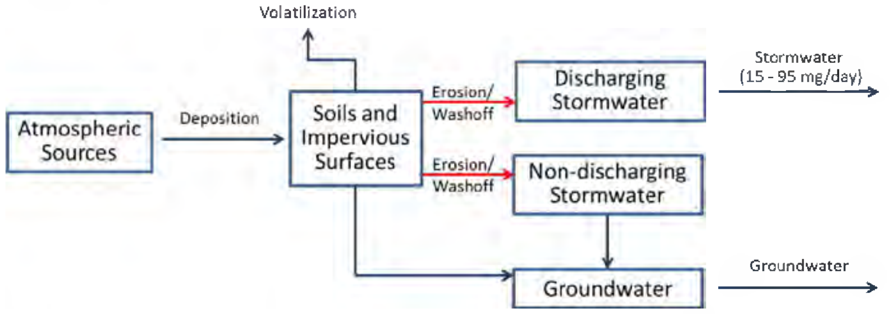
Description:	This action consists of creating and implementing land use/development ordinances or standards that encourage Low Impact Development (LID) and decrease impervious surfaces.
Group:	Institutional government practices
Significance of Pathway:	This control action is designed to prevent and minimize runoff from impervious surfaces and the PCBs that are contained in that runoff. The pathway for this action is primarily discharging stormwater systems, which delivers a total of 15 to 94 mg/day, This estimate is based upon loading from the City of Spokane, which contributes the majority of stormwater load to the river. This Control Action may be beneficial for other communities with stormwater discharges, although their contribution of PCBs to stormwater is not known. 
Reduction Efficiency:	Because PCBs in runoff are largely bound to soil particles, the efficiency of this control action can be estimated from the observed efficiency of LID on removing solids from runoff, which ranges from 40 to 88%. LID can also prevent stormwater from becoming contaminated by infiltrating it before it contacts contaminated surfaces such as roads. The portion of this load to the Spokane River that could be controlled by LID is unknown.
Cost:	Development and adoption of the ordinance in other communities (besides the City of Spokane which already has this type of ordinance) would likely be minimal (<$100,000) based on the information from the City of Spokane with their purchasing ordinance. However, related education and outreach efforts could be much more expensive ($100,000-$1million or more, depending on scope). Installation costs for Low Impact Development projects are project specific and would need to be evaluated with the ancillary benefits that offset the cost.
Implementing Entity:	This action is typically applied by the local agency responsible for managing land development (cities or counties). The City of Spokane LID program could serve as a model for implementation in other communities in the watershed.
PP Hierarchy:	This control action is intermediate in the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	A Low Impact Development ordinance has already been developed by the City of Spokane. Ecology has developed a guidance document to assist other jurisdictions with developing and implementing something similar. The Washington State Stormwater Center also has technical information and training resources for implementing low impact development projects in Eastern Washington.
Ancillary Benefit:	LID manages both stormwater and land use in a way that minimizes disturbance of the hydrologic processes, and uses on-site natural features that are integrated into an overall design so that stormwater practices include the use of natural processes such as transpiration, conservation, and infiltration. In addition to improved water quality, LID can reduce flooding, restore aquatic habitat, improve groundwater recharge, and enhance neighborhood beauty. This control action will provide other water quality benefits

	by reducing the loading of many other pollutants that are associated with solids and impervious surfaces (e.g. metals, bacteria).
Time Frame:	While LID ordinances can likely be developed within two years, the time frame for observing measurable reductions in PCBs is unknown.

Leaf Removal

Description:	This action consists of programs designed to enhance current municipal leaf removal programs since foliage is a receptor of atmospheric PCB loadings, and the organic matter in leaves can adsorb PCBs from other sources in runoff. Removal of leaf litter prior to it being discharged to the river could reduce loading PCB associated with this source area.
Group:	Institutional - government practices
Significance of Pathway:	This control action is theoretically 100% effective in controlling the release of PCBs from collected leaf litter. The fraction of overall leaf litter that would be captured by improved removal and the overall efficiency is of this control action is not fully known. 
Reduction Efficiency:	The overall efficiency is of this control action is not fully known. While it is theoretically 100% effective in controlling the release of PCBs from collected leaf litter, the fraction of overall leaf litter that would be captured by improved removal is currently unknown.
Cost:	This control action is generally being implemented, such that costs would consist of further expansion of the program and/or evaluation to see if leaf removal can be more efficient or effective. Costs associated with public outreach that encourage local residents to collect leaf litter and dispose of it as green waste through existing solid waste system could mitigate current program expenses.
Implementing Entity:	Municipalities and other local governments.
PP Hierarchy:	This control action is intermediate in the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	Leaf removal is already a government-provided service in the City of Spokane (seasonal), Spokane county (leaves can go in green bins collected by Waste Management), and Coeur d'Alene (last two weekends in April and September).
Ancillary Benefit:	This action provides secondary benefits beyond PCB removal by reducing the loading to the Spokane River of nutrients and oxygen-demanding material contained in leaf litter.
Time Frame:	While programs can likely be developed within two years, it is expected that measurable reductions in PCB loads will not be observed within five years.

Street Sweeping

Description:	This action consists of programs designed to modify current street sweeping frequency and area covered to specifically target source areas of PCBs, or when/where more material is washing down streets to prevent it from entering storm drains.
Group:	Institutional - government practices
Significance of Pathway:	This control action is targeted towards the portion of PCB contamination in stormwater runoff that accumulates on street surfaces. The primary mechanism delivering this source area to the river is discharging stormwater, which totals 15 to 94 mg/day. Due to the uncertainty in the extent of the stormwater load arising from street surfaces, the significance of this pathway is not fully known, but is likely a moderate contributor. 
Reduction Efficiency:	Studies to assess the ability of street sweeping to improve concentrations of particle-bound pollutant in stormwater have reported widely varying effectiveness. Several studies showed no significant differences in stormwater concentration in response to street sweeping (e.g. USGS, 2007) while other (e.g. Sutherland, 2009) have reported decreases in concentration of more than 50% and Contra Costa County, CA reported removal of 1 kg of PCBs via street sweeping. Ecology (2007) reported an average of 74% removal efficiency for TSS for street sweeping based on two studies conducted outside of WA state. Although there is a wide range of reported reduction efficiencies, street sweeping is rated as a highly suitable in terms of reduction efficiency.
Cost:	Spokane Valley's 2016 estimated street sweeping costs are $490,000, however there are no known provisions in the contract that specify practices (e.g., area swept, equipment used, frequency) to target PCBs in addition to the usual objectives. Based on this cost, any modification to current sweeping practices in order to specifically target PCB source areas would likely be a fraction of this cost and certainly <$100,000. Long term costs are judged to be moderate. For example, purchasing a new, high efficiency sweeper could cost $200,000-$300,000.
Implementing Entity:	Municipal Public Works Departments, State Departments of Transportation
PP Hierarchy:	This control action is intermediate in the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	This control action is primarily applicable to the City of Spokane, as they are responsible for the large majority of watershed area contributing to discharging stormwater systems. The City is currently developing and implementing an Integrated Clean Water Plan designed to control PCB loading from their stormwater systems, which includes street sweeping. It may be beneficial for other communities with stormwater discharges, although the size of their service area is relatively small.
Ancillary Benefit:	This action provides significant secondary benefits by reducing the loading to the Spokane River of pollutants typically associated with impervious surfaces, such as phosphorus.
Time Frame:	This control action can likely be developed within two years. Because street sweeping is already being applied, it is unlikely that modification to existing practices will show measureable benefits within the next five years.

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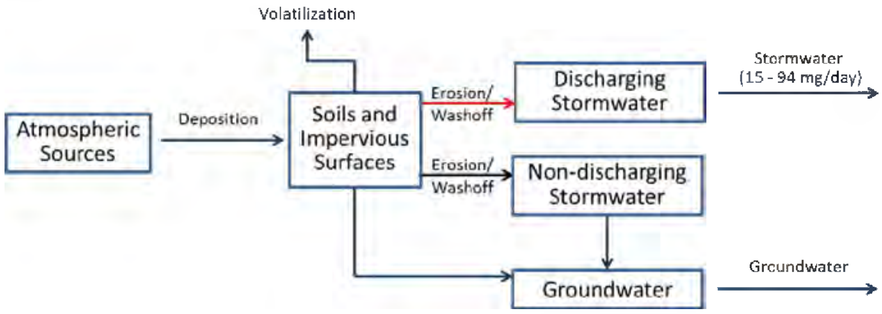
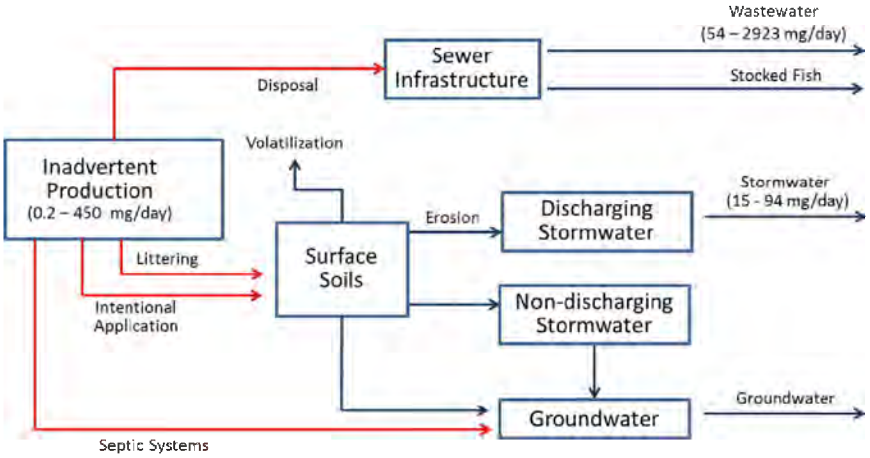
Catch Basin/Pipe Cleanout

Description:	This action consists of programs designed to increase the efficiency or effectiveness of catch basin and pipe cleanout to specifically remove PCB-contaminated sediment.
Group:	Institutional - government practices
Significance of Pathway:	This control action is targeted towards all pathways that deliver PCBs to discharging stormwater systems. The overall magnitude of the stormwater delivery pathway is 15-94 mg/day. Because this Control Action has the potential to affect the majority of delivered stormwater loads, the action is rated as highly suitable in terms of pathway. 
Reduction Efficiency:	While the exact reduction efficiency on the PCB overall loading rate is uncertain, the Control Action is effective in removing PCBs that could otherwise be delivered to the system. The City of Spokane removed 32.4 grams PCBs removed from their catch basins between 2010 and 2012 (Schmidt, 2015). This action also assists in source identification if PCB concentrations of the removed sediments are measured, as catch basins with higher PCB concentrations indicated elevated source areas in their drainage basis. Given the amount of PCB mass removed relative to overall stomwater loading, this action is rated as highly suitable.
Cost:	The City of Spokane spent just over $1 million on routine catch basin pumping each year (including staff, administration, dumping fees, and equipment). Increasing the frequency or changing the type of cleaning administered to catch basins in order to more effectively target PCB reduction would likely be a fraction of the total cost, or <$100,000 per year. Other communities' costs can be estimated based on the size of the city and number of catch basins. In 2015 the City checked 15,716 catch basins (of a total over 21,000) and pumped 1,723. The area they inspect includes the CSO area and drywells.
Implementing Entity:	Municipal Public Works Departments, Department of Transportation
PP Hierarchy:	This control action is intermediate in the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	This control action is primarily applicable to the City of Spokane, as they are responsible for the large majority of watershed area contributing to discharging stormwater systems. The City is currently developing and implementing an Integrated Clean Water Plan designed to control PCB loading from their stormwater systems, so independent development of Control Actions by the Task Force is considered redundant to this effort.
Ancillary Benefit:	This action provides secondary benefits by reducing the loading to the Spokane River of pollutants typically associated with solids (e.g. metals, bacteria) that are captured be catch basins. More frequent catch basin cleanout can also prevent flooding.
Time Frame:	This control action is currently being implemented. The extent to which additional catch basin and pipe cleanout will result in observable near-term reductions in stormwater PCB loads is unknown.

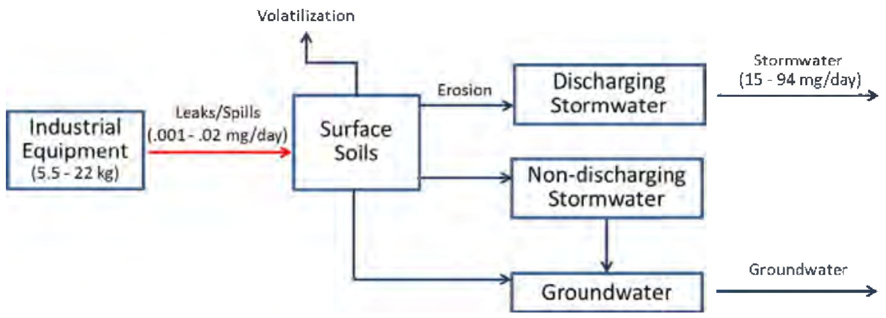
Purchasing Standards

Description:	This action consists of using existing local and state regulations to reduce or eliminate the purchase of products that contain PCBs. When wholistically implemented, it would include: 1) gathering information about PCB content in purchased products; 2) working with manufacturers to identify products with preferentially low concentrations of PCB; 3) preparing contract specifications for government purchased products in accordance with State law; and 4) providing public access to information and specifications that encourage the purchase of products with no or minimal concentrations of PCB.
Group:	Institutional - government practices
Significance of Pathway:	This control action is targeted towards the source area of inadvertently produced PCBs, which are estimated as entering the watershed at a rate of 0.2 to 450 mg/day. This class of PCBs is essentially unregulated so that it has the potential to significantly affect the delivery pathways for wastewater (54-2923 mg/day) and stormwater (15-94 mg/day) loading, although the specific contribution of inadvertent sources to these pathways is unknown. 
Reduction Efficiency:	This control action can theoretically reduce the contribution of affected inadvertent sources by 100%, if products currently containing PCBs can be replaced with PCB-free products. For this reason, it is rated as highly suitable in terms of reduction efficiency.
Cost:	The costs associated with this control action include: 1) Product identification and sampling; 2) Manufacturer outreach, 3) Contract specifications development and 4) public outreach. These costs are expected to be shared by implementing entities, depending on needs and funding availability.
Implementing Entity:	State governments (Departments of Ecology, Environmental Protection, Enterprise Services, Transportation), local jurisdictions within the watershed.
PP Hierarchy:	This control action in high on the Pollution Prevention hierarchy, as it is designed to reduce the use of inadvertently produced PCBs.
Existing Efforts:	Washington State Senate Bill 6086 (passed in 2014) requires State agencies to establish a purchasing and procurement policy that provides a preference for products that do not contain PCBs. (http://apps.leg.wa.gov/billinfo/summary.aspx?bill=6086&year=2013). Spokane County passed Resolution #2014-1022 in December 2014.The City of Spokane's ordinance requires City departments to purchase PCB-free items (defined as less than the practical quantification limit using EPA Method 1668) if a feasible alternative is available at less than a 25% cost increase (Spokane Municipal code 07.06.172).
Ancillary Benefit:	This control action supports Governor Inslee's Reducing Toxic Pollution efforts http://www.ecy.wa.gov/toxics/docs/ToxicsChemicals.pdf and Washington State Department of Ecology's "Reducing Toxic Threats" strategy: http://www.ecy.wa.gov/toxics/index.htm which aims at controlling the small but steady releases of toxic chemicals contained in everyday products that enter the environment and cause pollution. This

	control action creates market incentives to reduce PCBs found in products, which has a broader benefit than the Spokane watershed.
Time Frame:	Purchasing controls can be implemented in the short term. Given the time lag between implementing purchase controls and: 1) exhausting the supplies of previously purchased materials, and 2) having inadvertently produced PCBs make their way through the watershed to the Spokane River, it is not expected that noticeable improvements would be seen within five years.

Survey of Local Electrical Equipment

<table>
<tr><td>Description:</td><td>Conduct a survey of local utilities and other owners of electrical equipment to document the presence/amount of PCBs in transformers. Identify PCB-containing equipment (nominal 1 ppm concentration) that has a reasonable pathway to the river, if spilled, and target for removal.</td></tr>
<tr><td>Group:</td><td>Institutional - education</td></tr>
<tr><td>Significance of Pathway:</td><td>The action focuses on the potential for leaks or spills from industrial equipment, which has been estimated to be small (0.001 – 0.02 mg/day).


</td></tr>
<tr><td>Reduction Efficiency:</td><td>This action in and of itself will have no immediate impacts on PCB loads. If local utilities use this information to target and remove PCB-containing electrical equipment, it will be a step towards better source area identification and targeted Control Action implementation.</td></tr>
<tr><td>Cost:</td><td>An estimate to implement this control action at a statewide level in Washington Department of Ecology (2015) was less than $50,000 over two years. This was based on one FTE working 25% time on this project. At the watershed scale, it would likely be even less.</td></tr>
<tr><td>Implementing Entity:</td><td>States, Local utilities, industries with privately owned electrical equipment. The control action could be a regulatory requirement or voluntary action on the part of the utility. The latter is preferable as it meets the collaborative spirit of the Task Force.</td></tr>
<tr><td>PP Hierarchy:</td><td>This control action is intermediate in the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.</td></tr>
<tr><td>Existing Efforts:</td><td>A survey of local utilities was conducted as part of early stages of Comprehensive Plan development, and found that these utilities have already taken significant measures to reduce the PCB content in their equipment.</td></tr>
<tr><td>Ancillary Benefit:</td><td>This control action has the ancillary benefit of replacing older equipment, which is more likely to fail, with newer equipment; potentially reducing the number of spills and improving reliability.</td></tr>
<tr><td>Time Frame:</td><td>Given the very small magnitude of the source area, this Control Action is not expected to result in noticeable improvements in the next five years.</td></tr>
</table>

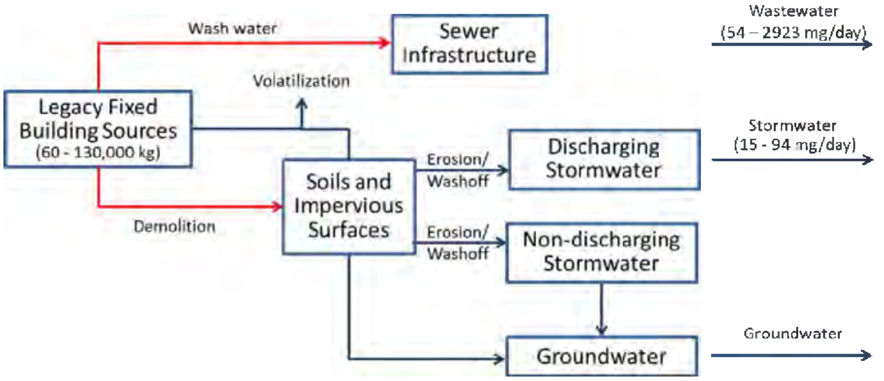
Regulation of Waste Disposal

Description:	This action consists of programs designed to review local/regional laws regulating waste disposal (including oil burning) and illegal dumping, and revise as necessary (e.g. enforcing fines/other penalties for improperly disposing of PCBs.)
Group:	Institutional--government practices
Significance of Pathway:	This action potentially affects a wide range of pathways, although the magnitude contributed by illegal disposal to any of these pathways is unknown.
Reduction Efficiency:	The reduction efficiency of this Control Action is unknown, but is likely small in terms of reducing the overall loading magnitude of any given pathway.
Cost:	The cost of this Control Action is unknown, but is expected to be less than $100,000
Implementing Entity:	Local governments.
PP Hierarchy:	This control action is intermediate in the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	None.
Ancillary Benefit:	This action may provide some limited ancillary benefit, by controlling improper disposal/release of other pollutants associated with illegal disposal.
Time Frame:	This Control Action is not expected to result in noticeable improvements in the next five years.

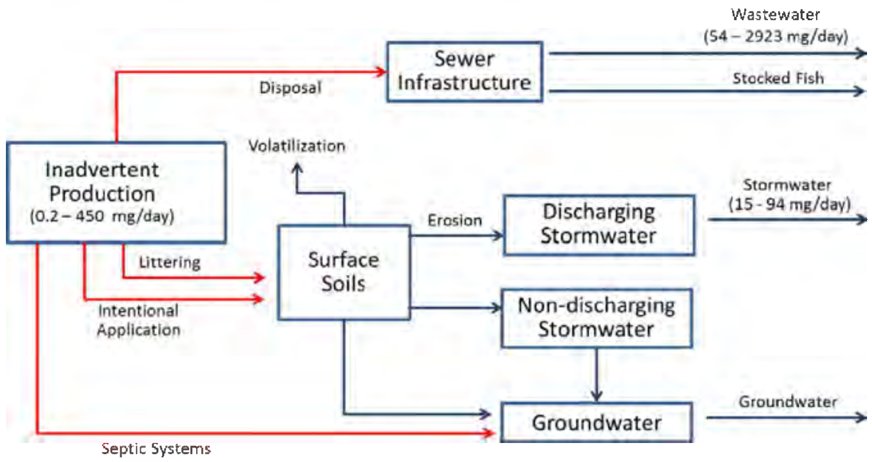
Removal of Carp from Lake Spokane

Description:	This action involves removing carp from Lake Spokane. Carp in the lake are known to be contaminated with PCBs, and removing them would prevent further cycling in the watershed.
Group:	Institutional--government practices
Significance of Pathway:	Removal of carp does not fall into the previously addressed delivery pathways, as those pathways all addressed external loads of PCBs to the system while carp represent a receptor of PCBs that have already been delivered. Nonetheless, this action can account for a significant amount of PCBs being removed, as removal of 1000 carp yields ranges of 1.5 – 4.1 grams of PCBs that could potentially be removed from Lake Spokane. If conducted on an annual basis, this corresponds to slightly less than 1% of the estimated load to the Spokane River.
Reduction Efficiency:	This is action is 100% efficient in removing PCBs from those carp that are harvested from in the lake, though 100% removal of carp in Lake Spokane is likely impracticable.
Cost:	Unknown at this point, though a pilot study is underway/planned.
Implementing Entity:	Avista Utilities and Washington Department of Ecology
PP Hierarchy:	This control action is at the bottom on the Pollution Prevention hierarchy, as it is designed to remove PCBs that are currently in the lake.
Existing Efforts:	This Control Action was suggested as a complement to existing studies conducted by Avista regarding removal of carp from Lake Spokane for the purposes of phosphorus removal. Should this effort be undertaken by Avista, there will be a direct removal of PCBs from the watershed and lake environment.
Ancillary Benefit:	This Control Action provides significant ancillary benefits. Removal of carp will also lead to a reduction in sediment phosphorus release caused by carp stirring up bottom sediments.
Time Frame:	This Control Action is not expected to result in noticeable improvements in the next five years.

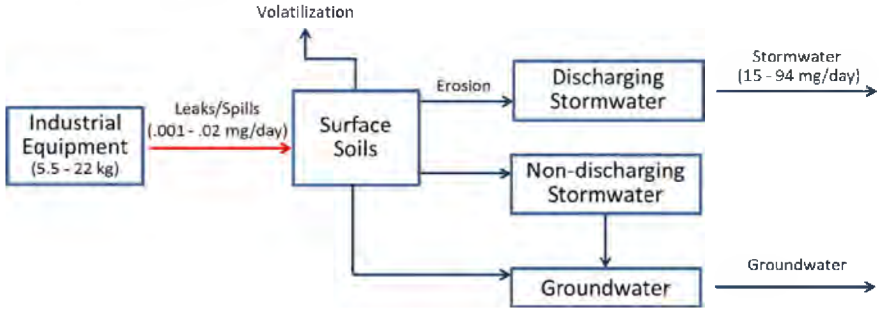
Building Demolition and Renovation Control Actions

Description:	This Control Action consists of establishing regulations or local ordinances that require management of PCB-containing materials and waste during building demolition and renovation.
Group:	Institutional - government practices
Significance of Pathway:	This Control Action is targeted towards legacy fixed building sources, which have been identified as one of the largest source areas of PCBs with an estimated mass range of 60 to 130,000 kg. Klosterhaus et al (2014) summarize the available literature that demonstrates that the rate that legacy PCBs can be delivered to surrounding soils during demolition and renovation, while uncertain, is likely very significant. Furthermore, PCBs liberated through renovation can be delivered through wash water to the sewer infrastructure. The delivery pathways by which these PCBs reach the river are large (stormwater systems at 15 to 94 mg/day; wastewater at 54 to 2923 mg/day). While the exact amount of PCBs which could be reduced by this action contribute to these delivery pathways is unknown, the magnitude of the source area and delivery pathways are so large that this may be a significant pathway. 
Reduction Efficiency:	The efficiency of this action is currently being investigated. Given that some regulations (e.g. Environ, 2014) require removal/remediation of all building materials with PCB concentrations greater than 50 ppb, this action has the potential to be highly effective in reducing loads.
Cost:	Costs to implement institutional-government programs would be associated with regulations, local ordinances or codes associated with managing demolition and removal projects and expected to be similar to the PCB-purchasing regulations and codes that were passed recently. In addition, there would be costs associated with public outreach and education to entities engaging in demolition and renovation. Costs to manage PCB-containing materials and debris are project specific and unknown. Estimated costs just to cut and remove caulk, and to scarify or remove adjacent substrates could range from $30-$50 per linear foot
Implementing Entity:	EPA, state, local governments.
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	While specific regulations are not currently in place EPA (2015) recommends that future MS4 permits should require that construction projects requiring a building permit contain requirements that the permit applicant implement specific Control Actions to minimize PCB release.
Ancillary Benefit:	This action may provide some limited ancillary benefit, by controlling improper disposal/release of other pollutants associated with building demolition. For example, a demolition practice that manages lead paint or asbestos may potentially be used to manage PCBs and vice versa.
Time Frame:	The time frame by which Building Demolition Control Actions would achieve noticeable reductions in loading is unknown.

PCB Product Labeling Law

Description:	This action consists of developing and passing an ordinance that requires labeling products that contain PCBs, similar to the 2014 law for labeling construction materials that contain asbestos (RCW 70.310.030).
Group:	Institutional--government practices
Significance of Pathway:	This control action is targeted towards the source area of inadvertently produced PCBs, which are being imported into the watershed at a rate of 0.2 to 450 mg/day. It has the potential to affect the significant delivery pathways of wastewater (54-2923 mg/day) and stormwater (15-94 mg/day) loading, although the specific contribution of inadvertent sources to these pathways is unknown. 
Reduction Efficiency:	The effectiveness of product labels to affect consumer behavior has been shown to vary widely based on many factors (Cox et al, 1997), such that the reduction efficiency is considered unknown at this time.
Cost:	Costs to be considered include regulatory rulemaking and public outreach. While the exact cost is unknown, it is expected to be under $100,000.
Implementing Entity:	Washington Department of Ecology, local governments
PP Hierarchy:	This control action is high on the Pollution Prevention hierarchy, as it is designed to reduce the use of inadvertently produced PCBs.
Existing Efforts:	There are currently no existing efforts regarding labeling products for PCBs. However, this control action is similar to an initiative taken by the Spokane Regional Clean Air Agency for asbestos in construction products.
Ancillary Benefit:	This control action raises public awareness about PCBs in products and supports Ecology's Reducing Toxics Threats initiative.
Time Frame:	Given the time lag between implementing product labeling and: 1) exhausting the supplies of previously purchased materials, and 2) having inadvertently produced PCBs make their way through the watershed to the Spokane River, it is not expected that noticeable improvements would be seen within five years.

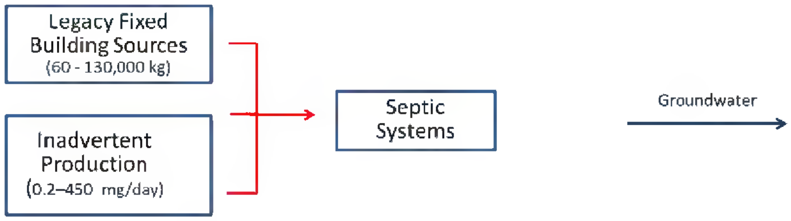
Leak Prevention/Detection in Electrical Equipment

Description:	This action consists of implementation of state and/or local ordinance to require a leak prevention/detection system in any PCB-containing transformer or capacitor.
Group:	Institutional--government practices
Significance of Pathway:	The action focuses on the potential for leaks or spills from industrial equipment, which has been estimated to be small (0.001 – 0.02 mg/day). 
Reduction Efficiency:	This action is expected to be highly effective, as it requires implementation of a system specifically designed to control this pathway.
Cost:	The cost creating an ordinance is expected to be under $100,000, although costs to utilities to implement the program will be higher.
Implementing Entity:	Washington Department of Ecology; local governments, utilities, electrical equipment owners
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	A survey of local utilities was conducted as part of Comprehensive Plan development, and found that these utilities have already taken measures to reduce the PCB content in their equipment. This action is therefore considered largely redundant.
Ancillary Benefit:	This control action has the ancillary benefit of replacing older equipment, which is more likely to fail, with newer equipment; potentially reducing the number of spills and improving reliability
Time Frame:	Given the very small magnitude of the source area, this Control Action is not expected to result in noticeable improvements in the next five years.

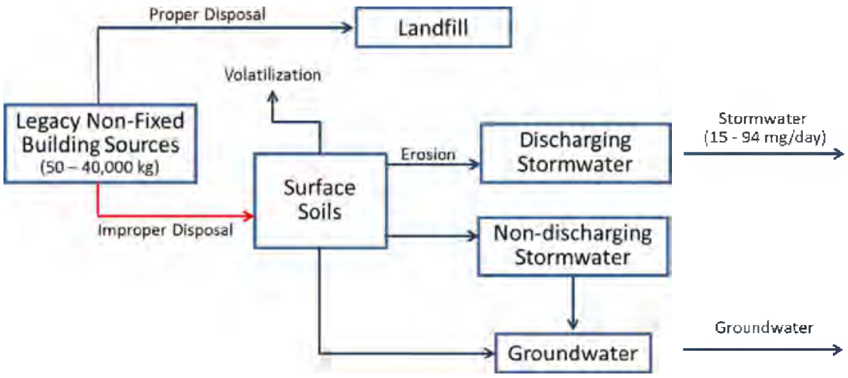
Environmental Monitoring

Description:	This is not technically a control action; rather, it consists of expanded environmental monitoring to identify the significance of uncertain source areas and pathways.
Group:	Institutional -- government practices
Significance of Pathway:	This action affects potentially all pathways.
Reduction Efficiency:	This action in and of itself will not have immediate impacts on PCB loads but will be a step towards better source area identification and targeted Control Action implementation.
Cost:	The cost of individual monitoring projects conducted to date by the Task Force have been small ($100,000) to moderate ($100,000 to $1,000,000).
Implementing Entity:	Spokane River Regional Toxics Task Force, Washington Department of Ecology, other entities
PP Hierarchy:	Depending upon that nature of the monitoring, this action could provide information on Control Actions throughout the entire range of the hierarchy.
Existing Efforts:	While several monitoring programs are currently in place, they are only addressing a small subset of the total number of uncertain source areas and pathways. Future studies would be targeted at investigating different source areas and pathways, such that there should be little overlap between new monitoring and existing monitoring.
Ancillary Benefit:	The ancillary benefit provided by monitoring will depend on the specific nature of the monitoring project, and could vary from negligible to significant. In addition to addressing data gaps needed to employ new control actions, monitoring can assess the effectiveness of individual control actions as well as the cumulative effectiveness of the comprehensive plan.
Time Frame:	This Control Action is not expected to result in noticeable improvements in the next five years.

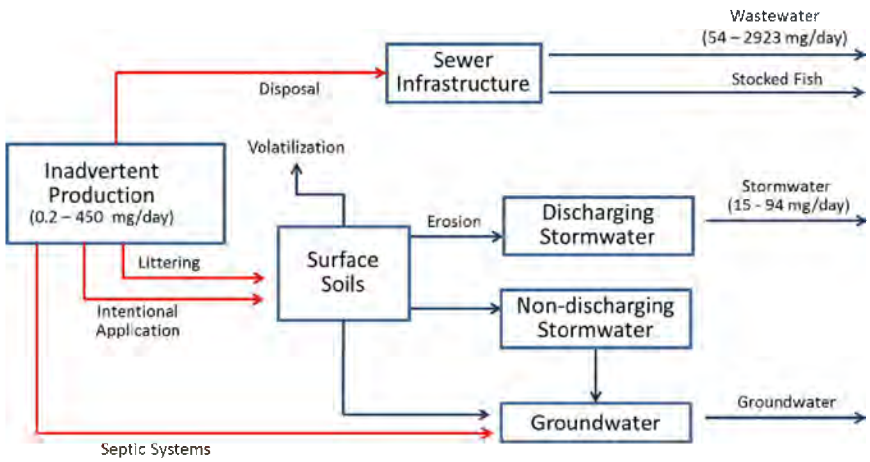
Accelerated Sewer Construction

Description:	This action consists of acceleration of sewer construction to replace septic systems.
Group:	Institutional--government practices
Significance of Pathway:	The source areas that contribute PCBs to septic systems are large. The ultimate delivery of these PCBs to the river and lake, while uncertain, is likely to be small. 
Reduction Efficiency:	This action will be nearly 100% efficient in removing loads from those septic systems that are not connected to a sewer system. Connection to a sewer system will transfer these loads to wastewater treatment plants, which will be effective in removing the PCBs. The PCB removal efficiency of a septic system is unknown, and may be equally effective as centralized wastewater treatment. While septic tank elimination has multiple benefits accelerated sewer construction may not result in the reduction of PCBs to the Spokane River.
Cost:	The cost for sewer construction is expected to be significant (i.e. much higher than the current $1M threshold used for evaluation).
Implementing Entity:	Local municipalities and governments.
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	Spokane County has a mandatory septic tank elimination program for septic tanks within the Urban Growth Area (UGA) in areas that have sewer available, requiring connection within a year of notification and enforcement through the Prosecutor's office. There is some overlap between the UGA and the Critical Aquifer Recharge Area (CARA), but still a large amount of area where sewer construction could help eliminate discharge to the CARA.
Ancillary Benefit:	This action will provide significant ancillary benefits, by removing the loading of a wide range of pollutants (e.g. nitrogen) to the aquifer.
Time Frame:	Given the very small magnitude of the source area, this Control Action is not expected to result in noticeable improvements in the next five years.

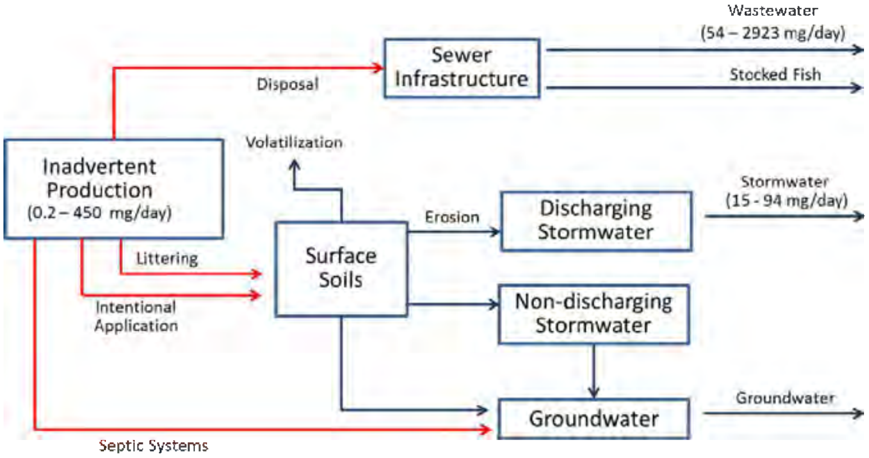
PCB Identification during Inspections

Description:	This action consists of identifying PCB-containing materials as part of other regular inspections (e.g., building permits, IDDE, facility inspections). It involves training inspectors to identify materials and what to do next (safe disposal, encapsulation, etc.).
Group:	Institutional -- government practices
Significance of Pathway:	This control action is targeted towards legacy non-fixed building sources, which have been identified as one of the largest source areas of PCBs with an estimated mass range of 50 to 40,000 kg. Due to the uncertainty in the number of appliances improperly disposed, as well as the ultimate fate of those PCBs, the significance of this pathway is considered unknown. 
Reduction Efficiency:	This action in and of itself will not have immediate impacts on PCB loads but will be a step towards better source area identification and targeted Control Action implementation.
Cost:	San Mateo County (CA) estimated their totai cost to add PCB product identification to a reguiar building inspector's task list to be about $5,500/year (planning was $1500/year and operating expenses were $4,000/year). Operating costs assumes 2 hours training/year plus 8 hours reporting/year per person for 5 people at $80/hr salary. This assumes that planning costs are good for a 10 year period. Based on this example, the cost to implement this control action in Spokane County would be relatively inexpensive, and definitely less than $100,000.
Implementing Entity:	Local governments.
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	The Washington Legislature recognized distressed urban waters (including the Spokane River) and created the Urban Waters Initiative (implemented by Ecology) and Local Source Control Program s (implemented by Regional County Health District). These programs regularly inspect hazardous waste generators and the works with local businesses to identify potential problems and provide technical assistance in correcting them.
Ancillary Benefit:	This action provides some ancillary benefit by identifying and helping to correct pollution sources other than PCB control.
Time Frame:	This Control Action is not expected to result in noticeable improvements in the next five years.

Regulatory Rulemaking

Description:	This action consists of regulatory reform of Federal TSCA and FDA's food packaging regulations (21 CFR 109) to 1) re-visit currently allowed concentration of PCBs in chemical processes; 2) eliminate or reduce the creation of inadvertently generated PCB; and 3) reassess the current use authorizations for PCBs.
Group:	Institutional -- government practices
Significance of Pathway:	This control action is targeted towards legacy sources as well as inadvertently produced PCBs, which are being imported into the watershed at a rate of 0.2 to 450 mg/day. It has the potential to affect the significant delivery pathways of wastewater (54-2923 mg/day) and stormwater (15-94 mg/day) loading, although its exact significance is unknown. 
Reduction Efficiency:	The overall efficiency is of this control action is unknown. Theoretically, it can reduce the contribution of affected inadvertent sources by 100%, if products currently containing PCBs can eliminated. In addition, the definition of PCBs under current use authorizations could be redefined to a number less than 50 ppm, which would help in the management of legacy PCB sources.
Cost:	The costs associated with this control action include costs needed to effectively engage with federal agencies (meetings, white papers, etc.) and costs incurred by the federal agencies to revise the regulations. These costs are unknown but could be substantial.
Implementing Entity:	The regulatory rulemaking will be implemented by Federal governments and agencies (e.g. EPA).
PP Hierarchy:	This control action is high on the Pollution Prevention hierarchy, as it is designed to reduce the creation of inadvertently produced PCBs. Federal rulemaking to reassess the current use authorizations for PCBs is intermediate on the Pollution Prevention hierarchy, as it is designed to manage the use of existing PCBs.
Existing Efforts:	A coalition of conservation groups, tribal organizations, cities, counties, business, industry, regulatory agencies, legislators, academics, Labor, trade organizations and many others have been working to get new rules introduced, but efforts to date have been unsuccessful. EPA currently has two use authorizations rulemakings underway that are relevant to this control action. The FDA does not have a similar rulemaking. However, the FDA rules are extremely old, with standards dating back to the early 1980s.
Ancillary Benefit:	If the FDA standards are revisited, this could potentially result in reducing exposure to PCBs in food sources and also in fish meal used by fish hatcheries.
Time Frame:	Given the time lag between implementing regulations and: 1) exhausting the supplies of previously purchased materials, and 2) having inadvertently produced PCBs make their way through the watershed to the Spokane River, it is not expected that noticeable improvements would be seen within five years.

Compliance with PCB Regulations

Description:	This control action consists requiring stricter accountability for compliance with existing rules. Potential activities include enforcement of existing TSCA rules to ensure imported and manufactured products are complying with allowable PCB levels, and enforcement of rules related to oil burning.
Group:	Institutional--government practices
Significance of Pathway:	This control action is targeted towards the source area of inadvertently produced PCBs, which are being imported into the watershed at a rate of 0.2 to 450 mg/day. It has the potential to affect the significant delivery pathways of wastewater (54-2923 mg/day) and stormwater (15-94 mg/day) loading, although its exact significance is unknown. 
Reduction Efficiency:	The overall efficiency is of this control action is unknown, due to uncertainty in the extent to which compliance with regulations currently exists.
Cost:	There is no direct cost to the Task Force associated with regulatory reform, although there are costs associated with attempting to educate legislators on the need for revisions that are likely small (<$100,000) to moderate ($100,000 to $1,000,000). Additional costs for this control action involve expenses associated with compliance and enforcement activities.
Implementing Entity:	Federal government.
PP Hierarchy:	This control action is high on the Pollution Prevention hierarchy, as it is designed to reduce the creation and use of inadvertently produced PCBs.
Existing Efforts:	The Task Force has requested this control action from the USEPA. The request remains relevant.
Ancillary Benefit:	A compliance program signals to producers of products that contain inadvertently produced PCBs (such as pigments) that violation of the TSCA manufacturing and import rules are not acceptable. This has the ancillary benefit of companies self-monitoring their own operations and reducing the overall production of this type of PCB.
Time Frame:	Given the time lag between requiring stricter accountability and: 1) exhausting the supplies of previously purchased materials, and 2) having inadvertently produced PCBs make their way through the watershed to the Spokane River, it is not expected that noticeable improvements would be seen within five years.

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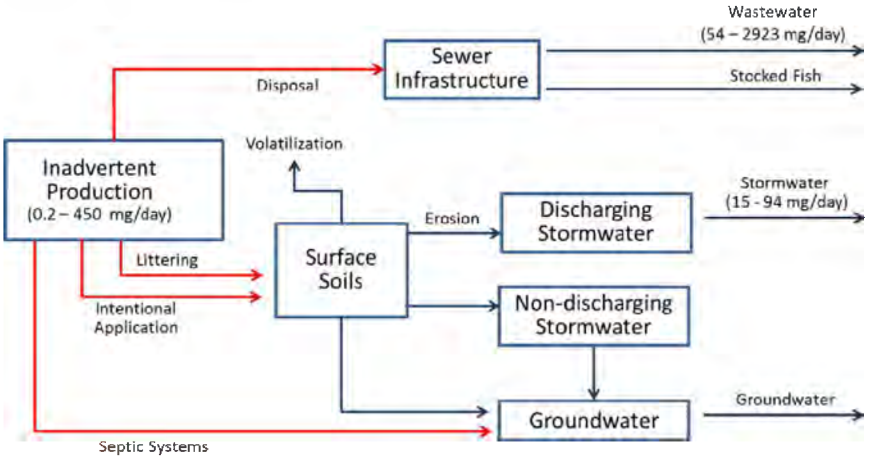
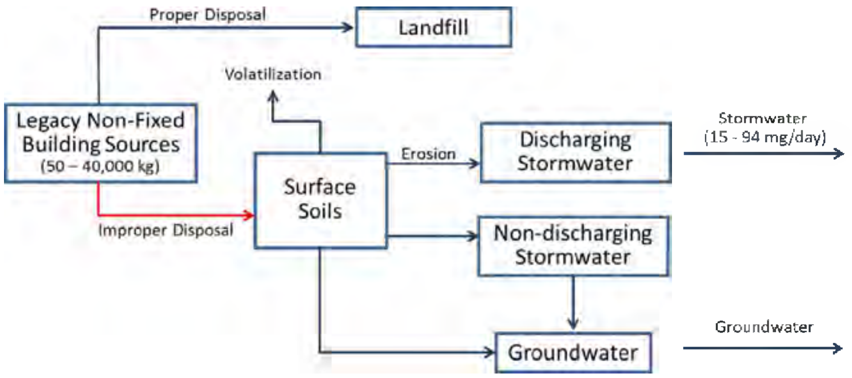
Support of Green Chemistry Alternatives

Description:	This action consists of working with chemical manufacturers to either develop alternative (non-chlorinated) products or develop products with reduced levels of PCBs. The Task Force could support existing efforts by providing guidance and feedback to Ecology, and reaching out to other parties such as EPA and universities.
Group:	Institutional - government practices
Significance of Pathway:	This control action is targeted towards the source area of inadvertently produced PCBs, which are being imported into the watershed at a rate of 0.2 to 450 mg/day. Although its exact significance is unknown, it has the potential to affect the significant delivery pathways of wastewater (54-2923 mg/day) and stormwater (15-94 mg/day) loading. 
Reduction Efficiency:	The overall efficiency is of this control action is unknown. Theoretically, it can reduce the contribution of affected inadvertent sources by 100%, if products currently containing PCBs can eliminated. For this reason, it is rated as highly suitable in terms of reduction efficiency.
Cost:	There is no direct cost associated with supporting green chemistry alternatives, although there are costs associated with coordination with chemical manufactures that are likely small (<$100,000) to moderate ($100,000 to $1,000,000).
Implementing Entity:	Chemical manufacturers.
PP Hierarchy:	This control action is high on the Pollution Prevention hierarchy, as it is designed to reduce the use of inadvertently produced PCBs.
Existing Efforts:	Ecology provides a range of technical support and expertise to educators looking to incorporate green chemistry into teaching materials, manufacturers looking to understand the potential impacts of the ingredients in their products, and to the general public who want to know which are safer choices for products (such as the "Safer Choice" label). Ecology has partnered with Northwest Green Chemistry on some of these information resources and tools.
Ancillary Benefit:	Green chemistry has many ancillary benefits including the reduction of harm associated with improper disposal. Green chemicals either degrade to innocuous products or are recovered for further use. TSCA regulatory reform will be easier if there are green chemistry alternatives to pigments that have inadvertently generated PCBs.
Time Frame:	Given the time lag between implementing green chemistry practices and: 1) exhausting the supplies of previously purchased materials, and 2) having inadvertently produced PCBs make their way through the watershed to the Spokane River, it is not expected that noticeable improvements would be seen within five years.

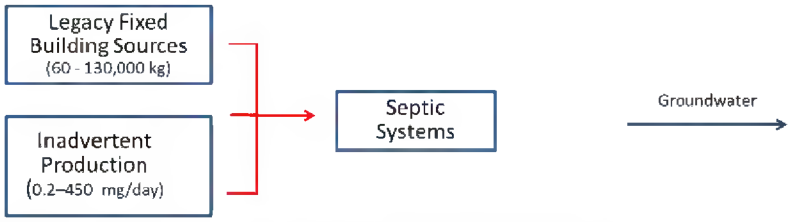
Survey Schools/Public Buildings

Description:	This action consists of programs designed to survey PCB-containing materials in schools/public buildings and enact a program to dispose of them properly or implement encapsulation.
Group:	Institutional - educational
Significance of Pathway:	This control action is targeted towards legacy non-fixed building sources, which have been identified as one of the largest source areas of PCBs with an estimated mass range of 50 to 40,000 kg. Due to the uncertainty in the number of appliances improperly disposed, as well as the ultimate fate of those PCBs, the significance of this pathway is considered unknown but potentially significant. 
Reduction Efficiency:	This action in and of itself will not have immediate impacts on PCB loads but will be a step towards better source area identification and targeted Control Action implementation.
Cost:	Ecology (2015) estimated that a state-wide survey of schools for PCB-containing materials would cost $68,198/year for 2 years for a total cost of $136,396. If this effort were scaled down to the Spokane River watershed it would certainly fall in the <$100,000 cost category.
Implementing Entity:	Ecology; Spokane County Regional Health District (and equivalent agencies for Idaho communities)
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	None known.
Ancillary Benefit:	This action is expected to reduce elevated human health exposure to PCBs within the affected schools and public buildings.
Time Frame:	This Control Action is not expected to result in noticeable improvements in the next five years.

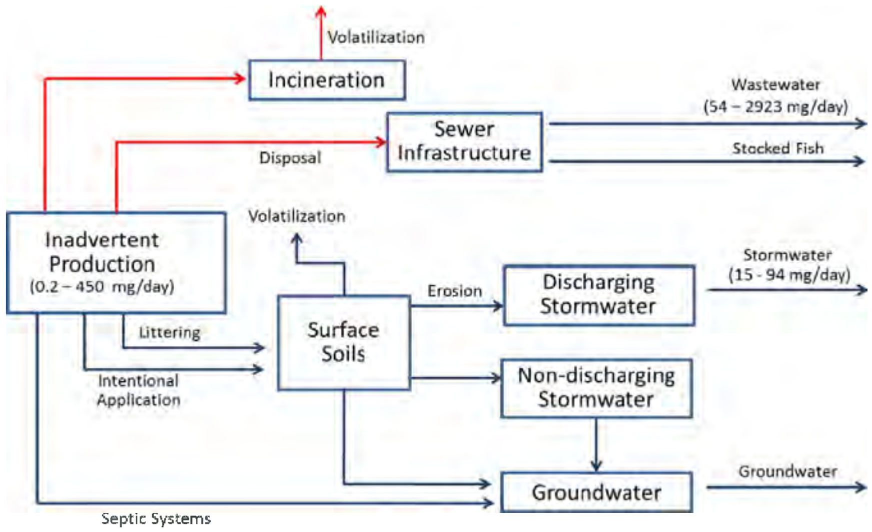
Education/Outreach on PCB Sources

Description:	Conduct public education and outreach campaigns to spread information about the potential sources of PCBs, what to do with them if discovered (e.g., avoid pouring paint down the drain), and safer alternatives.
Group:	Institutional--educational
Significance of Pathway:	This action potentially affects a wide range of pathways, although the specific magnitudes to be addressed by education are unknown.
Reduction Efficiency:	This control action's reduction efficiency is likely small though it may prevent some improper disposal of PCBs and also may reduce the amount of PCB-containing products from being purchased in the long term.
Cost:	Based on the Spokane County example (below), education specifically about PCBs would likely be less than $100,000 per year.
Implementing Entity:	Local government, Ecology, or Task Force-led effort
PP Hierarchy:	This control action is intermediate in the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed, but it may also limit the use of inadvertently produced PCBs as well.
Existing Efforts:	Two years ago, Spokane County hired a water resources specialist specifically tasked with developing an education/outreach program to implement the County's NPDES permit-mandated Toxics Management Plan. Approximately 1/3 of that person's time was devoted to those activities, including web site development, preparation of outreach materials (mailers, posters, etc.), participation in the outreach workgroup, and other Water Resource Center programs. Estimated cost per year was about $35,000 including salary and outreach materials/postage. Department of Ecology also has many education efforts that involve PCBs but mainly consist of general information on their website, and not a formal communication plan or materials production. Limited outreach has been conducted in coordination with release of the Chemical Action Plan and the purchasing law.
Ancillary Benefit:	This control action could be a joint effort among Task Force members to education the public/businesses about a range of pollutants and watershed health/protection in general.
Time Frame:	This Control Action is not expected to result in noticeable improvements in the next five years.

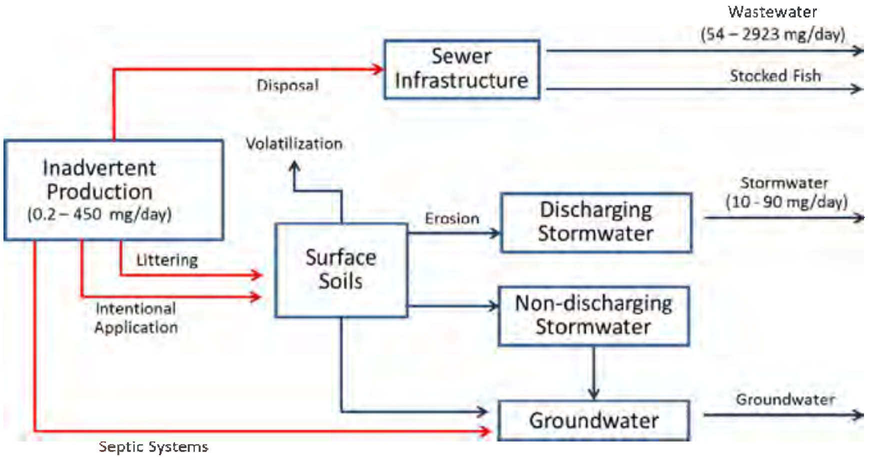
Education on Septic Disposal

Description:	Educate on-site septic system owners located over the aquifer recharge area on proper disposal of wastes (e.g., not "down the drain") and on the environmental and functional benefits of regular tank pumping
Group:	Institutional - educational
Significance of Pathway:	The source areas that contribute PCBs to septic systems are large. The ultimate delivery of these PCBs to the river and lake, while uncertain, is likely to be small. 
Reduction Efficiency:	The reduction efficiency associated with this control action is currently unknown.
Cost:	It is expected that the cost of this activity will be less than $100,000.
Implementing Entity:	Local governments.
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	This Control Action does not overlap with any other existing efforts.
Ancillary Benefit:	This Control Action could provide ancillary benefit by limiting the extent that other undesirable material are disposed through septic systems.
Time Frame:	Given the likely small magnitude of the delivery pathway, this Control Action is not expected to result in noticeable improvements in the next five years.

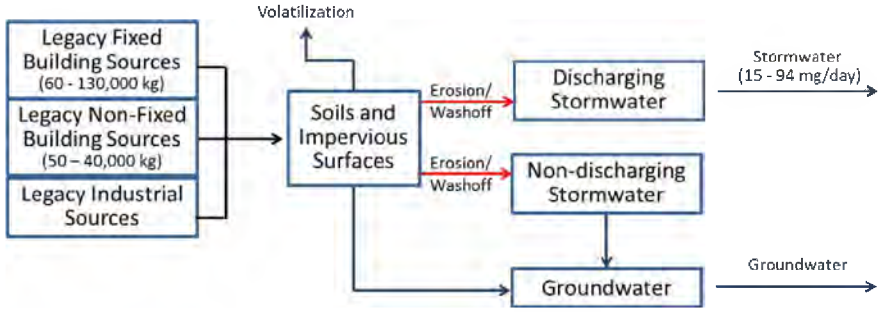
Education on Filtering Post-Consumer Paper

Description:	Conduct public education and outreach campaigns to inform the public about separating recycling materials that are paper w/yellow inks/pigments into the garbage stream rather than recycle bin (educational sticker on bins).
Group:	Institutional - educational
Significance of Pathway:	This control action is targeted towards the source area of inadvertently produced PCBs, which are being imported into the watershed at a rate of 0.2 to 450 mg/day. It has the potential to affect the significant delivery pathways of wastewater (54-2923 mg/day) and stormwater (15-94 mg/day) loading, although its contribution to these pathways is unknown. Conversely, it has the potential to re-route PCBs to the atmosphere as these products are incinerated. 
Reduction Efficiency:	The reduction efficiency associated with this control action is currently unknown.
Cost:	It is expected that the cost of this activity will be less than $100,000.
Implementing Entity:	Local governments.
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	This Control Action does not overlap with any other existing efforts.
Ancillary Benefit:	None known.
Time Frame:	This Control Action is not expected to result in noticeable improvements in the next five years.

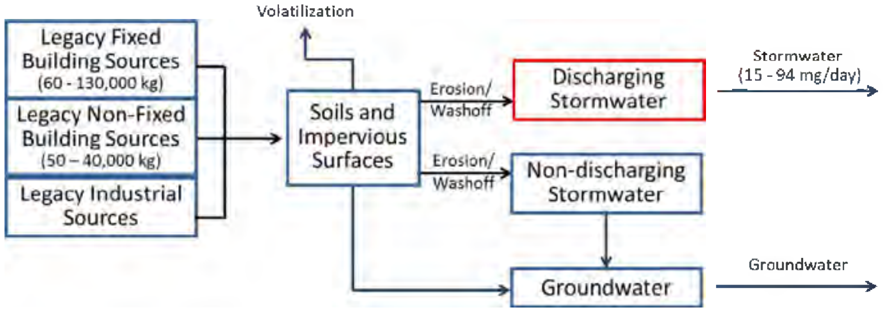
PCB Product Testing

Description:	This Control Action consists of further study of the extent to which commercial products contain inadvertently produced PCBs, as well as creation of a database to store the collected information. It could also include public education on products containing PCBs.
Group:	Institutional--education
Significance of Pathway:	This control action is targeted towards the source area of inadvertently produced PCBs, which are being imported into the watershed at a rate of 0.2 to 450 mg/day. It has the potential to affect the significant delivery pathways of wastewater (54-2923 mg/day) and stormwater (15-94 mg/day) loading, although its exact significance is unknown. 
Reduction Efficiency:	This action in and of itself will not have immediate impacts on PCB loads but will be a step towards better source area identification and targeted Control Action implementation.
Cost:	The cost of this action wiii depend on the number of materiais evaiuated. it is reasonabie to assume that sampling of a diverse range of materials, in conjunction with creation of a data base, will be intermediate (i.e. between $100,000 and $1,000,000) in cost.
Implementing Entity:	This action could be implemented by a range of entities, including Washington Department of Ecology, local governments, or the Spokane River Regional Toxics Task Force.
PP Hierarchy:	This control action in high on the Pollution Prevention hierarchy, as it is designed to reduce the use of inadvertently produced PCBs.
Existing Efforts:	Initial efforts in measuring PCB content of commercial products have been conducted by Ecology and the City of Spokane, although these studies have only evaluated a subset of the thousands of products potentially of concern.
Ancillary Benefit:	This action provides some ancillary benefit by supporting Ecology's Toxic Threats reduction activities.
Time Frame:	Given the time lag between understanding existing PCB content and: 1) exhausting the supplies of previously purchased materials, and 2) having inadvertently produced PCBs make their way through the watershed to the Spokane River, it is not expected that noticeable improvements would be seen within five years.

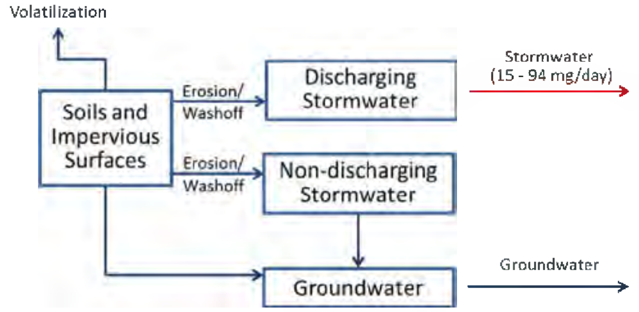
Stormwater Treatment - Pipe Entrance

Description:	This subcategory of control actions is designed to capture/treat stormwater onsite before it enters storm pipes, and can consist of: infiltration control actions such as trenches, basins, dry wells; bioretention control actions such as swales and buffer strips; filters; screens; wet vault; and hydrodynamic separator.
Group:	Stormwater Treatment - Pipe Entrance
Significance of Pathway:	This control action is targeted towards PCB contamination in stormwater. The primary mechanism delivering this source area to the river is discharging stormwater, which totals 15 to 94 mg/day and is considered a significant contributor. 
Reduction Efficiency:	Infiltration control actions can have very high removal of TSS which should be correlated to PCB load reduction. Tetra Tech (2010) reported 60-100% removal of TSS in various infiltration control actions in the Boston area. Washington State Department of Transportation (2008) also indicated high removal efficiency potential of infiltration control actions for both TSS and organic contaminants. Ecology (2007) reported 64% removal efficiency for TSS in filter strips, 71% for porous pavement, 51% for vegetated swales, and 85% for infiltration basins.
Cost:	Costs vary across specific Control Actions, but can generally be expected to be significant (i.e. >$1,000,000) for any widespread application.
Implementing Entity:	Local municipalities.
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	The primary mechanism delivering this source area to the river is discharging stormwater, which comes mostly from the City of Spokane. The City is developing control actions for PCBs as part of their Integrated Clean Water Plan, and is in a better position to evaluate this action than the Task Force. It may be beneficial for other communities with stormwater discharges, although the size of their service area is relatively small.
Ancillary Benefit:	This Control Action will reduce the loading of other pollutants associated with stormwater, such as nutrients.
Time Frame:	Depending upon the nature of the controls implemented, noticeable improvements could be expected within two to five years.

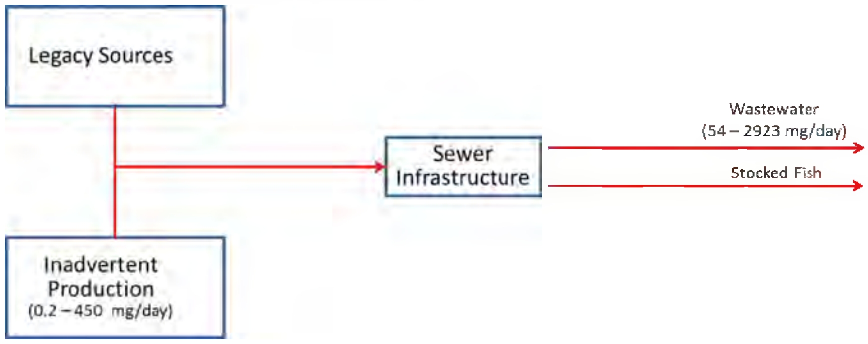
Stormwater Treatment – Pipe System

Description:	This subcategory of control actions is installed in the MS4 infrastructure (e.g., pipes, storm drain inlets). These actions usually have higher maintenance requirements (compared to other stormwater control actions) and can sometimes impede flow when not maintained properly. Options include: 1) Screens that trap contaminated solids and larger debris to prevent discharge of that material to receiving waterbodies; 2) Filters or "socks", like screens, that trap contaminated solids and prevent discharge of that material to receiving waterbodies; 3) Wet vaults, consisting of a permanent pool of water in a vault that rises and falls with storms and has a constricted opening to let runoff out. Its main treatment mechanism is settling of solids that are contaminated; and 4) Hydrodynamic separators that use cyclonic separation to trap solids and debris as stormwater flows through them before being discharged to receiving waterbodies
Group:	Stormwater Treatment - Pipe System
Significance of Pathway:	This control action is targeted towards PCB contamination in stormwater. The primary mechanism delivering this source area to the river is discharging stormwater, which totals 15 to 94 mg/day and is considered a significant contributor. 
Reduction Efficiency:	Infiltration control actions can have very high removal of TSS which can be correlated to PCB load reduction. Washington State Department of Transportation (2008) indicated high removal efficiency potential of wet ponds for both TSS and organic contaminants. Ecology (2007) reported 12% removal efficiency for TSS in centrifugal separators and 34% for filters.
Cost:	Costs vary across specific Control Actions, but can generally be expected to be significant (i.e. $1,000,000 for any widespread application.
Implementing Entity:	Local municipalities.
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	The primary mechanism delivering this source area to the river is discharging stormwater, which comes mostly from the City of Spokane. The City is developing control actions for PCBs as part of their Integrated Clean Water Plan, and is in a better position to evaluate this action than the Task Force. It may be beneficial for other communities with stormwater discharges, although the size of their service area is relatively small.
Ancillary Benefit:	This Control Action will reduce the loading of other sediment-bound pollutants associated with stormwater, such as nutrients.
Time Frame:	Depending upon the nature of the controls implemented, noticeable improvements could be expected within two to five years.

Stormwater Treatment - End of Pipe

Description:	This subcategory of control actions is installed at the end of the MS4 infrastructure. Options include: 1) Constructed wetlands, 2) Sedimentation basins, 3) Discharge to ground/dry well, 4) Diversion to treatment plant, and 5) Fungi (mycoremedation) or biochar incorporated into stormwater treatment.
Group:	Stormwater Treatment – End of Pipe
Significance of Pathway:	This control action is targeted towards PCB contamination in stormwater. The primary mechanism delivering this source area to the river is discharging stormwater, which totals 15 to 94 mg/day and is considered a significant contributor. 
Reduction Efficiency:	Infiltration control actions can have very high removal of TSS which can be correlated to PCB load reduction. Washington State Department of Transportation (2008) indicated high removal efficiency potential of stormwater wetlands for both TSS and organic contaminants. Detention basins had high removal efficiency for TSS and medium removal efficiency for organic contaminants. Tetra Tech (2010) reported TSS removal efficiency of 30-85% for wet ponds and 20-50% for dry ponds in the Boston Area. Ecology (2007) reported 72% removal efficiency for TSS in constructed wetlands and 25-69% for dry ponds (higher efficiency for vegetated ponds).
Cost:	Costs vary across specific Control Actions, but can generally be expected to be significant (i.e. $1,000,000 for any widespread application.
Implementing Entity:	The primary mechanism delivering this source area to the river is discharging stormwater, which comes mostly from the City of Spokane. The City is developing control actions for PCBs as part of their Integrated Clean Water Plan, and is in a better position to evaluate this action than the Task Force. It may be beneficial for other communities with stormwater discharges, although the size of their service area is relatively small.
PP Hierarchy:	This control action is lowest on the Pollution Prevention hierarchy, as it is designed to treat PCBs immediately before they are being discharged to the system.
Existing Efforts:	The primary mechanism delivering this source area to the river is discharging stormwater, which comes mostly from the City of Spokane. The City is developing control actions for PCBs as part of their Integrated Clean Water Plan, and is in a better position to evaluate this action than the Task Force. It may be beneficial for other communities with stormwater discharges, although the size of their service area is relatively small.
Ancillary Benefit:	This Control Action will reduce the loading of other pollutants associated with stormwater, such as nutrients.
Time Frame:	Depending upon the nature of the controls implemented, noticeable improvements could be expected within two to five years.

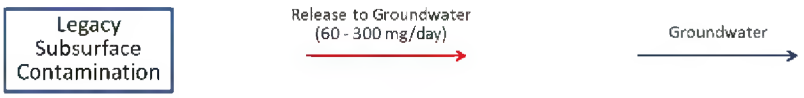
Wastewater Treatment

Description:	This subcategory of control actions correspond to reducing pollutant loading from wastewater treatment plans. Options include: 1) Development of a Toxics Management Action Plan, 2) Implementation of a source tracking program, 3) Chemical fingerprinting or pattern analysis, 4) Remediation and/or mitigation of individual sources, 5) Elimination of PCB-containing equipment, 6) Public outreach and communications, 7) Review of procurement ordinances, 8) Pretreatment regulations.
Group:	Waste water Treatment – End of Pipe
Significance of Pathway:	This control action is targeted towards PCB contamination in wastewater, which delivers a total load of 54 to 2923 mg/day and is considered a significant contributor. 
Reduction Efficiency:	Wastewater treatment has the potential to achieve high rates of PCB removal.
Cost:	Costs vary across specific Control Actions, but can generally be expected to be significant (i.e. $1,000,000 for any widespread application.
Implementing Entity:	NPDES permits are written by Ecology and EPA, while controls are implemented by municipalities and industries with NPDES permits.
PP Hierarchy:	This control action is lowest on the Pollution Prevention hierarchy, as it is designed to treat PCBs immediately before they are being discharged to the system.
Existing Efforts:	These actions are currently included as requirement in existing NPDES permits. These permits will continue to dictate wastewater treatment requirements, not the Comprehensive Plan
Ancillary Benefit:	This Control Action will reduce the loading of other pollutants associated with wastewater, such as nutrients.
Time Frame:	Depending upon the nature of the controls implemented, noticeable improvements could be expected within two to five years.

Contaminated Site Identification

Description:	This control action consists of the identification of contaminated sites that could be contributing PCBs to the Spokane River.
Group:	Contaminated Sites
Significance of Pathway:	This control action is targeted towards contaminated sites beyond those that are currently being remediated. The PCB loading from these sources is unknown, although the mass balance assessment conducted by the Task Force indicates that they could potentially be a significant contributor.
Reduction Efficiency:	This action does not reduce pollutant loads, but can contribute to future load reduction by identifying sites that contribute PCB loads that can be addressed by remediation.
Cost:	Costs will depend upon the amount of additional data collected to support investigations, but should generally be less than $100,000.
Implementing Entity:	Ecology, Task Force.
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	Ecology (2015) performed preliminary research to review existing groundwater and soil data to identify contaminated sites and evaluate their current status, and rated sites in terms of their potential for contributing PCBs to the river.
Ancillary Benefit:	Cleanup of contaminated PCB sites can provide moderate ancillary benefits, as other pollutants often co-occur with PCB contamination.
Time Frame:	This action will not directly result in load reductions, but could serve to identify additional candidate sites for the subsequent Control Action of Contaminated Site Remediation.

Contaminated Site Remediation

Description:	This control action consists of the cleanup of contaminated sites.
Group:	Contaminated Sites
Reduction Efficiency:	Cleanup activities are able to achieve a high degree of pollutant load reduction.
Significance of Pathway:	This control action is targeted towards contaminated sites, which are currently estimated to deliver a total load of 60 - 300 mg/day and is considered a significant contributor. 
Cost:	Costs vary across specific Control Actions, but can generally be expected to be significant (i.e. $1,000,000 for any widespread application.
Implementing Entity:	Ecology, identified responsible parties
PP Hierarchy:	This control action is intermediate on the Pollution Prevention hierarchy, as it is designed to manage PCBs that are currently in place in the watershed.
Existing Efforts:	Cleanup efforts are in place at known contaminated sites. These efforts include assessment of the effectiveness of prior remediation actions (e.g. Upriver Dam and Donkey Island, City Parcel, and General Electric) sites and ongoing remediation at the Kaiser site.
Ancillary Benefit:	Cleanup of contaminated PCB sites can provide moderate ancillary benefits, as other pollutants often co-occur with PCB contamination.
Time Frame:	The time frame by which noticeable improvements could be observed is currently unknown.

SPOKANE RIVER
REGIONAL TOXICS TASK FORCE

COLLABORATION INNOVATION PROGRESS

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RE: Implementation of TSCA to Reduce PCB Inputs to our Nation's Waters

Dear Mr. Jones and Ms. Giles:

The Spokane River Regional Toxics Task Force (SRRTTF) requests a meeting, within the next 2 months, with your agency to discuss current Toxic Substances Control Act (TSCA) allowances for polychlorinated biphenyls (PCBs) and the revised Water Quality Standards for Washington that were published by the EPA on November 28th of this year.

The Task Force has worked diligently since 2012 to identify and reduce sources of PCBs from entering the Spokane River. When we last wrote to you in 2013 (see attached letters) we requested that the EPA assist us in this effort. Specifically, we requested the EPA to consider reducing the nominal 50 parts per million (ppm) use allowance authorized under TSCA regulations. Our studies show that allowable concentrations of PCBs in consumer products represent an ongoing source of PCB loading to the Spokane River that, through normal use, contributes to exceedances of the applicable water quality standards.[1, 2] We also requested that the EPA provide enforcement on the use and importation of products containing PCBs in concentrations exceeding the 50 ppm levels. Studies have shown levels of "inadvertently generated PCBs" in pigments, printed materials and other products that exceed the TSCA standard.[3,4]

On November 28, 2016, the EPA published revised Water Quality Standards for Washington State.[5] The EPA rule lowered the PCB criterion applicable in Washington State from 170 parts per quadrillion (ppq) to 7 ppq. With this new rule, potentially every water body in the State of Washington will fail to meet water quality standards for PCBs. This situation is not unique to Washington.

The Spokane River is included in the more than 81,000 miles of rivers and streams nationwide that are listed for PCBs[6]. Of the limited number of PCB clean-up plans, also known as Total Maximum Daily Loads (TMDLs),

[1] http://srrttf.org/wp-content/uploads/2015/03/Revised-Prduct-Testing-Report-7-21-15.pdf
[2] Jia Guo in http://www.p2.org/wp-content/uploads/june-27-pcbs-webinar.pdf

[3] https://fortress.wa.gov/ecy/publications/SummaryPages/1604014.html
[4] Christie in http://www.p2.org/wp-content/uploads/june-27-pcbs-webinar.pdf
[5] https://www.gpo.gov/fdsys/pkg/FR-2016-11-28/pdf/2016-28424.pdf
[6] https://ofmpub.epa.gov/tmdl/attains_index.home

prepared to date, not one water body in the country has successfully met applicable water quality standards for PCBs through the TMDL process.

TSCA allows continued use of PCBs at levels that are billions of times higher than the PCB water quality standard. Municipal ratepayers and businesses, already burdened with removing PCBs that are not created by them, will now be held to even stricter standards that are neither measurable nor attainable with approved test methods and current treatment technologies. Our only opportunity for success in achieving these stringent water quality standards and providing economic fairness to all communities is to eliminate PCBs at the point of generation.

Since its inception, the Task Force has used an inclusive approach to engage diverse interests to solve difficult problems. We would like to meet with key members of EPA's TSCA and Water Quality programs within the next two months to discuss our thoughts on how to engage regulators, businesses, and environmental groups in a way that achieves mutually acceptable solutions. Please respond to Chris Page, with the Ruckelshaus Center, our third-party facilitator regarding your availability for this meeting. We will contact you in the next two weeks to set up a time to meet.

Sincerely,
Spokane River Regional Toxics Task Force
c/o Chris Page
WILLIAM D. RUCKELSHAUS CENTER
901 Fifth Avenue, Suite 2900
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CC
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Department of Ecology Director Maia Bellon/Heather Bartlett, Lacey, Washington
Congresswoman Cathy McMorris Rogers
Senator Maria Cantwell
Senator Patty Murray
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Message

From: Dave Dilks [ddilks@limno.com]
Sent: 9/7/2017 11:50:17 AM
To: Era-Miller, Brandee (ECY) [BERA461@ECY.WA.GOV]; Nickel, Brian [Nickel.Brian@epa.gov]
CC: Leber, Bud [Bud.Leber@kaisertwd.com]; kmwhitman (kmwhitman@wsu.edu) [kmwhitman@wsu.edu]; Page, C [c.page@wsu.edu]; Mann, Laurie [mann.laurie@epa.gov]; Ross, James D. (ECY) [JROS461@ECY.WA.GOV]
Subject: RE: "Number of samples required" calculator

The current Nine Mile data indicate that only three samples would be needed – going from two to three samples is the point at which the upper bound estimate in my table drops below 200 pg/l. Fewer samples are needed because both the mean and standard deviation are lower at Nine Mile.

I'll echo Brian's caveat in his final sentence:

- These analyses assume that the data collected to date are an accurate depiction of actual concentrations, i.e. 10 samples will be sufficient at Spokane Gage only if future samples contain the same mean and standard deviation as the historical samples. If future samples show a higher mean and/or wider variability, more samples would be needed to demonstrate compliance.

I'll add a few more thoughts:

- If the primary goal is only to show compliance with 200 pg/l, it won't take that many samples purely because the mean at each station is so much less than the target (>50 pg/l difference).
- The required number of samples will go way up if the goal is to examine much smaller differences, such as "is the river improving over time?" As my table indicates, collection of 100 samples will still have an error band around the mean of 18.9 pg/l. This means that hundreds of samples may be needed to discern small changes in concentrations.
- Both Brian's and my analyses make the simplifying assumption of ignoring seasonal variability in concentration due to seasonal changes in river flow. A more rigorous statistical assessment would look at the variability in concentration within each flow regime, but the numbers we've provided are reasonable for a first cut assessment.

Dave

From: Era-Miller, Brandee (ECY) [mailto:BERA461@ECY.WA.GOV]
Sent: Wednesday, September 06, 2017 6:36 PM
To: Dave Dilks <ddilks@limno.com>; Nickel, Brian <Nickel.Brian@epa.gov>
Cc: Leber, Bud <Bud.Leber@kaisertwd.com>; kmwhitman (kmwhitman@wsu.edu) <kmwhitman@wsu.edu>; Page, C <c.page@wsu.edu>; Mann, Laurie <mann.laurie@epa.gov>; Ross, James D. (ECY) <JROS461@ECY.WA.GOV>
Subject: RE: "Number of samples required" calculator

Thanks Brian and Dave for the quick responses.

Am I summarizing this correctly? Number of samples needed at 1 location for 90% confidence that the central tendency is >200 pg/L:

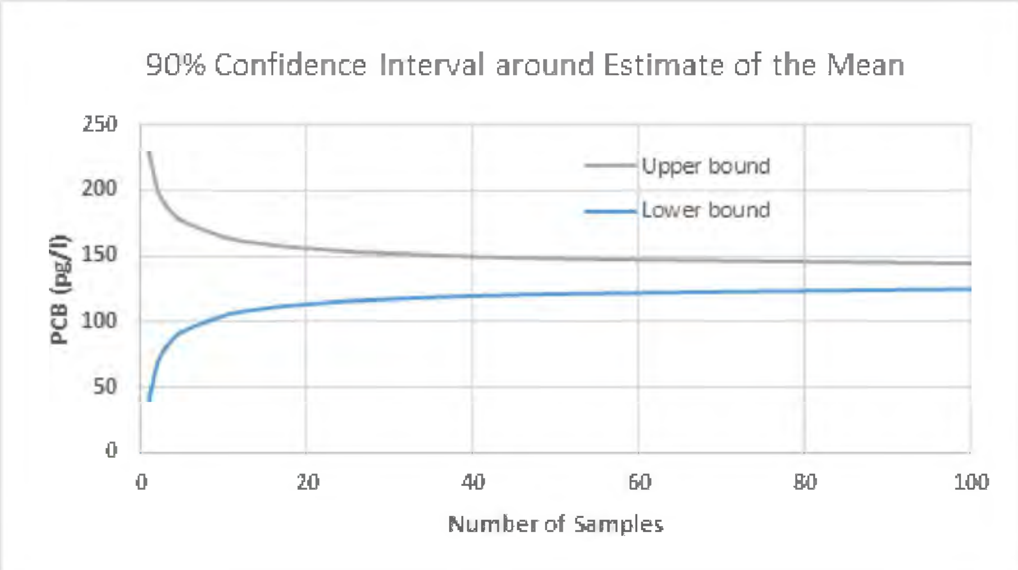
- Brian's example: 10 samples at the Spokane Gauge
- Dave's example: 20 samples at Ninemile

Thanks,
Brandee

From: Dave Dilks [mailto:ddilks@limno.com]
Sent: Wednesday, September 06, 2017 2:25 PM
To: Nickel, Brian <Nickel.Brian@epa.gov>; Era-Miller, Brandee (ECY) <BERA461@ECY.WA.GOV>

Cc: Leber, Bud <Bud.Leber@kaisertwd.com>; kmwhitman (kmwhitman@wsu.edu) <kmwhitman@wsu.edu>; Page, C <c.page@wsu.edu>; Mann, Laurie <mann.laurie@epa.gov>
Subject: RE: "Number of samples required" calculator

Here is the analysis I offered to do, which is similar to Brian's but looking at it from a slightly different direction. Note that I am using the synoptic and monthly monitoring data from Nine Mile (mean = 134.7, s.d.=57.3).



n	Lower bound	Upper bound	Error band
1	40.4	229.1	188.6
2	68.0	201.4	133.4
3	80.3	189.2	108.9
4	87.6	181.9	94.3
5	92.5	176.9	84.4
10	104.9	164.6	59.7
15	110.4	159.1	48.7
20	113.6	155.8	42.2
50	121.4	148.1	26.7
100	125.3	144.2	18.9

From: Nickel, Brian [mailto:Nickel.Brian@epa.gov]
Sent: Wednesday, September 06, 2017 5:11 PM
To: Dave Dilks <ddilks@limno.com>; Era-Miller, Brandee (ECY) <BERA461@ECY.WA.GOV>
Cc: Leber, Bud <Bud.Leber@kaisertwd.com>; kmwhitman (kmwhitman@wsu.edu) <kmwhitman@wsu.edu>; Page, C <c.page@wsu.edu>; Mann, Laurie <mann.laurie@epa.gov>
Subject: "Number of samples required" calculator

Dave, Brandee (cc Bud, Kara, and Chris):

Laurie Mann told me that you were interested in seeing my calculation estimating the number of samples that would be needed to determine if the central tendency of the PCB concentrations in the Spokane River is < 200 pg/L.

I should point out that I am not an expert on statistics. I based my calculation on Appendix N to the EPA's Local Limits Development Guidance. Since I had already set up a spreadsheet to implement the method described there, I decided

to use it on the Spokane River PCB data. Appendix N begins on PDF page 75. Note that the subscript for the "Z" for a 90% confidence level in Table 1-1 should be 0.95, not 0.975.
https://www3.epa.gov/npdes/pubs/final_local_limits_appendices.pdf

The purpose of this appendix is to estimate the number of samples one would need to take from a POTW's influent or effluent, to determine the "true" mean concentration of a parameter, with a specified confidence level and acceptable error between the measured mean and the true mean. But, the principle is the same for ambient monitoring.

This method assumes a normal distribution. A 4-bin histogram (included in the spreadsheet) shows that the actual distribution of total PCB samples in the Spokane River at the Spokane gauge is skewed to the right, so it's probably closer to a lognormal distribution. I'm not sure how large of an error that introduces.

I specified a 90% confidence level and an acceptable relative error of 34%, which is the difference between the 200 pg/L target and the arithmetic mean blank-corrected total PCB concentration from all the samples the Task Force has collected at the Spokane gauge, which is 149 pg/L [(200 – 149) ÷ 149 = 0.34]. As you can see, this shows that 10 samples would be required.

Again, this is a rough estimate, since the assumption of a normal distribution may not be valid. This is also specific to the arithmetic mean.

Thanks,

Brian Nickel, E.I.T.

Environmental Engineer
US EPA Region 10 | Office of Water and Watersheds | NPDES Permits Unit
Voice: 206-553-6251 | Toll Free: 800-424-4372 ext. 6251 | Fax: 206-553-1280
Nickel.Brian@epa.gov
http://epa.gov/r10earth/waterpermits.htm
Please conserve natural resources by not printing this message.

Example Calculation of Tissue Equivalent Concentrations (TEC) for PCBs in the Water Quality Assessment

TEC calculation PCB

For chemicals that have non-carcinogenic effects (TEC_N):

TEC_N = (Reference dose) x (Body weight) ÷ Fish consumption rate

(0.02µg/kg-day x 80kg x *1000g/kg*) ÷ 175g/day = **9.1µg/kg**

For chemicals that have a carcinogenic effect level (TEC_C):

TEC_C = (Risk level) x (Body weight) ÷ (Cancer slope factor) x (Fish consumption rate)

(.000001 x 80kg x *1000g/kg*) ÷ ((2mg/kg-day)$^{-1}$ x 175g/day) = 0.00023mg/kg = **0.23µg/kg**

Example Spokane Tissue PCB Dataset

Median values of PCB (ppb) for Spokane River sites (2012 Ecology data only)

Site	LSS	N	MWF	N	RBT	N	NPM	N
1-Stateline	40.6	7						
2-Plante Ferry	97.0	7			29.8	3		
3-Mission Park	89.8	7	124	5	93.6	3		
4-Ninemile	30.0	7	154	7	42.2	3		
5-Upper Spokane Lake	182	7	91.0	7				
7-Little Falls Pool	33.0	7						
8-Spokane Arm					ND	5	24	3

Category 5 determination- fictitious example

Example Category Determinations for Fish Tissue

PCBs: Cat 5 carcinogenic threshold = **2.3ppb**

Example 1:

Species	Median [ ] ppb	# comp. samples
Cutthroat Trout	ND	1
Mountain Whitefish	3.2	2
Northern Pikeminnow	6.7	1
Rainbow Trout	1.2	1

Category determination: Category 5- 303(d) list

PCBs: Cat 5 carcinogenic threshold = **2.3ppb**

Example 2:
CAT 2

Species	Median [ ] ppb	# comp. samples
Mountain Whitefish	0.20	1
Northern Pikeminnow	2.8	1
Rainbow Trout	Non-detect	1

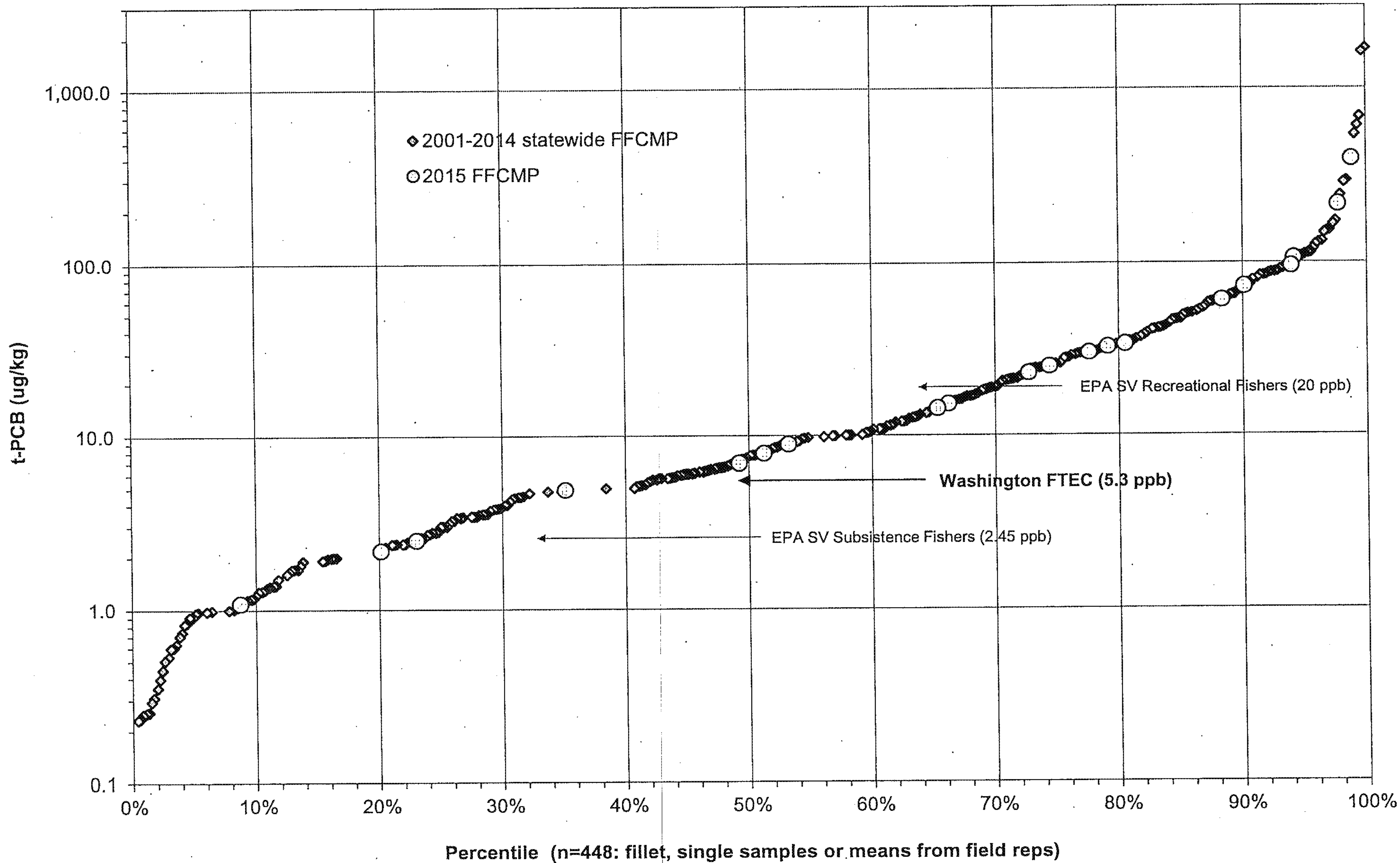
PCBs: carcinogenic threshold = **0.23ppb**

Example 3:
CAT 1

Species	Median [ ] ppb	# comp. samples
Cutthroat Trout	ND	2
Mountain Whitefish	0.10	3
Northern Pikeminnow	0.20	2
Rainbow Trout	0.05	3

42

Distribution of FFCMP fish t-PCB results



Z:\My Documents\TOX\report\cumltve freq\2015 cmltv freq\t-PCB cmltv freq to 2015 ffcmp PCBa and PCBc for PL 10-27-17.xlsx Fig PCB fillet rnk 1
lndscp
3/5/2018

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3123

OFFICE OF THE REGIONAL ADMINISTRATOR

SEP 24 2018

Ms. Adriane Borgias
Spokane River Regional Toxics Task Force
Washington State Department of Ecology
4601 North Monroe Street
Spokane, Washington 99205-1295

Dear Ms. Borgias:

Thank you for the May 9, 2018, letter on behalf of the Spokane River Regional Toxics Task Force. I appreciated the chance to attend the March Task Force meeting and to learn about some of your accomplishments, as well as about concerns members have regarding meeting the human health-based water quality standard for polychlorinated biphenyls (PCBs). The Task Force is a national model for how a diverse stakeholder group of dischargers, environmental groups, and public agencies can collaborate to develop a plan to meet environmental goals, and I commend this important work.

The EPA recognizes and appreciates the challenges you face in meeting the water quality standard for PCBs. As you know, on August 3, 2018, EPA Assistant Administrator for Water, David Ross, announced that EPA would reconsider its November 2016 actions on Washington's human health water quality criteria. Should EPA decide to conduct a rulemaking to amend any part of the federal rule, the Agency would provide an opportunity for public notice and comment.

Regarding concerns raised in your letter about regulatory consistency between the Toxic Substances Control Act (TSCA) and the Clean Water Act (CWA), the EPA agrees that actions to reduce PCBs need to include source reduction and technological measures, as well as enforcement. One of the challenges that EPA faces in approaching these issues is that TSCA requires the Agency to consider costs when developing a regulatory standard, and the CWA does not. For EPA to consider additional rulemaking under TSCA, the Agency must first make a finding that existing concentrations of inadvertently generated PCBs present an unreasonable risk to health or the environment and that any newly proposed levels would not. EPA currently has health assessment information for just 12 of 209 PCB congeners. EPA is working to develop additional data, as highlighted below:

- The National Toxicology Program (NTP) is evaluating PCB 11 for potential toxicity with emphasis on the similarities and differences between PCB 11 and other PCB congeners. The study includes the following PCB congeners:
    - PCB 126, a PCB with known "dioxin-like" activity;
    - PCB 153, a PCB that is persistent but does not cause effects like dioxin;
    - PCB 95, a PCB with neurotoxic activity;
    - Aroclor 1254 and Aroclor 1016, two commercial mixtures that were used heavily in the past, and which contain mixtures of "dioxin-like" and "non-dioxin-like" PCB congeners.
- The NTP is also evaluating the effects of PCB 11 in a human liver cell line measuring cell viability and changes in RNA expression.

These studies will indicate whether PCB 11 has activity similar with other PCB congeners tested and/or to the Aroclor mixtures, and will help us better understand the nature of and relative importance of the hazards posed by PCB 11.

Separately, EPA Region 10 leads a national workgroup focusing on inadvertently generated PCBs that has:

- Developed an inventory of available research on inadvertently generated PCBs (and shared with the Task Force's green chemistry workgroup);
- Secured funding for a limited number of product tests –
  - Any products with PCB concentrations above 100 ppb will undergo further evaluation to determine if PCBs are emitted from the product, and if so, at what rate and concentration.
  - One product will also undergo analysis to evaluate the PCBs that migrate into settled dust on the product.

As far as we know, this will be the first data generated on consumer products that demonstrates whether PCBs are emitted from consumer products into the air or migrate into settled dust. Results may allow for future evaluation of additional pathways of exposure, and support further study of the toxicity of inadvertent congeners. When available, my team will share the results of these tests with the Task Force. I also welcome your suggestions for additional research that would be most helpful to the Task Force.

Regarding help to identify products that contain PCBs, and help in identifying and promoting substitute products, EPA does not maintain this kind of a national database or website. However, in addition to sharing the results of product testing as noted above, the EPA will continue to look for ways to collaborate with stakeholders to identify substitutes. I am encouraged by public agencies and companies which use their purchasing power to drive down PCB concentrations in products. Examples such as the state of Washington Department of Transportation's decision earlier this year to prohibit use of diarylide yellows in its master contract for maintenance paint, and Hewlett Packard's recent announcement of a new tighter standard (0.1 ppm) inadvertent PCBs in specs for suppliers are both very promising.

Thank you again for taking time to communicate your concerns and interests. If you have any questions or would like to discuss these issues further, please feel free to contact me, or Lucy Edmondson on my staff at edmondson.lucy@epa.gov or (360) 753-9082. I look forward to continuing our work together to protect human health and the environment.

Sincerely,

Chris Hladick
Regional Administrator

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Mr. Grant Pfeifer, Eastern Regional Director, Washington Department of Ecology

Mr. Jeffrey Morris, Director, US EPA Office of Pollution Prevention and Toxics
Ms. Charlotte Bertrand, Acting Principal Deputy Administrator, US EPA Office of Chemical Safety and Pollution
Mr. Tim Hamlin, Director, US EPA R10, Office of Air and Waste
Mr. Dan Opalski, Director, US EPA R10, Office of Water and Watersheds
Ms. Lucy Edmondson, Director, US EPA R10, Washington Operations Office

TMDL Alternatives Guidance SWRO

Version: 4/19/2018

Introduction

TMDLs in SWRO are becoming ever more complex, controversial, and resource intensive resulting in significant development delays and bottlenecks. In addition, our TMDL program is currently facing legal challenges which threaten to stall TMDL development further. In light of this difficult future, TMDL alternatives are becoming an increasingly important water quality improvement tool. However, there appears to be considerable uncertainty regarding TMDL alternatives – when they're appropriate, what type of TMDL alternative to pursue, project development procedures, and even disagreement over naming conventions. This document attempts to address these problems by providing basic guidance to staff and management on currently available alternative options and factors to consider when evaluating what type of project to pursue.

The Clean Water Act (CWA) was designed to address a fairly narrow problem - pollution associated with industrial activities in heavily urbanized watersheds (e.g. the Cuyahoga River in Ohio). The TMDL process was originally conceived as a regulatory back stop to be utilized when the Clean Water Act's primary pollution control tool, the NPDES permit program, failed to maintain water quality standards. Since the CWA was established our understanding of water pollution has grown considerably. We now know that sources of water pollution are often more diverse and complex than originally thought and technology based effluent limits alone are often not enough to ensure water quality standards are met. Hence, the TMDL program expanded to fill the growing need, often becoming the primary water cleanup tool in many watersheds.

TMDLs work well to address urban watersheds dominated by point sources, primarily industrial dischargers and WWTPs. However, TMDLs struggle to adequately address nonpoint sources, primarily because nonpoint sources aren't subject to the enforcement controls of the NPDES program. The TMDL process of determining the pollution loading capacity and the assignment of load and wasteload allocations is useful in limiting discharges from multiple point sources. It has limited value, however, when controlling diffuse nonpoint sources managed via the application of BMPs.

Goal

This document provides guidance on TMDL Alternatives available to TMDL leads in order to improve water quality and meet standards in an efficient and timely manner resulting in waterbodies of the state being delisted from the 303d list.

Objectives

1. Provide clear and concise definitions for Traditional TMDLs, TMDL Alternatives, and Straight to Implementation Projects.
2. Provide guidance to TMDL leads on which type of project is most appropriate for the waterbody they are working in.
3. Provide guidance on writing and implementing TMDL Alternatives.
4. Describe a process for getting internal approval to move forward with developing a TMDL Alternative or Straight to Implementation Project.
5. Identify potential areas of confusion from different stakeholders and provide leads guidance on ways to minimize confusion.
6. Reiterate existing policy for delisting waterbodies when standards are met.

Definitions

Both TMDLs and TMDL-Alternatives are planned, organized efforts. The object of both is to improve water quality and meet state water quality standards.

TMDL: A total maximum daily load is a CWA-defined allocation of pollutant loads that will meet water quality standards. TMDLs establish the loading capacity of a waterbody and set wasteload allocations for point sources and load allocations for nonpoint sources. TMDLs are sent to EPA for their approval. WLAs set in TMDLs are legally required to be included in NPDES permits. Ecology must ultimately conduct a TMDL for all waterbodies that do not meet water quality standards.

TMDL-Alternative: Any effort focused on implementing corrective actions directly, rather than relying on modelling or the assignment of load allocations and wasteload allocations, is a TMDL alternative. These projects do not meet the definition of a TMDL. When waters are clean enough to meet water quality standards, they are delisted.

STI: Straight to Implementation (STI) is a type of TMDL Alternative. It is an Ecology led process and relies on Ecology staff actively investigating and identifying problem sites, and working with landowners to improve conditions through the implementation of BMPs.

4B: The term '4b' refers to a 303(d) list category intended for water bodies with a pollution control program in place other than a TMDL that is expected to solve the pollution problems.

4bs are not in and of themselves pollution control actions, but represent a way to formally recognize cleanup efforts and associated water quality improvements. To be included in category 4b, TMDL Alternatives must have legal or financial guarantees that they will be implemented. To be placed in the 'Has a Pollution Control Project' category, the pollution control project must meet all of the following criteria:

- Be problem-specific and waterbody-specific.
- Have reasonable time limits established for correcting the specific problem, including load reduction or interim targets when appropriate.
- Have a monitoring component to evaluate effectiveness.
- Have adaptive management built into the plan to allow for course corrections if necessary.
- Have enforceable pollution controls or actions stringent enough to attain the water quality standard or standards.
- Be feasible, with enforceable legal or financial guarantees that implementation will occur.
- Be actively and successfully implemented and show progress on water quality improvements in accordance with the plan.

Not all TMDL Alternatives are eligible for inclusion in 4b. While the criteria for 4b exclude some TMDL Alternative efforts, those projects are still important pieces to our efforts to achieve clean water. Ecology proposes water body segments for category 4b and they are reviewed by EPA during the 303(d) listing process.

Checklist: When to use TMDLs and when to use alternatives

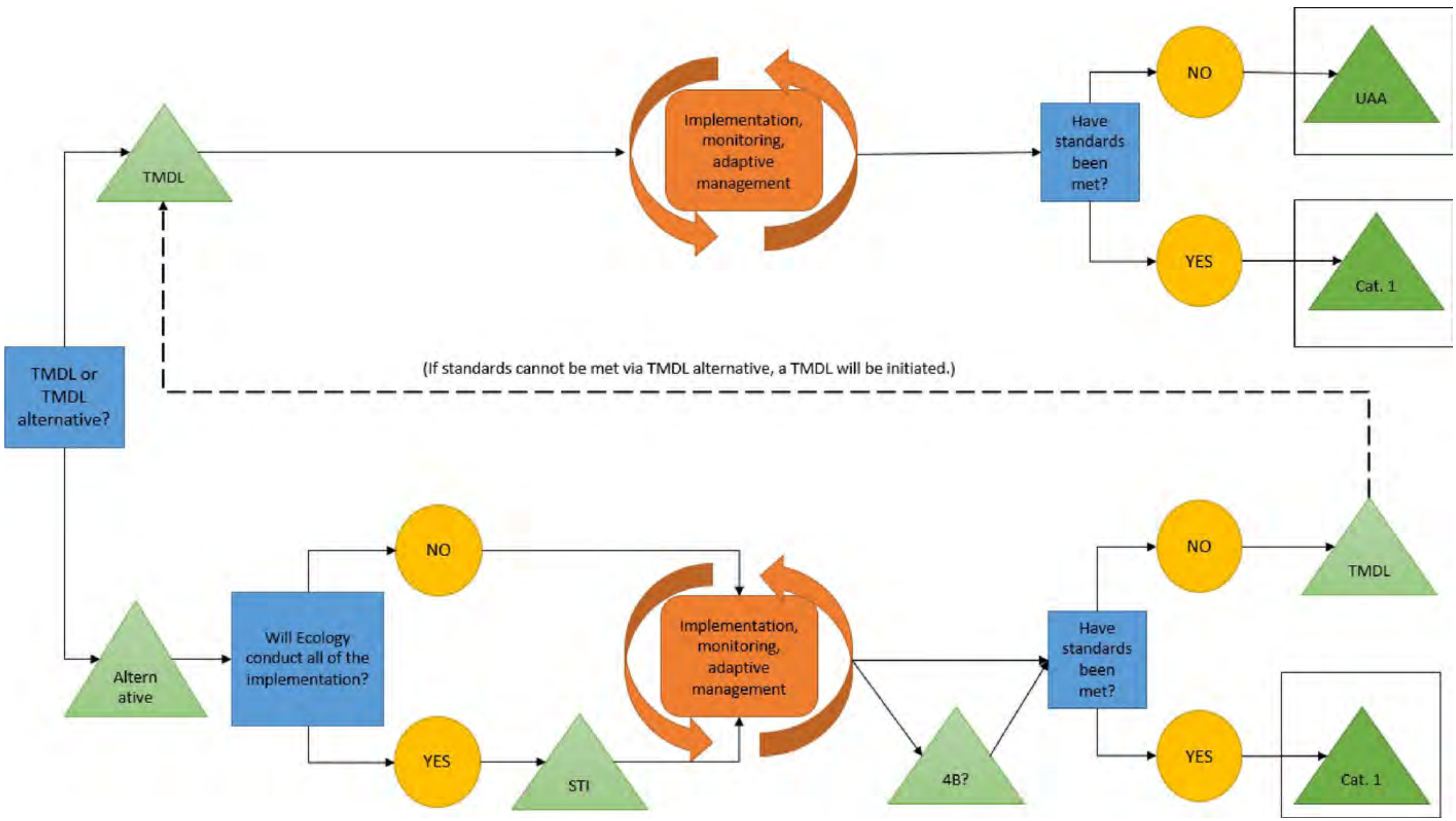
As discussed above, TMDLs are best suited for watersheds and parameters where NPDES permitted point sources are the primary source of pollution. SWRO's general TMDL development approach is described here: [HYPERLINK "http://teams/sites/WQ/swwcta/TMDLs/SWRO%20TMDL%20Future.docx"]. There are additional factors a TMDL lead should consider when deciding whether a TMDL alternative is a more appropriate course of action. Watersheds where NPDES-permitted point sources are a significant source of pollution (and their contributions can be solved through new NPDES permit effluent limitations) a traditional TMDL is likely the best approach. The checklist below highlights watershed and pollution characteristics that may be well suited for TMDL Alternative projects. This list is not comprehensive and other site specific details should be included in your decision.

Note that the descriptions that follow in parenthesis are meant solely to help guide the decision making process and should not be strictly applied.

☐ The watershed is primarily rural (<50% of the watershed area is covered with impervious surfaces).

☐ The watershed is ‘small’ (< 100 square miles or mainstem < 20 miles in length).
☐ The watershed is dominated by nonpoint sources (> 75% of pollution load).
☐ The point sources are dominated by municipal stormwater permittees (> 50% of the point source pollution load),
☐ There are many local implementing resources available (e.g. grants, watersheds councils, volunteer groups, ‘stream teams’, and sophisticated local governments and conservation districts).
☐ There is local community and governmental support for water cleanup efforts.
☐ Many opportunities remain for nonpoint improvement.
☐ There are monitoring data available to inform implementation and/or data have been analyzed and modeled.
☐ Ecology TMDL resources are limited (EAP project backlogs, bottlenecks, no monitoring funds).
☐ The WQ pollution problem is simple and well understood (conventional parameters, no suspected hidden or unknown sources, no complex relationships between multiple parameters).

Flowchart for determining next steps and decision points for TMDLs and TMDL alternatives.



How to write a TMDL Alternative plan

Some form of planning is necessary to structure recovery efforts in lieu of a TMDL. There's value to at least some planning even in the simplest situations (if for no other reason than to check assumptions and avoid oversights). Plans are also helpful in tracking project progress and can be convenient reference tools when discussing implementation priorities with staff. However, planning should not be an exhaustive, time consuming exercise. It should provide the minimum amount of information needed to inform implementation. In 'simple' watersheds rudimentary plans of a few pages may be sufficient, but in more complex watersheds a more thorough planning exercise may be necessary. It's up the TMDL lead to decide the level of detail needed to get the job done, but the focus should be on direct actions that improve water quality in a streamlined and effective manner. The TMDL lead will need to use their judgement in assessing the tradeoffs between the time spent developing the plan and the head start gained by beginning implementation actions sooner. TMDL leads may be able to take excerpts from other existing plans which can help to expedite process and ensure consistency with other restoration efforts.

Planning efforts can range from joint local/public processes to strictly internal work plan development. TMDL leads and/or nonpoint staff should assess the project needs before deciding the preferred approach. Joint, public planning efforts are usually preferable because, though they may be slower, the outcomes are more likely to be implemented, as there is consensus on the problems and solutions at the end of the process. However, where there's local resistance to water quality improvement actions on principle, public processes will likely stall and an internal process may be more productive at least initially.

Without the TMDL template to follow, leads are free to design a plan to meet their project needs. This flexibility can be useful, but some may find it daunting. There's also a danger that some items may be accidentally omitted. For these reason it's advisable to consider using an established alternate template. EPA's watershed planning guidance is a good place to start: [HYPERLINK "https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=2868"]. Using this template increases the likelihood that outcomes will be consistent with EPA's requirements. Hence, regulatory actions (e.g. re-categorization of Category 5 listings) are more likely to be accepted and federal funding may be easier to obtain. Several other tools are available to suit TMDL leads' needs for various levels of planning detail. Whatever structure TMDL leads choose to follow, plans should at a minimum address the following key items (from EPA's 'Steps in the Watershed Planning Process')

Step 1. Build partnerships
Step 2. Characterize your watersheds
Step 3. Finalize goals and identify solutions
Step 4. Design an implementation program
Step 5. Implement the watersheds plan
Step 6. Measure progress and make adjustments

These concepts are expanded a little further in EPA's '9 Minimum Elements of Successful Watershed Plans' tool:

Step 1. Identify causes and sources of pollution
Step 2. Estimate load reductions expected
Step 3. Describe management measures and targeted critical areas
Step 4. Estimate technical and financial assistance needed
Step 5. Develop an information and education component
Step 6. Develop a project schedule
Step 7. Describe interim, measurable milestones
Step 8. Identify indicators to measure progress
Step 9. Develop a monitoring component

TMDL leads are encouraged to consult EPA's 'Handbook for Developing Watershed Plans to Restore and Protect Our Waters': [HYPERLINK "https://www.epa.gov/sites/production/files/2015-09/documents/2008_04_18_nps_watershed_handbook_handbook-2.pdf"].

TMDL leads should feel free to use the whole document or only those sections that they find useful or applicable. In the case of the latter however, TMDL leads are referred back to the guidance above to ensure they retain at least the minimum elements of a good plan.

Internal Outreach

Internal outreach on TMDL Alternatives should include all individuals who will participate in the project over its lifespan. Participation may be minor (e.g. review a completed draft plan) for internal partners with minor roles or those who are familiar with the project. Internal partners who have large roles or are unfamiliar with the project should have a larger role in developing the plan. People will be more likely to support projects if they helped to create them.

Internal partners are project dependent, but will often include:

- nonpoint staff
- permit staff
- EAP (water quality monitoring)
- SEA (wetlands, shorelines)
- WR (water rights).

Management and HQ:

- The unit supervisor should be briefed periodically throughout the process
- The section manager should be briefed at key points.
- Unless the specifics of the project dictate more involvement, only final plans need to be sent to HQ staff.

Outreach during the implementation phase is project-specific. Periodic big-picture status updates for all participants is recommended to keep everyone engaged.

Internal review process

The internal review process for a TMDL alternative plan depends on the complexity of the plan, the policy challenges it addresses, and whether it will be used externally. The following steps should be followed during the review process:

1. Unit supervisor, regional TMDL leads, and nonpoint staff review draft
2. Plain talk review (optional)
3. TMDL lead revises draft
4. Unit supervisor, TMDL leads, nonpoint staff, and plain talk reviewer confirm revisions (as needed)
5. Technical review (optional)
6. Policy review (optional)
7. Section supervisor review
8. TMDL lead revises draft
9. Policy reviewer (and technical reviewer if necessary) and Section supervisor *confirm revisions*
10. Administrative Assistant checks for formatting, spelling, and grammatical errors (optional).
11. (Optional) Draft distributed to local stakeholders/partners – 30 days to review (in lieu of formal public comment process)
12. TMDL lead makes revisions
13. Plan finalized and (if publishing) sent to HQ publications coordinator
14. Published and link to project webpage (optional)

External outreach on developing a TMDL Alternative

All TMDL projects require some degree of outreach to communities and stakeholders. TMDL Alternatives may require additional communication since many stakeholders may be unfamiliar with the concept and may have concerns regarding how they are different (or similar) to a traditional TMDL. Conservation groups may be concerned that the outcome of a TMDL alternative will be different than a TMDL and it will be important to explain that the intended outcome – to meet water quality standards – is the same. Highlighting successful projects (such as [HYPERLINK "https://fortress.wa.gov/ecy/publications/documents/1710011.pdf"] and Asotin Creek) will help ensure stakeholders that this type of work is a good option with a proven track record.

When beginning a project, first identify all entities who will be involved in the process.

1. City and county personnel
2. Environmental advocates
3. Tribes
4. Other state agencies
5. Watershed group
6. External Permittees (if applicable)

Make sure you understand the role of each stakeholder involved. If this is an Ecology-led process you'll need to communicate your needs to municipalities and other stakeholders that you wish to partner with. If Ecology is not leading the process, you'll need to provide support to those who are. You may also need to solicit project sponsors.

Plans will likely have a better chance of being implemented if TMDL leads collaborate on plan development with stakeholders and partners. Creating ownership should be a key step in TMDL Alternative development, especially so if Ecology isn't leading implementation.

You should also discuss the intended project outcomes with stakeholders. This will help in the development of the implementation plan and ensure that community needs are met. Stakeholders may have different visions of what restoration looks like and clearly identifying these goals in the beginning will be helpful to the process. What goals do stakeholders have and how do they align with meeting water quality standards?

Finally, it may helpful to discuss methods to monitor water quality improvements. This may help those who have relied on the traditional TMDL methods trust that our intention is indeed to improve water quality. Discuss what monitoring needs to occurs and when. You may also need to develop a plan of action if the anticipated improvements do not occur within a designated timeframe.

Other States

TMDL leads thought it would be useful to compare our TMDL Alternative approach and definitions with those of other Region 10 states. The purpose was to:

a) find out whether other states had similar TMDL development problems and TMDL Alternative needs,
b) see if we were largely consistent in our respective approaches, and
c) provide new insights and ideas for additional TMDL Alternative tools.

Ecology staff conducted an informal survey of TMDL staff in Alaska, Idaho, Oregon and California. Responses were mixed, but largely consistent with Washington's approach. Alaska stated that they generally looked to Washington as an example regarding TMDL Alternatives and didn't have substantive contributions. California didn't respond. Idaho stated that they had successfully pursued TMDL Alternatives and 4b designation in the past, the 'Bear Valley' project being a good example. Most recently they were attempting something similar in the Lower Boise Watershed. Idaho staff stated that seeking 4b designation often required considerable work, it was more effective and efficient than attempting to develop TMDLs in nonpoint dominant watersheds.

Of all those states consulted, Oregon has perhaps investigated the TMDL Alternative approach most fully. Oregon was successful in getting EPA support for claiming 4b designation in watersheds enrolled in their Pesticide Stewardship Program (PSP). The Program works by:

- Identifying local, pesticide-related water quality issues

- Sharing water quality monitoring results early and often with local communities and all those who have a direct interested in the state's waters
- Explaining data in relation to effects and water quality criteria or benchmarks
- Engaging pesticide users and technical assistance providers to identify and implement solutions
- Using long-term monitoring to measure success and provide feedback to support water quality management

The program uses both water quality and crop quality as measures of success. Pest management and water quality management must both be effective for long-term stewardship of natural resources.

Oregon thought the 4B listings would provide watershed partners (e.g., agricultural producers) with additional assurances that they're committed to the voluntary approach. The TMDL process remains the regulatory backstop if efforts aren't successful. While EPA is supportive of the program and associated 4b designation, resource constraints have limited its use in Oregon thus far.

Oregon's assessment of their direct implementation efforts in Fifteenmile Creek (eastern Cascades) serves as a useful cautionary tale about the limits of any approach (including TMDL Alternatives) to achieve water quality standards. Since 1994 the creek has been the focus of a multi-agency effort to install agricultural BMPs (no till practices) to reduce soil erosion and sediment sources. However, monitoring data over the period failed to show significant reductions in sediment loading. Other studies found that where BMPs were installed without buffers (as was the case in Fifteenmile) positive impacts were negligible. And there's some evidence to suggest that past land-use activity, particularly agriculture, may result in long-term modifications to and reductions in aquatic diversity, regardless of restoration of riparian zones. While these results are discouraging, it would be likely that Oregon would be no better off had they first attempted a TMDL as that would likely have recommended the same BMPs.

Many other Region 10 states have concluded, as we have, that there's a need for TMDL Alternatives. As in Washington they're also looking to the 4b designation as a way to 'get credit' for those efforts. The EPA is supportive of some other states' TMDL Alternative efforts. While no new tools were discovered through this effort, Oregon's examples illustrate the importance of having adequate resources to support implementation and the limitations of BMPs to address water quality problems associated with larger legacy ecosystem changes.

Delisting

Policy 1-11 addresses delisting (moving waters from Category 5 to 1): [HYPERLINK "https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d/Assessment-policy-updates"]. The policy is currently being revised, and the proposed draft is on the website. SWRO will follow the policy for delisting. We support making interim (formal or informal) delisting calls in conjunction with HQ 303(d) staff when data becomes available. These interim delisting calls can be made in between full updates to the 303(d) list.

Can we meet WQS? If not, what do we do?

Situation 1: Standards can be met.
Implement the TMDL Alternative, improve water quality, meet water quality standards, move the waterbody to Category 1, and declare success.

Situation 2: Standards can't be met, but significant improvements in water quality and/or biological quality can be made.
Implement the TMDL Alternative and make the improvements that are feasible. Work with local stakeholders to develop ambitious-yet-realistic interim targets. If easily done, model the impact of all the feasible improvements. Focus on the benefits of the improvement, despite water quality standards not being met. If that interim target is met at some point in the future, declare partial success and deprioritize future work. Eventually, a TMDL and/or UAA (see top of flow chart) is legally required.

Situation 3: Standards can't be met, and there isn't much anyone can reasonably do to improve water quality.
SWRO will deprioritize these waterbodies and focus our work on Situations 1 and 2. Stakeholders may pursue UAAs if they desire. Eventually, a TMDL and/or UAA (see top of flow chart) is legally required.

Appendix: Prioritizing Workload

There are hundreds of unaddressed 303(d) listings in SWRO. This is a 70-year backlog at our current TMDL production pace. Most 303(d) listed streams do not include significant sources of pollution from NPDES permit holders. Unfortunately, we only have five staff who work on TMDL-related efforts, grants, and monitoring. SWRO has four nonpoint staff for the region. Our current (February 2018) work is split five ways:

Writing TMDLs	1.25 FTEs	Budd Inlet TMDL and Lower White TMDL
Implement Existing TMDLs*	0.5 FTEs	Chehalis, Henderson, Puyallup, and Deschutes
TMDL Alternatives	1.25 FTEs	Burnt Bridge Creek, EF Lewis, North Ocean Beaches, Clover Creek
Grant Administration	1 FTE	
Monitoring	1 FTE	

* SWRO nonpoint staff are also engaged in implementation of existing TMDLs.

While prioritization will fluctuate over time, we expect to continue focusing most of our time on the combination of implementing existing TMDLs and TMDL Alternatives.

Spatial Assessment of PCBs in Fish and Water

Objective

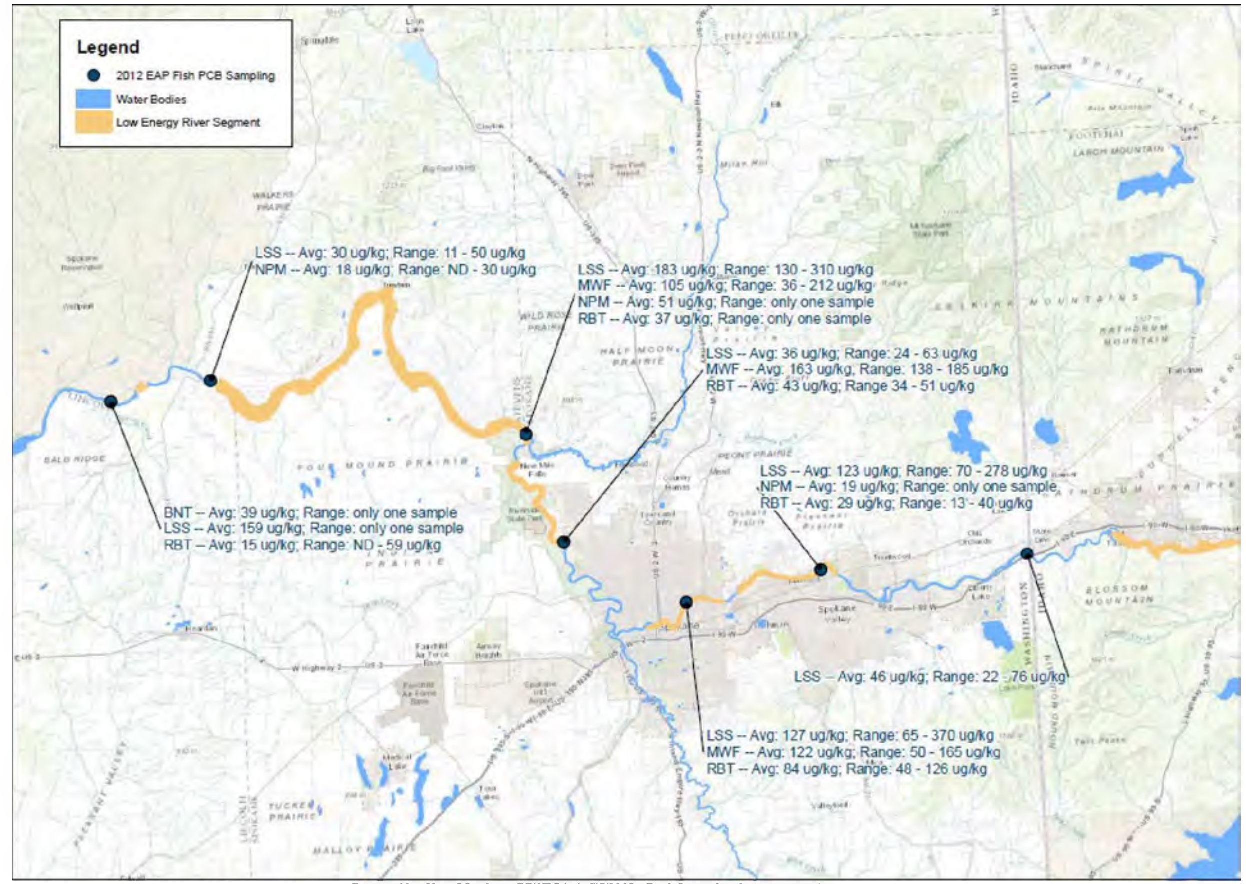
- Determine whether the relationship between fish tissue and water column PCBs differs significantly across locations
- Desired Outcomes
  - Identification of pathways leading to fish contamination
  - Potentially identify previously un-considered source

Approach

- Compile all 2012 fish data corresponding to SRRTTF study area
  - Determine which congeners represent the ten highest concentrations
- Compile all 2014-2018 water column data at nearest sampling station
  - Determine which congeners represent the ten highest concentrations
- Compare results across stations and fish species

Fish Locations Examined

- Stateline
  - Sucker
  - Barker Rd. water quality
- Plante's Ferry
  - Sucker, rainbow trout, pikeminnow
- Mission Park
  - Sucker, rainbow trout, whitefish
  - Greene St. water quality
- Upstream of Nine Mile
  - Sucker, rainbow trout, whitefish



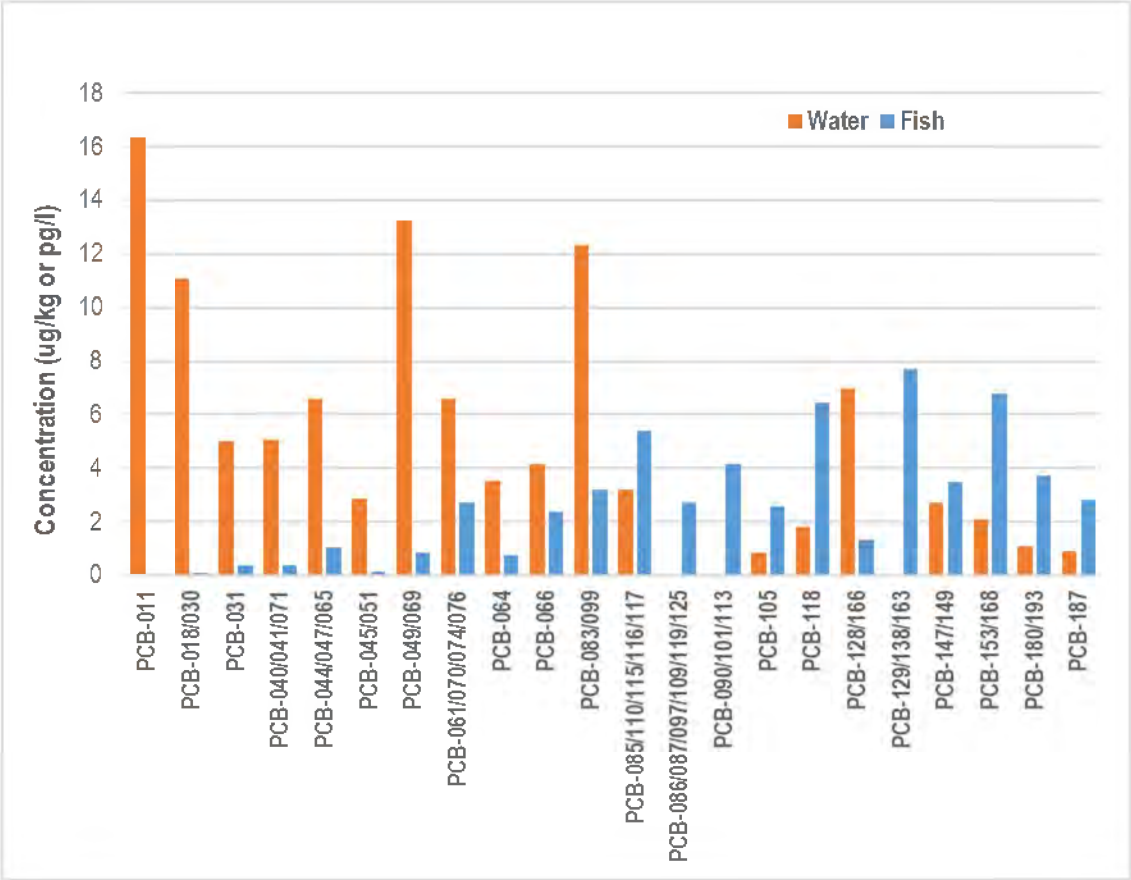
Prepared by City of Spokane RPWRF Lab 5/5/2016 - For informational purposes only

BNT: Brown Trout
LSS: Largescale Sucker
MWF: Mountain Whitefish
NPM: Northern Pike Minnow
RBT: Rainbow Trout

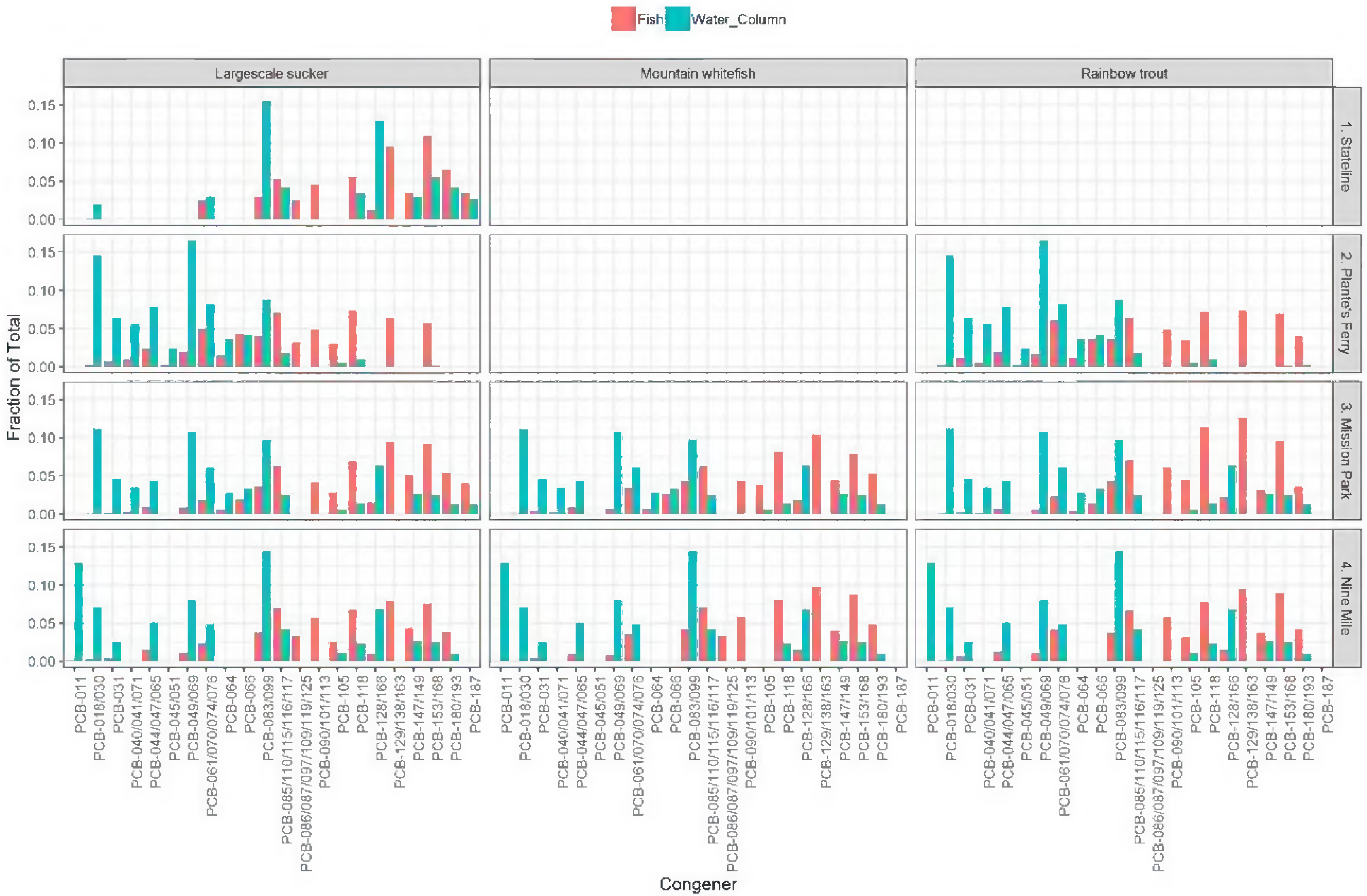
*Low energy river segments are qualitative best estimates for areas where river velocities tend to be low compared to the rest of the river. These are subject to change depending on season/river flows.

Results: Across All Stations and Species

- Clear differences overall between water column and fish tissue congener distribution
  - Water column dominated by PCB-11 through PCB-83/99
  - Water column dominated by PCB-85 through PCB-187



Results: By Station and Species



Conclusions

- Clear indication that congeners bioaccumulate to different degrees
  - Consistent with bioaccumulation model results
  - For highly bio-accumulative congeners, possible to be elevated in fish tissue and non-detectable in water column
- No obvious spatial trends observed implicating “new” sources

SPOKANE
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It's Your River ♦ We Protect It

Adriane Borgias
Water Quality Section Manager, Eastern Regional Office
Washington Department of Ecology
4601 N. Monroe, Spokane, WA 99205-1295

June 4, 2019

RECEIVED
JUN 07 2019
Department of Ecology
Eastern Washington Office

RE: Spokane Regional Toxics Task Force

Dear Adriane,

The Spokane Riverkeeper today announces our decision to resign from the Spokane River Regional Toxics Task Force (SRRTTF), effective immediately. As a signatory to the SRRTTF since its 2012 inception, we have invested considerable energy and time toward the success of the Task Force, and we have deliberated carefully before reaching this decision. However, it is necessary for us to step away from our formal participation in the SRRTTF at this time, and we respectfully register the following recommendations and concerns:

- **We call for the work of the SRRTTF to be formally folded into a conventional Total Maximum Daily Load (TMDL).**

We stand by our previous efforts to help the Task Force succeed, and we believe that parts of this process are worth keeping and reforming. As such, we call for the scientific sampling and implementation actions of the SRRTTF to be folded into a conventional Clean Water Act cleanup plan with regulatory accountability.

A conventional TMDL would assign a total load limit for PCBs, and would assign waste load allocations for dischargers and load allocations for non-point sources. The work of the SRRTTF could perhaps prove effective in the form of an implementation team, but only when scaffolded by mandatory pollution loading limits. A total pollution loading limit should be developed under the NPDES program and assigns limits to nonpoint sources of pollution. This would provide the framework for benchmarks, compliance schedules, and timelines inside the NPDES Permits, which would also include a requirement for effluent limits with Discharge Monitoring Reports.

- **We stand behind the EPA-promulgated 2016 Washington State Water Quality Standards for PCBs and we call for their continued support from all stakeholders in the Spokane Basin.**

www.spokaneriverkeeper.org
509.835.5211 | 35 W. Main Ave Suite 300 Spokane, WA 99201

WATERKEEPER® ALLIANCE MEMBER

The EPA's 2016 water quality standards should be a cornerstone upon which all other cleanup actions and processes follow. These criteria are scientifically calculated to bring us to clean fish and should be the standard from which we all work. However, local efforts to petition the EPA to rescind its water quality standards for PCBs have eroded our confidence in the SRRTTF. We are no longer convinced that meeting water quality standards is indeed the goal of all SRRTTF stakeholders. We cannot continue to be a signatory to an entity whose members whose members are involved in efforts to change the very goalposts by which success or failure are to be measured. To retain our own integrity and that of our efforts, we are suspending our involvement in the SRRTTF.

We would like to emphasize that the Spokane Riverkeeper will continue to 1) monitor and comment on SRRTTF activities and 2) be open to dialogue on the issues at stake. We are well aware that collaboration is a necessary part of these difficult community processes, and we value opportunities to work productively with other stakeholders toward true, standards-based progress. As such, we are actively engaged with other stakeholders and with the WDOE on several other major issues; we will continue our current presence with two other regional TMDL processes and with the Agricultural Water Quality Advisory Committee, and we are continuing our involvement as a stakeholder on the Clean Water and Agricultural Guidance processes.

If there are other opportunities that arise, we will certainly examine these and assess whether our involvement can help and improve the process of protecting and cleaning up the Spokane River.

Respectfully,

Jerry White, Jr.
Spokane Riverkeeper
Center for Justice
35 W. Main Street, Suite 300
Spokane WA 99201

CC: Mr. Chris Hladick, Administrator of EPA, Region 10
Mr. Dan Opalski, Director of Environmental Cleanup, EPA Region 10
Ms. Lucy Edmondson, Director Washington Operations Office EPA, Region 10
Ms. Maia Bellon, Director of Washington Department of Ecology
Ms. Heather Bartlett, Program Manager, Washington Department of Ecology
Ms. Brooke Beeler, Director of Eastern Regional Office, Washington Department of Ecology

Measurable Progress

Process, Analysis and Schedule

Karl Rains
23 October 2019

DEPARTMENT OF ECOLOGY
State of Washington

Accountability

Washington NPDES permits state that **if Ecology determines** that the SRRTTF is failing to make **measurable progress** toward meeting applicable WQ criteria for PCBs, Ecology would be obligated to proceed with the development of a TMDL or alternative

Measurable Progress reflects the success of the SRRTTF towards reducing PCBs in the Spokane River and towards achieving applicable WQ criteria for PCBs

Definition Review

Measurable Progress evaluates the status of three key metrics

Inputs: organizing activities

Outputs: activities and work products

Outcomes: progress toward achievement of the applicable WQ criteria for PCBs in the Spokane River

- Achievement of the applicable WQ standards
- Achievement of health standards
- Measured reductions of toxics to or in the Spokane River

Measurable Progress Evaluation Process

GOAL:

Demonstrate compliance w/ applicable WQS for PCBs

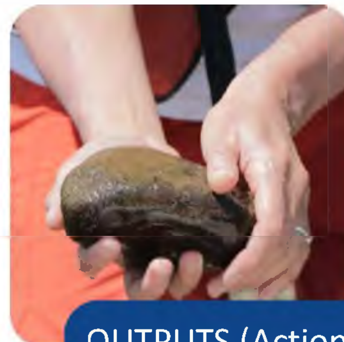
NO →

INPUTS:

SRRTTF continues…

- to work collaboratively
- forward momentum and progress

YES →



OUTPUTS (Actions):

- Makes decisions & recommendations
- Prepares meaningful work products
- Identifies/implements source reduction & BMPs

YES →

OUTCOMES (Results):

- Progress towards WQ criteria
- Measurable real or potential reductions of PCBs to the SR
- Compliance w/ permit conditions

NO → **Regulatory action by Ecology** ← NO

NO ↓

Content of the Review

- **Criteria** related to inputs, outputs, and outcomes in Attachment A
- Use **existing data** from SRRTTF and from permit submittals
- **Supplemental data** will be considered and subject to acceptance
  - Quality assured
  - And/or documented

Defensible Data

- SRRTTF minutes, attendance sheets, points of decision, etc.
- Outputs of the SRRTTF demonstrating completion of specified criteria
  - Work plans, status reports, outreach activities, etc.
- Reports and studies completed under an approved QAPP
- Information submitted under permit requirement
  - Toxics Management Plan, analytical data
- Other defensible evidence with supporting documentation
  - Clean ups, studies, source reductions, BMPs, Avista data, etc.

Assessment

Three fundamental criteria

1) Is the SRRTTF **still working together** in a collaborative manner?
2) Is the SRRTTF still moving forward on activities that will lead to:
   - Identification of sources of PCBs
   - Reduction of PCBs in the river (water column and/or fish tissue)
   - Development of BMPs
   - A comprehensive plan for progress toward achieving applicable WQ criteria for PCBs
3) Is there **environmental evidence** that progress is being made towards achieving applicable WQ criteria for PCBs in the Spokane River?

Demonstration of Measurable Progress

The following conditions, **when accompanied by defensible data**, will be considered a demonstration of measurable progress:

- Compliance with applicable WQ standards for PCBs
- Evidence that the SRRTTF is functioning in a collaborative manner and continuing to engage in activities that will lead to the reduction of PCBs in the river
- Development and **implementation** of a comprehensive Spokane River toxics reduction plan
- Actions that eliminate, remove, or isolate PCBs from the river or watershed
- Environmental trends showing a decrease of PCBs in the river, sediments, or biota

SRRTTF Schedule

Potential Outcomes

- **The Spokane River meets WQS**? – Task done, celebrate!!
- SRRTTF is **working well together** and **moving towards the goal**? – Measurable Progress is evident
- SRRTTF is **working well together** and **environmental outcomes not evident**? – Review with the SRRTTF and permittees, identify adaptive management measures
- SRRTTF is **not working, not meeting nor creating meaningful work products**? – Ecology is obligated to proceed with a TMDL or alternative

WQ27? Yes/No	Name of Project Either the name of the TMDL, STI, or Alternative. The spreadsheet refers to these as "projects". Each project may consist of multiple listings (beans).	Type TMDL, STI, or Alternative	Region	TMDL Lead	Current Status Select the current status from the drop-down menu list.	EAP Start	Data Collected	EAP Technical Work Completed	WQP Completion Year Enter the year of EPA Approval	# of Listings The bean count (# of 303d listings)	Parameter(s)	Comment	Update Date Enter the date you updated this information	Report Type
Yes	Squalicum Creek Multi-Parameter TMDL	TMDL	BFO	Steve Hood	In Development	2011			?	6	Bacteria, Bioassessment	Needs extended scoping and needs a Stressor ID analysis to determine bioassessment listings can be attributed to a pollutant before a TMDL can be initiated. Also waiting to see if Soos methodology can be replicated for Squalicum, so the schedule for this is somewhat dependent on the Soos TMDL.	3/27/2019	TBD during scoping
Yes	South Fork Nooksack Temperature TMDL	TMDL	BFO	Steve Hood	In Development	2001		2015	2019	9	Temperature	Modeling complete, TMDL being drafted, natural conditions issue		
Yes	Whatcom Creek Bacteria TMDL	TMDL	BFO	Steve Hood	In Development				2022	5	Bacteria	Data collected, Bellingham implementing		
Yes	Drayton Harbor Tributaries Bacteria TMDL	TMDL	BFO	Steve Hood	In Development	2005	2007-08	Draft 2010	2022	14	Bacteria	Data collected, modeling finished, may need to re-analyze new data	3/27/2019	(old template) Joint TMDL report
No	Myron Lake Ammonia STI	STI	CRO	Laine Young	In Development	1990	2012	2014	2018	1	Ammonia-N			
Yes	Moxee Drain STI	STI	CRO	Laine Young	In Development	2013	2013	2014	2019	4	Temperature			
Yes	Mid Yakima Basin Bacteria TMDL	TMDL	CRO	Vacant	In Development	2005	2012	2013	2019	37	Bacteria			
No	Yakima River Basin Toxics Action Plan/TMDL	TMDL	CRO	Jane Creech	In Development	2006	2007-08	2010	2022	58	Chlorinated Pesticides, TSS, Turbidity			
Yes	Wide Hollow TMDL	TMDL	CRO	Laine Young	In Development	2013	2013	2014	2022	7	DO, pH	Monitoring complete, social/political issues, may need UAA		
No	Yakima River Temperature TMDL	TMDL	CRO	Laine Young	In Development	2018	2019?		2026	3	Temperature	Planning. Existing data being collected and reviewed For model.		
No	Tieton and Lower Naches Rivers Temperature TMDL	TMDL	CRO	Laine Young	In Development	2015	2015	2017	2026	3	Temperature			
No	Lower Yakima Basin Bacteria TMDL	TMDL	CRO	Vacant	In Development				2026	8	Bacteria			
No	Yakima River DO and pH TMDL	TMDL	CRO	Laine Young	In Development	2018	2019?		2028	7	Dissolved Oxygen, pH			
No	Giffen Lake Total Phosphorus STI	STI	CRO	Vacant	In Development	N/A	N/A	N/A	?	1	Total Phosphorus			
No	South Fork Palouse River Multiparameter TMDL	TMDL	ERO	Mitch Redfern	In Development	2006	2006-07, 2010	2019?	2020	10	Temperature, Dissolved Oxygen, pH	Data collected, model run, may need UAA		
Yes	Hangman Creek Watershed DO/pH Alternative	Alternative	ERO	Mitch Redfern	In Development	2008	2017-18	2019?	2022	10	Dissolved Oxygen, Total Phosphorus, pH, Total Nitrogen	Data gathered. Project is in early stages of data management/analysis.	3/26/2019	Source assessment technical report
Yes	Alkali Flat Creek STI	STI	ERO	Vacant	In Development				2022	13	Bacteria, Dissolved Oxygen, pH, Temperature			
Yes	Spring Flat Creek STI	STI	ERO	Mitch Redfern	In Development				2022	2	Temperature, pH			
Yes	Almota and Little Almota Creek STI	STI	ERO	Vacant	In Development				2022	7	Bacteria, Temperature			
Yes	Little Spokane River DO and pH TMDL	TMDL	ERO	Vacant	In Development	2005	2005-06,2015-16	2019?	2022	22	Dissolved Oxygen, pH	EAP sections of TMDL report complete and peer reviewed, awaiting new WQP TMDL lead to be assigned to this project to write implementation plan, develop LA/WLAs etc.	3/26/2019	(old template) Joint TMDL report
No	Spokane River Regional Toxics Task Force	Alternative	ERO	Karl Rains	In Development	2001	2003-07	2011	2027	24	PCB; 2,3,7,8 TCDD; 2,3,7,8 TCDD TEQ	Task force identifying sources, fate, and transport of PCBs; performing data collection; implementing PCB removal and source control BMPs		
Yes	Pend Oreille River Watershed Temperature TMDL	TMDL	ERO	Vacant	In Development				2011	7	Temperature	Waiting for EPA approval		(old template) Joint TMDL report
No	Stillaguamish River, Island Reach DO TMDL Addendum	TMDL	NWRO	Heather Khan	In Development	2009	2012-13		2017	0	Dissolved Oxygen	Modeling completed by Tony Whiley. Technical information provided to NWRC Municipal Unit for Arlington permit development. Consulting internally on the value of doing a TMDL addendum...seems unlikely.		
Yes	Pilchuck Temperature and DO TMDL	TMDL	NWRO	Heather Khan	In Development	2012	2013-14	2019?	2019	13	Temperature, Dissolved Oxygen	Modeling complete, Draft TMDL nearly complete for internal review	3/27/2019	(old template) Joint TMDL report
Yes	Padilla Bay FC TMDL	TMDL	NWRO	Scott Bohling	In Development	2015	2016-17	2019?	2020	9	Bacteria	Field work completed, modeling complete, new TMDL will draft impl plan late 2018, early 2019		(new template) Joint TMDL report
Yes	French Creek Temperature and DO Alternative Restoration Plan	Alternative	NWRO	Heather Khan	In Development	2012	2013-14		2021	11	Temperature, Dissolved Oxygen	Modeling planned to start in early 2019. Advisory Group formation possible in 2020.	3/27/2019	Scoped as a joint TMDL report, now source assessment technical report from EAP
Yes	Sammamish River Temperature and DO Alternative Restoration Plan	TMDL	NWRO	Cleo Neculae	In Development	2015	2015	2021	2022	10	Temperature, Dissolved Oxygen	Awaiting modeler assignment from EAP. Current completion date assumes 1.5 years to complete modeling and groundwater analysis with FY 20 start date.	3/27/2019	Scoped as a joint TMDL report, now source assessment technical report from EAP
Yes	Soos Creek Subbasin Multiparameter TMDL	TMDL	NWRO	Cleo Neculae	In Development	2007	2007-08 for Temp/DO, but using data from 2000-2015 for hydrology, sediment & bioassessment	2022	2022	15	Temperature, Dissolved Oxygen, Bioassessment	HSPF modeling in progress for pilot bioassessment work. Lots of entities have been involved in monitoring and modeling efforts and technical work over the years (King County, Muckleshoot Indian Tribe, TetraTech, EPA, EAP).	3/27/2019	Tech Memo on Bioassessment + New Template Joint TMDL report
No	North Ocean Beaches	Alternative	SWRO	Leanne Whitesell	In Development				2019	3	Bacteria		10/25/2018	

WQ27? Yes/No	Name of Project Either the name of the TMDL, STI, or Alternative. The spreadsheet refers to these as "projects". Each project may consist of multiple listings (beans).	Type TMDL, STI, or Alternative	Region	TMDL Lead	Current Status Select the current status from the drop-down menu list.	EAP Start	Data Collected	EAP Technical Work Completed	WQP Completion Year Enter the year of EPA Approval	# of Listings The bean count (# of 303d listings)	Parameter(s)	Comment	Update Date Enter the date you updated this information	Report Type
Yes	Lower White River pH TMDL	TMDL	SWRO	Donovan Gray	In Development	1990	1990 2012	Draft 2016, 2019?	2020	3	pH	Allocations in development.	3/27/2019	New Template Joint TMDL report
Yes	East Fork Lewis River	Alternative	SWRO	Devan Rostorfer	In Development	2004	2005-06	2018	2020	21	Temperature, Bacteria	Active implementation through EF Lewis River Partnership lead by Devan	10/25/2018	EAP-Source Assessment report--completed
Yes	Burnt Bridge Creek	Alternative	SWRO	Devan Rostorfer	In Development	2007	2008-08	2019?	2021	3	Bacteria, Dissolved Oxygen, Temperature, pH	Data analysis resumes 2019.	4/19/2018	
Yes	Budd Inlet DO TMDL	TMDL	SWRO	Leanne Weiss	In Development	1997	2003	2019?	2021	3	Dissolved Oxygen	Allocations in development.	4/19/2018	New template (Joint report)
No	Clover Creek	Alternative	SWRO	Donovan Gray	In Development	2012	2013-14	2016	2021	8	Bacteria, Temperature		4/19/2018	EAP-Source Assessment report--completed
No	Lacamas Creek	Alternative	SWRO	Devan Rostorfer	In Development	2010	2010-11		2024	17	Dissolved Oxygen, Bacteria, pH, Temperature	Plan to scope in FY2020	4/19/2018	TBD during scoping

SPOKANE
RIVERKEEPER®

It's Your River ♦ We Protect It

Governor Jay Inslee

March 3, 2021

Office of the Governor
Box 40002
Olympia, WA 98504-0002

RE: Appropriation of Monsanto Settlement Funds to create a TMDL and Direct Implementation Fund to bring the Spokane River into compliance with Washington Water Quality Standards for PCBs.

Dear Governor Inslee:

I am writing to you as a long-standing advocate for the Spokane River.

The Spokane Riverkeeper is a member of the International Waterkeeper Alliance and is an advocate for the Spokane River Watershed. Our organization works for a fishable and swimmable Spokane River.

Recently, the State of Washington settled with the Monsanto Corporation to address historic pollution by the polychlorinated biphenyls (PCBs) marketed by Monsanto under the trade name of Aroclors. These PCBs persist to this day in the wastewater, sediments, and groundwater of the Spokane River Basin. The Settlement dedicated sixty million dollars to the general fund of Washington in order to address PCB pollution in the State's waters. In so doing, Attorney General Bob Ferguson made the statement, "I urge the Legislature to use this historic recovery to help repair the damage PCBs have inflicted on our environment and public health in Washington state. This recovery should be invested in our environment."[1]

We are at a historic moment that offers the State of Washington an opportunity to make great strides in the cleanup of the Spokane River and the fish that exceed Washington's water quality standards due to pollution from PCBs. However, the pathway to clean water requires a course correction that includes the development of a Total Maximum Daily Load (TMDL). A TMDL stands in contrast to the Spokane River Regional Toxics Task Force (SRRTTF) approach. Recently the SRRTTF made a request for Monsanto

[1]https://www.atg.wa.gov/news/news-releases/monsanto-pay-record-95-million-end-ferguson-s-lawsuit-over-pcbs

settlement funds as a 10 year and biennial funding package[2]. A quick review of the SRRTTF request reveals the central flaw in this current effort. Their $10,065,000 request focuses almost exclusively on studies, education, and administrative costs. This continues eight years (life of SRRTTF) of process and study that has yielded no concrete results of verifiable, water column improvements. On close examination, the SRRTTF request mostly confirms this process orientation and the continued lack of concrete plans to bring the Spokane River into compliance with PCB water quality standards.

We submit as alternative approach, (see Attachment 1) a funding package that places the emphasis on Monsanto settlement funds being directed toward measurable cleanup by:

1) Creating a Direct to Implementation Fund (DIF) to accelerate the implementation of PCB cleanup activities.
2) Implementing projects that will directly remove persistent organic pollutants in the water column and in the fish that live in the Spokane River Watershed.
3) Creating an agency led comprehensive TMDL planning effort that has implementation goals, benchmarks, schedules, loading limits, and is legally defensible.

The attached budget shows our suggested allocations of funds in the service of the above priorities. In so doing, the monies are converted from a body that is process orientated to a constructive, results-oriented effort to remove PCBs and bring the Spokane River into compliance with water quality standards. PCBs have been studied for thirty years, and we need to transition to concrete removal.

Please note the allocation of these funds will also resolve litigation and jurisdictional authority issues that nongovernment organizations and the Spokane Tribe of Indians are embroiled in with the State of Washington and the EPA.

If you have questions or comments, please do not hesitate to contact me. Thank you for the opportunity to be a part of responsible change.

Respectfully,

R Jerome White, Jr.

Jerry White, Jr.
Executive Director,
Spokane Riverkeeper

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[2] http://srrttf.org/wp-content/uploads/2021/01/3-Final-20210107-SRRTTF-State-Legislators-Request-Letter.pdf

cc: Senator Andy Billig
Representative Marcus Riccelli
Representative Timm Ormsby
Michelle Pirzadeh, Acting Regional Administrator, EPA Region 10
Dan Opalski, Director, Water Division, EPA Region 10
Laura Watson, Director, Washington Department of Ecology
Brooke Beeler, Director, Washington Department of Ecology, ERO
Adriane Borgias, Water Quality Manager, Director, Washington Department of Ecology, ERO

Attachment 1

Action	Summary	Amount
PCB TMDL and Direct to Implementation (DIF) funding Package		
Interagency PCB Implementation Advisory Committee (IPIAC)	This is the formation and activation of an advisory committee that recommends PCB implementation and clean up actions along with recommended prioritization ranking. This would occur concurrently with sun-setting the SRRTTF and reestablishing the jurisdictional authority of the state.	$200,000
Direct Implementation Funds (DIF) for PCB removal and cleanup of PCBs to include PCB destruction and removal strategies and methods for Waste Water Dischargers. PCB removal technologies will be documented and piloted Waste Water Removal projects should be fast tracked, and a "treatment train" of technologies to remove permanently the effluent from the Spokane River.	Storm Water removal from Cochran Basin in City of Spokane MS4 basin.	$2,000,000
	Little Spokane River Hatchery Project Upgrade (augmentation funds)	$1,000,000.
	Removal and reuse of Spokane River Discharge wastewater	$2.000,000
	WSDOT removal of all stormwater outfalls - implement LID - to the Spokane River, Little Spokane River, and Hangman Creek	$2,500,000
	Kaiser Mead Ground Water Implementation - UV PCB Destruction Technology - DIF for WDOE personnel to advise and work with Kaiser to fast track technologies that can be upscaled and exported to other waste water discharge facilities.	$1,500,000
Administration of TMDL Development		
Staff/expertise for the Development and approval of a TMDL for Spokane River PCB Pollution	These funds would be directed to the Washington Department of Ecology to develop and seek EPA approval for a Spokane River/Little Spokane River TMDL for PCBs	$300,000
Further WDOE, Environmental Assessment Program studies to fill gaps the data gathering efforts that have taken place by the SRRTTF and contractors at Limnotech	Examine the studies and sampling of PCBs in the Spokane River, determine what other studies are necessary to complete a loading assessment and a cleanup plan	$500,000
PCB Policy reform - **Needed Policy reform in regulation, planning, and implementation**		
Petition EPA for TSCA Reform.	The Toxics Substance and Control Act is out of sync with clean-up efforts in Washington. However, the sole effort to address this issue under the SRRTTF is expensive and indirect. The slow, expensive methods employed to reform TSCA do not follow established legal processes for petition, have no attainable goals, nor benchmarks for success. This money would be allocated to simply petition the EPA.	$15,000

Petition EPA to use the updated test method of 1668c for compliance use in the NPDES Program	Currently the system of measuring PCBs in waste water for compliance in the NPDES program is inadequate. This method provides data gaps that frustrate the administration of permits, evade accountability, and continue to cause and contribute to water quality violations.	$20,000
Outreach Efforts	Any cleanup effort would have an outreach component to help the public the proper disposal of household waste in the service of preventing PCBs from entering the waste water stream. (Education and outreach would be capped at 5% of the total budget)	$30,000
Total DIF spend		**$9,200,000**
Total TMDL Administration/Development Spend		**$800,000**
Total Policy Reform Spend		**$65,000**
Total Spend		**$10,065,000**

Message

From: Lara Floyd [lara@whitebluffsconsulting.com]
Sent: 3/16/2021 10:40:35 PM
To: ABOR461@ECY.WA.GOV; Alyssa Gersdorf [alyssag@postfallsidaho.org]; Amanda Parrish (aparrish@landscouncil.org) [aparrish@landscouncil.org]; Ben Brattebo (bbrattebo@spokanecounty.org) [bbrattebo@spokanecounty.org]; bencarleton@iepco.com; BiJay Adams (bijay@libertylake.org) [bijay@libertylake.org]; Brent.Downey@kaisertwd.com; crossley@spokanetribe.com; Nickel, Brian [Nickel.Brian@epa.gov]; Cadie Olsen (colsen@spokanecity.org) [colsen@spokanecity.org]; Christopher.Donley@dfw.wa.gov; Craig Borrenpohl (cborrenpohl@postfallsidaho.org) [cborrenpohl@postfallsidaho.org]; Dave Dilks (ddilks@limno.com) [ddilks@limno.com]; Dave Knight (dkni461@ecy.wa.gov) [dkni461@ecy.wa.gov]; dave.mcbride@doh.wa.gov; Diana Washington (dwas461@ecy.wa.gov) [dwas461@ecy.wa.gov]; Doug Krapas (dougkrapas@iepco.com) [dougkrapas@iepco.com]; galenb1@comcast.net; Greg Weeks (weeks.kay@gmail.com) [weeks.kay@gmail.com]; Hermanson, Mike [MHERMANSON@spokanecounty.org]; Jeff Donovan (jdonovan@spokanecity.org) [jdonovan@spokanecity.org]; John Beacham (jbeacham@postfallsidaho.org) [jbeacham@postfallsidaho.org]; Ken Windram (kwindram@harsb.org) [kwindram@harsb.org]; Kevin Booth (kevin.booth@avistacorp.com) [kevin.booth@avistacorp.com]; Lisa Dally Wilson (lisadallywilson@gmail.com) [lisadallywilson@gmail.com]; Edmondson, Lucy [Edmondson.Lucy@epa.gov]; MARTIN, BEN [BMARTIN@cdaid.org]; Soscia, Mary Lou [Soscia.Marylou@epa.gov]; Mike Anderson (manderson@cdaid.org) [manderson@cdaid.org]; Mike Coster (mcoster@spokanecity.org) [mcoster@spokanecity.org]; mlascuola@srhd.org; mpetersen@landscouncil.org; Mike Zagar (zagar659@gmail.com) [zagar659@gmail.com]; Ott, Monica [Monica.Ott@avistacorp.com]; 'Pond, Elsa' [PondE@wsdot.wa.gov]; Rains, Karl (ECY) [KRAI461@ECY.WA.GOV]; rstevens@cdatribe-nsn.gov; Rich Watson (richard.watson@dfw.wa.gov) [richard.watson@dfw.wa.gov]; rlindsay@spokanecounty.org; robert.steed@deq.idaho.gov; tagnew@libertylake.org; Tammie Williams (williamt@wsdot.wa.gov) [williamt@wsdot.wa.gov]; Vikki Barthels (vbarthels@srhd.org) [vbarthels@srhd.org]; Weaver, Dean [WeaverD@wsdot.wa.gov]
CC: Benjamin Floyd [ben@whitebluffsconsulting.com]
Subject: Riverkeeper letter/SRRTTF response letter to Gov. Inslee
Attachments: Riverkeeper letter to Inslee_PCB+TMDL_3-3-2021.pdf; Recommended Letter Gov Inslee 20200316.pdf

Importance: High

Hi Task Force members,

Earlier this month Riverkeeper sent a letter to Governor Inslee requesting the Monsanto Settlement Funds be used towards establishing a Spokane River TMDL process, among other things. We felt it was appropriate to respond to this as a Task Force. We have attached their letter and also a response letter encouraging Governor Inslee to support the SRRTTF funding request regarding the Monsanto funds.

Please review the Task Force letter and provide comments or your approval of the letter by no later than the close of business this Thursday, March 18. Lisa Dally Wilson, Doug Krapas and Rob Lindsay have all provided input on the letter we are recommending be approved. If we don't hear from you by Thursday we will assume support.

Thanks,

Lara Floyd
White Bluffs Consulting
509-460-2001

SPOKANE RIVER
REGIONAL TOXICS TASK FORCE

COLLABORATION INNOVATION PROGRESS

SPOKANE RIVER REGIONAL TOXICS TASK FORCE
SUPPORT FOR MONSANTO PCB SETTLEMENT FUNDING REQUEST

March 18, 2021

Dear Governor Inslee:

Thank you for your leadership in promoting environmental excellence in Washington State and for your continued support of the work of the Spokane River Regional Toxics Task Force (Task Force). As you are aware, the Task Force is a diverse group comprised of local governments, businesses, environmental organizations and state and federal agencies dedicated to a collaborative alternative to the traditional Total Maximum Daily Load (TMDL) process.

You recently received a request from the Spokane Riverkeeper, an organization that withdrew from the Task Force in 2019, promoting the traditional TMDL process instead of our more innovative approach. While we share many of the same goals and actions outlined in the Riverkeeper proposal and hope to work with them on achieving these, we are confident the Task Force approach and actions identified in our funding request will yield more tangible results in reducing PCBs than the traditional TMDL process.

In light of the recent Spokane Riverkeeper communications, we are reiterating our request for your support for dedicating state funding received through the Monsanto PCBs settlement agreement to cleaning up the PCB contamination and environmental damage in the State and the Spokane River basin. We have made a similar request to senators and representatives from the Spokane region and other leaders in the State Legislature, and have been pleased with the support we are receiving.

Task Force funding will be dedicated to implementing a 10-year list of projects in $2 million biennium budget increments. The projects include the Task Force's priority actions, including investigations, feasibility evaluations, pilot scale-testing of treatment methods and other activities that are part of our ongoing efforts to identify and reduce PCB loading to the Spokane River, consistent with our Comprehensive Plan and Work Plan.

Progress is Being Made

A 2014 'Measurable Progress report' from the Washington State Department of Ecology (Ecology) indicates that the SRRTTF has made measurable progress toward identifying, reducing and controlling PCBs and related toxic chemicals in the Spokane River. The report concludes that "the Spokane River Regional Toxics Task Force has removed 265 pounds of PCBs from soil, wastewater and stormwater, and eliminated the potential for another 18 pounds from reaching the river."

A subsequent Measurable Progress report is currently being prepared by Ecology. That report will summarize additional mass removal of PCBs from soil, wastewater and stormwater over the last six years. These results are coupled with the installation of advanced water quality treatment systems by dischargers in Washington and Idaho. Where those systems have already been installed, we are seeing a 98 to 99% removal of PCBs in the treatment processes. We are also seeing promising trends in water quality monitoring that the Spokane River is meeting the state PCB standards. We are hopeful that as the efforts of community, Task Force and dischargers proceed we will also see the steady decline in the presence of PCBs in fish tissue.

As a Task Force we remain committed to continuing what is a national model for addressing regional water quality issues, to making measurable progress in reducing PCB risks, and to achieving the associated socio-economic and environmental benefits. Thank you for your support. We look forward to continued work with you to achieve these objectives.

cc w/attachments:
Senator Andy Billig
Representative Marcus Riccelli
Representative Timm Ormsby
Michelle Pirzadeh, Acting Regional Administrator, EPA Region 10
Dan Opalski, Director, Water Division, EPA Region 10
Laura Watson, Director, Washington Department of Ecology

SPOKANE RIVER
REGIONAL TOXICS TASK FORCE

COLLABORATION INNOVATION PROGRESS

Attachment 1

Table 1 - 10-year Funding Request

SRRTTF Draft 10-Year Funding Request Washington State Legislature for Monsanto Settlement Funds			
Action/Project	**Schedule**	**Cost/Annual**	**Total Cost**
Long-term monitoring program	Every 2 years	$200K	$1000K
High flows synoptic sampling	2021-2023	$100K	$200K
Low flow synoptic to capture gw inputs between Spokane and Nine mile gages plus other stations upstream	2021 – 2023	$100k	$200K
Additional hot spots investigation - Biofilm in Mission Reach - GW elevation monitoring near Mission reach - Subbottom profiling to ID buried drums or transformers - known contaminated sites, targeting Aroclors 1254 and 1260 based on past production processes - review of historical records	2021 – 2025	$400K	$400K
Evaluating wastewater treatment methods and materials for PCB treatment at utility scale, including engineering evaluations, trial runs, pilot testing and further evaluations	Initiate in 2021-2023 with research of available technology. Testing and evaluation to be performed in outyears	varies	$4,500K
Evaluate stormwater to drywell connection, including Industrial parks' dry wells	2021 – 2023	$200K	$400K
Evaluate stormwater management strategies to	2023-2025	$200K	$400K

address findings from drywell and groundwater investigations			
More detailed bioaccumulation assessment - how PCBs move up to food chain	3 year study, planned for 2023-2027	$250K	$750K
Opportunistic sampling, e.g., additional Trent bridge piling samples	As opportunities emerge	N/A	$15K
Building demolition and renovation control - to determine effectiveness and follow up actions	2025-2027	$25K	$25K
Enhanced waste disposal assistance - - to determine effectiveness and follow up actions	2025 – 2027	$25K	$25K
Education & Outreach activities	Annual/ongoing	$40K	$400K
iPCB/TSCA actions	Annual/ongoing	$50K	$500K
Review and updateComprehensive plan/adaptive managment	Review and update every 2 years	$25 - 100K	$250K
Program management, facilitation and technical support	Annual/ongoing	$105K	$1050K

Total $10,065,000

Table 2: 2021 – 2023 Biennuim Funding Request

Action/Project	Total Cost
Long-term monitoring program	$200K
High flows synoptic sampling	$200K
Low flow synoptic to capture gw inputs between Spokane and Nine mile gages plus other stations upstream	$200K
Additional hot spots investigation	$400K
Work plan for evaluating wastewater treatment methods and materials for PCB treatment at utility scale	$100K
Stormwater to drywell connection, including Industrial parks' dry wells	$400K
Opportunistic sampling	$10K
Education & Outreach activities	$80K
iPCB/TSCA actions	$100K
Review and update Comprehensive plan/adaptive management	$100K
Program Management, facilitation and technical support	$210K

Total $2,000,000

Sierra Club, et al. v. McClerran, et al. (U.S. EPA), No. 2:11-cv-01759-BJR (W.D. Wash.)
Administrative Record for Judicial Review of "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015 (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
The listed documents EPA previously submitted to the Court, at ECF Doc. Nos. 59 and 79, incorporated by reference.				
001	EPA_PLAN_0000001 - 0024	12/08/1983	EPA Proposed Rule - Polychlorinated Biphenyls (PCBs); Exclusions, Exemptions and Use Authorizations [FR Vol. 48, No. 237, 55076]	
002	EPA_PLAN_0000025 - 0032	08/08/1997	EPA Memorandum from Bob Perciasepe, Assistant Administrator to Regional Administrators and Regional Water Division Directors re: New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)	
003	EPA_PLAN_0000033 - 0980	11/01/2000	Toxicological Profile for Polychlorinated Biphenyls (PCBs), US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry	
004	EPA_PLAN_0000981 - 1069	07/29/2005	EPA Memorandum from Diane Regas, Director, Office of Wetlands, Oceans and Watersheds to Regional Water Division Directors re: Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Section 303(d), 305(b) and 314 of the Clean Water Act with attachment: Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Section 303(d), 305(b) and 314 of the Clean Water Act	Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act
005	EPA_PLAN_0001070 - 1099	10/01/2006	van den Berg, et al., The 2005 World Health Organization Re-Evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds, Toxicol. Sci. 2006 October 93(2): 223-241	
006	EPA_PLAN_0001100 - 1139	01/23/2012	Memorandum of Agreement Regarding Spokane River Regional Toxics Task Force	
007	EPA_PLAN_0001140 - 1418	05/01/2012	Final Site-Wide Groundwater Remedial Investigation, Kaiser Trentwood Facility, Spokane Valley, Washington, Volume I, Hart Crowser Report	

Sierra Club, et al. v. McClerran, et al. (U.S. EPA), No. 2:11-cv-01759-BJR (W.D. Wash.)
Administrative Record for Judicial Review of "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015 (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
008	EPA_PLAN_0001419 - 1424	04/23/2013	Technical Consultant Support to Spokane River Regional Task Toxics Task Force, Preliminary Scope of Work for Phase 2 Through 4, Initial Estimate of Activities to be Conducted by LinmoTech	
009	EPA_PLAN_0001425 - 1436	11/14/2013	Memorandum from Dave Dilks, Tim Towey, Kat Ridolfi, LimnoTech, to the SRRTTF re: Identification of Data Gaps - Final	
010	EPA_PLAN_0001437 - 1500	06/01/2014	Polychlorinated Biphnenyls (PCBs) in General Consumer Products, State of Washington, Department of Ecology	Product Testing
011	EPA_PLAN_0001501 - 1502	12/12/2014	Roster, Spokane River Regional Toxics Task Force, Update 12/12/2014	
012	EPA_PLAN_0001503 - 1725	02/01/2015	PCB Chemical Action Plan, State of Washington, Department of Ecology and Department of Health	PCB Chemical Action Plan
013	EPA_PLAN_0001726 - 1801	02/01/2015	PCB Chemical Action Plan, Appendix G, Response to Comments, State of Washington, Department of Ecology and Department of Health	PCB CAP Appendix G:
014	EPA_PLAN_0001802 - 1802	03/18/2015		FW: contract
015	EPA_PLAN_0001803 - 1815	03/18/2015		
016	EPA_PLAN_0001816 - 1817	03/20/2015	2015-03-20 email from Ecology to EPA regarding Task Force	Links to information on the SRRTTF website
017	EPA_PLAN_0001818 - 1819	03/30/2015	2015-03-30 email from EPA to Ecology concerning PCB reductions in stormwater	FW: PCB load reductions in MRP (San Francisco)

Sierra Club, et al. v. McClerran, et al. (U.S. EPA), No. 2:11-cv-01759-BJR (W.D. Wash.)
Administrative Record for Judicial Review of "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015 (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
018	EPA_PLAN_0001820 - 1824	03/30/2015	Attachment to 2015-03-30 email concerning PCB reductions in stormwater	
019	EPA_PLAN_0001825 - 1826	04/06/2015	2015-04-06 email chain concerning Task Force MOA, Annual Report, Work Plan, and Schedule	FW: SRRTTF Memorandum of Agreement: comparison of original 2012 and revised version for legal review
020	EPA_PLAN_0001827 - 1827	04/07/2015	2015-04-07 email from Ecology to EPA concerning Task Force meeting agenda	FW: revised draft agenda
021	EPA_PLAN_0001828 - 1828	04/07/2015	Attachment to 2015-04-07 email from Ecology to EPA concerning Task Force meeting agenda	
022	EPA_PLAN_0001829 - 1830	04/07/2015	2015-04-07 email from Ecology to EPA concerning Spokane Tribe participation in Task Force	FW: Spokane River Regional Toxics Task Force
023	EPA_PLAN_0001831 - 1831	04/08/2015	2015-04-08 email from Ecology to EPA concerning Task Force Work Plan	RE: Milestone schedule
024	EPA_PLAN_0001832 - 1833	04/08/2015	Task Force Work Plan Status; Attachment to 2015-04-08 email from Ecology to EPA	
025	EPA_PLAN_0001834 - 1835	04/08/2015	2015-04-08 email from Ecology to EPA concerning Spokane City Council Clean Water Plan	FW: Council to consider adoption of Clean Water Plan
026	EPA_PLAN_0001836 - 1837	04/08/2015	City of Spokane Media Release; Attachment to 2015-04-08 email from Ecology to EPA concerning Spokane City Council Clean Water Plan	
027	EPA_PLAN_0001838 - 1839	04/08/2015	Executive Summary; Attachment to 2015-04-08 email from Ecology to EPA concerning Spokane City Council Clean Water Plan	

Sierra Club, et al. v. McClerran, et al. (U.S. EPA), No. 2:11-cv-01759-BJR (W.D. Wash.)
Administrative Record for Judicial Review of "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015 (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
028	EPA_PLAN_0001840 - 2075	04/08/2015	Draft Integrated Clean Water Plan; Attachment to 2015-04-08 email from Ecology to EPA concerning Spokane City Council Clean Water Plan	
029	EPA_PLAN_0002076 - 2076	04/08/2015	2015-04-08 email from Ecology to EPA concerning useful references	Useful References
030	EPA_PLAN_0002077 - 2476	04/08/2015	Handbook for Developing Watershed Plans to Restore and Protect Our Waters; Attachment to 2015-04-08 email from Ecology to EPA	
031	EPA_PLAN_0002477 - 2547	04/08/2015	W.K. Kellogg Foundation Logic Model Development Guide; Attachment to 2015-04-08 email from Ecology to EPA	
032	EPA_PLAN_0002548 - 2551	04/08/2015	2015-04-08 email from Ecology to EPA concerning PCBs in consumer products	FW: PCB Product Testing Grant G1400545, Final Report
033	EPA_PLAN_0002552 - 2553	04/08/2015	2015-04-08 email from Ecology to EPA concerning PCB removal numbers	FW: PCB removal numbers
034	EPA_PLAN_0002554 - 2557	04/08/2015	2015-04-08 email from Ecology to EPA concerning PCB removal program at Avista (Spokane)	FW: Compliance Review: AWB Environmental Excellence Awards
035	EPA_PLAN_0002558 - 2558	04/08/2015	2015-04-08 email from Ecology to EPA concerning reported PCB removal data	Reported PCB removal data from SRSP
036	EPA_PLAN_0002559 - 2559	04/09/2015	2015-04-09 email from Ecology to EPA concerning Spokane PCB report	FW: Ecology blog post on Spokane PCB report
037	EPA_PLAN_0002560 - 2561	04/10/2015	2015-04-10 emails between EPA and Ecology concerning development of EPA Plan	RE: Internal Meeting with EPA re: Permits/Cleanups and PCB Lawsuit Coordination

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Administrative Record for Judicial Review of "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015 (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
038	EPA_PLAN_0002562 - 2563	04/14/2015	2015-04-14 emails between EPA and Ecology concerning MTCA cleanup levels at Kaiser	RE: MTCA clean up levels for PCB in groundwater at Kaiser
039	EPA_PLAN_0002564 - 2565	04/14/2015	2015-04-14 email chain concerning MTCA cleanup levels at Kaiser	RE: MTCA clean up levels for PCB in groundwater at Kaiser
040	EPA_PLAN_0002566 - 2566	04/23/2015	2015-04-23 email from Kaiser Aluminum representative to EPA concerning technical work needs	Response to Order
041	EPA_PLAN_0002567 - 2567	04/23/2015	Attachment to 2015-04-23 email from Kaiser Aluminum representative to EPA concerning technical work needs	
042	EPA_PLAN_0002568 - 2570	05/07/2015	emails between Task Force members and EPA concerning Task Force input into EPA Plan	FW: SRRTTF input into EPA submittal
043	EPA_PLAN_0002571 - 2573	05/07/2015		FW: SRRTTF input into EPA submittal
044	EPA_PLAN_0002574 - 2575	05/11/2015	2015-05-11 email from EPA to Ecology concerning EPA Plan	FW: Spokane PCB: questions from EPA
045	EPA_PLAN_0002576 - 2578	05/18/2015	2015-05-18 emails between EPA and Task Force concerning Task Force input on EPA Plan	FW: Conference Call Scheduled- EPA Requests a unified response from the Task Force
046	EPA_PLAN_0002579 - 2579	05/18/2015	Attachment to 2015-05-18 emails between EPA and Task Force concerning Task Force input on EPA Plan	
047	EPA_PLAN_0002580 - 2615	05/20/2015	Spokane River Regional Toxics Task Force Phase 2 Technical Activities Report, Draft, LimnoTech	

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Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
048	EPA_PLAN_0002616 - 2617	05/20/2015		Coordinated Task Force Response: EPA's submittal to the United States (federal) District Court Judge
049	EPA_PLAN_0002618 - 2618	05/26/2015	email from Bud Leber (Kaiser) to EPA concerning summary of Kaiser activities	Requested Information
050	EPA_PLAN_0002619 - 2621	05/26/2015	Attachment to: email from Bud Leber (Kaiser) to EPA concerning summary of Kaiser activities	
051	EPA_PLAN_0002622 - 2622	05/26/2015		Requested Information
052	EPA_PLAN_0002623 - 2625	05/26/2015		
053	EPA_PLAN_0002626 - 2626	05/26/2015	E-mail regarding benchmarks for EPA's response to the district court.	Conference Call Follow-up
054	EPA_PLAN_0002627 - 2627	05/26/2015	2015-05-26 e-mail regarding water quality benchmarks for the EPA plan for submittal to the district court.	Conference Call Follow-up
055	EPA_PLAN_0002628 - 2629	05/28/2015		Comments/Revisions to Coordinated Task Force Response Due by Friday May 29th
056	EPA_PLAN_0002630 - 2631	06/02/2015		PCB transformer removal progress
057	EPA_PLAN_0002632 - 2633	06/03/2015		Comments/Revisions to Coordinated Task Force Response: Small Work Group to meet Thursday June 4th from 9am-12pm at the Department of Ecology

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Administrative Record for Judicial Review of "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015 (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
058	EPA_PLAN_0002634 - 2635	06/03/2015	2015-06-03 emails between EPA and Ecology concerning development of EPA Plan	RE: Spokane PCB: questions from EPA
059	EPA_PLAN_0002636 - 2651	06/03/2015	Attachment to 2015-06-03 emails between EPA and Ecology concerning development of EPA Plan	
060	EPA_PLAN_0002652 - 2653	06/04/2015	Task Force mass mailer email concerning comments/revisions to Task Force coordinated Task Force response for EPA Plan	Comments/Revisions to Coordinated Task Force Response Complete: Conference call to be held Friday June 5th from 9 to 11 am to explain the edits and gain Task Force feedback before final version posted for decision
061	EPA_PLAN_0002654 - 2654	06/05/2015	2015-06-05 email from EPA to Ecology concerning PCB in fish tissue	PCB in fish tissue
062	EPA_PLAN_0002655 - 2664	06/05/2015	Attachment to 2015-06-05 email from EPA to Ecology concerning PCB in fish tissue	
063	EPA_PLAN_0002665 - 2666	06/08/2015	Task Force mass mailer email concerning Draft Coordinated Task Force Response on EPA Plan	Final DRAFT Coordinated Task Force Response Complete: Ready for Decision on June 15th conference call
064	EPA_PLAN_0002667 - 2668	06/08/2015		Final DRAFT Coordinated Task Force Response Complete: Ready for Decision on June 15th conference call
065	EPA_PLAN_0002669 - 2670	06/08/2015		Final DRAFT Coordinated Task Force Response Complete: Ready for Decision on June 15th conference call
066	EPA_PLAN_0002671 - 2671	06/10/2015	2015-06-10 email from EPA transmitting link to comprehensive PCB article	PCB article
067	EPA_PLAN_0002672 - 2672	06/10/2015	2015-06-10 email from Ecology to EPA concerning long term monitoring on Spokane	Long term monitoring on Spokane

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Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
068	EPA_PLAN_0002673 - 2674	06/10/2015	2015-06-10 emails between EPA and Ecology concerning Kaiser cleanup	FW: Kaiser: summary paragraph (draft)
069	EPA_PLAN_0002675 - 2675	06/12/2015	2015-06-12 email from Ecology to EPA concerning Ecology's General Hatchery Permit	draft FS and permit
070	EPA_PLAN_0002676 - 2722	06/12/2015	Attachment to 2015-06-12 email from Ecology to EPA containing Ecology's General Hatchery Permit	
071	EPA_PLAN_0002723 - 2755	06/12/2015	Attachment to 2015-06-12 email from Ecology to EPA; Fact Sheet for Ecology's General Hatchery Permit	
072	EPA_PLAN_0002756 - 2828	06/15/2015	Coordinated Response to EPA Regarding the Remand from Judge Rothstein	
073	EPA_PLAN_0002829 - 2829	06/15/2015	2015-06-15 email from Lynn Schmidt (City of Spokane) to EPA concerning Task Force Coordinate Response to EPA Plan	SRRTTF Coordinated Response
074	EPA_PLAN_0002830 - 2902	06/15/2015	Spokane River Regional Toxics Task Force Coordinated Response to EPA Regarding the Remand from Judge Rothstein; Attachment to 2015-06-15 email from Lynn Schmidt (City of Spokane) to EPA	
075	EPA_PLAN_0002903 - 2903	06/16/2015	2015-06-16 email from Lynn Schmidt of City of Spokane to EPA concerning Task Force coordinated response	RE: SRRTTF Coordinated Response
076	EPA_PLAN_0002904 - 2904	06/16/2015	Attachment to 2015-06-16 email from Lynn Schmidt of City of Spokane to EPA concerning Task Force coordinated response	
077	EPA_PLAN_0002905 - 2905	06/16/2015	2015-06-16 email from EPA to Ecology transmitting Washington Hatchery General Permit and Fact Sheet	draft epa gp

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Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
078	EPA_PLAN_0002906 - 2991	06/16/2015	Attachment to 2015-06-16 email from EPA to Ecology transmitting Washington Hatchery General Permit	
079	EPA_PLAN_0002992 - 3072	06/16/2015	Attachment to 2015-06-16 email from EPA to Ecology transmitting Washington Hatchery Fact Sheet	
080	EPA_PLAN_0003073 - 3073	06/18/2015		Spokane Regional Health District efforts towards PCB Reductions in the Spokane River
081	EPA_PLAN_0003074 - 3076	06/18/2015		
082	EPA_PLAN_0003077 - 3077	06/22/2015	2015-06-22 email from EPA to Ecology transmitting draft permitting recommendations	Draft permitting recommendations
083	EPA_PLAN_0003078 - 3084	06/22/2015	2015-06-22 Draft Permitting Recommendations	
084	EPA_PLAN_0003085 - 3085	06/23/2015	2015-06-23 email from EPA to Ecology transmitting draft permitting recommendations	Revised permitting recommendations
085	EPA_PLAN_0003086 - 3092	06/23/2015	06-23-2015 Permitting Recommendations	
086	EPA_PLAN_0003093 - 3093	06/24/2015		Letters from Spokane Regional Health District and City of Spokane re: PCB reduction
087	EPA_PLAN_0003094 - 3096	06/24/2015		

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Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
088	EPA_PLAN_0003097 - 3098	06/24/2015		
089	EPA_PLAN_0003099 - 3114	06/24/2015		
090	EPA_PLAN_0003115 - 3116	06/24/2015		FW: SPOKANE COUNTY + Coordinated Task Force Response: EPA's submittal to the US (federal) District Court Judge
091	EPA_PLAN_0003117 - 3118	06/24/2015		
092	EPA_PLAN_0003119 - 3191	06/24/2015		
093	EPA_PLAN_0003192 - 3279	06/24/2015		
094	EPA_PLAN_0003280 - 3280	06/25/2015	2015-06-25 email from EPA to Idaho DEQ transmitting EPA's draft permitting recommendations	Draft permitting recommendations for discharges in the Spokane watershed
095	EPA_PLAN_0003281 - 3287	06/25/2015	2015-06-23 Draft Permitting Recommendations	
096	EPA_PLAN_0003288 - 3289	06/25/2015	2015-06-25 email from Idaho DEQ to EPA concerning review of permitting recommendations	RE: Draft permitting recommendations for discharges in the Spokane watershed
097	EPA_PLAN_0003290 - 3291	07/02/2015	2015-07-02 emails between EPA and Ecology concerning review of PCB data	Re: reviewing PCB data

Sierra Club, et al. v. McClerran, et al. (U.S. EPA), No. 2:11-cv-01759-BJR (W.D. Wash.)
Administrative Record for Judicial Review of "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015 (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
098	EPA_PLAN_0003292 - 3292	07/06/2015		Ecology comments on the Draft Permitting Recommendations
099	EPA_PLAN_0003293 - 3299	07/06/2015		
100	EPA_PLAN_0003300 - 3302	07/08/2015		RE: contract
101	EPA_PLAN_0003303 - 3305	07/08/2015	2015-07-07 letter from Margaret C. Hupp to David J. Kaplan and Ronald L. Lavigne concerning response to Court Order in Sierra Club v. McLerran	
102	EPA_PLAN_0003306 - 3306	07/09/2015	2015-07-09 email from Ecology to EPA concerning EPA Plan interim milestones	Ecology language to augment interim milestones
103	EPA_PLAN_0003307 - 3307	07/10/2015	2015-07-10 email transmitting EPA's final draft permitting recommendations for EPA Plan	Final draft permitting recommendations
104	EPA_PLAN_0003308 - 3315	07/10/2015	2015-07-10 Draft of EPA's Permitting Recommendations for the Spokane River Watershed	
105	EPA_PLAN_0003316 - 3317	07/13/2015	2015-07-13 emails between EPA and Ecology concerning final draft permitting recommentations	RE: Final draft permitting recommendations
106	EPA_PLAN_0003318 - 3351	07/14/2015	EPA's response to remand RE: EPA's plan to attain applicable water quality standards for PCBs in the Spokane River	
107	EPA_PLAN_0003352 - 3352	07/14/2015	2015-07-14 email from EPA to Ecology transmitting final permitting recommendations	NPDES Permitting Recommendations for the Spokane River Watershed

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Administrative Record for Judicial Review of "EPA's Plan for Addressing PCBs in the Spokane River," dated July 14, 2015 (See ECF No. 237)

Document Number	Bates Range	Document or Transmittal Date	Document Description (where applicable)	Email Subject (where applicable)
108	EPA_PLAN_0003353 - 3353	07/14/2015	2015-07-13 letter from Michael J. Lidgard, EPA, to Jim Bellatty, Ecology, transmitting NPDES Permitting Recommendations for the Spokane River Watershed	
109	EPA_PLAN_0003354 - 3361	07/14/2015	2015-07-13 Final Permitting Recommendations for the Spokane River Watershed	
110	EPA_PLAN_0003362 - 3406	07/21/2015	PCBs in Municipal Products, Revised, Wastewater Management Department, City of Spokane	PCBs in Municipal Products
111	EPA_PLAN_0003407 - 3407	02/24/2016		
112	EPA_PLAN_0003408 - 3409	06/16/2016		RE: SRRTTF Meeting Announcement: June 22, 2016
113	EPA_PLAN_0003410 - 3410	06/16/2016		

SPOKANE RIVER REGIONAL TOXICS TASK FORCE

Coordinated Response to EPA Regarding the Remand from Judge Rothstein

EPA has requested the following information as a coordinated response from the Spokane River Regional Toxics Task Force ("Task Force") in order to provide information associated with Judge Rothstein's order in the matter of *Sierra Club v. Dennis McLerran; EPA, et al.* (U.S. Dist. W. Wash. No. 11-CV-1759-BJR). This correspondence was formally approved by the Task Force on June 15, 2015.

Executive Summary

The Task Force is a well-functioning, collaborative effort that is making progress in identifying and reducing PCB sources in the Spokane River watershed. Each entity has expended significant time, effort, and funding to work towards the common goal of achieving PCB water quality standards. Work has been done collectively to not only create scientifically defensible data on PCBs in the watershed, but to also to identify and mitigate sources of PCBs.

Task Force actions to reduce PCBs include:

- Completing the first comprehensive, simultaneous, bi-state data collection project to identify the magnitude of dry weather PCB sources
- Identifying and reducing PCB sources in wastewater and stormwater systems
- Changing procurement practices to reduce use of products higher in PCBs
- Driving for the necessary modification of TSCA rules that allow PCBs in products at concentrations up to 50 billion times greater than water quality standards
- Educating the public
- Task Force funding to date totals about $1 million
- See "**Current Actions**" for an expanded list of Task Force accomplishments.

The Spokane River is among the more than 80,000 miles of threatened or impaired rivers in the United States that are listed for PCBs. Only about 10% of these impaired waterbodies have a TMDL. To date, not one of these waterbodies has achieved water quality standards, regardless if a TMDL was created.

Ecology and EPA selected an innovative direct-to-implementation approach for the Spokane River watershed, creating the Task Force to make progress towards meeting water quality standards in lieu of the traditional Total Maximum Daily Load (TMDL) process. This process is in concert with EPA's "alternatives" goal outlined in the 2013 EPA document, "A Long-Term Vision for Assessment, Restoration, and Protection Under the Clean Water Act Section 303(d) Program" (Attachment D). Task Force members strongly believe that the work they are performing under the direct-to-implementation approach is the most effective tool to address water quality protection and restoration efforts. Continuing upon the momentum that has been gained by the Task Force is in the best interest of the Spokane River.

Framework for the Toxics Task Force

In 2011, the Department of Ecology ("Ecology") issued NPDES permits for all Spokane River wastewater dischargers in Washington. These permits require participation by the permittees in a Regional Toxics Task Force ("Task Force"). In 2014, EPA issued permits for Idaho dischargers requiring their participation in the Task Force. The goal of the Task Force is to develop a comprehensive plan to bring the Spokane River into compliance with applicable water quality standards for PCBs.

The NPDES permits specify that if Ecology determines that the Task Force is failing to make measurable progress toward meeting applicable water quality criteria for PCBs, Ecology would be obligated to proceed with the development of a TMDL in the Spokane River for PCBs, or determine an alternative to ensure water quality standards are met.

Task Force participants currently include NPDES permittees, conservation, environmental, and health interests including Lake Spokane Association, Spokane Riverkeeper and the Lands Council; Spokane Regional Health District; Ecology; Idaho DEQ; Washington State Department of Health; the Coeur d'Alene Tribe; and USEPA. By late 2012, the Task Force was organized, had developed an operating Memorandum Of Agreement ("MOA") (Attachment A), established an administrative and contracting entity, and procured a national expert as a community technical advisor for the important work it was undertaking. Funding for the Task Force to date has been obtained primarily from NPDES permittees in Washington and Idaho, as well as grants and a Washington State Legislative Procurement in 2013.

Background: Early Studies Showed Data Gaps

In April 2011, Ecology published a PCB Source Assessment for the Spokane River. This report relied on data collected between 2003 and 2007 using various sampling methods. As a result, the understanding of PCBs in the Spokane River (the river) in 2011 showed significant data gaps and inconsistencies with today's technology. For example:

- The report calculated PCBs crossing the Idaho/Washington state line to be approximately 477 mg/day
- Between the Idaho/Washington state line and Long Lake Dam, approximately 3,187 mg/day of PCBs were estimated to be entering the river
- Measured discharges from Washington point sources (NPDES Permit Holders) accounted for about 307 mg/day of PCBs
- Tributaries to the Spokane River accounted for 97 mg/day of PCBs

- 690 mg/day of PCBs were estimated to be entering the River from the City of Spokane's stormwater system. (Recent sampling and analysis by the City shows the estimated stormwater contribution to be approximately 46 mg/day.)

In summary, the 2011 report findings indicated that at least 66% of the PCB sources measured in the River were unknown, and much of these data were uncertain.

Development of the Work Plan

To achieve their goal of developing a Comprehensive Plan to bring the Spokane River into compliance, the Task Force developed and adopted an initial Work Plan in 2012 (Attachment B), setting forth the Task Force vision, identifying the anticipated work required to accurately identify primary sources of PCBs, and the possible schedule for the completion of that work. The Task Force is currently on schedule with the work, and is making measurable progress in the reduction of PCBs in the Spokane River. As more information is learned, the Comprehensive Plan may be amended and additional source reduction measures may be implemented.

Initial Task Force Actions: Expedient and On Target

The Task Force developed and organized the work plan by breaking the work out into Phases 1-4. In April 2013, the Task Force engaged LimnoTech, a firm with national expertise on the fate and transport of PCBs, as a technical advisor to assist with the development of an initial scope of work for its technical efforts.

Phase 1 *(late 2012 – early 2014)*

These initial efforts included compilation of all PCB data which may be relevant for characterizing either potential PCB source contribution or instream PCB conditions, review and evaluation of the compiled data for future use, analysis of the data to identify data gaps which are critical to developing a clear understanding of current conditions, development of a data collection strategy, companion sampling, analysis, and quality assurance project plans.

Existing PCB Data Compilation

An inventory of existing groundwater, stormwater, point source discharges, and river and lake sampling data has been compiled and includes publically available information (e.g. Ecology publications and open literature), as well as data from known public and private sources and Task Force members. These data were placed into an Access data base for future use. These data, while critical, require supplementation to identify reduction opportunities.

Review and Evaluation of Compiled Data

Once the data compilation effort was completed, the data was reviewed and characterized based on quality and usability with respect to potential source identification, source delivery pathways to the river, and instream fate and transport.

Data Gap Analysis

An inventory of missing information (data gaps) has been developed using a conceptual model for the river. This model considered potential sources and source pathways and covered the river from its origin at the outlet of Lake Coeur d'Alene to Nine Mile Dam, below the Spokane urban area. Four main data gaps have been formally identified:

- The magnitude of true sources contributing to stormwater loads
- Sources between the outlet of Lake Coeur d'Alene and the Idaho/Washington State Line
- Loading from atmospheric sources
- Loading from groundwater sources

Data Collection Strategy

Based upon the above identified data gaps, the initial "Phase 2" data collection strategy was developed. This strategy was to focus on dry weather monitoring of the Spokane River between Lake Coeur d'Alene and Nine Mile Dam in order to quantify PCB loading from groundwater sources and Idaho. The strategy for the dry weather monitoring (baseline monitoring) included all point sources as well as all river and tributary locations where flow was either measured or calculated. Although uncertainty regarding exact PCB concentrations exists, this strategy assisted in the develop a report which quantifies the relative magnitude of sources for each river segment between river flow gages so that the contribution of PCB loads via unknown sources (presumably groundwater) could be determined.

Ecology, Idaho DEQ and EPA approved a Quality Assurance Project Plan (QAPP) to provide consistency and uniformity with collection of data. Data collection, associated sampling, analysis, and quality assurance are especially challenging because of the extremely low concentrations of PCBs in the water column and the low sediment deposits in the Spokane River. As such, the Task Force's work in measuring PCBs at such low levels is precedent setting. We have learned that concentrations of PCBs in the laboratory blanks are near or even above those concentration levels in the samples. The QAPP and its unanimous approval by the Task Force ensures all data generated from the study is consistent and as accurate as possible. Such collaboration regarding acceptance of data is noteworthy. Therefore, confidence in the data allows decisions and actions to move forward in a more expeditious manner.

Phase 2 *(2014 to end of 2015)*

Dry Weather Synoptic Sampling Event in 2014: the First Comprehensive Analysis

In August 2014, the Task Force implemented the Phase 2 data collection strategy. This represents the *first comprehensive, simultaneous, bi-state data collection* effort performed on the Spokane River for PCB loading between the outlet of Lake Coeur d'Alene to Nine Mile Dam. Sampling was conducted over a very short time period (synoptic) so that a contemporaneous "snapshot" of the river from the outlet of Lake Coeur d'Alene to Nine Mile Dam could be obtained. Approximately 70 water samples from instream locations, point sources, and flow data at each river segment were obtained at a cost of about $400,000. Initial analysis of this new data shows:

- The river has gaining and losing reaches as it interconnects with the groundwater in the Spokane Valley Rathdrum Prairie (SVRP) aquifer. During the dry season sampling, more than half of the river flow at the Trent gage enters the river from groundwater between the Barker and Trent gages. PCB loading from groundwater flowing into the river for this segment of the river represented the single largest mass source (mg/day) measured during the synoptic sampling event.
- Data indicates that a second segment (Greene Street to Spokane Gage) may exist where groundwater flows into the river could be contributing a significant PCB load.

Work of the Task Force Achieves PCB Reductions

The Task Force has completed approximately one-half of the Phase 2 data collection work to identify data gaps and to create adequate data in order to characterize and quantify PCB sources. Additional data collection is needed in order to: (1) evaluate if wet season sampling will give meaningful data to define seasonal variations in PCB loadings; (2) assess concentrations of PCBs in groundwater across the Rathdrum Prairie Spokane Valley Aquifer to better estimate PCB loading into the Spokane River and Little Spokane River; and (3) assess the effect of aerial deposition as a potential source to determine if aerial deposition is a significant source of PCBs into the Spokane River. When the initial work plan was developed in 2012, little was known about the technical complexity of these comprehensive PCB sampling efforts, the funding levels that would be necessary compared to available dollars, and additional data gaps that were discovered during Phase 1 and 2 activities.

Phase 3 *(mid 2015 to early 2016)*

Phase 3 involves characterization and quantification of the identified sources of PCBs entering the Spokane River. It is anticipated that these sources will include all of the known point sources including wastewater treatment facilities that discharge to the Spokane River and stormwater from the City of Spokane. PCB contributions estimated from groundwater and other sources will be included as well.

Characterizing point sources will include an evaluation of PCB reduction measures that are expected to result as each wastewater treatment facility implements their facility upgrades per the Spokane River Dissolved Oxygen TMDL.

Phase 4 *(2016)*

Phase 4 of the initial Work Plan will develop a Comprehensive Plan, summarizing the identified sources of PCBs into the Spokane River to date. For each identified source, a range of Best Management Practices (BMPs) that could eliminate or reduce the source of the PCBs will be identified with recommendations for implementation. To address remaining data gaps, recommendations will be made for future studies to be implemented over the next permit cycle.

Future Work

The Task Force will facilitate implementation of the Comprehensive Plan, which will include recommendations for BMPs and future studies to fill data gaps. Major known data gaps remaining at this time include the magnitude of PCB contribution from aerial deposition, snowmelt, groundwater, sediment, and hatchery fish. Completion of these studies and the advancement of technology over time will identify where to target efforts in the future. There is much to be learned on this subject, and the Task Force is gaining significant knowledge in coordination with its collaborators across the country.

Current Actions:

Task Force Completed Actions that Quantify and Reduce PCB Sources

Based on the information developed to date, the Task Force is implementing a number of actions to reduce potential PCB sources. Maintaining this progress is the most likely pathway to reducing PCBs in the Spokane River. It is prudent that EPA's workplan continue these actions and consider the resulting measurable progress made.

Current actions include:

- Low flow synoptic sampling has shed light on previously unidentified areas of the river where there is groundwater contribution of PCBs. The Task Force has authorized future evaluation of these areas that will direct source removal efforts.
- On a parallel track with the technical analyses, the Task Force and Task Force members are identifying and eliminating PCB contributions from stormwater runoff sources and street waste solids within their own jurisdictions.
- Task Force members are funding the establishment and maintenance of stream gages on the Spokane River to understand river flow in areas where significant PCB loading has been found.
- Task Force members are now involved in product testing to identify products which may have the greatest concentrations of PCBs. This is important to identify PCB sources that may contribute significant PCBs to the Spokane River.
- Based on recent sampling by the City of Spokane, hydroseed has been identified as a source of PCBs. The Task Force is sampling and analyzing additional hydroseed samples to identify the specific product component containing the greatest amount of PCBs. The hydroseed project demonstrates the necessity of the collaborative effort: Ecology provided the grant funding, and the Task Force engaged manufacturers and state agencies for the purposes of identifying and implementing BMPs.
- Hatchery fish food is a potential source of PCBs. Task Force members will be sampling and testing for PCB concentrations in the tissue of hatchery fish used to stock the river.
- The Task Force pushed for state adoption of legislation that restricted PCB procurement.

- The City of Spokane and Spokane County have approved policies to allow for the preferential purchase of products (or products with packaging) that do not contain PCBs above established thresholds.
- Task Force members are conducting additional studies within their wastewater and stormwater collection systems to identify specific sources of PCBs.
- The Toxic Substances Control Act (TSCA) currently allows a level of inadvertently produced PCBs that is up to 50 parts per million compared to the Spokane River standard of less than 2 parts per quadrillion. The Task Force has requested EPA support and is working with elected officials to eliminate or significantly reduce this allowance.
- Task Force members are collaborating on public outreach activities to engage the Spokane Community and reduce the usage of products containing inadvertently produced PCBs that enter the waste stream. Posters, power point presentations, website information, printed literature and brochures, public service announcements on radio and television, opinion editorials in local news papers, and presentations at scientific conferences such as the Spokane River Forum have been completed.
- The Task Force has held several technical workshops, inviting experts from around the country to share their professional expertise and to best determine the path forward at critical junctures.
- Task Force members are collaborating with synergistic efforts such as the Columbia River Toxics Reductions Work Group, Northwest Green Chemistry, University of Iowa Superfund Basic Research Program, The WSU Center for Environmental Research, Education, and Outreach, Rutgers University, and the Northwest Pollution Prevention Center.

Funding

About $1 million has been spent on direct Task Force efforts to date, including over $500,000 in contributions from NPDES permittees and another $500,000 from state funding through Ecology. In addition to Task Force activities, individual members have contributed significant funding towards efforts in their own communities. Nearly $250 million is being invested in upgrades to municipal treatment facilities, and several million dollars have been spent on collection system PCB sampling efforts, Toxics Management Plans, and stormwater management.

Task Force members have spent a significant amount of time and resources developing outreach strategies and distributing information. These efforts contribute to public literacy around the nature of PCBs as well as educate the public about the efforts of the Task Force in bringing the Spokane River into compliance.

Wastewater Treatment Upgrades are Underway

Concurrent with the Task Force efforts to identify the unknown sources, permittees are investing in significant upgrades to address the known discharges to the Spokane River. These upgrades will further increase removal of PCBs. Driven by the Dissolved Oxygen TMDL, NPDES permits for the regional treatment facilities discharging to the Spokane River require that the next level of treatment be installed and then optimized by the year 2021 for Washington permit holders and 2024 for Idaho permit holders. For municipalities, the next level of treatment will generally include sophisticated technology such as membrane filters. This technology will potentially improve the PCB removal efficiency up to 99% and is anticipated to cost a total of nearly $250 million for the municipal dischargers. The Spokane County wastewater treatment facility, which became operational in December 2011, has demonstrated that membrane filtration technologies are capable of removing up to 99% of PCBs from municipal wastewater facilities. Industrial wastewater treatment facilities will also undergo significant multi-million dollar upgrades using innovative site specific technologies. Permittees are already removing PCBs from their discharge with current treatment technology. A summary of PCBs currently being removed from municipal and industrial wastewater is provided as Attachment C.

PCB TMDL Scientific Challenges

Many scientific challenges complicate the development of a TMDL. The efforts of the Task Force have significantly increased the body of knowledge with regard to PCBs in the Spokane River, but substantial data gaps still prevent the development of a scientifically credible TMDL.

Initial studies have led to both an improved understanding of the Spokane River and to the realization that much uncertainty remains to be resolved. The following examples illustrate some of the data that would be required, which is outside the scope of the Task Force:

- Available information shows a discrepancy between the concentrations of PCBs found in river water and in fish tissue. A study to evaluate the correlation between PCB concentrations in river water and fish tissue must be done before a credible TMDL could be completed.
- There are insufficient data on the quantity of PCBs in sediments throughout the Spokane River basin. This information is needed to determine the effects of sediment on fish tissue, before a TMDL could be completed.
- There are insufficient data on the quantity of PCBs in invertebrates throughout the Spokane River basin. This information is needed to determine the effects of invertebrates on fish, since they are a major food source for fish.
- A fish tissue "finger printing" study is necessary to identify which PCB compounds are accumulating in fish compared to PCB compounds that are found in the water column and discharged from specific sources. This study would show whether there is a specific correlation between PCB compounds in the Spokane River water column and PCB compounds found in fish tissue. This information would help to identify potential sources.
- It is not possible to successfully implement a TMDL to achieve the PCB water quality standard for the Spokane River as long as the current Federal TSCA allowances for PCBs in products exist (these allowances are as much as 50 billion times greater than the current water quality standard).
- Current analytical methods do not provide low enough detection limits for PCBs relative to potential applicable water quality standards for the Spokane River.

- EPA has not promulgated a sampling or analytical method for PCBs to measure to the levels necessary to demonstrate compliance with a TMDL on the Spokane River.

Without this data there is inadequate information to understand how PCBs enter the river water and accumulate in the fish tissue. This information is necessary to have a more complete understanding of how to meet applicable water quality standards.

Future Role of the Task Force

In 2013, the EPA published "A Long-Term Vision for Assessment, Restoration, and Protection Under the Clean Water Act Section 303(d) Program," describing an "alternatives goal" that encourages States to use alternative approaches to TMDLs tailored to specific circumstances where such approaches are better suited to implement actions that achieve water quality goals. The Task Force is embracing this guidance and is making strides toward PCB reductions using this alternate direct-to-implementation method that efficiently identifies non-point and point sources and actionable BMPs.

The Task Force collectively possesses the strongest scientific understanding of the Spokane River ecosystem available. Each member is an expert within their river segment, a particular area, or has a particular focus. Utilizing this group and building upon their efforts to develop the necessary scientific studies is the best opportunity in existence to close the data gaps.

The Task Force is well organized and is methodically researching the sources of PCBs to establish a credible scientific understanding of the river system. Scientific study developed with the input of critical stakeholders is less likely to result in legal and technical challenges. Involving all interested parties and building upon the momentum of the collective Task Force, using sound science to answer the questions at hand, is the most likely path toward success.

The Task Force has a high degree of confidence that continuing on the direct-to-implementation approach is the most successful path towards meeting water quality standards. The Task Force requests that EPA include continuing the direct-to-implementation approach in its response to Judge Rothstein's order.

[Note: In addition to Attachments A through D, individual members of the Task Force will submit supporting attachments to this coordinated response directly to the EPA.]

Attachments

Attachment A – SRRTTF MOA
Attachment B – SRRTTF Initial Work Plan (2012) and Milestones/Schedule
Attachment C – Permittee PCB Reduction Activities to Date (SRSP)
Attachment D – EPA 2013 Document Regarding Alternative TMDL Approaches

Supplemental Documents for the Court's Judicial Review in this Case		Sierra Club, et al. v. EPA, Case No. 2:11-cv-01759-RSL Western District of Washington		
Document Number	Date	Document Description	Bates No.	
Supp. 1	1996	May 31, 1996 Letter Transmitting Washington State 303d list 1996	Supp. 002710 - 002735	
Supp. 2	2/2005	Implementation of Washington's TMDL Program 1998-2003	Supp. 002736 - 002774	
Supp. 3	4/30/2008	Washington State Department of Health News Release	Supp. 002775 - 002776	
Supp. 4	1/2009	Washington State Department of Health Fish Advisory-Spokane River	Supp. 002777 - 002778	
Supp. 5	2009	Washington State Department of Health Updated Fish Advisory	Supp. 002779	
Supp. 6	4/2010	2008 Washington State Toxics Monitoring Program	Supp. 002780 - 002944	
Supp. 7	8/5/2011	Health Consultation Potential Cumulative Health Effects Associated with Eating Spokane River Fish	Supp. 002945 - 002990	
Supp. 8	12/2011	EPA PCB TMDL Handbook	Supp. 002991 - 003024	
Supp. 9	3/29/2012	McLerran letter to Hubbard-Gray discussing Spokane River Regional Toxics Task Force	Supp. 003025 - 003026	
Supp. 10	2/4/2013	Brian Crossley Declaration filed in 11-cv-01759-RSL	Supp. 003027 – 003032	
Supp. 11	2/5/2013	Letter to Brian Crossley from C. Psyk Responses to Tribe's Comments on PRE-Draft Idaho NPDES Permits (Documents in Record at 36, 37, 38)	Supp. 003033 - 003037	

SPOKANE REGIONAL HEALTH DISTRICT

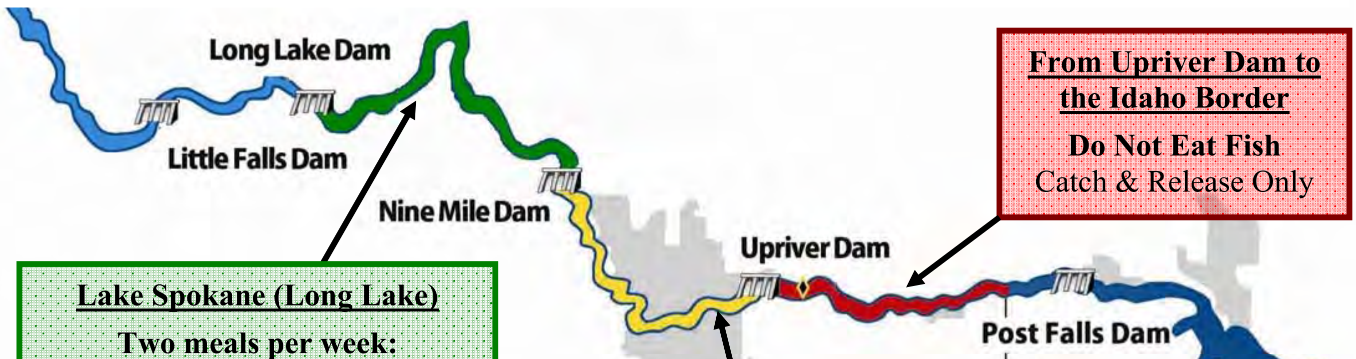
Spokane River Fish Advisory

Updated 2009

Washington State Department of Health

Spokane River fish contain chemicals called PCBs and PBDEs (flame retardants). These chemicals can be harmful to your health and the health of your children if eaten in quantities higher than advised.

This advisory is for everyone; men, women, and children. Woman who are or might become pregnant, nursing mothers, and young children should pay special attention to this advisory.



From Upriver Dam to the Idaho Border

Do Not Eat Fish

Catch & Release Only

Lake Spokane (Long Lake)

Two meals per week:

Rainbow Trout

Yellow Perch

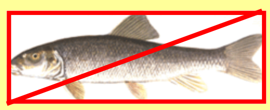
One meal per week:

Mountain Whitefish

One meal per month: Brown Trout & Largescale Sucker

From Nine Mile Dam to Upriver Dam

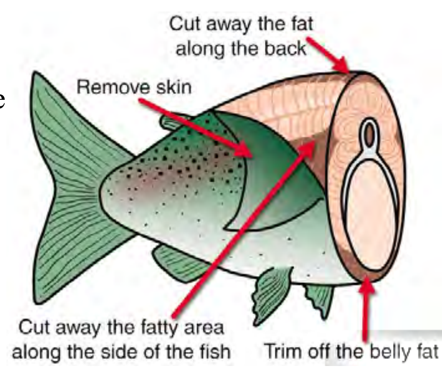
Do Not Eat: Largescale Sucker



All other species: One meal per month

You can reduce your exposure to PCBs if you prepare your fish this way:

- When cleaning fish, remove the skin, fat, and internal organs before cooking
- Cook fish on a rack so the juices and fat will drip off
- Do not eat the head, juices, bones, organs/guts, fat, and skin
- Consume younger, smaller fish



Questions?

Spokane River Fish Advisory:
Spokane Regional Health District
Mike LaScuola 509-324-1574
www.srhd.org

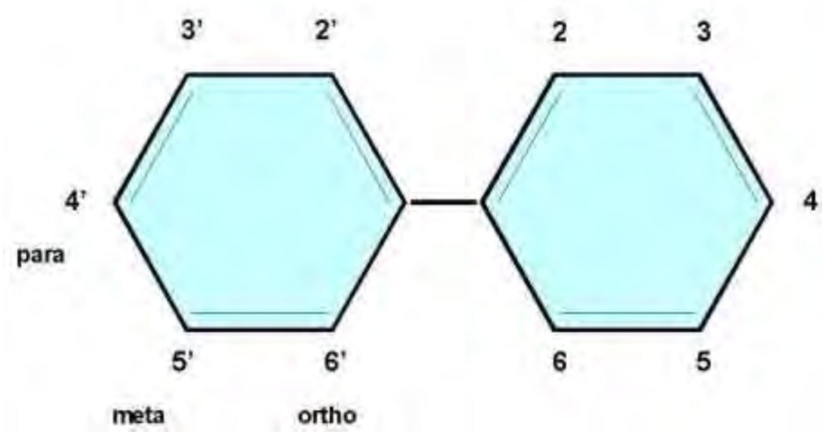
Fish Advisories in Washington State:
WA Department of Health
Toll-Free 1-877-485-7316
www.doh.wa.gov/fish

DOH PUB NO: 334-164

Washington State Mercury Advisory: Women who are or might become pregnant, nursing mothers, and young children should follow this advice due to high mercury levels in these fish statewide:

Northern Pikeminnow – Do Not Eat **Largemouth and Smallmouth Bass – Two meals per month**

PCB TMDL Handbook



Structure of Polychlorinated Biphenyl (PCB) Molecule

U.S. Environmental Protection Agency
Office of Wetlands, Oceans and Watersheds

DISCLAIMER

This document provides technical guidance and recommendations to states, authorized tribes, and other authorized jurisdictions to develop Total Maximum Daily Loads (TMDLs) for legacy pollutants like polychlorinated biphenyls (PCBs) under the Clean Water Act (CWA). Under the CWA, states, authorized tribes and US Environmental Protection Agency (USEPA) establish TMDLs to implement water quality standards in impaired waterbodies. State and tribal decision-makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance when appropriate and scientifically defensible. While this document contains USEPA's recommendations and guidance, it does not substitute for the CWA or USEPA regulations; nor is it a regulation itself. Thus it cannot impose legally binding requirements on USEPA, states, authorized tribes, or the regulated community, and it might not apply to a particular situation or circumstance. USEPA may change this guidance in the future.

December 2011
EPA 841-R-11-006

U.S. Environmental Protection Agency
Office of Wetlands, Oceans and Watersheds
Watershed Branch (4503T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Polychlorinated Biphenyl (PCB) Total Maximum Daily Load (TMDL) Handbook
Contents

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF WATER

December 20, 2011

MEMORANDUM

SUBJECT: Polychlorinated Biphenyl (PCB) Total Maximum Daily Load (TMDL) Handbook

FROM: Tom Wall, Acting Director /s/
Assessment and Watershed Protection Division

TO: Water Division Directors, Regions 1-10

I am pleased to provide the attached document entitled "PCB TMDL Handbook." The purpose of the attached handbook is to provide Regions, states, and other stakeholders with a compendium of updated information for use in developing total maximum daily loads (TMDLs) for waterbodies impaired by polychlorinated biphenyls (PCBs). This handbook identifies various approaches to developing PCB TMDLs and provides examples of them from around the country, complete with Web references.

PCBs rank sixth among the national causes of water quality impairment in the country. Of the 71,000 waterbody-pollutant combinations listed nationally, over 5,000 (eight percent) are PCB-related. However, of the more than 46,000 TMDLs in place nationally, only about 400 (less than one percent) address PCBs as a pollutant. Our intent is that this handbook will aid in the completion of PCB TMDLs, particularly where these TMDLs will address ongoing and significant sources of PCBs.

The handbook opens with background on what PCBs are and some factors to consider in the early stages of TMDL development (e.g., scale, modeling approaches). Next, the handbook identifies the key elements of a TMDL (e.g., "Identification of Waterbodies, Pollutant Sources, Priority Ranking," "Water Quality Standards and TMDL Target," "Wasteload Allocation") and discusses how those elements can be addressed in PCB TMDLs. The handbook also summarizes and provides Web resources for related tools, including databases for PCB sources, references for analytical methods, and regional air monitoring initiatives.

We thank those who provided assistance in the development of this information and provided comments, including States. If you have further questions, please do not hesitate to contact me at 202-564-4179, or have your staff contact Sarah Furtak at 202-566-1167.

Attachment
cc: Alexandra Dunn, ACWA

I. Overview

A. What is the purpose of this handbook?

In this handbook, we aim to provide stakeholders with a compendium of updated information for using total maximum daily loads (TMDLs) to address waterbodies impaired by polychlorinated biphenyls (PCBs) consistent with Clean Water Act (CWA) section 303(d) and EPA regulations at 40 CFR §130.7(c)(1).

This handbook will identify different approaches that have been successfully used to develop PCB TMDLs and provide examples. In particular, the handbook will address how to develop PCB TMDLs that account for all sources of PCB contamination (including "passive" sources such as landfills in which PCBs are contaminating the soil). One goal of this handbook is to illustrate how development of PCB TMDLs take into account other program considerations (e.g., Water Quality Standards [WQS]), and how TMDLs may benefit from tools available in other programs (e.g., Superfund).

B. Which pollutant are we addressing?

The focus of this handbook is on PCBs, one of the most significant legacy pollutants in terms of number of waterbodies impaired. PCBs rank sixth atop national causes of impairment as tracked in the Assessment, TMDL Tracking, and Implementation System (ATTAINS). PCBs represent about eight percent of all causes of impairment nationally on CWA section 303(d) lists.[1]

C. What are PCBs[2]?

PCBs are a family of chlorinated organic compounds formed by two benzene rings linked by a single carbon-carbon bond. Various degrees of substitution of chlorine atoms for hydrogen are possible on the remaining ten benzene carbons. There are 209 possible arrangements of chlorine atoms on the biphenyl group. Each individual arrangement or compound is called a congener. Thirteen of the 209 congeners are known to show toxic responses similar to those caused by 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD), the most toxic dioxin compound.

Historically, PCBs were produced in very large quantities both within and outside the United States. Although their uses in capacitors and transformers are well known, PCBs were also used in a wide variety of applications including some involving direct contact with the environment (e.g., building materials, paints, sealants). In the United States, commercial PCBs production started in 1929 and continued until

[1] This estimate is based on current cause of impairment listings in the ATTAINS database (http://iaspub.epa.gov/waters10/attains_nation_cy.control?p_report_type=T) November 18, 2011; this estimate is based on the most recent CWA section 303(d) and 305(b) data reported to EPA by states and available in ATTAINS.
[2] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

1977. Importation of PCBs continued after U.S. production was banned until January 1, 1979.

PCB congeners vary markedly in their chemical and physical properties depending on the degree and position of chlorination. Important properties such as non-flammability, low electrical conductivity, high thermal stability, and high boiling point make PCBs highly stable and persistent in the environment. PCBs are also soluble in non-polar organic solvents and biological lipids, hence their tendency to bioaccumulate in living organisms.

II. Factors to Consider in Early Stages of PCB TMDL Development

With respect to development and establishment of PCB TMDLs, as with TMDLs addressing other pollutants, a variety of factors will determine the appropriate "investment" of time and resources. Motivating factors for prioritizing establishment of PCB TMDLs include the following:

- **Consent decrees** – Legal obligation may drive the establishment of these TMDLs.
- **Stakeholder interest** – National or local environmental or citizen's groups may have a specific interest in particular legacy pollutant listings or TMDL development decisions.
- **Risk to human health and the environment** – PCB "hot spots" in urban areas (e.g., a Superfund site) may be viewed as high priority for remediation or TMDL development to reduce risks to humans. When developing PCB TMDLs, consider developing targets protective for both human health and wildlife.

Other factors determining "investment" of time and resources with respect to PCB TMDLs, as with TMDLs addressing other pollutants, may include the scale at which PCB TMDLs are developed, pollutant sources, and the modeling approaches available:

- **Scale --** PCB sources tend to vary in combinations and concentrations from waterbody to waterbody, and hotspots may exist. States should be careful to think about PCB concentrations when selecting the scale at which a PCB TMDL is written. For example, the Delaware River Estuary is a large-scale multijurisdictional waterbody spanning the States of DE, PA, and NJ. A TMDL was established for each of five riverine zones in order to account for the variations in PCB concentrations throughout the estuary.[3] The Delaware River Estuary PCB TMDLs are being revised at the time of this handbook's development.

[3] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.

- **Sources --** A PCB TMDL can more quickly guide cleanup if a localized source or sources are determined to be affecting the waterbody (e.g., Superfund site, illegal discharge), and in turn, remediation tools and/or legal authorities are available to control the source(s). On the other hand, if the sources are more diffuse or not amenable to existing controls, environmental outcomes or benefits may manifest more slowly.

  Appendix Tables 1 and 2 identify common PCB sources (e.g., incinerators, wastewater treatment plants) and related databases.

- **Modeling approaches --** Various modeling approaches are available for developing PCB TMDLs. Level one, level two, and level three techniques for TMDL development are briefly contrasted below:

  - ***Level one approaches*** for PCB TMDLs include non-modeling approaches, such as assuming a proportional one-to-one relationship between PCB loadings and fish tissue, and using a bioconcentration factor to calculate a water column value. A level one approach may also involve back-calculating from the sediment targets and sediment data to determine the loading capacity. Examples of TMDLs that have used a level one approach include the Kawkawlin River in Michigan[4], Lower Okanogan River Basin in Washington[5], and TMDLs in California (San Diego Creek and Newport Bay[6], and Calleguas Creek[7]).

  - ***Level two approaches*** may involve mass balance modeling, which estimate PCB concentrations in the water column, fish tissue and sediment using sampling data. An example of an intermediate modeling approach is the Shenandoah PCB TMDL[8].

  - ***Level three approaches*** may involve linking a hydrodynamic sediment transport model with a PCB fate and transport model, and may also be linked with a watershed model. Examples of such complex models applicable to PCBs include a modified WASP-DYNHD hydrodynamic

[4] *Total Maximum Daily Load for Polychlorinated Biphenyls for the Kawkawlin River, Bay County, Michigan*, August 2002, available at http://www.epa.gov/waters/tmdldocs/3843_tmdl-kawkawlin.pdf.

[5] *Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load,* October 2004, available at http://www.ecy.wa.gov/pubs/0410043.pdf.

[6] *Total Maximum Daily Loads For Toxic Pollutants San Diego Creek and Newport Bay*, *California,* June 14, 2002, available at http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/sd_crk_nb_toxics_tmdl/summary0602.pdf.

[7] *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf.

[8] "Shenandoah River PCB TMDL," available at http://www.epa.gov/reg3wapd/tmdl/VA_TMDLs/Shenandoah/index.htm.

model (used in the Delaware River Estuary PCB TMDLs[9] and the Tidal Portions of the Potomac and Anacostia Rivers TMDLs[10]).

III. Identification of Waterbodies, Pollutant Sources, Priority Ranking

As described in existing EPA guidance, TMDLs, including PCB TMDLs, should include the following[11]:

- Identification of specific waterbody and pollutant (PCBs) addressed by the TMDL.
- Identification of the pollutant sources, including quantity and location(s) of National Pollutant Discharge Elimination System (NPDES)-permitted sources within the waterbody (including regulated stormwater sources) and nonpoint sources (including non-regulated stormwater sources) (also see section VI of this handbook identifying point source loadings).
- Source assessment, including amount of PCBs from air deposition, and contribution from point and legacy sources (e.g., sediments; also see section VII on nonpoint source loadings). Although a comprehensive source assessment can be challenging, states are encouraged to consider the best available data in identifying PCB sources, and to describe how PCB sources were identified. Commensurate with historic data and information on PCB presence, budget, and other priorities, conducting a good source assessment as part of a TMDL can help ensure that all sources are accounted for, and in turn, ensure that the TMDL can be better designed to address those sources. *Method 1668C: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS* guidance describes the PCB analysis method the EPA developed for use in CWA programs and for wastewater, surface water, soil, sediment, biosolids, and tissue matrices.[12]
- Linkage to 303(d) list/Integrated Report (i.e., identify waterbody and impairment as it appears on the 303(d) list, the listing cycle, and priority ranking of the waterbody).
- Identification of other factors within the waterbody or watershed that may affect PCB loadings (e.g., watershed area, land use/land cover, population, future growth, distribution of sources and loadings, including air deposition, etc.).

[9] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf. Note that these TMDLs are being revised at the time of this handbook's development.

[10] *Total Maximum Daily Loads of Polychlorinated Biphenyls (PCBs) for Tidal Portions of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia*, October 31, 2007, available at http://www.potomacriver.org/cms/index.php?option=com_content&view=article&id=136:tidal-pcb-tmdl&catid=41:pollution&Itemid=1.

[11] Unless otherwise noted, "existing guidance" in this handbook refers primarily to EPA's guidance for TMDL approvals, *Guidelines for Reviewing TMDLs under Existing Regulations* issued in 1992, available at http://www.epa.gov/owow/tmdl/guidance/final52002.pdf. Although some information is repeated from the 1992 guidance, this handbook does not replace that guidance.

[12] *Method 1668C: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS* guidance, April 2010, is available at http://water.epa.gov/scitech/methods/cwa/other.cfm. The EPA proposed this method in a September 23, 2010 Federal Register notice and is currently reviewing comments on the proposed rule. A decision has not been made on the promulgation of this method. Additional background on PCB analysis includes: Muir, Derek and Ed Sverko, 2006. *Analytical methods for PCBs and organochlorine pesticides in environmental monitoring and surveillance: a critical appraisal.* Anal Bioanal Chem. 386: 769-789, available at http://www.inweh.unu.edu/Coastal/CCPP/2009_Merida/Reports/Muir&Sverko_AnalBioanalChem2006.pdf.

Maryland and Virginia have recently published a source tracking study and point source guidance, respectively, that may be informative to other states. The "2005 Caged Clam Study to Characterize PCB Bioavailability in the Impaired Watersheds throughout the State of Maryland" aimed to characterize Maryland subwatersheds draining into the PCB-impaired tidal waters as (i) those with no apparent sources and (ii) those with relatively significant sources of PCB runoff.[13] Virginia Department of Environmental Quality personnel refer to a "Guidance for Monitoring of Point Sources for TMDL Development Using Low-Level PCB Method 1668" when selecting the types of facilities that should be targeted for PCB monitoring (within PCB fish impaired waterbodies) and for its standard operating procedures for sample collection, Method 1668 analysis of the samples, and submittal of PCB data to VADEQ by permitted dischargers.[14]

Pursuant to CWA section 308, the EPA may enter and inspect the facilities and records of current NPDES permit holders. Inspections ascertain the degree of compliance with requirements of the NPDES permit. During such an inspection, representatives may observe process operations, inspect monitoring equipment and lab methods, collect samples, and examine appropriate records.[15] The opportunity to observe or collect samples may help identify point sources of PCBs that otherwise would have escaped detection.

IV. Water Quality Standards and TMDL Target

TMDLs are established at a level that attains and maintains the applicable WQS, including designated uses, numeric and narrative criteria, and antidegradation policy [40 CFR §130.7(c)(1)]:

- Depending on the impairment being addressed by the TMDL, existing criteria may include human health, aquatic life, and wildlife criteria.
- The state's existing numeric PCB criterion may be a water column concentration or fish tissue value.
- TMDLs identify a numeric TMDL target or WQS criterion, a quantitative value used to attain and maintain applicable WQS, including designated uses. A TMDL also includes, as necessary depending on the nature of the sources, load allocations (LAs) and wasteload allocations (WLAs) [40 CFR § 130.2(i)].

Where a fish tissue target is used for the TMDL, appropriate justification for using a fish tissue target should be included, considering existing numeric and narrative criteria as well as designated uses.[16] For example, where a state has a narrative criterion such as

[13] Available at http://www.mde.state.md.us/assets/document/2005_Corbicula_Study_final.pdf.

[14] *Guidance for Monitoring of Point Sources for TMDL Development Using Low-Level PCB Method 1668* , March 6, 2009, available at *http://www.deq.virginia.gov/waterguidance/pdf/092001.pdf.* Additional background on PCB analysis includes: Muir, Derek and Ed Sverko, 2006. *Analytical methods for PCBs and organochlorine pesticides in environmental monitoring and surveillance: a critical appraisal.* Anal Bioanal Chem. 386: 769-789, available at http://www.inweh.unu.edu/Coastal/CCPP/2009_Merida/Reports/Muir&Sverko_AnalBioanalChem2006.pdf.

[15] *NPDES Compliance Inspection Manual-- Appendix E: Sample Section 308 Letter*, available at http://www.epa.gov/oecaerth/resources/publications/monitoring/cwa/inspections/npdesinspect/npdesinspect.pdf.

[16] As described in the *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* ("2006 IR Guidance"), when deciding whether to identify a segment as impaired, states should determine whether there are impairments of designated uses and narrative criteria, as well as the numeric criteria. The guidance notes that, while numeric human health criteria for ambient water column concentrations of pollutants are a basis for determining

"no toxics in toxic amounts," and where a state considers there to be an impairment of a designated use due to presence of a fish consumption advisory, it may be appropriate to use a fish tissue target to interpret a narrative standard. Reliance on advisories may decrease as PCB detection levels become more precise/sensitive. The TMDL should include a demonstration of how meeting the fish tissue target will achieve WQS [40 CFR §130.7(c)].

In the San Francisco Bay PCB TMDL, the numeric target is a fish tissue concentration as fish tissue PCB concentrations are the direct cause of impairment of the designated uses. In the Palouse River Chlorinated Pesticide and PCB TMDL, numeric targets are based on fish tissue; the determination as to whether WQS have been achieved is based on fish tissue criteria.[17]

Multi-state scale

For a TMDL established for a multi-jurisdictional waterbody, in addition to the above elements, TMDLs identify WQS for each applicable state and established at a level to attain and maintain the WQS in each state. The TMDL should demonstrate that it is set at a level to achieve the WQS in each state; where the state standards are different, the TMDL should include a separate TMDL calculation to meet each standard. Large, multi-state PCB TMDL examples include the Delaware River Estuary, Ohio River, and the Potomac River and Anacostia River TMDLs. The Delaware River Estuary TMDL – being revised at the time of this guidance - addresses impairments listed in DE, NJ, and PA. The Ohio River TMDL considered WV, OH, and PA WQS; the WV standard, being most protective of human health, was used to establish TMDL endpoints within the TMDL segment. The Potomac River and Anacostia River TMDLs address impairments listed in DC, MD, and VA and are written with allocations to achieve water column concentrations less than or equal to jurisdiction-specific water quality criteria and water column and sediment concentrations less than or equal to jurisdictional fish tissue thresholds.

Total PCBs

For San Francisco Bay in California, the EPA established the PCBs water quality criterion for the protection of aquatic life based on the sum of Aroclors (i.e., the trade name given to different types of PCB mixtures) and for the protection of human health based on total PCBs (e.g., the sum of all congeners, or isomers or homologs or Aroclor analyses).[18]

impairment, the attainment of such criteria does not always mean that designated uses are being protected. For example, a segment can be meeting numeric ambient water quality criteria, but not attaining the designated uses because fish or shellfish tissue concentrations exceed levels that are protective of human health or levels used as the basis for fish consumption advisories. See the 2006 IR Guidance for additional information on listing waters with fish or shellfish consumption advisories at http://www.epa.gov/owow/tmdl/2006IRG.

[17] *Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load Water Quality Improvement Report and Implementation Plan,* July 2007, available at http://www.ecy.wa.gov/pubs/0703018.pdf.

[18] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf and "Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California. 40 CFR Part 131.38."

In San Francisco Bay and Calleguas Creek PCB TMDLs[19], the pollutant 'total PCBs', has been defined as:

- Sum of Aroclors;
- Sum of the individual congeners routinely quantified by the Regional Monitoring Program (RMP) or a similar congener sum; or
- Sum of the National Oceanic and Atmospheric Administration (NOAA) 18 congeners converted to total Aroclors. A comparison of the sum of 18 NOAA congeners converted to Aroclor with quantified sums of Aroclors shows relatively good correlation in one study[20].

Sediment concentrations

Desorption of sediment-bound PCBs may contribute significantly to the concentrations detected in water. PCBs, particularly the highly chlorinated congeners, adsorb strongly to sediment and soil where they tend to persist with half-lives on the order of months to years. Specific examples of PCB contamination in sediment follow:

Calleguas Creek[21]

The applicable water quality criteria for protection of aquatic life in the Calleguas Creek Watershed are 0.014 μg/L [ppb] (freshwater) and 0.130 μg/L [ppb] (marine). Multiple numeric targets (including fish, sediment, and water) are considered in this TMDL as there is uncertainty that a single numeric target is sufficient to ensure protection of designated beneficial uses. In order to address impaired waters listings for PCBs in the water column, fish tissue, and sediment, multiple targets are used to protect organisms, wildlife, and human health from the potentially harmful effects of PCBs.

Sediment quality guidelines endorsed by NOAA and contained in NOAA's Screening Quick Reference Tables are selected as numeric targets for PCB sediment concentrations. Use of threshold effect level (TEL) values and effect range low (EFL) values for marine sediment represents a conservative (i.e., more protective) choice. Since these sediment guidelines are not EPA-approved sediment quality criteria, they are used as numeric targets only for reaches with sediment listings. The TMDL is calculated as a reduction in sediment concentration, which is based upon fish tissue and water concentrations (and consideration of sediment guidelines for reaches with sediment listings. In order to translate required reductions in fish tissue and water column concentrations into sediment concentration reductions, it is assumed that bioaccumulation factors for fish tissue to sediment and partition coefficients for water to sediment

[19] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf. *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf

[20] NOAA. 1993. Sampling and Analytical Methods of the National Status and Trends Program-National Benthic Surveillance and Mussel Watch Projects 1984-1992. NOAA Technical Memorandum NOS ORCA 71, Volume 1. July, 1993. pp.I-34-39.

[21] *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf.

are linear, and that a given percent reduction in fish tissue or water concentration results in an equal percent reduction in sediment concentration.

***Ohio River*[22]**

Although the operating WQS of 0.044 ng/L [0.000044 µg/L or ppb] for the water column was used to establish TMDL endpoints, WV and OH conducted a sediment survey to address water column PCB loads resulting in part from resuspension of contaminated sediments and to identify "hot spots." Specific sediment quality criteria for total PCBs have not been standardized for the Ohio River; however, *The Incidence and Severity of Sediment Contamination In Surface Waters of the United States* (EPA 823-R-97-006), also known as The National Sediment Inventory, includes multiple PCB screening levels for the protection of consumers. These values are based upon theoretic bioaccumulation potential and cancer risk levels from the primary route of human exposure to contaminated sediment: consumption of fish. Screening levels are guidelines for analysis of sediment quality data; they are not regulatory criteria.

***San Francisco Bay*[23]**

The mass of PCBs in sediments is much greater than in the water column. However, it is important to note that a numeric PCB criterion exists in California for the water column but not for sediments.

PCB uptake by biota from sediment is well documented in the scientific literature. In a shallow bay with a large sediment PCB reservoir, such as San Francisco Bay, this is the most important pathway for PCB bioaccumulation in fish. Therefore, reducing PCB concentrations in Bay sediments is the most effective means of reducing fish tissue PCB concentrations. This TMDL uses a food web model to translate the fish tissue numeric target to a corresponding sediment concentration. It then uses a waterbody (mass budget) model to predict the long-term fate of PCBs in the Bay and determine the external load of PCBs that will attain the sediment concentration goal resulting in attainment of the fish tissue numeric target.

Starting with the numeric fish tissue target of 10 ng/g [0.01 µg/g or 10 ppb], the food web model yields a corresponding concentration of 1 µg/kg [0.001 µg/g, 1 ng/g, or 1 ppb] PCBs in sediment. This human consumption-based sediment PCB concentration goal is much lower than the sediment concentration California has deemed protective of wildlife of 160 µg/kg [0.160 µg/g, 160 ng/g, or 160 ppb] total PCBs, and is therefore considered to result in attainment of all beneficial uses currently impaired by PCBs.[24]

[22] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

[23] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

[24] Water quality unit conversions available at US Geological Survey "Conversion Factors and Abbreviated Water-Quality Units," http://pubs.usgs.gov/circ/circ1133/conversion-factors.html.

V. Loading Capacity – Linking Water Quality and Pollutant Sources

TMDLs identify loading capacity and reductions needed to meet WQS [40 CFR §130.2(f)].

As described in existing EPA guidance, TMDLs should provide documentation of the approach used to establish a linkage between the numeric PCB target and PCB sources, factors within the waterbody or watershed that may affect PCB loadings, the strengths and weaknesses of the approach, and the results of any modeling. As described earlier, however, factors such as likelihood of controlling the PCB source, existence of consent decrees, and risk to human health and the environment will influence level of investment devoted to modeling and analysis (see section II).

Examples of PCB fate-and-transport assumptions that may influence the calculations in an approved TMDL include ocean influence treated as background and net burial of PCBs into sediments that result in removal of PCBs from the system. Below are additional considerations to bear in mind in conducting a linkage analysis:

- A linkage analysis may include water quality modeling or other analytical approaches, although modeling is not required.
- Selecting an analytical approach depends on the type of questions to be answered and may include simple, non-modeling approaches, mass balance approaches, and more complex modeling approaches. Types of models that may be used to calculate PCB TMDLs include steady-state, hydrodynamic, and food web models. Results of air deposition modeling, as well as runoff models, may also be used as input to water quality models in a linked approach (see section II, "Factors to Consider…").
- Data on which the linkage analysis is based (e.g., waterbody characteristics, sources, fish tissue data) should be included in the TMDL.

Where a fish tissue target is used to establish a TMDL, states are encouraged to include the following items as part of the linkage analysis documentation. Unless otherwise noted, examples of each item below can be found in the San Francisco Bay PCB TMDL:

- A description of the fish tissue data (number of samples, concentration, locations, etc.)
- Identification of the specific fish species, or multiple species, and
- Identification of statistic used to calculate the baseline PCB concentration and the TMDL target (e.g., which percentile), and the rationale for the target level and fish species used.

VI. Linking Water Quality and Pollutant Sources – Point Source Loadings

As described in existing TMDL guidance, the TMDL should, to the extent data allow, identify specific point sources covered by the TMDL, and the total point source loadings. Point sources may include wastewater treatment plants, combined sewer overflows

(CSOs), municipal separate storm sewer systems (MS4), rail yards, landfills, or other locations where capacitors, transformers, or other PCB-laden products have been used.

The EPA encourages states to consider the following in determining the total point source loading of PCBs:

- States are encouraged to use data on point source loadings most representative of current conditions where relevant information is available.
- Where facility or category-specific PCB discharge data are available and of appropriate quality, states are encouraged to consider such data, and develop estimates of PCB loadings applicable to each category of sources (e.g., wastewater treatment, power plants, stormwater, and other potential PCB dischargers), rather than calculating a single average for all types of dischargers.
- Where source-specific data are not available, states are encouraged to develop representative estimates for loadings for each source category or land use.
- States should indicate how they have accounted for PCB contributions from NPDES-permitted stormwater sources in the estimate of total PCB loadings. Contributions from NPDES-permitted sources should be included in the point source estimate, and contributions from non-NPDES permitted stormwater sources may be included in the estimate of nonpoint source loadings[25]. States are encouraged to estimate contributions from specific NPDES-permitted sources such as MS4s.
- Maps showing location of key sources, land-use, and other waterbody characteristics are encouraged.

VII. Linking Water Quality and Pollutant Sources – Nonpoint Source Loadings

EPA regulations say that LAs "may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading" [40 CFR §130.2(g)]. The EPA encourages states to consider the most recent and best available data.

As described in existing TMDL guidance, the TMDL should include estimates of nonpoint source loadings (e.g., atmospheric deposition, contaminated sediment, runoff from contaminated sites, groundwater). The EPA encourages states to consider the following in developing such estimates:

- As with point sources, maps showing the location of key sources or source areas are encouraged.
- Loading estimates should account for air deposition and nonpoint sources other than those nonpoint sources containing loadings from air deposition (e.g., runoff from waste sites, legacy sources). States may wish to use runoff models to estimate PCB loadings to the waterbody from the watershed.
- While not necessary for developing the load allocation (LA), parsing out the contributions to the air deposition loading may be helpful in developing an implementation plan. Parsing out contributions to the air deposition loading is

[25] "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.

contingent upon decisions regarding the appropriate level of analysis; if contribution from air is small, environmental outcomes or benefits may not be commensurate with the amount of effort spent on this analysis. For example, in contrasting two water quality impairment scenarios -- a rural Kansas scenario vs. a downtown Chicago scenario -- industry codes in the latter may be able to help identify PCB release information.

- Studies have also shown that PCB flux from water to air is significant; according to the San Francisco Bay TMDL, PCBs escape to the atmosphere from the Bay at a greater rate than they are deposited from the atmosphere, resulting in a net loss of PCBs.[26] Similarly, a Lake Michigan Mass Balance Study publication concluded from the concentration and distribution of PCB congeners collected from vapor over water, over land, and dissolved in the water, that volatilization of PCBs from contaminated waters is a major source of PCBs to the local atmosphere.[27]
- Developing a detailed source identification plan may be especially important in a highly populated urban area for protection of human health.
- Where possible, the TMDL should include estimates of the contributions from air deposition to permitted stormwater sources and account for such loadings in the point source load estimate, rather than the nonpoint source load estimate. Contributions from nonpermitted stormwater sources may be included in the nonpoint source loading estimate.[28]

Examples of PCB TMDLs that quantify nonpoint source loadings include State of Washington PCB TMDLs. In the Lower Okanogan River Basin DDT and PCB TMDL and the Palouse River Chlorinated Pesticide and PCB TMDL, sediment, runoff from waste sites, and legacy sources are considered to be nonpoint sources of focus.[29] [30]The Lower Okanogan River Basin DDT and PCB TMDL examines the relationship between contamination of fish tissue and bottom sediments.[31] Also, the Palouse River Chlorinated Pesticide and PCB TMDL evaluates total suspended solids levels from nonpoint source drainages and legacy hazardous waste sites.[32]

As mentioned earlier in this section VII, the nonpoint source loading portion of the TMDL may include, as appropriate, LAs for contaminated sites. The Delaware River Estuary PCB TMDLs, for example, acknowledge that reducing NPDES permitted point source discharges alone will not be sufficient to achieve estuary WQS. Runoff from

[26] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

[27] Hornbuckle, K.C. et al, 1993. Over-Water and Over-Land Polychlorinated Biphenyls in Green Bay, Lake Michigan*. Environ. Sci. Technol*. 27(1): 87-98, abstract available at http://www.epa.gov/glnpo/lmmb/results/pubs.html.

[28] "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.

[29] *Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load,* October 2004, available at http://www.ecy.wa.gov/pubs/0410043.pdf.

[30] *Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load Water Quality Improvement Report and Implementation Plan,* July 2007, available at http://www.ecy.wa.gov/pubs/0703018.pdf.

[31] *Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load,* October 2004, available at http://www.ecy.wa.gov/pubs/0410043.pdf.

[32] *Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load Water Quality Improvement Report and Implementation Plan,* July 2007, available at http://www.ecy.wa.gov/pubs/0703018.pdf.

contaminated sites is a significant source of PCBs: the combined load from these 49 sites in the Delaware watershed comprises about 57% of the loading from Zone 3, 38% of the loading from Zone 4, and about 46% of the loading from Zone 5.[33]

Regional air monitoring initiatives
There may be air deposition data that can be used in TMDL development as a result of various air monitoring efforts. Air monitoring efforts include the following:

Great Lakes
Since 1990, the EPA's Great Lakes National Program Office (GLNPO) has utilized the Integrated Atmospheric Deposition Network (IADN)[34], a joint project with Canada, to determine atmospheric PCB loadings, look at trends in PCB concentrations, and use data to measure progress. IADN consists of 15 monitoring sites around the Great Lakes, five of which are US sites.

IADN also works with an EPA transformer database covering the Great Lakes States, New York, Pennsylvania and New Jersey. IADN data indicate no correlation between transformers and concentrations of PCBs (i.e., transformers are fairly closed systems); however, it is likely that data are missing (e.g., there may be discrepancies as industries have been phased out of the database). GLNPO still recommends phasing out transformers associated with PCBs as a means of restoring water quality within the Great Lakes system.

Western Airborne Contaminants Assessment Project (WACAP)
This project was initiated to determine risk to ecosystems and food webs in eight core national parks -- in the western US and Alaska -- from long-range transport of airborne contaminants. From 2002 to 2007, analysis of the concentration and biological effects of contaminants in air, snow, water, sediment, lichen, conifer needles, and fish was conducted in the national parks. Partners include the National Park Service, the EPA, US Geologic Survey, US Forest Service, Oregon State University, and University of Washington.[35]

New Jersey Atmospheric Deposition Network (NJADN)
NJ Department of Environmental Protection and Rutgers University partnered to measure concentrations of PCBs in air (gas phase), aerosol (particle phase), and precipitation at ten NJ sites representing an array of land-use regimes at regular intervals between 1997 and 2003. Based on the measured gas, particle, and precipitation phase concentrations, NJADN researchers estimated the atmospheric deposition flux, or flow, of total PCBs at the different sites.[36]

[33] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.
[34] USEPA IADN website is available at http://www.epa.gov/glnpo/monitoring/air2/index.html.
[35] National Park Service and USEPA "Western Airborne Contaminants Assessment Project" available at http://www.nature.nps.gov/air/Studies/air_toxics/wacap.cfm and http://www.epa.gov/nheerl/wacap/, respectively.
[36] NJ Dept. of Environmental Protection "New Jersey Atmospheric Deposition Network" available at http://www.state.nj.us/dep/dsr/njadn/ and Atmospheric Deposition: PCBs, PAHs, organochlorine pesticides, and Heavy Metals available at http://www.nj.gov/dep/dsr/trends2005/pdfs/atmospheric-dep-pcbs.pdf.

San Francisco Estuary Institutes' Regional Monitoring Program for Trace Substances (RMP) and Watersheds Science Program
The RMP is made up of a group of representatives from wastewater treatment plants, stormwater agencies, industrial dischargers, and the San Francisco Bay Water Board. The RMP works to support the development of TMDLs and other water quality attainment strategies for the San Francisco Bay.

The Watersheds Science Program provides Bay area environmental managers with quality science information in the context of the whole system (watersheds, the airshed, wetlands, and the Bay).[37]

Chesapeake Bay Atmospheric Deposition Network Nutrient-Toxics Deposition Monitoring Program (CBAD-NT)
The CBAD-NT was conducted at urban and non-urban sites along the shoreline of the Chesapeake Bay during 1995-1999. The primary objective of the CBAD-NT study was to provide the best possible estimates of total, annual atmospheric loadings of nitrogen-based nutrients and organic contaminants, including PCBs, directly to the surface waters of the Chesapeake Bay, and to conduct a study of a series of key processes for estimating reductions in deposition to the watershed and delivered loads to the tidal bay.[38]

VIII. Wasteload Allocation (WLA)

TMDLs include WLAs which identify the portion of the loading capacity allocated to individual existing and future point sources [40 CFR §130.2(h), 40 CFR §130.2(i)].

Consistent with the 2006 decision by the D.C. Circuit Court of Appeals in *Friends of the Earth v. EPA*, the EPA has recommended that TMDL allocations be expressed as a daily load[39]. Because PCB levels in fish represent bioaccumulation over longer periods of time, it may be appropriate to express allocations in PCB TMDLs as both an annual and daily load. If appropriate, states may also express allocations using other averaging periods, such as seasonal, in addition to a daily load.

Stormwater
NPDES-permitted stormwater discharges are included in a TMDL's WLA [40 CFR §130.2(h)[40]].

Here are three examples of TMDLs that address stormwater within their WLA:

San Francisco Bay[41]

The TMDL identifies the two major sources of PCB loadings to the Bay as Delta inflow from the Central Valley watershed and urban stormwater discharges. Sediments from the Central Valley watershed carry a large mass of PCBs but are lower in concentration than in-Bay sediments, potentially helping to reduce current impacts of PCBs on the Bay by burying more contaminated sediments. Implementation of the TMDL is thus focused on reducing sediment PCB concentrations by controlling PCB sources in urban stormwater discharges.

A potential means to reduce urban stormwater discharge of PCB loads might be to strategically intercept and route stormwater to municipal wastewater treatment facilities. The TMDL designates a separate WLA for discharges associated with urban stormwater treatment via municipal wastewater treatment facilities, since such actions will result in increased PCBs loads from municipal wastewater dischargers. The individual WLAs for municipal wastewater treatment works dischargers reflect current performance levels.

The TMDL also includes WLAs for stormwater discharges for each county. These WLAs apply to all NPDES permitted municipal stormwater discharges. These WLAs implicitly include all current and future permitted discharges within the geographic boundaries of municipalities and unincorporated areas within each county. Examples of sources of PCBs in stormwater discharges include, but are not limited to, California Department of Transportation (Caltrans) roadways and non-roadway facilities, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites.

Delaware River Estuary[42]

In the 2003 Stage 1 PCB TMDL for the tidal Delaware River, point sources include all municipal and industrial discharges subject to regulation by the NPDES permit program, including CSOs and stormwater discharges. This Stage 1 TMDL explicitly assigns a portion of each of the different estuary zone WLAs to storm water discharges.

In developing the Stage 1 TMDLs, the WLAs were calculated for traditional point source discharges based upon effluent concentrations and the actual effluent flows during a one-year model cycling period.

Calleguas Creek[43]

An aggregate concentration-based WLA was developed for MS4s. The aggregate allocation will apply to all NPDES-regulated municipal stormwater

[41] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

[42] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.

[43] *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf.

discharges in the watershed. Stormwater WLAs will be translated into the NPDES permits as ambient receiving water PCB concentration limits measured at instream discharge points for each subwatershed. They will be achieved through the implementation of best management practices (BMPs) as outlined in the implementation plan. Compliance will be determined through the measurement of in-stream water quality, sediment, and fish tissue measurements at the base of each subwatershed. To facilitate stormwater co-permittees measuring compliance in all six subwatersheds, additional monitoring stations will be needed in four of the subwatersheds mentioned within the TMDL.

Reserve capacity and WLA

A portion of a TMDL's loading capacity may be set aside as a "reserve" to allow for future increases in pollutant loading. Use of a reserve may be relevant to PCB TMDLs in particular, as there may be unexpected discharges of PCBs not identified in the initial TMDL. The concept of reserving loading capacity for "future" sources of pollutants is expressly included in the definitions of "wasteload" and "load" allocations [40 CFR § 130.2(g), 40 CFR § 130.2(h)]. Thus, a TMDL may assign a WLA or LA to a particular source that is larger than its current pollutant contribution to allow room for future loading increases by that source (in other words, using design capacity of a facility in setting its WLA). A TMDL may also set aside a gross, unallocated "reserve" (as part of the overall WLA, the overall LA, or the overall total loading capacity) to account for increased future pollutant contributions from a variety of existing or future sources. In all cases, the sum of the WLAs, LAs, the margin of safety (if an explicit load has been defined), and any reserve capacity must be equal to or less than the loading capacity (TMDL=ΣWLA + ΣLA + MOS + Reserve). The EPA does not support trading of pollutants considered by the EPA to be persistent bioaccumulative toxics (PBTs).[44]

In the case of PCB TMDLs for waterbodies where there are no permitted or un-permitted point source dischargers at the time the TMDL is established, inclusion of a reserve capacity in a TMDL's WLA could allow for permits for newly identified sources.

A reserve for future pollutant contributions from point sources may be included in the TMDL as a WLA. The EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to the individual existing and future point source(s) [40 CFR §130.2(h), 40 CFR §130.2(i)]. Reserve capacity may be incorporated into the individual WLA of each individual point source. One method is to allocate a WLA at design flow of a facility when the facility is currently permitted under capacity. Individual WLA reserves may also be expressed as a percentage of the initial WLA as calculated in the Delaware River Estuary Volatile Organics and Toxicity TMDLs.[45]

It may be reasonable to express allocations from multiple point sources as a single categorical WLA when data and information are insufficient to assign each source or

[44] USEPA "Final Water Quality Trading Policy," January 2003, available at http://www.epa.gov/owow/watershed/trading/finalpolicy2003.html.

[45] *Wasteload Allocations for Volatile Organics and Toxicity: Phase I TMDLs for Toxic Pollutants in the Delaware River Estuary,* December 1998, available at http://www.state.nj.us/drbc/regs/wlareport.pdf.

outfall individual WLAs.[46] In a PCB TMDL, it may thus be reasonable to set aside a gross WLA reserve to account for the following PCB point source loadings: (a) post-TMDL identified discharges from existing NPDES permittees that were not captured in a specific WLA (in other words, newly identified discharges from NPDES permittees that did not have PCB limits previously); and (b) newly identified dischargers (those not holding any NPDES permits previously).

Protecting Local Water Quality
Where a TMDL includes an aggregate allocation, states are strongly encouraged to include specific information on how NPDES permits, including stormwater permits, will be implemented. It is recommended that the TMDL specifically state that, at the time of permit issuance, an analysis will be conducted to determine that there will be no localized exceedances of the WQS. For example, three stormwater outfalls are located in hypothetical Smith Creek watershed with an aggregate allocation of 30 units per day. One outfall is considerably closer to Smith Creek than the other two and wants a larger allocation of 12 units per day. The two remaining outfalls would then have an allocation of 9 units per day each. These allocations may be appropriate as long as they will not be contributing to localized exceedances of the WQS or designated uses at any of the three outfalls. Another option, using the same three stormwater outfalls, would be to assign a smaller allocation to the closer outfall to Smith Creek if necessary to implement WQS and designated uses due to the proximity of the outfall to the impaired waterbody.

IX. Load Allocation (LA)

TMDLs include a LA, which identifies the portion of the loading capacity attributed to existing and future nonpoint sources and natural background. LAs may range from reasonably accurate estimates to gross allotments [40 CFR §130.2(g)].

As described in VIII above, contributions from NPDES-permitted stormwater sources that include contributions from air deposition should be included in the WLA. Contributions from air deposition in stormwater discharges not currently subject to NPDES regulation may be included in the LA.[47]

As with WLAs, the LAs should be expressed as a daily load; however, given bioaccumulative properties of PCBs, TMDL writers may wish to express allocations as both an annual and daily load.

X. Margin of Safety (MOS)

TMDLs include an MOS to account for uncertainty in relationship between pollutant loads and quality of receiving water [CWA §303(d)(1)(C), 40 CFR §130.7(c)(1)]. As described in existing guidance, the MOS may be implicit (conservative assumptions in

[46] "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.
[47] See "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs," November 22, 2002, available at http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf.

the calculations or overall approach) or explicit (e.g., build in additional percent load reduction). For an implicit MOS, the TMDL should describe the assumptions used to account for the MOS. The MOS in a TMDL is distinct from the conservative assumptions that may be incorporated into a WQS.

Implicit MOS
Examples of implicit MOS in PCB TMDLs include, but are not limited to, the following:

- Conservative approach to derive fish tissue target[48]
- Conservative assumptions of (1) mass assumed to be completely conserved as it passes through the study area and (2) existing OH River tributary loadings estimated using conservative approach[49]
- Combination of several conservative assumptions, including (1) selecting the greater percent reduction required of water or fish tissue concentrations as the basis for determining the percent reduction required in sediment, (2) ensuring protection of downstream subwatersheds from upstream inputs by reducing the allowable concentration for upstream subwatersheds where downstream allowable concentrations are lower, (3) decision to use the lower of the allowable concentration or the numeric target for sediment as the WLA and LA for all reaches with 303(d) listings for sediment.[50]

Explicit MOS
A range of explicit MOS values from five percent to 20% of the total loading were observed in the sample of TMDLs below. The choice of a specific, explicit MOS will depend on the facts of each particular TMDL. States are encouraged to document and explain the basis for the particular MOS value they choose.

The Palouse River Chlorinated Pesticide and PCB TMDL[51] recognizes the uncertainties associated with stormwater and WWTP loading of PCBs and dieldrin, and includes a safety margin of 20% of the loading capacities of the South Fork and mainstem Palouse River.

Within the Newport Bay and San Diego Creek TMDLs for toxic pollutants[52], a 10% explicit MOS was applied to account for uncertainties in the analysis. A 10% MOS was subtracted from the loading capacity or existing load, whichever was the smaller value. An explicit MOS was deemed appropriate because of significant uncertainty in the analysis of pollutant effects, loads, fate (i.e., chemical transformations and degradation following discharge), and transport in the watershed. The data supporting the TMDLs

[48] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.
[49] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.
[50] *Calleguas Creek Watershed OC Pesticides and PCBs TMDL Technical Report*, June 20, 2005, available at http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/2005-010/05_0426/OC_6_TechnicalReport.pdf.
[51] *Palouse River Chlorinated Pesticide and PCB Total Maximum Daily Load Water Quality Improvement Report and Implementation Plan*, July 2007, available at http://www.ecy.wa.gov/pubs/0703018.pdf.
[52] *Total Maximum Daily Loads For Toxic Pollutants San Diego Creek and Newport Bay, California,* June 14, 2002, available at http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/sd_crk_nb_toxics_tmdl/summary0602.pdf.

were somewhat limited. Additionally, for all pollutants the TMDLs also incorporate an implicit MOS because numerous conservative assumptions were made to ensure that the analytical methods applied are environmentally protective.

The Delaware River Basin Commission's (DRBC's) Toxic Advisory Committee recommended use of an explicit MOS of five percent within the Stage 1 PCB TMDLs. This recommendation, which was adopted in the TMDLs, was based upon the use of a one-year cycling period for the hydrodynamic and water quality model. Since the conditions under which the TMDL is determined, like tributary flows, are related to the long-term conditions and not to design conditions associated with human health WQS for carcinogens (such as the harmonic mean flow of tributaries), expression of the MOS as an explicit percentage of each zone TMDL was considered more appropriate than an implicit MOS.

XI. Critical Conditions and Seasonal Variation

TMDL calculations take into account critical conditions for stream flow, loading and water quality parameters [40 CFR §130.7(c)(1)]. For PCBs, critical conditions might be based upon freshwater flow rates due to precipitation regardless of season. Thus, the applicable allocation for a given source does not depend on time of year, but on actual stream flow (or associated sediment disposition rate for organochlorine compounds) at time of discharge. Wet weather events, which may occur at any time of the year, produce extensive sediment redistribution and transport downstream. This would be considered the critical condition for loading; however, the effects of organochlorine compounds are manifested over long time periods in response to bioaccumulation in the food chain. Therefore, short term loading variations (within the time scale of wet and dry seasons each year) are not likely to cause significant variations in beneficial use effects. The Newport Bay and San Diego Creek TMDLs[53], for example, consider seasonal variations in loads and flows but are established in a manner that accounts for the longer time horizon in which ecological effects may occur.

As PCBs bioaccumulate over time, annual variations may be considered more important than seasonal variations, particularly if a fish tissue target is used. States are encouraged to indicate how, when, and where fish tissue data were collected.

XII. Reasonable Assurance

When a TMDL is developed for waters impaired by point sources only, the issuance of an NPDES permit provides the reasonable assurance that the WLAs contained in the TMDL will be achieved. This is because 40 CFR 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL.[54]

[53] *Total Maximum Daily Loads For Toxic Pollutants San Diego Creek and Newport Bay, California,* June 14, 2002, available at http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/sd_crk_nb_toxics_tmdl/summary0602.pdf.
[54] May 2002 "Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992," available at http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/final52002.cfm.

When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, the EPA's 1991 TMDL Guidance states that the TMDLs should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for the EPA to determine that the TMDL, including the LAs and WLAs, has been established at a level necessary to implement WQS. The EPA's August 1997 TMDL Guidance also directs Regions to work with states to achieve TMDL LAs in waters impaired only by nonpoint sources. [55]

For TMDLs for PCB-impaired waters, the reasonable assurance demonstration is challenging because of the nature of the sources and the inability to trade allocations among nonpoint and point sources. Each TMDL's demonstration of reasonable assurance is, of necessity, case-specific and therefore states are encouraged to contact their EPA Region.

XIII. Post-TMDL Monitoring

States are encouraged to implement a multi-media monitoring program, commensurate with prevalence and availability of PCBs, budget, and other priorities, to track progress in reducing emissions and loadings from PCB source categories and, in turn, to track progress toward the TMDL target.

Where discharge data on particular sources or source categories is not available when developing the TMDL, follow-up monitoring by those sources is encouraged. Further monitoring can assist in refining the loading estimates and allocations using an adaptive management approach. States are encouraged to implement as many elements of a multi-media program as possible to reduce PCB loadings, depending on resources.

A monitoring plan should identify which parameters will be monitored and the frequency of monitoring. States may also wish to identify a baseline against which to measure progress.

Delaware River Estuary

The 2003 Stage 1 TMDLs for PCBs within the tidal Delaware River Estuary anticipate that facilities that discharge to the river, including its tributary streams, will develop and implement a pollutant minimization plan (PMP) [56]. This PMP is expected to include a list of all known and suspected point and nonpoint sources of PCBs, a description of studies used to track down PCBs (i.e., evaluate the most appropriate sampling and analytical techniques for identifying PCB contamination to the municipal utility authority

[55] May 2002 "Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992," available at http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/final52002.cfm.

[56] *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.
PCB TMDLs, Pollution Minimization Plans, and Source Trackdown in Camden City, August 2008, available at http://www.state.nj.us/dep/dsr/health/trackdown-rps.pdf.

(MUA) collection system and identifying upland sources), a description of actions to minimize the discharge of PCBs, and a proposed time frame for PCB load reductions.

Innovative methods explored in this study included the use of PCB analytical Method 1668a to attain high sensitivity in sampling, including quantification of 124 separate PCB congeners as a means to identify unique source signatures, the use of passive in-situ continuous extraction samplers (PISCES) for sample integration over long time periods (14 days), the use of inexpensive immunoassay techniques for sampling PCBs in street soils, and the use of NJ Department of Environmental Protection's hazardous waste site's electronic data collection system in conjunction with a geographic information system (GIS) to screen and isolate potential upland sources for further investigation.[57] The pilot study was carried out in two phases. Phase 1 involved only in-sewer sampling of wastewater to identify sewersheds with PCB hotspots. Phase 2 followed up on this sampling with additional in-sewer sampling but also with more detailed street soil sampling for PCBs in front of suspect facilities.

Ohio River

The Ohio River PCB TMDL[58] states that initial actions were to be focused on addressing current point sources of PCBs. Limited sampling identified publicly owned treatment works (POTWs) as possible point sources. Additional monitoring was deemed necessary to better quantify the loadings from these facilities. Once loadings are established possible control strategies can be considered.

Limited high-volume water sampling conducted on the effluent at two municipal wastewater treatment plants within the TMDL study area revealed the presence of PCBs. Similar results were found at another POTW downstream of the study area. Considering the large number of POTWs within the entire Ohio River Basin, the potential loadings from these facilities may be significant. The TMDL recommended additional monitoring be conducted to more accurately quantify the PCB loads discharged from POTWs and to determine the amount of PCBs attributable to source water loadings.

XIV. Implementation

An implementation plan is not a federally-required element of a TMDL that is subject to EPA approval. However, a TMDL implementation plan is required in some states as a matter of state law. The EPA encourages states to develop an implementation plan for PCB TMDLs even where one is not required. In addition to implementing PCB TMDLs through NPDES permits, a number of additional implementation authorities, sources, and approaches, which could be involved in development of implementation plans for PCB TMDLs, are provided here.

[57] Note *Method 1668C: Chlorinated Biphenyl Congeners in Water Soil, Sediment, Biosolids, and Tissue by HRGC/HRMS* guidance, April 2010, available at http://water.epa.gov/scitech/methods/cwa/other.cfm, descr bes the updated analytical method version (1668C).

[58] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

Superfund and Toxic Substances Control Act

In implementing a PCB TMDL, the EPA recommends coordinating with the Superfund Program. TMDLs established by states, territories or authorized Indian tribes may or may not be promulgated as rules. Therefore, TMDLs established by states, territories, or authorized Indian tribes, should be evaluated on a regulation-specific and site-specific basis. EPA-established TMDLs are not promulgated as rules, are not enforceable, and, therefore, are not appropriate or relevant and appropriate requirements (ARARs). Even if a TMDL is not an ARAR, it may aid in setting protective cleanup levels and may be appropriately a TBC ["to be considered"]. Project managers should work closely with regional EPA Water program and state personnel to coordinate matters relating to TMDLs. The project manager should remember that even when a TMDL or wasteload allocation is not enforceable, the water quality standards on which they are based may be ARARs. TMDLs can also be useful in helping project managers evaluate the impacts of continuing sources, contaminant transport, and fate and effects. Similarly, Superfund's remedial investigation and feasibility study may provide useful information and analysis to the federal and state water programs charged with developing TMDLs.[59]

The principal federal law regulating PCBs is the Toxic Substances Control Act (TSCA) and its implementing regulations, including regulations at 40 CFR 761[60]. EPA regulations under TSCA allow discharge of water to a treatment works or navigable waters if the PCB concentration is less than 3 ug/L (parts per billion), or if the concentration complies with a PCB water discharge limit in the discharger's CWA permit [40 CFR 761(b)(1)(ii)].

Although PCBs were banned in 1979, the EPA's regulations under TSCA allow the inadvertent manufacture of PCBs as the result of some manufacturing processes. Under the regulations, a manufacturer can have up to 50 ppm PCBs in products leaving the manufacturing site (except components of detergent bars can only have less than 5 ppm), so long as the annual average concentration in those products is less than 25 ppm, and so long as the manufacturer complies with other restrictions, including proper disposal of any PCB wastes produced [40 CFR 761.20(b), 761.3]. EPA regulations also allow the continued use of PCBs in various electrical and other applications, under certain conditions [40 CFR 761.30].

Examples of Superfund Program response actions that have been initiated to help clean up waterways and sediments contaminated with PCBs include the Lower Duwamish Waterway Site Washington and the Hudson River Site in New York (see "Sediment Sources: Dredging and Excavation" further below).

Air Sources

When developing PCB TMDLs, states are not required to identify contributions from individual air sources or air source categories; however, identifying such contributions

[59] EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, December 2005, available at http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf .

[60] http://www.access.gpo.gov/nara/cfr/waisidx_08/40cfr761_08.html

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On page 21, paragraph two, the citation to the EPA regulation 40 CFR 761(b)(1)(ii) is incorrect. The correct citation is 40 CFR 761.50(a)(3).

can assist in developing a targeted implementation plan. PCBs may be released to the air from equipment or materials that are still in use, such as transformers and fluorescent light ballasts; disposal sites containing transformers, capacitors, and other PCB waste; incineration of PCB-containing wastes, particularly PCB-containing oils; and redistribution and transport of PCBs already present in the environment.[61] For PCB air sources over which a state has control, particularly the most significant sources, TMDL implementation may be based on existing delegated and/or approved federal air program requirements. States are encouraged to address air sources not already covered by federal requirements. States should also evaluate cumulative emissions from air sources other than the most prominent (i.e., secondary, tertiary) and adopt controls as appropriate.

Water Pollutant Minimization Plans (PMPs)

The EPA's existing regulations require NPDES permits to include WQBELs to control all pollutants or pollutant parameters that the permitting authority determines are or may be discharged at a level which will cause, have a reasonable potential to cause, or contribute to an excursion above any state WQS, including state numeric and narrative criteria for water quality [40 CFR §122.44(d)(1)(i)]. In the case of waters impaired by PCBs, states may consider implementing compliance schedules and cost-effective pollutant minimization plans (PMPs) for wastewater treatment plants and industrial discharges [see "Pollutant Minimization Plans (PMPs)," below]. For implementation of the WLA by permitted sources, also see discussion under previous sections VIII ["Wasteload Allocation (WLA)"] and XII ("Reasonable Assurance").

Sediment Sources

TMDL implementation plans might discuss anticipated remediation measures. Remediation approaches for PCBs include capping and dredging. Descriptions of these measures and examples within PCB TMDL implementation plans or discussions follow:

Capping

In-situ capping refers to the placement of a subaqueous covering or cap of clean material over contaminated sediment that remains in place. Caps are generally constructed of clean sediment, sand, or gravel, but can also include geotextiles, liners, or the addition of material, such as organic carbon, to attenuate the flux of contaminants into the overlying water.[62] The San Francisco Bay TMDL discusses cost estimates and potential implications of capping in-bay sediments for area noise and cultural resources.[63]

Dredging and excavation

Dredging and excavation are the two most common means of removing contaminated sediment from a waterbody, either while it is submerged (dredging) or after water has been diverted or drained (excavation). Both methods typically

[61] "Polychlorinated Biphenyls (PCBs) (Arochlors) ," January 2000, available at http://www.epa.gov/ttn/uatw/hlthef/polychlo.html.
[62] More details on in-situ capping can be found in EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, December 2005, available at http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf.
[63] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

necessitate transporting the sediment to a location for treatment and/or disposal. They also frequently include treatment of water from dewatered sediment prior to discharge to an appropriate receiving waterbody.[64] One of the principal advantages of dredging and excavation is often that, if they achieve cleanup levels for the site, they may result in the least uncertainty regarding future environmental exposure to contaminants because the contaminants are removed from the aquatic ecosystem and disposed in a controlled environment.[65] The San Francisco Bay PCB TMDL discusses the cost of dredging and disposal of in-bay sediments.[66] The challenges of dredging, including high cost and risks of habitat destruction and resuspension of contaminants are recognized in the Ohio River TMDL.[67]

A collection of technical reports on PCB treatment technologies, including sediment capping, in-situ thermal desorption-destruction of PCBs, and phytoremediation of persistent organic compounds is available through the EPA's Technology and Innovation Program[68]. The EPA, United Nations Environment Programme, and US Army Engineer Research and Development Center are among the developers of these resources.

Examples of Superfund contaminated sediment cleanups include the Lower Duwamish Waterway in Washington and the Hudson River in New York.

The Lower Duwamish Waterway Cleanup Site covers a 5.5 mile waterway that empties into Elliot Bay in Seattle as well as the 32 square mile basin that discharges into the Duwamish. Past and present activities have left a legacy of chemical pollution in the waterway and in the sediment. Pollutants include PCBs, dioxins, furans, and other chemicals. In 2001-2002, the EPA and Washington Department of Ecology listed the Lower Duwamish Waterway under the federal Superfund law and Washington's Model Toxic Substances Control Act because of the health risks to people and animals exposed to contaminated sediments. Currently, the EPA is overseeing development of a Feasibility Study and is developing a recommendation for the cleanup. The Proposed Plan will be available for public comment in early 2012. Meanwhile, PCBs have driven several of the "Early Action" cleanup areas' sediment investigation and removal plans.[69]

The Hudson River PCBs Site encompasses a nearly 200-mile stretch of the Hudson River in eastern New York State from Hudson Falls, New York to the Battery in New York City. The EPA named this a Superfund site, contaminated by PCBs, in 1984.

From approximately 1947 to 1977, the General Electric Company (GE) discharged as much as 1.3 million pounds of PCBs from its capacitor manufacturing plants into the Hudson River. Since 1976, high levels of PCBs in fish have led New York State to close various recreational and commercial fisheries and to issue fish consumption advisories,

Phase 1 dredging for Hudson River cleanup took place between May and November 2009 in a six-mile stretch of the Upper Hudson River near Fort Edward in New York. Phase 1 was designed to address approximately 10 percent of the material to be dredged over the six-year project timeframe. At the end of Phase 1, an estimated 283,000 cubic yards of PCB-contaminated sediment had been removed from the river. Phase 2 (final phase) dredging began in June 2011. During this phase of dredging, GE will remove about 2.4 million cubic yards of sediment from a forty-mile section of the Upper Hudson River. [70]

Multi-media Sources

PCBs can be released from disposal of products discarded as solid waste, ongoing use of PCB-containing equipment and materials, industrial processes, and other sources. These releases may have cross-media impacts. Examples of approaches to address these sources include monitored natural recovery and PMPs (below), as well as working with industry, local governments, and the general public through outreach and communication regarding proper disposal of PCB-containing products.

Monitored Natural Recovery (MNR)

Although burial by clean sediment is often the dominant process relied upon for natural recovery, multiple physical, biological, and chemical mechanisms frequently act together to reduce risk. Evaluation of MNR should usually be based on site-specific data, including multiple lines of evidence such as decreasing trends of contaminant levels in fish, in surface water, and in sediment. Project managers should evaluate the long-term stability of the sediment bed and the mobility of contaminants within it. Contingency measures should be included as part of a MNR remedy when there is significant uncertainty that the remedial action objectives will be achieved within the predicted time frame. Generally, MNR should be used either in conjunction with source control or active sediment remediation.

While this approach to PCB contamination has a relatively low financial cost, these natural processes act very slowly on persistent, bioaccumulative pollutants such as PCBs (estimates from Indiana University[71] calculate the half-life of PCBs at between 13 and 17 years and another estimate in the Central Valley puts half-life at 56 years[72]).[73] MNR involves analyzing the processes that will result in

[70] USEPA, "Hudson River PCBs" website, available at http://www.epa.gov/hudson/.

[71] Venier, M. and Hites, R.A. Time Trend Analysis of Atmospheric POPs Concentrations in the Great Lakes Region Since 1990, *Environ. Sci. Technol.*, 2010, *44* (21), pp 8050–8055. Venier, M. and Hites, R.A. Regression Model of Partial Pressures of PCBs, PAHs, and Organochlorine Pesticides in the Great Lakes' Atmosphere, *Environ. Sci. Technol.*, 2010, *44* (2), pp 618–623.

[72] *Total Maximum Daily Load for PCBs in San Francisco Bay Final Staff Report for Proposed Basin Plan Amendment*, February 13, 2008, available at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaypcbs/Staff_Report.pdf.

achieving cleanup objectives and monitoring the recovery to ensure that cleanup is proceeding as expected. MNR has been selected as a component of the remedy for contaminated sediment at over one dozen Superfund sites. Historically, at many sites MNR is combined with dredging or in-situ capping of other areas of a site. Although reduced contamination in sediments following effective source control has been observed at some of these sites, long-term monitoring data on fish tissue are not yet available at most sites to document continued risk reduction.[74]

When considering MNR versus a more aggressive remedy, Superfund cleanup levels are based on regulatory standards that constitute ARARs such as WQS, or where not available or sufficiently protective, based on risk to human health and the environment. For human health carcinogenic cleanup levels are based on a 10^{-4} to 10^{-6} excess cancer risk range (i.e., 1/10,000 - 1/1,000,000 risk range) with 10^{-6} as the point of departure. For toxicity endpoint, the cleanup level is based on a Hazardous Index of one or less. Cleanup levels are set to protect ecological receptors.

Factors to take into account when considering MNR versus other remedies include an analysis of the processes that are contributing to achieving the cleanup levels through MNR, the expected time frame to achieve the protective levels, and how this compares against other more active remedies. General factors for evaluation of MNR need to be evaluated on a case-by-case basis. Examples of site conditions that might support use of MNR may include such factors as the sediment bed is reasonably stable and likely to remain so, and sediment is resistant to resuspension (e.g., cohesive or well-armored sediment).

Several PCB TMDLs consider natural recovery within their implementation sections. For example, the Ohio River TMDL looks toward addressing PCB contamination present in sediments; options include natural attenuation.[75] An ongoing annual fish tissue monitoring program makes data and information available to assess and define current and future long-term trends in PCBs in the Ohio River system.[76] Fish tissue monitoring measures trends and natural attenuation progress; it provides information on impacts from sediment concentration (atmospheric deposition may also affect fish tissue concentration).

Pollutant minimization plans (PMPs)

In the case of waters impaired by PCBs, states may consider implementing cost-effective PMPs.

For PCB control, a PMP might include identification of all known and suspected point and nonpoint sources of PCBs, a description of studies used to identify

[73] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

[74] *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, December 2005, available at http://www.epa.gov/superfund/health/conmedia/sediment/pdfs/guidance.pdf.

[75] *Ohio River Total Maximum Daily Load (TMDL) for PCBs,* September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.

[76] These data can be found on Ohio River Valley Water Sanitation Commission's website at http://www.orsanco.org/fish-tissue/193.

PCB sources, a description of actions to minimize prospective discharge of PCBs, a proposed time frame for PCB load reductions, a method to demonstrate progress, and ongoing PCB monitoring. As an example, PMP elements for PCBs were identified in a DRBC resolution and guidance manual[77]. DRBC has aggregated resources for completing and implementing PMPs -- including a handbook on PCBs in electrical equipment, a report on technological feasibility for proposed water quality criteria for NJ, and a NJ pilot "trackdown" program for

PCB sources entering storm drains and CSOs in order to abate PCB transport to the Delaware River, thereby decreasing bioaccumulation in foodfish and decreasing risk to human consumers. To that end, the State of New Jersey narrowed down the universe of potential PCB sources in Camden County MUA's collection system from a county-wide range of potential sources and municipalities to just a few specific neighborhoods, industry types and streets in Camden City (77% of PCB load). Methods used included soil collection, enzyme-linked immunosorbent assays (ELISA), and high resolution gas chromatography/high resolution mass spectrometry. [79]

DRBC's[80], recommended actions to minimize known and probable on-site PCB sources include the following:

- Removal;
- Engineering controls (such as caps and containment dikes);
- Fluid changeout;
- Substitutions / modifications of raw or finished materials used in the treatment process;
- Modifications to material handling including transport; and
- Remedial activities for spills and leaks (current or legacy).

Recommended minimization activities for probable collection system sources include the following[81] [82]:

- Indirect Discharge Permit review and amendment;
- Recommendations for improved and upgraded industrial pre-treatment;
- Remedial activities for spills and leaks (current or legacy);
- Recommendations for remediation by other agencies under other regulatory programs; and
- Hydraulic controls to minimize PCB mass loads through CSOs.

[77] *Pollution Minimization Plans, and Source Trackdown in Camden City,* August 2008, available at http://www.state.nj.us/dep/dsr/health/trackdown-finalreport.pdf.
[78] Available at http://www.state.nj.us/drbc/PMP_Resources/index.htm.
[79] *PCB TMDLs, Pollution Minimization Plans, and Source Trackdown in Camden City,* August 2008, available at http://www.state.nj.us/dep/dsr/health/trackdown-rps.pdf.
[80] *Recommended Outline for Pollution Minimization Plans for Polychlorinated Biphenyls in the Delaware Estuary*, January 26, 2006, available at http://www.state.nj.us/drbc/PMP-POTW-012606.pdf
[81] *Recommended Outline for Pollution Minimization Plans for Polychlorinated Biphenyls in the Delaware Estuary*, January 26, 2006, available at http://www.state.nj.us/drbc/PMP-POTW-012606.pdf.
[82] Also see 40 CFR Part 403; these regulations set forth requirements for publicly owned treatment works (POTWs) to control discharges into the collection system and POTW treatment plant, as well as requirements for industries that discharge to the POTW.

Where appropriate, states may wish to use "adaptive implementation," which is "an iterative implementation process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities."[83] In implementing a TMDL, states may wish to modify implementation activities as new information on assumptions in the TMDL, such as previously uncharacterized dischargers as described in section V, becomes available. PCB TMDLs have also used a "staged" implementation approach, in which implementation is staged over a period of time, with reduction goals to be met in several phases.[84]

[83] See "Clarification Regarding "Phased" Total Maximum Daily Loads," August 2, 2006, at http://www.epa.gov/owow/tmdl/tmdl_clarification_letter.html and *Adaptive Implementation of Water Quality Improvement Plans: Opportunities and Challenges,* September 2007, at http://nicholasinstitute.duke.edu/water/quality/adaptive-implementation-of-water-quality-improvement-plans-opportunities-and-challenges.

[84] See *Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) for Zones 2-5 of the Tidal Delaware River*, December 15, 2003, available at http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/DelawareRiver/TMDLreport.pdf.

Appendix: PCB Sources

Table 1. Databases for PCB Sources			
Database	**Description**	**Location**	**Comments**
Toxic Release Inventory (TRI)	Contains information on releases of nearly 650 chemicals and chemical categories from industries, including manufacturing, metal and coal mining, electric utilities, commercial hazardous waste treatment, among others.	www.epa.gov/tri	Other sources for information on toxic chemical site releases: www.epa.gov/triexplorer --www.epa.gov/enviro --www.scorecard.org --www.rtk.net
Permit Compliance System (PCS)	Provides information on companies which have been issued permits to discharge waste water into rivers. You can review information on when a permit was issued and expires, how much the company is permitted to discharge, and the actual monitoring data showing what the company has discharged.	http://www.epa.gov/enviro/html/pcs/	
National Priority List (NPL)	Lists national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation.	http://www.epa.gov/superfund/sites/query/basic.htm (Basic Query)	--Locate NPL sites, check their cleanup progress, and get information on new and proposed NPL sites. --Query parameters include contaminant of concern (e.g., PCBs)
Envirofacts Warehouse Database	Provides access to several EPA databases (e.g., PCS, TRI) to provide information about environmental activities that may affect air, water, and land anywhere in the United States.	http://www.epa.gov/envirofw/	Learn more about environmental activities in your area or generate maps of environmental information here.
EPA Transformer Registration and PCB Activity Databases	Provides information on companies or people who have PCB transformers, are conducting business involving the disposal of PCBs, or are conducting research and development involving PCBs.	http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/data.htm	

Table 2. General PCB Sources		
General Source	**Description**	**Related Databases (reference Table 1, above)**
Items intentionally containing PCBs	Transformers, capacitors, hydraulic and heat transfer fluids	EPA Transformer Registration and PCB Activity Databases
Industry	Steel manufacturing, power plants, electric lamps, plastic materials and resins, motors, carbon and graphite products, wiring devices, communication equipment, rubber, aluminum foundries	TRI, NPL, EPA Transformer Registration and PCB Activity Databases
Combustion of PCB-laden materials	Incinerators of municipal, medical, and hazardous wastes; sewage sludge, scrap tires, industrial and utility boilers	TRI
Environmental sinks	Contaminated sediments	NPL
Inadvertent generation of PCBs	--Combination of carbon, chlorine, and high temperatures can result in PCB generation --Up to 200 chemical processes may create PCB byproducts --Products inadvertently containing PCBs include paint, inks, ag chemicals, plastics, detergent bars	
Storage and disposal facilities	Storage facilities, wastewater treatment plants, incinerators, landfills, decontamination facilities, hazardous waste sites (old products include dust control agents, adhesives, construction materials, gaskets, sound deafening felt)	TRI, NPL, EPA Transformer Registration and PCB Activity Databases
Ohio River Total Maximum Daily Load (TMDL) for PCBs, September 2002, available at http://www.epa.gov/reg3wapd/tmdl/wv_tmdl/Ohio/OhioReport.pdf.		

EXHIBITS

Documents for which judicial notice is requested

EXHIBIT A

Illinois
Environmental
Protection Agency

Bureau of Water P.O.
Box 19276 Springfield,
IL 62794-9276
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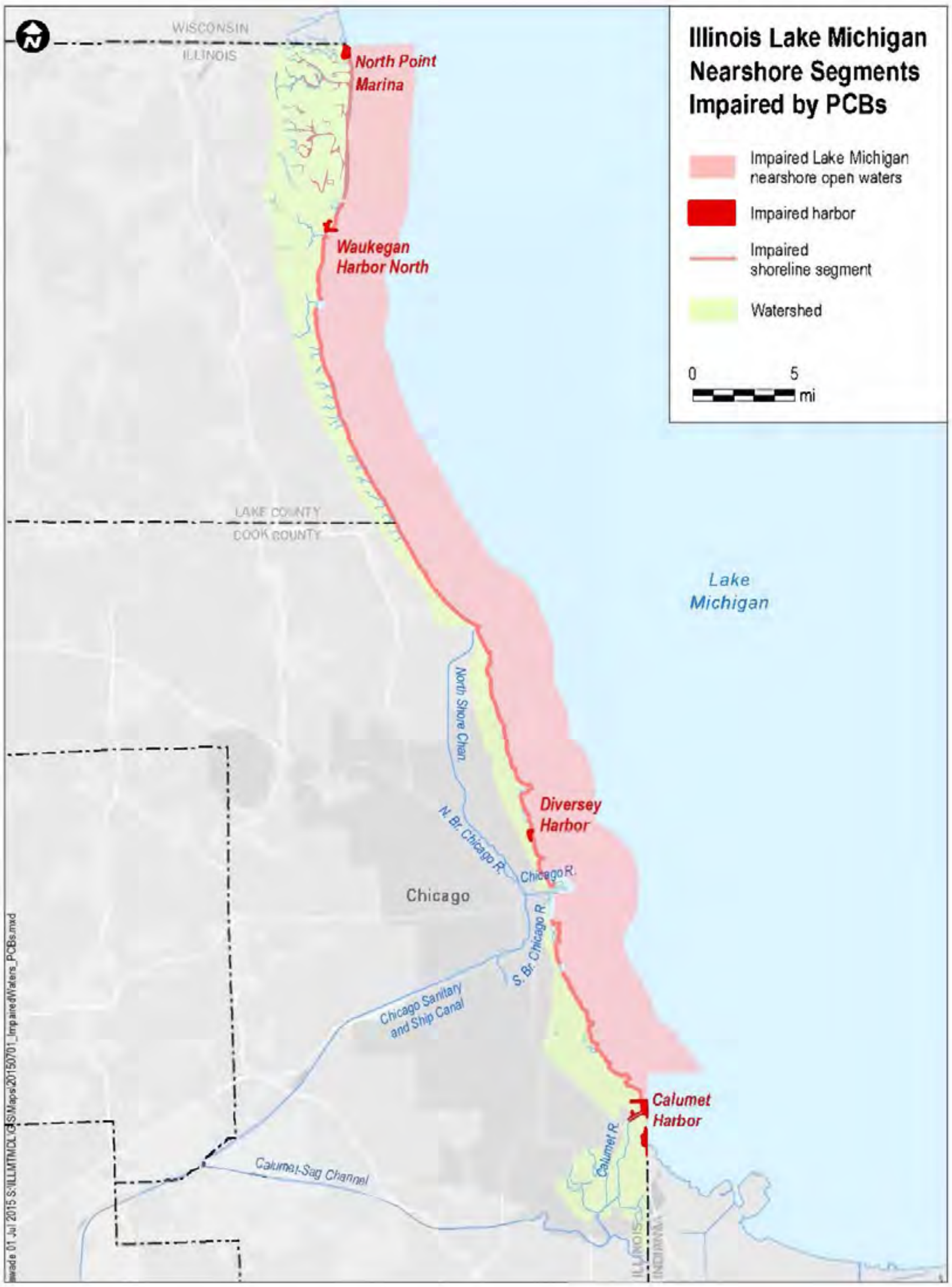
April 2019

IEPA/BOW/IL-2019-003

Illinois Lake Michigan Nearshore Watershed PCB TMDL Report



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PCB TMDL Development for the Illinois Lake Michigan Nearshore Watershed, Illinois

This file contains the following documents:

1) U.S. EPA Approval letter and Decision Document for the Final PCB and Mercury TMDL Report

2) PCB TMDL Report

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

APR 1 8 2019

REPLY TO THE ATTENTION OF:

WW-16J

Sanjay Sofat, Chief
Bureau of Water
Illinois Environmental Protection Agency
P.O. Box 19276
Springfield, Illinois 62794-9276

Dear Mr. Sofat:

The U.S. Environmental Protection Agency (EPA) has completed its review of the Final Illinois Lake Michigan Nearshore PCB and Mercury Total Maximum Daily Loads (TMDL) Reports, and all the accompanying documentation, submitted by the Illinois Environmental Protection Agency (IEPA) to EPA for approval. The Illinois Lake Michigan Nearshore PCB and Mercury TMDLs address a total of 56 waterbody segments impaired by PCBs and mercury in fish tissue and the water column. The waterbodies are identified in Appendix A of the enclosed EPA Decision Document.

The TMDLs meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations at 40 C.F.R. Part 130. EPA hereby approves Illinois' 112 TMDLs for PCBs, and mercury. EPA's review of Illinois' compliance with each statutory and regulatory TMDL requirement is described in the enclosed Decision Document.

We wish to acknowledge the State's effort in submitting these TMDLs and look forward to future TMDL submissions by the State of Illinois. If you have any questions, please contact Mr. Peter Swenson, Chief of the Watersheds and Wetlands Branch, at 312-886-0236.

Sincerely,

Joan M. Tanaka
Acting Director, Water Division

Enclosure

cc: Abel Haile, IEPA

TMDL: Illinois Lake Michigan Nearshore PCB and Mercury TMDL
Effective Date: APR 1 8 2019

Decision Document for Approval of
The Illinois Lake Michigan Nearshore PCB and Mercury TMDL Reports

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable TMDLs. Additional information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable. These TMDL review guidelines are not themselves regulations. They are an attempt to summarize and provide guidance regarding currently effective statutory and regulatory requirements relating to TMDLs. Any differences between these guidelines and EPA's TMDL regulations should be resolved in favor of the regulations themselves.

1. Identification of Waterbody, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the waterbody as it appears on the State's/Tribe's 303(d) list. The waterbody should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the waterbody and specify the link between the pollutant of concern and the water quality standard (see section 2 below).

The TMDL submittal should include an identification of the point and non-point sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the waterbody. Where it is possible to separate natural background from non-point sources, the TMDL should include a description of the natural background. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as:

(1) the spatial extent of the watershed in which the impaired waterbody is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
(5) an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable.

Comment:

1.1 Watershed Characterization: TMDL Spatial Extent and Scope

The Illinois Lake Michigan Nearshore (ILMN) TMDLs for mercury and polychlorinated biphenyls (PCBs) cover a long, narrow, area within Lake and Cook Counties, Illinois. The watershed includes portions of the municipalities of Winthrop Harbor, Zion, Beach Park, Waukegan, North Chicago, Lake Bluff, Lake Forest, Highwood, Highland Park, Glencoe, Winnetka, Kenilworth, Wilmette, Evanston, Chicago, and Burnham. Some of the watershed drains directly to Lake Michigan, but most of the watershed is highly urbanized and has been altered extensively to drain away from the lake, as explained in Section 1.2 of this Decision Document. The impaired nearshore open water segment is 180 square miles in size, extending 5 km into Lake Michigan from the Illinois shoreline, with Lake Michigan serving as its eastern boundary as shown in Figures 1 and 2 of this Decision Document. The total length of the shoreline segments[1] in the study area is approximately 63.5 miles, with individual segment lengths ranging from 0.07 to 5.5 miles.

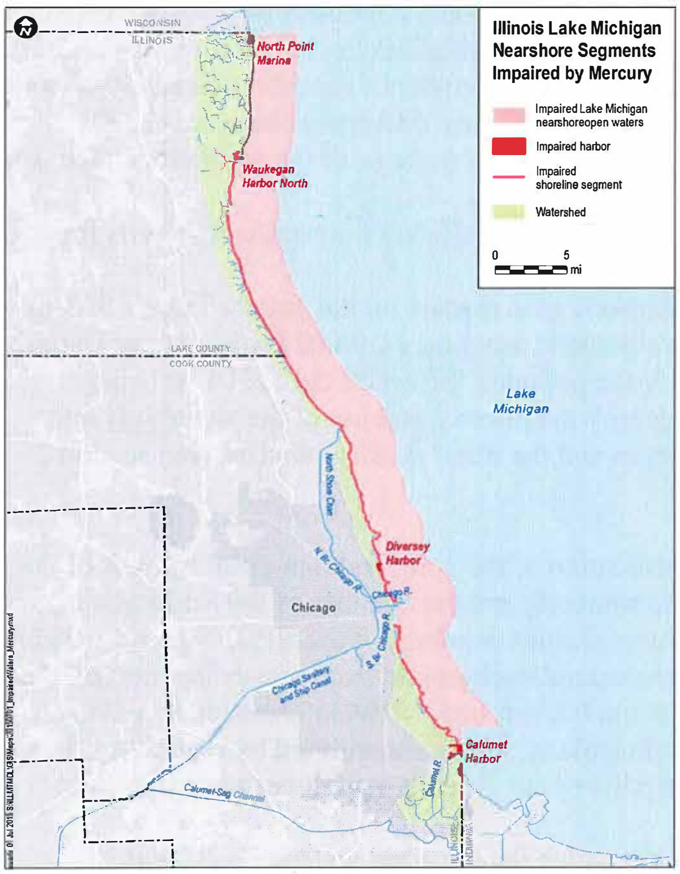

Figure 1. Mercury TMDL Impaired Mercury Segments (Figure 2.3 of the mercury TMDL)

Interspersed with the shoreline segments are four harbors:

Waukegan Harbor North (~0.07 sq.mi.), North Point Marina (~0.12 sq. mi.), Diversey Harbor (~0.05 square miles), and Calumet Harbor (~2.4 sq. mi.). These harbors are also shown in Figures 1 and 2 of this Decision Document.

1.1 TMDL Scope:

The impaired waters of the Illinois Lake Michigan Nearshore PCB and Mercury TMDLs are included on the Illinois Integrated Water Quality Report and Clean Water Act Section 303(d) list (Illinois EPA, 2014), and impairments are described in further detail in Section 2 of this Decision Document. Appendix A of this Decision Document contains a full listing of the impaired segments and causes. There are two separate TMDL submittals, one for mercury and one for PCBs. Because of the similar watersheds and pollutant transport mechanisms, the

[1] The term *shoreline segment* is used in this document, because not all of the segments have beaches.

Figure 2. PCB TMDL Land Use (Figure 2.5 of the PCB TMDL)

two TMDLs are addressed in one Decision Document. A TMDL Direct Proportionality Approach is used to link fish tissue concentrations endpoints directly to air deposition loads (see Section 3.2 of this Decision Document). Illinois EPA used a simple method to calculate stormwater loadings by aggregating urban areas by land use and applying a single concentration to stormwater runoff for each land use in the study area. By treating the study area segments as a single area[2,3] Illinois EPA was able to quantify a proportional relationship between a target concentration in fish tissue and the corresponding allowable PCB and mercury air deposition loads to the entire study area.

TMDL Scope: PCBs

The Illinois Environmental Protection Agency's (Illinois EPA's) PCB TMDL addresses fifty-one shoreline segments, one nearshore open water segment and 4 harbors that have been identified as impaired due to PCB concentrations in fish (56 total segments). The Waukegan Harbor North segment is also listed as impaired due to PCB concentrations in the water column. All segments in the study area were considered together as one area to calculate the PCB TMDL.

TMDL Scope: Mercury

Similar to the PCB TMDL, the scope of the mercury TMDL covers the 56 nearshore shoreline, harbor, and open water segments impaired due to mercury in fish in the areas shown in Figure 1 of the Decision Document. All waters were considered together to calculate the mercury TMDL.

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[2] "simple methods are compilations of expert judgement and empirical relationships between physiographic characteristics of the watershed, in general rely on large scale aggregation." EPA Compendium of Watershed-scale Models for TMDL Development Section 1.2, Classification of Watershed Scale Models. Pg. 2-3.

[3] Ibid, Section 2.3.1 Simple Methods, Pg. 13

The mercury TMDL quantifies the pollutant load reductions needed to reduce mercury levels in fish tissue and the water column so that the waterbodies can meet water quality standards.

1.2 Watershed Characterization

The study area watershed is complex and largely developed. Land use is about 73 percent residential, 4 percent industrial, 4 percent commercial, and 19 percent open space. Within Lake County, the watershed boundary extends inland farther than it does in Cook County and narrows near the south end of Lake County. This is because flows from the Chicago River and the Little and Grand Calumet River were diverted away from Lake Michigan (in 1900 and 1922, respectively) and drain into the Chicago Area Waterway System (CAWS) which drains towards the Des Plaines River, except in the case of elevated flows during (extreme) storm events. Maps of the CAWs are provided in Appendix F of this Decision Document showing the physical extent and the waterways composing the CAWS.

Chicago Area Waterway System (CAWS)

Illinois EPA defines the CAWS as a 76.3-mile branching network of navigable waterways that convey a variety of point-source and precipitation-related flows, including water reclamation plant effluents and stormwater runoff from impervious surfaces throughout the watershed. According to the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC)[4], approximately 75 percent of waterbodies making up the length of the CAWS are man-made canals, and the remainder are natural streams that have been deepened, straightened and /or widened. The MWRDGC serves approximately 40 municipalities including most of the city of Chicago. Over 70 percent of the annual flow in the system is treated municipal wastewater effluent from the Calumet, Lemont, North Side and Stickney Water Reclamation Plants (WRPs) owned and operated by the MWRDGC. Rivers and streams contribute flow to the CAWS, including the Grand Calumet River, the North Branch and small watersheds along the Calumet - Sag Channel (CSC) and Chicago Sanitary Ship Canal (CSSC).

The Clean Water Act regulates stormwater through Phase 1 and 2 of the municipal separate storm sewer systems (MS4) NPDES permitting program for municipalities with populations greater than 100,000 (Phase 1), and smaller municipalities (Phase 2), along with other entities designated by the State.[5] There are numerous small stormwater drainage inputs along the CAWS including areas served by storm sewers (parking lots, roof top drains, etc.) from several municipalities and Illinois DOT drainage facilities. Almost 100% percent of the study area watershed lies within an MS4 city or village or regulated entity, as discussed in greater detail in Section 1.4 of this Decision Document. There are also small streams and ravines in the study

[4] Metropolitan Water Reclamation District of Greater Chicago.

[5] Phase 1 of the MS4 permit program was issued in 1990. Phase 2, issued in 1999, requires regulated small MS4s in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage, usually under general permits, for their stormwater discharges. *Watershed Academy Web: Introduction to the Clean Water Act.*

area watershed that carry intermittent stormwater and surface drainage directly to Lake Michigan.

In addition to the MS4s, a total of 255 combined sewer and stormwater systems from study area WRPs can experience combined sewer overflows (CSOs) resulting in the discharge of stormwater and untreated sewage to the CAWS during periods of elevated flows.[6] The CSO collection area is approximately 375 square miles[7] (see CSO map, Appendix F of this Decision Document). The CAWS usually flows toward the Des Plaines River watershed and away from the study area during normal and smaller storm events. The flow of water in the CAWS is artificially controlled by hydraulic structures. When extreme storm events occur, the flow is reversed through the O'Brien Lock and Controlling Station, the Chicago River Lock and Controlling Station, and the Wilmette Pumping Station and discharged into Lake Michigan to alleviate flood conditions. Any PCBs or mercury in stormwater and CSOs that discharge into the CAWS can contribute to the impairment of the Lake Michigan Nearshore TMDL study area when severe storms require the locks to be opened and flows are passed through the control works into Lake Michigan. These events occur infrequently. A Consent Decree between the Chicago MWRD and EPA to ameliorate these events and improve the water quality of the CAWs, is described in the Reasonable Assurance section of this Decision Document.

Study Area Harbors

Waukegan Harbor is a manmade harbor about 40 miles north of Chicago in Waukegan, Illinois and is used for both industrial and recreational activities (IDNR, 2012). The area was contaminated by PCBs which Outboard Marine Corporation (OMC) used in hydraulic fluids at its boat motor manufacturing plant (EPA, 2014). An estimated 300,000 pounds of PCBs were discharged into the harbor by OMC between 1961 and 1972.

The site is on the National Priorities List and the United States and Canadian governments identified it as an Area of Concern (AOC) in the 1980s. The EPA and partner Agencies performed remediation actions that removed roughly one million pounds of PCBs in soils, industrial facilities, and sediment from the OMC site and Waukegan Harbor, respectively, in the 1990's (EPA, 2015c). Illinois EPA states in the PCB TMDL that in 2002, EPA and Illinois EPA determined, through risk assessment, the remediation standards for PCB concentrations that would meet the ecological target of lowering the levels of PCB concentration in sport fish tissue to levels seen in open lake sport fish. The resulting target for PCB concentrations in sediment were 0.25 to 1.0 ppm (IDNR, 2012). In 2012 and 2013, an additional 124,000 cubic yards of contaminated sediment were removed from Waukegan Harbor (EPA, 2015c). The Waukegan Harbor Area of Concern Habitat Management Plan (IDNR, 2012) defines the PCB target for the Waukegan Harbor open water unit as "reduce PCB levels in Waukegan Harbor sediments to 0.2 ppm."

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[6] 2008. MWRDGC R &D Department. Report No. 08-15R Description of the Chicago Waterway System for the Use Attainability Analysis. (March 2008) CSO information is available at https://www.mwrd.org/irj/go/km/docs/documents/MWRD/internet/reports/Monitoring_and_Research/pdf/2008/08-15%20Description%20of%20CWS%20Report%20for%20UAA.pdf

[7] Ibid, p.6

Winthrop Harbor is home to North Point Marina, the largest marina on the Great Lakes (IDNR, 2015a).

Diversey Harbor is in Lincoln Park, adjacent to Lake Shore Drive. Due to bridge restrictions, the harbor can only accommodate power boaters (Chicago Harbors, 2015).

Calumet Harbor and River include an approach channel and outer harbor channels that are located primarily in Indiana (and which are not part of the Illinois TMDL). They also include the entrance channel and river channel in Illinois and extend approximately 6.7 miles up the Calumet River to Lake Calumet (USACE Chicago and Rock Island Districts, 2015). Calumet Harbor is a deep draft commercial harbor that is protected by 12,153 linear feet of steel sheet pile and timber crib breakwater structures (USACE Detroit District, 2015). This is the largest of the study area's four impaired harbors, and Calumet Harbor and River is the third busiest port on the Great Lakes by tonnage, moving an annual average of over 14 million tons of commodities (USACE Detroit District, 2015). At Calumet Harbor and River, an average of approximately 50,000 cubic yards of sediment are dredged annually, and this dredging requirement is expected to continue (USACE Chicago and Rock Island Districts, 2015).

1.3 Problem Characterization

PCBs Problem Characterization

Illinois EPA characterized PCBs as a class of synthetic, chlorinated organic chemicals that were produced and used because of their insulating and stable properties prior to being banned in 1979. It is estimated that over half of the U.S. production of PCBs occurred between 1960 and 1974. Many technical mixtures and different trade names were used throughout the production period (e.g., Aroclor, Askarel, Inerteen, etc.). In 1979, EPA banned commercial PCB production, but PCBs may be present in a wide range of products and materials produced before 1979 (discussed further in the PCB TMDL, Appendix C: Historic PCB Uses and Sources). There are no known natural sources of PCBs, however, they continue to be produced inadvertently as a manufacturing byproduct of many chlorinated organic compounds.

PCBs and Fish Consumption

Illinois EPA characterized human exposure through the consumption of fish as the principal public health concern related to the assessed impairment for these waters related to Illinois EPA's fishable designated use (Illinois EPA, 2014). PCBs have been demonstrated to cause cancer, and to have a variety of other adverse health effects on the immune system, reproductive system, nervous system, and endocrine system (EPA, 2015). PCBs are persistent in the environment and tend to accumulate in sediments and concentrate and bioaccumulate in living tissues.

Illinois EPA has identified 56 nearshore beach/shoreline, harbor and open water segments in the Illinois Lake Michigan Basin that are impaired for fish consumption use due to concentrations of PCBs in fish tissue or aquatic life use (Illinois EPA, 2014). These impaired waters are included in the Illinois Integrated Water Quality Report and Clean Water Act Section 303(d) list (Illinois

EPA, 2014). Appendix B of the PCB TMDL contains a complete list of the impaired segments and causes.

Although median PCB concentrations in top predator fish have declined since PCB production was banned, PCB fish advisories remain in place for all five Great Lakes (EPA, 2015a). Fish tissue concentrations in all the Great Lakes remain above the 1987 Great Lakes Water Quality Agreement target of 0.1 mg/kg wet weight (EPA, 2012). Illinois EPA uses EPA data in Figure 2-1 in the PCB TMDL to show 7-percent annual declines in total PCBs in lake trout from Lake Michigan.

Atmospheric Deposition of PCBs to the Water Column

According to Illinois EPA, the Integrated Atmospheric Deposition Network (IADN), created in 1990, is a joint venture of Environment Canada, the Ontario Ministry of the Environment, and the EPA's Great Lakes National Program Office. IADN consists of a master monitoring station located on each of the five Great Lakes and several satellite stations, including one in Chicago. The atmospheric gas phase PCB concentrations observed over Chicago continue to be much higher than concentrations measured over the main Lake Michigan open water and at other IADN stations (Buehler and Hites, 2002), even though gas phase PCB concentrations in Chicago have decreased by about half between 1996 and 2003. Total PCB concentrations in precipitation and gas phase over Chicago are about an order-of-magnitude higher than over the Sleeping Bear Dunes in Michigan, as shown in the TMDL (from Sun et al., 2006).

The Lake Michigan Mass Balance Study (Green et al., 2000) and the Atmospheric Exchange Over Lakes and Oceans Study (AEOLOS) (Simcik et al., 1997; Zhang et al., 1999) confirmed that a combination of prevailing westerly winds off Chicago and an elevated rate of PCB gas phase emissions over the city led to elevated gas phase PCB concentrations for about 20-40 km off the Chicago shoreline. These elevated gas phase PCB concentrations consequently lead to increased absorption fluxes, i.e. the transfer of gas phase PCBs from the atmosphere to the water column.

Mercury Problem Characterization

Illinois EPA characterizes the mercury problem in Section 2.1 of the mercury TMDL. Mercury is a naturally-occurring metal that is prevalent throughout the global environment and in Illinois. Mercury exists in three forms: elemental mercury, inorganic mercury, and organic mercury. Illinois EPA discussed how the various forms of mercury move through the environment and explained that mercury properties and behavior in the environment depend on the form it takes in the environment (Section 2.1 of the Mercury TMDL). Numerous sources of mercury from both natural and anthropogenic origins release mercury to the atmosphere. Once released, mercury cycles between land, water, and the atmosphere.

Mercury and Fish Consumption

Illinois EPA characterized mercury's neurotoxic properties as posing a danger to both humans (especially the young) and wildlife in the mercury TMDL's Problem Statement (Section 2.1). One of the major routes of human exposure is through consumption of the methylated mercury (MeHg) found in contaminated fish (Clarkson and Magos, 2006). Illinois EPA noted in the mercury TMDL that even low levels of prenatal MeHg exposure may cause early childhood neurocognitive effects (Karagas et al., 2012). In the United States alone, it is estimated that over 300,000 newborns each year may be at risk of adverse neurodevelopmental effects due to *in utero* exposure to MeHg (Mahaffey et al., 2004). Human exposure through the consumption of fish poses a public health concern which has resulted in mercury-related fish consumption advisories in Illinois and all the eight Great Lakes states. Illinois EPA described the Fish Contaminant Monitoring Program (FCMP) in Illinois which uses a 0.06 mg/kg fish tissue concentration as the reference level for issuing a "one meal per week" fish consumption advisory. All segments in the TMDL study area are classified as Not Supporting for fish consumption use due to mercury, and Waukegan Harbor North is also classified as Not Supporting for aquatic life use. How these segments are identified is further defined in Section 3 of the mercury TMDL. The Illinois Lake Michigan mercury TMDL addresses mercury impairments in 56 nearshore beach/shoreline, harbor, and open water segments. Appendix B of the mercury TMDL contains a full listing of the mercury-impaired segments covered by this TMDL and causes of impairment.

The Mercury Cycle: Atmospheric Mercury, Deposition, and Methylation

Illinois EPA stated, in Section 2.1 of the mercury TMDL, that much of mercury loading in the study area waterbodies is a result of atmospheric deposition. Illinois EPA highlighted the tendency of elemental mercury, when emitted to the upper atmosphere, to be transported long-distances from its source. Illinois EPA provides references in Section 2.1 of the mercury TMDL, that support the atmosphere being the most important pathway for the transport and dispersion of mercury (Fitzgerald et al., 1998; Mason et al., 1994; Mason and Sheu, 2002). Section 1.6 of the Decision Document and Section 2.1.1 of the mercury TMDL provide further information on the atmospheric deposition of mercury over time. In addition, previously deposited mercury can be re-emitted from terrestrial and aquatic surfaces through natural processes including biomass burning and emissions from soil, inland waters, oceans, and vegetation. Airborne mercury returns to the terrestrial and aquatic environments via wet and dry deposition, where it undergoes complex biogeochemical cycling. Inorganic mercury can combine with carbon to form methylmercury (MeHg) under certain environmental conditions in a process called methylation. The formation of MeHg is an important step in mercury cycling (Ullrich et al., 2001) because MeHg can be bio-accumulated through the food web, reach high concentrations in aquatic organisms and eventually result in the primary mechanism for methylmercury exposure of animals and humans through the consumption of fish.

1.4 PCB and Mercury Source Assessments

Variations in Sample Analysis for PCBs and Mercury

Illinois EPA presents results from the PCB and mercury TMDL source assessments in Section 4 of the PCB and mercury TMDLs (Table 3 of this Decision Document). Contaminant monitoring required by NPDES permits and reported by certified laboratories must use analytical methods approved by EPA under 40 CFR Part 136. EPA has approved several analytical methods to measure PCBs and mercury in water that can be used for a variety of study and regulatory purposes.

The lowest concentration that can be reliably measured is called a "detection limit" (DL). Illinois EPA identified DLs in the TMDLs when data used in the TMDLs were below the detection limit. EPA provides the DLs in Sections 1.5, 1,6, and throughout the Decision Document when the TMDL uses them to determine as an upper bound to a range of loading estimates.

Illinois EPA assessed pollutant sources with data that was collected and analyzed during different time periods, using varied methods and equipment. EPA approves sample analysis methods for compliance and other uses and prescribes the steps that must be performed for each analysis method as well as equipment type, and a range of conditions and constraints needed to produce a reliable pollutant concentration measurement. Among these conditions and constraints are: instrument limitations, equipment interference, varying filtration types and extraction solvents. EPA's periodic updates and modifications of each of its approved methods allow pollutants to be measured at progressively lower concentrations. For example, EPA approved mercury analysis methods 245.1, and 245.2 for mercury analysis in 1974. Both have been commonly used in the NPDES program permit compliance determination. The range for the method 245.2 is documented as measuring mercury concentrations as low as 0.2 µg/L (200 ng/L)[8].

EPA notes in the approved mercury analysis method 1631E (2002), that "the method detection limit (MDL) (40 CFR 136, Appendix C) for Hg has been determined to be 0.2 ng/L when no interferences are present."[9] An MDL as low as 0.05 ng/L can be achieved for low Hg samples by using a larger sample volume, a lower BrCl level (0.2%), and extra caution in sample handling (Section 1.5 of Method 1631E).

EPA has also noted in Sections 1.5 and 1.6 of the Decision Document when Illinois EPA used off-site monitoring results generated with updated sensitive analysis methods to estimate loads for PCBs and mercury stormwater sources to provide addition information for the MS4 source assessments.

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8 http://www.caslab.com/EPA-Methods/PDF/EPA-Method-2452.pdf accessed 2/27/2019

9 The sensitivity of Methods 245.1 and 245.2 are well above the water quality criteria now adopted in most states (and criteria included by EPA in the Final Water Quality Guidance for the Great Lakes System) for the protection of aquatic life and human health, (generally in the range of 1 to 50 ng/L). Method 1631E, with a quantitation level of 0.5 ng/L, supports the measurement of mercury at these levels.

Common Elements of PCB and Mercury MS4 Source Assessments

Illinois EPA provided point source assessment information for MS4 sources that is common to both the PCB and Mercury TMDLs. Information that is similar for PCBs and mercury is presented together in Section 5 of this Decision Document, to avoid duplication.

Stormwater discharges are regulated under the NPDES MS4 program (i.e., Phase I and Phase II communities). All the municipalities listed above in this Decision Document's Spatial Extent and Scope Section except Burnham have MS4 permits for discharges to Lake Michigan, and 100% percent of the study area watershed lies within an MS4 city or village or regulated entity. The MS4 permits include these municipalities, together with the MS4 permits for the Cook County Highway Department, Illinois Department of Transportation, Lake County, Shields Township, and Waukegan Township (permit numbers presented in Table B-1 in Appendix B of the Decision Document). Because the study area watershed has no site-specific data for stormwater PCB or mercury loads ((MWRDGC, 2015), Illinois EPA estimated the stormwater pollutant loads for both PCB and mercury based on the drainage area, stormwater runoff quantity, and stormwater pollutant concentration from samples outside the watershed. Runoff quantity was calculated using the method developed by the Metropolitan Washington Council of Governments (MWCG) (Schueler, 1987) as:

$$R = P * Pj * Rv$$

where:

R = Annual runoff (inches),
P = Annual rainfall (inches), estimated as 36.1 inches, based on the average annual rainfall reported for Chicago Midway Airport 3 SW for the 1929-2013 period
Pj = Fraction of annual rainfall events that produce runoff (set to the default of 0.9)
Rv = Runoff coefficient.

Rv is a function of impervious cover in the study area watershed calculated using Geographic Information System (GIS) analysis to determine land use categories: commercial (0.71), industrial (0.54), and residential (0.37). The following runoff coefficients resulted from these impervious cover values: commercial (0.69), industrial (0.54), and residential (0.38). The area of the contributing watershed was calculated as 99.6 square miles, broken down as 3.82 square miles commercial, 4.05 square miles industrial, and 91.73 square miles residential.

1.5 PCB Sources and Baseline Source Assessment

Illinois EPA explained that PCBs may still exist in a wide range of products and materials produced before the 1979 ban, including electrical, heat transfer, and hydraulic equipment; plasticizers in paints, plastics, and rubber products; pigments, dyes, and carbonless copy paper; and many other industrial applications (EPA, 2015). Despite the ban, PCBs continue to be produced inadvertently as a manufacturing byproduct of many chlorinated organic compounds.

Illinois EPA explored all readily available information to identify the current sources of PCBs to the study area water, including: point sources (NPDES-permitted municipal, industrial, and stormwater dischargers), and nonpoint sources (e.g., atmospheric deposition, runoff from Superfund and other contaminated sites).

Illinois EPA found the most significant sources to the TMDL study area to be atmospheric loading and hydrodynamic transport of PCBs from the open water of Lake Michigan (Section 4.2 of the PCB TMDL). Atmospheric PCBs are deposited to the main body of Lake Michigan water and are transported into the study area by a process called hydrodynamic transport (Section 4.1 of the TMDL). Illinois EPA estimated the loadings from each source using the data gathered. The estimates for the atmospheric and hydrodynamic transport to the study area produced a range of current loadings as explained below. Resuspension and pore water diffusion of PCBs from bed sediments were found to be small contributors. The remaining source categories could only be roughly estimated, because all available data for those sources were below laboratory detection limits. Below is a summary of how the loads for each source were estimated.

Illinois EPA grouped all the segments into one study area and analyzed total current and target PCB loads to the study area rather than examining each impaired waterbody segment separately. This was done to 1) make the best use of the available fish tissue data, 2) support the development of targeted reductions for sources to the entire study area, and 3) evaluate the overall impact of and to properly account for large, ubiquitous sources to Lake Michigan (see additional details on fish tissue data in Section 3 of the Decision Document). The sections in the TMDL containing additional detail on the methods used are as follows

Nonpoint Sources

- Hydrodynamic transport - Section 4.1
- Atmospheric loading - Section 4.2.1- 4.2.3
- Resuspension and/or pore water diffusion of PCBs from bed sediments- Section 4.6

Point Sources

- MS4 stormwater loading-Section 4.3
- Flow reversals from the Chicago Area Waterways-Section 4.4
- Other point source discharges -Section 4.5

Hydrodynamic Transport of PCB Loads

Illinois EPA describes the open water of Lake Michigan as a source of PCBs to the project study area in Section 4.1 of the PCB TMDL. The predominant flow patterns in Lake Michigan circulate counter-clockwise near the study area (Beletsky and Schwab, 2001; Beletsky et al. 1999). Illinois EPA used results from a set of hydrodynamic transport models called the NOAA Great Lakes Coastal Forecasting System[10] (GLCFS) to predict the annual average flow of Lake Michigan water into the study area (1,810 m^3/s). Illinois then multiplied the flow times a range of

[10] A set of models that simulate and predict the two- and three-dimensional structure of currents, temperatures, winds, waves, and ice in the Great Lakes using a 4-km^2 grid size.

concentration results, from an estimated open lake PCB concentration of 140 pg/L[11] (EPA Great Lakes Aquatic Contamination Survey data, 2004), to a PCB concentration in the lake near Chicago of 233 pg/L (Venier et al., 2014). The final range of possible net PCB baseline load values through hydrodynamic transport from north to south[12] entering the study area was found to be 8-13 kg/yr. Illinois EPA described another estimate that could be used as a baseline estimate of PCB loadings to Lake Michigan from the Lake Michigan Mass Balance Study The study estimated that if the lake followed a "continued slow recovery", the average lake PCB concentration could be reduced to 80 pg/L by 2014 (see Figure 4-2 in PCB TMDL). If this were the case, the annual PCB load from the open lake to the study area would be 4.6 kg/yr. Illinois EPA used 4.6 kg/yr, as a lower bound hydrodynamic loading estimate for an estimated range of 4.6 - 13 kg/yr.[13]

Atmospheric PCB Loading:

Illinois EPA used an annual atmospheric PCB concentration, along with the surface area of the study area waterbodies and the mass transfer rate, to calculate a PCB loading rate from atmospheric sources. Illinois EPA focused on gas deposition as the dominant atmospheric PCB loading component to the study area, and quantified PCB deposition using atmospheric gas phase PCB concentration and the mass transfer coefficient which controls the rate at which PCBs pass through the air-water interface (Section 4.2.2 of the TMDL).

As Illinois EPA explained in Section 4.2 of the TMDL, PCBs from atmospheric sources are delivered to the study area via wet deposition, dry deposition, and gas phase deposition. Gas deposition is a transfer of PCBs across the air-water interface that occurs when atmospheric gas phase PCB concentrations exceed the equivalent dissolved phase PCB concentrations in the water column. Gas phase deposition in the Chicago area of Lake Michigan greatly exceeds wet and dry deposition (Miller et al., 2001). Great Lakes research shows that at least 90 percent of total air deposition of PCBs to the lakes is in the form of gaseous PCB absorption into the Great Lakes surface, and that wet and dry deposition account for less than 10 percent (Green, et.al., 2000).

There are two available data sets measuring atmospheric PCB concentration: The Integrated Atmospheric Deposition Network (established 1990) and the AEOLOS.[14] The data from both are highly variable as they are strongly correlated to wind directions and seasons (temperature).

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[11] This number has been corrected from the value 1.40 pg/L in the original Illinois Lake Michigan Nearshore TMDL. See email record, May 11, 2018 between Christine Urban, EPA, David Dilkes, Limnotech, and Abel Haile, Illinois EPA.

[12] Ibid.

[13] http://www.epa.gov/med/grosseile_site/LMMBP/pcbs.html)

[14] The AEOLOS project, administered through the EPA Great Lakes National Program Office and the Office of Research and Development, was designed to study atmospheric deposition in the Great Waters. EPA and scientists from the Universities of Minnesota, Michigan, Maryland, Delaware, and the Illinois Institute of Technology began the project in 1993 to determine the contributions of urban source categories to measured atmospheric concentrations and deposition, and the air-water exchange of contaminants and their partitioning into aquatic phase.

Illinois EPA considered two data integration methods to develop an annual atmospheric PCB concentration over the study area: the Simcik method (1997) and the Zhang method (1999).

Illinois EPA selected the Simcik integration methodology (Simcik et al., 1997) which integrates concentration measurements of atmospheric PCBs for various conditions, resulting in an annual average concentration over the study area of 529 pg/m^3. The Simcik data set contained 25 nearshore, over-lake PCB measurements (1994-1995), which cover multiple discrete measurements over three seasons and a range of wind conditions. Illinois EPA used the results from the Simcik study as the basis for the annual average atmospheric PCB concentrations over the study area because the data set used in this study was more specific to the study area. The Zhang et al. (1999) data represented the average atmospheric concentration over the larger, southern quarter of Lake Michigan (356 pg/m^3).

PCB Mass Transfer Rate at the Air-Water Interface

Illinois EPA used the data integration methodology by Zhang (et al., 1999), for determining the PCB mass transfer rate at the air-water interface which was needed to determine a PCB loading rate from atmospheric sources (see Section 4.2.2 of the PCB TMDL). The Zhang method uses empirical regressions of the data to estimate an annual atmospheric PCB concentration as a function of environmental conditions. Illinois EPA explained in Section 4.2.2 of the TMDL that the Zhang dataset contains hourly wind speed and water temperature readings necessary to calculate that the mass transfer rate calculation (Zhang et al, 1999). The results of their analysis showed an annual gross absorptive flux of PCBs of 300 kg/yr in response to an annual average atmospheric PCB concentration of 356 pg/m^3. Illinois EPA's flux calculation represented the 16,000 km^2 surface area of the southern quarter of Lake Michigan used in Zhang's study. Illinois EPA normalized their calculation statistically, on an areawide basis resulting in an annual mass transfer rate of 300 kg/yr per 356 pg/m^3 per 16,000 km^2 [(=5.3 x 10^{-5} $kg/km^2/yr$ / (pg/m^3)] (Section 4.2.2 of the PCB TMDL).

PCB Atmospheric Loading Rate

Illinois describes in Section 4.2.3 of the PCB TMDL how it merged a selected atmospheric gas phase concentration with information on the mass transfer rate to estimate a 2015 atmospheric loading rate. The data from Simcik et al. (1997) showed an annual average atmospheric PCB concentration over the study area of 529 pg/m^3 for the period of 1994-1995. Observed atmospheric PCB concentrations throughout the Great Lakes in general, and over the Chicago area in particular, have decreased over that period. Available research shows a range of half-life values for atmospheric PCB concentrations. Sun et al. (2006) calculated a half-life of 7.7 years in the Chicago area, and Venier and Hites (2010b) calculated that atmospheric PCBs around the Great Lakes were decreasing with a half-life of 17 years. Depending upon which decay rate is assumed, the estimated 2015 PCB concentration ranges from 87 to 234 pg/m^3. Illinois combines the mass transfer rate at the air-water interface defined in Section 4.2.2 of the PCB TMDL and a surface area of 473 km^2 for the study area waterbodies, to give a range of current atmospheric loading of 2.1 to 5.8 kg/year.

NPDES Facilities Permitted for PCB

Illinois EPA explains in Section 4.5 in the PCB TMDL how the contributions of NPDES sources in the study area were considered for the TMDL. Three individual NPDES permits in the watershed have permit special conditions for PCBs: Zion Station (IL0002763), Winnetka Power Generation Station (IL0002364), and Midwest Generation LLC Waukegan (IL0002259). All of these permits state "There shall be no discharge of PCBs."

Zion Station (IL0002763) also has permit monitoring requirements for PCBs. Available effluent PCB measurements (2009-2015) for Zion Station were less than the 0.001 mg/ L (1000 ng/L or 1,000,000 pg/ L) detection limit. Illinois EPA calculated an upper bound load estimate of less than 5 kg/yr by multiplying the average facility flow of 3.6 MGD from Zion Station by the detection limit concentration of 0.001 mg/L. The result is presented in Table 1 in the Decision Document.

MS4 Stormwater PCB Sources

Illinois EPA estimated PCB loads from MS4s using the method discussed above in Section 1.4 of this Decision Document (Common Elements of PCB and Mercury MS4 Source Assessments) because site-specific data were not available to quantify current/existing stormwater PCB loads for the study area watershed (MWRDGC, 2015). The loading was determined using an annual estimated rainfall of 36.1 inches, and the area of the contributing watershed calculated as 99.6 square miles broken down by land use.[15] Illinois EPA used an actual PCB concentration value of 0.00000727 mg/L (7,270 pg/L) from the City of Spokane[16] to estimate the urban stormwater load to the study area. Spokane has a land use distribution similar to the study area watershed.[17] The estimated stormwater PCB base load for the study area equaled 0.62 kg/yr, or 0.0017 kg/day.

Chicago Area Waterways Source PCB Load Estimate Using CSO Information

Limited site-specific PCB concentration data were available to estimate loads from the CAWS during flow reversals. Site-specific 2013 PCB data for the CAWS collected by the MWRDGC near the control works were lower than detection level (less than 0.3 μg/L). Illinois EPA calculated two load estimates. The first was based on measured flow and detection limit concentration levels. Illinois EPA used the detection limit of 0.3 μg/L (300,000 pg/L) as an upper-bound estimate of PCB concentration and the average 2010-2014 annual volume of water entering Lake Michigan through the three locks for a gross estimate of < 45.68 kg/yr (0.125 kg/day).

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[15] It was conservatively assumed that all the runoff generated within the study area watershed drained to Lake Michigan, although as described in Section 1.2 above, the runoff usually flows to the CAWS and away from the lake except under certain conditions related to large storm events.

[16] Based on samples collected between 2012-2014 (2014).

[17] 73 percent residential, 4 percent commercial, and 19 percent open space

The second load estimate was based on measured flow from the Illinois study area, and measured PCB levels from the Spokane River Watershed, Washington, which has similar land uses. Illinois EPA reasoned that the PCB concentration in CAWS flow reversals is similar to actual measurements in urban areas with similar land uses, such as Spokane Washington, which is subject to a WQS of 170 pg/L and a more sensitive analysis method, EPA method 1668[18] (detection limit of 0.01-0.5 ng/L). Illinois EPA estimated the PCB loading from the CAWS flow reversals by multiplying the same site-specific flow data[19] times the observed average PCB concentration of 12,420 pg/L for CSOs to the Spokane River, resulting in a PCB loading estimate of less than 1.9 kg/yr, or 0.005 kg/day. Illinois EPA determined that the second load estimate of <1.9 kg/yr more accurately represents the loading from CAWS, and therefore this value was used in the TMDL.

Comparing PCB Loads

Table 1 below compares PCB loads from various sources. Illinois EPA found the most significant sources to the TMDL study area to be hydrodynamic transport of PCBs from the open water of Lake Michigan, and atmospheric loading.

Data for the remaining sources were limited. As a result, Illinois EPA estimated current/existing loads from stormwater, other point source discharges, and flow reversals from the CAWS. Because all available data for those sources were below laboratory detection limits, the estimates involved multiplying anticipated flows from these sources by the detection limit, which is the upper bound of this value. Literature-based estimates for these sources indicate that they are likely to be minor contributors to the study area.

Table 1. PCB Loads to the Study Area (from Table 4.2 of the PCB TMDL)

Process	Data Sufficiency	Estimated Magnitude
Hydrodynamic Transport from Main Body of Lake Michigan	Acceptable	4.6 to 13 kg/yr
Atmospheric Loading[20]	Acceptable	2.1 to 5.8 kg/yr
MS4 Stormwater Loading	Limited. Rough estimate made using literature-based concentrations	0.62 kg/yr
Other Point Source Discharges[21]	Limited. Estimate of upper bound; all available data are non-detectable	<< 5 kg/yr

[18] Fernandez, Arianne. 2012. Spokane River Urban Waters Source Investigation and Data Analysis Progress Report (2009-2011), Washington DOE Publication No. 12-04-025 September 18, pg 12.
[19] It was assumed that CSOs comprise a significant portion of the CAWS flows. Note that the actual composition of flows in the CAWS during periods of flow reversals is unknown. (MWRDGC, 2015b)
[20] Range based on half-life value used, as described in Section 4.2.3.
[21] The number is based on the detection level for the monitored data times the flow from one facility (Zion) with monitoring data. Email between EPA and David Dilkes, May 16, 2018.

Process	Data Sufficiency	Estimated Magnitude
Flow Reversals from the CAWs	Limited. Estimate of upper bound; all available data are non-detectable.	<<1.9 kg/yr
Resuspension and/or Pore Water Diffusion of PCBs from Bed Sediments	Limited. Estimated using site-specific sediment concentrations combined with literature values for diffusion rates.	0.012 kg/year

Site-specific data sufficiency in Table 1 above is characterized as limited by Illinois EPA indicating the use of literature values and/or measurements less than the detection level) for the majority of the processes of concern, with hydrodynamic transport and atmospheric loading being the only sources quantified with existing data.

1.6 Mercury Sources and Baseline Source Assessment

Illinois EPA provided an assessment of the potential current and legacy sources of mercury released to the study area in Section 4 of the mercury TMDL. Because of its diverse properties, mercury has been used in household, commercial, medical, and industrial applications including: medical instruments and equipment, fluorescent lights, electrical switches and relays, and dental amalgam.

In 2004, EPA estimated that U.S. manufacturers use 500-600 metric tons of mercury annually as part of their production processes or to create products that rely on mercury's chemical and physical properties.

Illinois EPA evaluated a number of potential sources bringing mercury into the study area in Section 4 of the mercury TMDL:

- Hydrodynamic transport - Section 4.1
- Atmospheric loading - Section 4.3
- MS4 stormwater loading -Section 4.2
- Flow reversals from the CAWS (Section 4.4)
- Other point source discharges

Mercury Hydrodynamic Transport

Illinois EPA used the outputs from the NOAA Great Lakes Coastal Forecasting System (GLCFS) model to estimate hydrodynamic transport between Lake Michigan and the nearshore open water segment. The GLCFS is a set of models that simulate and predict the two- and three-dimensional structure of currents, temperatures, winds, waves, and ice using the Modified Princeton Ocean Model, developed by NOAA's Great Lakes Environmental Research

Laboratory and Ohio State University (NOAA, 2015). The predominant flow patterns in Lake Michigan circulate counter-clockwise in the vicinity of the study area (Beletsky and Schwab, 2001; Beletsky et al., 1999). Illinois EPA used the results from the GLCFS model for the study area to estimate mercury loads to the northern edge of the study area using the annual average flow into the study area (1,810 m3/s; USGS, undated) and averaged mercury concentrations from the main body of Lake Michigan measured outside the study area (0.18 ng/L). Illinois EPA multiplied this concentration by flow to produce a net mercury load of 10.3 kg/yr entering the study area due to transport from Lake Michigan.[22] Illinois EPA noted that atmospheric deposition is the dominant source of mercury into the main body of Lake Michigan, such that reductions attained through this TMDL to control atmospheric loads will also help control loading from Lake Michigan.

Mercury Atmospheric Deposition

Anthropogenic sources of mercury released to the atmosphere include power plants, metals manufacturing facilities, caustic soda production plants, active or abandoned mines, ore processing facilities, incinerators for medical, urban and industrial wastes, cement plants, and chemicals production facilities. Natural sources include geological processes (AMAP/UNEP, 2013).

Illinois EPA discussed the decline of mercury emissions in the U.S., and in the Great Lakes over the past several decades due to the implementation of pollution control technologies in Section 2 of the mercury TMDL. Illinois EPA discussed the increase in mercury emissions from Asia largely due to expanding energy generation from coal-fired power plants (Pirrone et al., 2010; Wilson et al., 2010; UNEP, 2013).

Illinois EPA focused on the contribution of Illinois sources in Section 4 of the mercury TMDL. Illinois EPA used results from EPA's Regional Modeling System for Aerosols and Deposition (REMSAD; EPA, 2008) to obtain the total atmospheric mercury deposition focusing on the nearshore TMDL study area including open waters, harbors and portions of the watershed draining directly to study area waters. Illinois EPA used REMSAD, a "three-dimensional grid model," to simulate both wet and dry deposition of mercury and calculate the concentrations of both inert and chemically reactive pollutants in the atmosphere that affect pollutant concentrations" (EPA, 2008). It should be noted that REMSAD tracks emissions from selected emission sources, or groups of sources, and quantifies their contributions to mercury deposition throughout a specified area and simulation period. The mercury emissions of NRG/Midwest Generation, LLC, a coal-fired power plant in Waukegan that operates within the study area, were included in the REMSAD simulations.

Illinois EPA used REMSAD simulations to estimate the mass of mercury from all sources that contributed to deposition to the study area (i.e., Lake Michigan nearshore). The total estimated atmospheric[23] deposition was 23 kg/yr (Section 4.2 of the mercury TMDL). REMSAD estimated

[22] Email between EPA and David Dilkes, May 16, 2018.

[23] The REMSAD was applied at a national scale. The year 2001 was chosen as the annual simulation year because REMSAD model inputs (emissions and meteorology) were primarily derived from the 2001 Clean Air Interstate Rule (CAIR) database, which EPA used in the evaluation of the CAIR and the Clean Air Mercury Rule.

that Illinois sources contribute 37 percent of the 23 kg/yr atmospheric mercury deposition to the study area, as shown in the pie chart in Figure 4.2 of the mercury TMDL. The Waukegan power plant was estimated to contribute 9.4% of the modeled Illinois deposition (0.82 kg/yr based on 2001 data). REMSAD estimated that sources outside of the state of Illinois (U.S. States, Canada, Mexico and background) were responsible for 61 percent of mercury deposition to the project study area. Another 2 percent was estimated to come from previously deposited mercury that has been volatilized from water, land, or vegetation.

Illinois EPA presented results from the 2002 National Emissions Inventory (NEI),[24] as shown in Figure 3 of this Decision Document. Coal-fired electric utilities contributed over 70 percent of the total airborne mercury emitted from Illinois sources (Section 4.2.2 of the mercury TMDL). Other notable mercury source categories in Illinois include: emissions from primary and secondary metal production; various industrial processes; fuel combustion for industrial, commercial, and residential purposes; waste incinerators including hazardous and medical waste combustors; and cement and lime manufacturing. Illinois EPA plans for addressing these sources are discussed in Section 8 of this Decision Document.

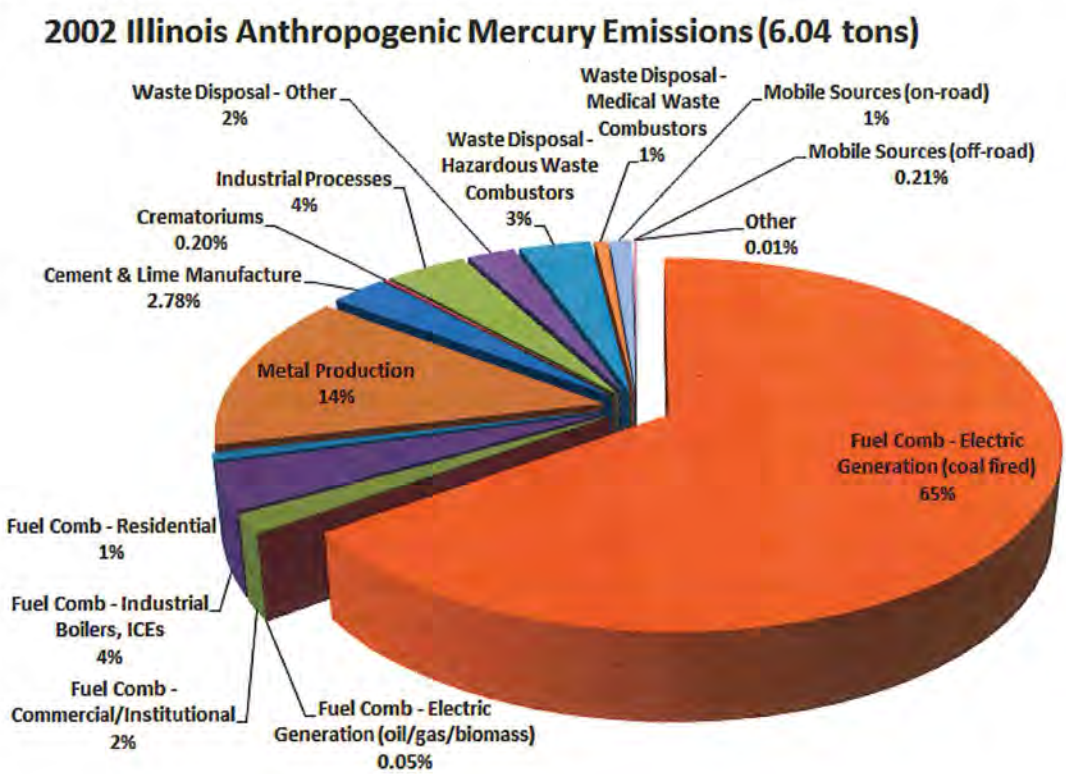

Figure 3. Anthropogenic Sources of 2002 Mercury Air Emissions to the Atmosphere from Illinois (Source: NEI, 2002)

[24] Time period is consistent with the REMSAD modeling period.

NPDES Permitted Facilities

Illinois EPA identified the North Shore Water Reclamation District (NSWRD) Waukegan Water Reclamation Facility as the only facility in the study area with an individual NPDES permit containing mercury effluent limits. Five additional individual permits include mercury monitoring requirements but do not contain effluent limits.

The permit for the NSWRD Waukegan Water Reclamation Facility (IL0030244) contains an average annual mercury concentration limit of 0.0000013 mg/L (1.3 ng/L), which is consistent with the most stringent water quality standards for the study area waterbodies. The estimated annual average mercury load for this facility equals the permitted load of 0.04 kg/yr (0.00024 lbs/day at the design average flow)

Five individual NPDES permits contain mercury monitoring requirements (see Table 7-5 of the mercury TMDL). The Illinois EPA plan for these facilities is discussed in *Mercury Reasonable Assurance,* Section 8.3 of the Decision Document.

Municipal Separate Sanitary Sewer Systems (MS4s)

Illinois EPA listed the municipalities in the study area with MS4 permits in Section 2.2.1 of the mercury TMDL, stating that all of the listed municipalities except Burnham have MS4 permits to discharge to Lake Michigan (see Section 1.1 of this Decision Document). Ninety-three percent of the study area watershed lies within an MS4 city (including Chicago) or village. The MS4 permits for these municipalities, together with the MS4 permits for the Cook County Highway Department, Illinois Department of Transportation, Lake County, Shields Township, and Waukegan Township, cover close to 100 percent of the study area.

To estimate stormwater mercury loads, Illinois EPA conservatively assumed that all the runoff generated within the study area watershed drains to Lake Michigan (both the predominant MS4 discharge and small nonpoint source load). Illinois EPA has no available site-specific MS4 concentration data, so Illinois EPA estimated stormwater mercury loads for the study area watershed (Section 4.3 of the TMDL), by multiplying stormwater runoff depth by the study area drainage area, and by a stormwater mercury concentration. Stormwater mercury concentration was calculated using the method developed by the MWCG (Schueler, 1987) (Section 4.3 of the mercury TMDL) as discussed in Section 1.4 of this Decision Document. The area of the contributing watershed was calculated as 99.6 square miles, broken down as 3.82 square miles commercial, 4.05 square miles industrial, and 91.73 square miles residential. Illinois EPA based its load estimate on USGS measurements of mercury concentration in stormwater for the Columbia River Basin, Washington and Oregon (2009-2010) (Section 4.3 of the mercury TMDL). The Illinois EPA used the average of reported concentration values for total mercury, which equaled 37.17 ng/L. The estimated study area stormwater mercury load equaled 6.96 lbs/year (3.16 kg/yr).

Chicago Area Waterways Mercury Sources

According to Illinois EPA, flow in the CAWS is composed of treated sewage effluent, CSO, and stormwater runoff. See Watershed Characterization in the Decision Document (above) for the physical description of the CAWS. A gate reversal occurs adjacent to the lock structure and involves small volumes of water. A lock reversal occurs when the locks are opened during severe storms. Lock reversals allow a much greater volume of water to flow into Lake Michigan than a gate reversal. Lock reversals allow flow from the CAWS to discharge to Lake Michigan through the O'Brien Lock, Chicago River Lock, and Wilmette Lock control works shown in Figure 4.5 of the TMDL (also see Appendix F of this Decision Document).

The amount of measured flow and site-specific concentration data from flow reversals is limited. Illinois estimated loads entering the study area from periodic flow reversals of the CAWS by performing two load calculations. One Illinois estimate used site-specific flow and mercury concentration data, and the other used a set of mercury measurements from a location outside of the study area which provided additional information to build a better estimate.[25]

The MWRDGC conducted water quality sampling in the CAWS during flow reversals in 2013, including measurements of mercury.[26] However, loads from this data source could not be accurately characterized because all mercury concentration measurements were lower than the detection limit.

Instead, Illinois EPA estimated a range mercury loads from 0.099 kg/yr to 0.56 kg/yr resulting from flow reversals. The lower load value was estimated based on low level mercury measurements taken in the Chicago River (average = 6.5 ng/L, when values less than detection are set equal to the detection level of 0.5 or 10 ng/L depending on sample analysis method used) and reported MWRDGC flow volumes. The higher value was estimated based on MWRDGC flow volumes and Columbia River stormwater concentrations (37.17 ng/L). Illinois EPA concluded in Section 4.6 of the mercury TMDL that no determination could be made for stormwater loading, or flow reversals from the CAWS, because site-specific mercury concentration data were either below detection limits or not available. Illinois EPA suggested that estimates based on literature values, (i.e., reference concentration values from the Columbia River) used to calculate loads indicate that these sources are relatively small contributors to study area loads. Illinois EPA did not rule out the potential of stormwater or CAWS contributions to make up a larger portion of mercury loads to individual harbors (Section 4.6 of the mercury TMDL).

Comparing Mercury Loads

The results from the Illinois source assessment in Section 4 of the mercury TMDL, are provided below in Table 2. Illinois EPA found the most significant sources to be hydrodynamic transport

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[25] MWRDGC Website, Flow Reversal Data 1985 to 2017 accessed last (March 5, 2019) http://www.mwrd.org/irj/go/km/docs/documents/MWRD/internet/protecting_the_environment/Combined_Sewer_Overflows/pdfs/Reversals.pdf

[26] EPA Methods 136.3 accessed 12/28/18, https://www.ecfr.gov/cgi-bin/text-idx?SID=a6bb8a02b6d783f9356758b5ff0ed106&mc=true&node=pt40.25.136&rgn=div5#se40.25.136_13

of mercury from the open water of Lake Michigan, and atmospheric loading. As previously discussed, no definitive determination could be made for stormwater loading, individual permitted point source discharges, or flow reversals from the CAWs, because site-specific mercury concentration data are either below detection limits or not available. Because all available data for those sources were below laboratory detection limits, the estimates involved multiplying anticipated flows from these sources by the detection limit, which represent the upper bound loading values. Estimates of these sources using reference concentration information, such as the Columbia River stormwater concentrations, were also made and indicate that they are likely to be minor contributors to the study area.

Table 2. Mercury Loads to the Study Area

Process	Data Sufficiency[a]	Estimated Magnitude
Hydrodynamic transport from main body of Lake Michigan	Acceptable	10.3 kg/yr
Atmospheric Loading	Acceptable	23.24 kg/yr
MS4 Stormwater Loading	Limited. Rough estimate made using literature-based concentrations	3.16 kg/yr
Flow Reversals from the Chicago Area Waterways	Limited. All available data are non-detectable; A range of rough estimates were made using Chicago River data and literature-based concentrations	0.099 kg/yr - 0.56 kg/yr
Other Point Source Discharges (Individual Permitted)	Acceptable	0.04 kg/yr

* Reproduced from the Illinois Lake Michigan Nearshore Mercury TMDL Table 4-3

Conclusion: *EPA reviewed the Illinois Nearshore PCB and Mercury TMDLs and finds that the TMDL documents submitted by Illinois EPA adequately describe the impaired water bodies, pollutants of concern, priority (medium) and pollutant sources that are addressed by these TMDLs, based upon available data and information. Illinois EPA identified the waters impaired by PCBs and mercury in the latest Integrated Report submittal, using data from various State programs. The State compiled all readily available information including NPDES data, air emissions data, Lake Michigan nearshore and open water data, and fish tissue data, etc. to identify sources of PCBs and mercury. EPA also finds that the State adequately defined how various key terms were used in the TMDL, such as "air deposition" and "hydrodynamic transport." Illinois EPA also described complex urban watershed characteristics, such as the Chicago Area Waterways and Harbor areas, and adequately supports the approaches used in the development of the TMDL. EPA has concluded that Illinois EPA's characterizations of the nonpoint source loads (including hydrodynamic transport, and air deposition) as primary sources of PCBs and mercury loads in the TMDL are adequately supported by their loading estimates and available data.*

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Targets

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative Air water quality criterion, and the antidegradation policy (40 C.F.R. §130.7(c) (1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard (WQS). The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Comment:

2.1 Introduction to Water Quality Standards and Targets

Depending on the designated use being addressed, TMDL targets may be based on human health, aquatic life, or wildlife criteria (EPA, 2011). TMDL targets are established at levels that attain and maintain the applicable WQS, including designated uses, numeric and narrative criteria, and antidegradation policy [40 CFR§130.7(c)(1)]. Where possible, the water quality criterion for the pollutant causing impairment is used as the numeric water quality target when developing the TMDL.

Illinois analyzed available biological, physiochemical, physical habitat, toxicity, and other available data to evaluate each assessment unit against the State's assessment criteria. The degree to which each assessment unit meets its designated uses is defined as: Fully Supporting (good), Not Supporting (fair), or Not Supporting (poor). A waterbody in which at least one applicable use is not fully supported is considered to be impaired.

The waterbodies in the PCBs and Mercury TMDL fall into the Lake Michigan Basin category of Illinois' water quality standards (Illinois EPA, 2014). This category includes all tributaries of Lake Michigan, harbors, and open waters of the Illinois portion of the lake (Illinois Administrative Code (35 IAC 302.501-595, Subpart E). The applicable WQS for the TMDL are designed to protect Lake Michigan Basin aquatic life, human health, and wildlife. Waters of the Lake Michigan Basin must be free from any substance, or any combination of substances, in concentrations toxic or harmful to human health, or to animal, plant, or aquatic life (35 IAC 302.540). The TMDL targets for PCBs and mercury in this TMDL must be consistent with water quality criteria developed to protect the fish consumption and aquatic life uses. The standards for PCBs and mercury are described in Section 2.3 of this Decision Document.

The Fish Consumption Designated Use (PCBs and Mercury)

Illinois EPA based the reductions in sources identified in the Lake Michigan mercury and PCB TMDLs, on attaining a fish tissue target value to meet its human health narrative standard (35 IAC 302.540). Illinois' fish consumption use is associated with all waterbodies in the State, and assessment is based on (1) waterbody-specific fish-tissue data and (2) fish-consumption advisories issued by the multi-agency[27] Illinois Fish Consumption Monitoring Program (FCMP). The FCMP uses a risk-based process developed in the Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory (Anderson et al. 1993).[28] The Protocol requires the determination of a Health Protection Value (HPV) for a contaminant, which is used to calculate the fish tissue concentration of that contaminant that will be protective of human health (based on range of meal consumption frequencies).[29]

Because all of the assessment units addressed in the PCB and mercury TMDLs are impaired for the fish consumption use, a HPV for fish consumption was used in both TMDLs to derive the TMDL fish tissue contaminant targets for PCBs and mercury. Illinois' lowest fish tissue concentration HPVs for fish consumption are the HPVs for sensitive populations (which include pregnant or nursing women, women of child-bearing age, and children under the age of 15). For PCBs the fish consumption HPV for sensitive populations is 0.05 μg/kg/day.[30] The fish consumption HPV for sensitive populations for mercury is 0.10 μg/kg/day.[31]

Aquatic Life Uses (PCBs and Mercury)

Waters are assessed for aquatic life use (ALU) using available data for the most recent three years. For Lake Michigan open waters and harbors, if two or more samples exceed the acute aquatic life criterion, the waters are considered impaired. If more than 10 percent of the samples exceed the chronic aquatic life criterion, the waters are considered impaired.

2.2 PCB Water Quality Standards

Numeric PCB TMDL Target: Fish Consumption Use

TMDL submittals must include numeric water quality targets, which are quantitative values used to measure whether or not applicable WQS are being attained. Illinois uses a target fish tissue PCB concentration to determine support of its Fish Consumption Use for the PCB TMDL. The HPV for fish consumption is 0.05 μg/kg/day. Based on this HPV, the lowest PCB fish tissue

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27 From Illinois Department of Public Health website Factsheet "Fish Advisories in Illinois"

28 "Designated Use Support" - Section 3.2 of the PCB TMDL and Section in Mercury TMDL

29 Consumption frequencies range from unlimited consumption to "do not eat"

30 2018 Illinois EPA Draft CWA Integrated Report, Table C-14 and C-15

31 Illinois EPA. 2006. Technical Support Document for Reducing Mercury Emissions from Coal-Fired Electric Generating Units. Table 4.2 Current Human Health-Based Concentrations in Fish Tissue for Issuing consumption Advisories due to Mercury (Mg/Kg in fillets, et weight), P. 53.

concentration that triggers a fish consumption advisory is 0.06 mg/kg for all species (Section 3.2 of the PCB TMDL). Illinois uses the fish consumption advisories triggered by the 0.06 mg/kg concentration to assess whether waters are fully supporting the fish consumption use or are considered to be impaired.

Illinois used a PCB fish tissue concentration target (0.06 mg/kg) to determine reductions necessary to address impaired waters and to thus achieve the fish consumption designated use standard for the Lake Michigan Basin (USEPA, 2011). Illinois noted in the TMDL that the fish tissue assessment concentration was derived independently of the State's numeric water column criteria for PCBs (Section 3.2 of the PCB TMDL).

Numeric PCB Standards for the Water Column

Illinois EPA's numeric water quality criteria are developed to protect the designated uses of surface water. The criteria for PCBs were adopted by the State of Illinois as part of the Great Lakes Water Quality Initiative (GLI). The criteria for PCBs in surface waters of the Lake Michigan basin are 120 pg/L for the protection of wildlife, and 26 pg/L for the protection of human health [35 IAC 302.504(e)]. Only one water in the PCB TMDL is listed for water column impairment. As discussed in Section 3.3 of the Decision Document, Illinois EPA demonstrated that meeting the reduction in PCB loadings necessary to meet the TMDL targets for the fish tissue in a select fish species would also meet the water column concentration target.

2.3 Mercury Water Quality Standards

Numeric TMDL Mercury Target for Fish Tissue

Illinois uses a HPV for mercury of 0.10 µg/kg/day for fish consumption by sensitive populations. An extensive database of studies of the health effects of methyl mercury was used to develop the HPV, which is used as the starting point for issuing a "one meal per week" advisory. This concentration was derived by the Great Lakes Fish Advisory Task Force and accepted by the Great Lakes states for use in their sport fish advisory programs. Based on the 0.10 µg/kg/day HPV, the lowest fish tissue concentration that would result in a fish consumption advisory is 0.06 mg/kg for all species. The State of Illinois uses this concentration to assess support of the fish consumption use and to trigger a fish consumption advisory.

Numeric Mercury Standards for Surface Waters

The WQS for mercury in surface waters of the Lake Michigan Basin are 0.0013 µg/L (or 1.3 ng/L) for the protection of wildlife, 0.0031 µg/L (or 3.1 ng/L) for the protection of human health, and 1.7 µg/L (1,700 ng/L) and 0.91 µg/L (910 ng/L) for the protection of aquatic life from adverse effects due to acute and chronic toxicity, respectively [35 IAC 302.504(e)]. These standards were adopted by the State of Illinois as part of the Great Lakes Water Quality Initiative and apply to all waters of the Lake Michigan Basin (Section 3.1 of the mercury TMDL).

In Section 3.3 of the mercury TMDL, Illinois demonstrated that if a water complies with the TMDL fish tissue target, it will also meet the water quality targets (i.e., water column concentrations) to protect human health and wildlife (for all waters addressed by the TMDL), and the aquatic life criteria for Waukegan Harbor. Illinois applied published bioaccumulation factors (BAFs) for the Great Lakes to demonstrate the relationship between pollutant concentration in the water column and resulting fish tissue contamination (USEPA, 1995). The water column concentration corresponding to the fish tissue TMDL target of 0.06 mg/kg mercury was calculated to equal 0.43 ng/L. This is lower (more stringent) than the most stringent WQS for mercury; the wildlife criterion (1.3 ng/L). EPA agrees that reductions in mercury achieving the TMDL target fish tissue concentration will result in water column concentrations that will comply with applicable water quality criteria to protect human health and wildlife.

EPA finds that the TMDL document submitted by Illinois EPA adequately identifies the WQSs that are impaired, and the TMDL endpoint needed to attain each WQS. All the assessment units addressed in these TMDLs are impaired for the fish consumption use for PCBs and mercury. EPA finds that it is appropriate for Illinois to use a fish tissue concentration target of 0.06 mg/kg for both PCBs and mercury, to determine source reductions necessary to address the impairments (i.e. to achieve the fish consumption designated use standard) for PCBs and mercury in the study area, and to ensure that the Lake Michigan Basin standards are met. Using the value which triggers a fish consumption advisory (0.06 mg/kg) is appropriate for both contaminants, because the value is derived using the HPVs for fish consumption, and because fish advisories are directly linked to the determination of waterbody impairment. A fish tissue concentration value represents the primary source of contaminants affecting human health.[32] *EPA agrees that Illinois' use of published BAFs is reasonable, and that if a water meets the TMDL fish tissue target concentration for PCBs and Mercury of 0.06 mg/kg in fish tissue, it will also meet the water quality targets (i.e., water column concentrations), including the human health and wildlife criteria described above (for all waters addressed by the TMDL), and will also meet the aquatic life criteria for mercury in Waukegan Harbor.*

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

32 Note: setting the Target fish tissue to achieve a water quality standard of 26 pg/L would also comply with the wildlife 120 pg/L standard.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

TMDLs must take into account critical conditions for stream flow, loading, and water quality parameters as part of the analysis of loading capacity. (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable critical conditions and describe their approach to estimating both point and non-point source loadings under such critical conditions. In particular, the TMDL should discuss the approach used to compute and allocate non-point source loadings, e.g., meteorological conditions and land use distribution.

Comment:

3.1 Data Supporting the PCB and Mercury TMDLs

The TMDL project team representing the Illinois EPA, EPA Region 5, and sub-contractor Limnotech under contract to Baker, Inc., led a webcast on September 17, 2014, to help identify additional studies or data sets relevant to the project. Agencies contacted for data included the EPA Great Lakes National Program Office (GLNPO); EPA Office of Research and Development, Grosse Ile, Michigan; EPA Superfund Division; EPA Water Division; Illinois EPA Toxicity Assessment Unit, Illinois EPA Bureau of Water; Illinois FCMP; Illinois Department of Natural Resources (IDNR); Wisconsin Water Science Center of the U.S. Geological Survey; National Oceanic and Atmospheric Administration (NOAA); Environment Canada; Area of Concern project managers; USACE; U.S. Navy; Waukegan Citizens Advisory Group; North Shore Sanitary District; Illinois Lake Michigan Fisheries Program; and researchers at Loyola University and the University of Iowa.

Data collected in the open water of the Lake Michigan Nearshore were used to assess the nearshore and the 51 shoreline segments. These segments are collectively referred to as being within the "nearshore open water/shoreline TMDL zone."

PCB Fish Tissue Concentration Data.

Illinois EPA considered fish tissue PCB concentration data for 164 samples (2000 to 2012) for 16 species of fish, to determine a current PCB tissue concentration which represents all impaired fish. The results are reported in Table 5-1 of the PCB TMDL.

Table 3. Study Area Fish Fillet Mean Sample Concentration for PCBs (mg/kg)

Species	Count	Mean	Species	Count	Mean
Carp	52	4.329	Smallmouth Bass	7	0.172
Lake Trout	30	0.811	Pumpkinseed Sunfish	3	0.183
Black Bullhead	3	1.027	Alewife	6	0.187
Rock Bass	10	0.276	Round Goby	3	0.137

Species	Count	Mean	Species	Count	Mean
Sunfish	7	0.189	Yellow Perch	22	0.092
Largemouth Bass	4	0.225	Brown Trout	1	0.659
Bloater	7	0.270	Rainbow Trout	2	0.152
white Sucker	6	0.237	Rainbow Smelt	1	0.100

Table 4. Study Area Fish Fillet Mean Sample Concentration for Mercury (mg/kg)

Species	Count	Mean (mg/kg)
Largemouth Bass	3	0.2800
Smallmouth bass	7	0.1096
Rock Bass	9	0.1023
White sucker	4	0.0528
Sunfish	5	0.0328
Black bullhead	2	0.0550
Rainbow trout	2	0.0638
Brown Trout	1	0.1030

Carp tissue PCB data are not available for every impaired segment. The number of carp tissue samples available ranges from zero samples in Diversey Harbor, Calumet Harbor and the nearshore open water/shoreline, to 40 samples in Waukegan Harbor (Table 5-2 of the PCB TMDL).

Mercury Fish Tissue Concentration Data

During the period between 2000 and 2012, there were 33 samples for fish tissue mercury concentrations available across 8 species of fish. Due to a lack of data for several harbors and the nearshore open water/shoreline zone, Illinois EPA extrapolated the existing fish data across the sites in certain TMDL zones that have a limited number of fish samples. Although only three samples exist for largemouth bass (each are composites of 5 fish), and all from a single marina, their use as a target species is reasonable given the data available and is further explained in Section 5.1 of the mercury TMDL.

3.2 Introduction to Fish Tissue-Based (FTB) Proportionality Approaches For PCBs And Mercury

Illinois uses a similar rationale for its fish tissue-based approaches for both PCBs and mercury in its Lake Michigan Nearshore TMDLs. Illinois EPA described the FTB proportionality approach in Section 5.1 of both the PCB and Mercury TMDLs as linking atmospheric pollutant loads directly to fish tissue concentrations. The FTB proportionality approach was patterned after TMDLs that were developed in the Great Lakes states and other states,[33] that used empirical zero-dimensional, steady-state modeling approaches.

33 Minnesota Pollution Control Agency (MPCA, 2007), statewide mercury and PCB TMDLs developed by the Michigan Department of Environmental Quality (LimnoTech, 2013; LimnoTech, 2012), which drew from the work of Jackson et al. (2000), and a regional mercury TMDL for the Northeast United States (CDEP et al., 2007).

Key assumptions of the FTB approach outlined in the TMDL (Section 5.1) include: 1) a reduction in PCB concentration levels in the air, or a reduction in mercury emissions will result in a proportional reduction in the overall PCB or mercury deposition rate, respectively; 2) the reduced deposition rate will ultimately result in a proportional decrease in contaminant loading to waterbodies; and 3) a reduction in PCB or mercury loading into waterbodies will result in a proportional decrease in fish tissue PCB or mercury concentrations.

Application of the FTB proportionality approach requires the establishment of 1) a target fish tissue concentration (Section 3.3 of the Decision Document (for PCBs) and 2.4.1(for mercury)), 2) selection of an appropriate fish species which is used to measure the reduction needed, and

3) calculation of a reduction percentage, for meeting the needed reduction in the selected fish species, also referred to as a reduction factor (RF).

To calculate a percent reduction, Illinois EPA first calculated a baseline fish-tissue contaminant concentration in a selected target fish species for each contaminant. Illinois EPA then quantified the reductions needed in both the fish tissue PCB and mercury baseline concentration to reach the target fish tissue PCB and mercury concentration. Illinois EPA then used the percent reduction needed in fish to calculate the needed reduction in baseline pollutant/atmospheric sources.

3.3. FTB Proportionality Approach to PCB TMDL Development

Selection of a PCBs Fish tissue Target

Illinois EPA described how a direct proportionality approach can be used to link sources with resulting concentrations in fish tissue and the water column in Section 5.1 of the Illinois Lake Michigan Nearshore PCB TMDL. EPA supports the use of this approach when there is not sufficient data to support more complex methods. As stated above Illinois EPA uses the HPV for PCBs to determine a fish tissue concentration (0.06 mg/kg) that will be protective of human health (Section 3.3 of the TMDL and Section 2.3 of the Decision Document) for a variety of meal frequencies, and for sensitive populations.

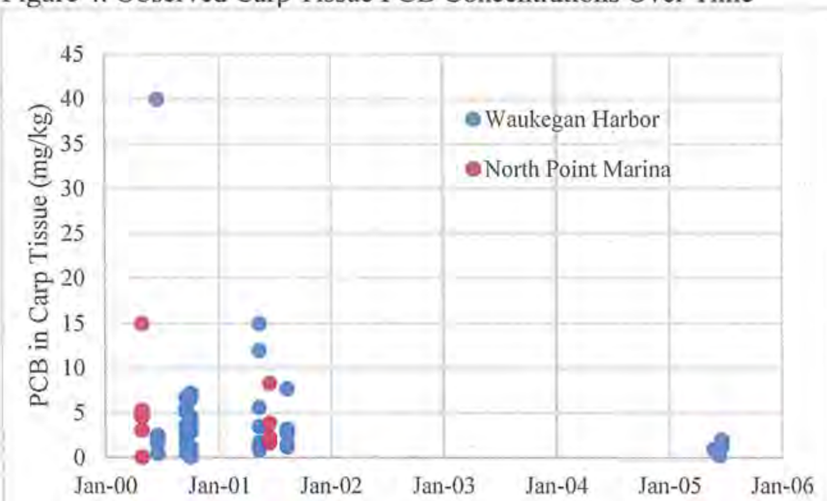
Appropriate Fish Species to Represent the Baseline PCB Load

Illinois EPA described its selection of a species of fish from which to calculate a fish tissue concentration baseline in Section 5.1.1 of the PCB TMDL. That species was used to calculate fish tissue PCB reductions. These reductions will be needed to meet standards in the entire impaired fish community.

Illinois EPA considered the following in its selection of an appropriate fish species: 1) the target species current PCB tissue concentration should be high enough that percent reductions in the target species will also achieve the target concentrations in other species when applied, 2) the sample size and scope must represent the project area; and 3) the influence of legacy effects (past contamination that is not due to current sources of loading).

Illinois EPA selected carp as the species to represent baseline fish tissue PCB concentrations and to use for calculating the needed reductions in PCB concentrations to attain TMDL goals. The high PCB concentrations in carp tissue and the widespread sample data for carp made them a reasonable choice for the target species (Section 5.1.1 of the TMDL). Illinois EPA carefully considered its selection of carp for use in the fish tissue-based, direct proportionality approach because carp may reflect historical PCB loads more than other fish because: carp are benthic feeders and receive much of their PCB exposure from bottom sediments and pollutant concentrations in bottom sediments respond more slowly to pollutant load reductions when compared with fish that are exposed to pollutant concentrations in the water column. The FTBP approach assumes that only current loads are reflected in fish tissue concentrations, and Illinois EPA considered several methods to account for fish tissue PCB data that may reflect exposure to legacy sources. Illinois EPA decided that the only viable approach for removing the influence of legacy sources on existing PCB data was to use the most recent dataset for fish tissue PCBs concentrations to represent existing concentration when calculating the needed decrease in percent fish-tissue concentration (5.1.2 of the PCB TMDL). Illinois observed this in the carp tissue data available for this TMDL, (see Figure 4 in the Decision Document).

Figure 4. Observed Carp Tissue PCB Concentrations Over Time



Illinois determined that the observed decrease in carp tissue concentrations over time represents a decreasing importance of legacy sources in the later data (possibly a reflection of several actions taken prior to 2005 after Waukegan Harbor PCBs were discovered). Illinois used the average of the most recent data for the current fish tissue baseline (2005 average = 1.13 mg/kg).

FTB Proportionality Approach - Percent Reduction Calculations for PCBs in Carp and Trout)

Section 5.3.1 in the PCB TMDL explains how Equations 5-1 and 5-2 in the PCB TMDL can be rearranged to calculate a required percentage reduction in fish tissue:

$$\%\,Reduction = 100 \times (C_{fish,current} - C_{fish,target})/C_{fish,current} \qquad \text{(P 5-7)}$$

Where:

$C_{fish,current}$ = current PCB concentrations in fish (mg/kg)
$C_{fish,target}$ = target PCB concentrations in fish (mg/kg)

Illinois EPA used equation 5-7 to calculate the required percent reductions necessary to meet fish tissue targets in carp by subtracting the 0.06 mg/kg fish tissue target concentration from current observed carp tissue data (2005 average) of 1.13 mg/kg. Dividing by 1.13 mg/kg and multiplying by 100 yields the required 94.7 percent reduction in fish tissue concentration, which could also be applied as a percent reduction in the (corresponding) atmospheric PCB load. IEPA also applied Equation 5-7 of the PCB TMDL to the average PCB concentration of all lake trout data (0.811 mg/kg) to calculate a required load reduction of 92.6 percent. The word "current" in Equation 5-7 of this PCB Decision Document is the same as "baseline" throughout the PCB TMDL document.

Percent Reduction Calculations for the Gas- Exchange Model (GEM) Proportionality Approach

In Section 5.3.2 of the PCB TMDL, Illinois EPA used the results from the GEM approach (Section 5.2 of the PCB TMDL) to estimate the required percent reduction in PCB loadings necessary to meet the TMDL targets for the carp and lake trout tissue targets calculated above, as well as demonstrate attainment of the water column concentration target. The load reduction required to meet the water column total PCB concentration target can be determined using the following equation:

$$\%\,Reduction = 100\,x\,(C_{atm,current} - C_{atm,target})/C_{atm,current} \qquad \text{(P 5- 8)}$$

Where:

$C_{atm,current}$ = current atmospheric PCB concentrations (pg/m^3)

$C_{atm,target}$ = atmospheric PCB concentrations necessary to meet water column criterion, as defined by (pg/m^3)

Illinois EPA concluded in Section 4.2.3 of the TMDL that the atmospheric concentration data supplied by Simcik et al. (1997) provided the best estimate of nearshore over-lake PCB concentration measurements, as of 1994-1995. Illinois EPA adjusted the 1994-1995 data to the 2005 baseline year by using a PCB concentration half-life of 7.7 years to extrapolate a 2005 Chicago-area atmospheric PCB concentration of 197 pg/m^3 (Section 5.3.2 of the PCB TMDL). Illinois used Equation P 5-3 to show that an atmospheric concentration of 82 pg/m^3 was required to attain an equilibrium equivalent water column standard of 26 pg/L (Section 5.2.1 of the PCB TMDL). Inserting the baseline concentration of 197 pg/m^3 and the target concentration of 82 pg/m^3 in equation P 5-8 of the PCB TMDL results in a required reduction percentage of 58 percent.

Application of a biota sediment accumulation factor (BSAF)[34], (grams organic carbon/grams lipid) in Section 5.2.3 of the PCB TMDL showed that a water column PCB concentration of 26 pg/L would be expected to result in a carp tissue concentration of 0.0585 mg/kg, which is essentially equal to the fish tissue target of 0.06 mg/kg selected for the PCB TMDL. For this reason, the 58 percent reduction in atmospheric concentration determined above as necessary to meet the water column target for PCBs would also be required to meet the carp tissue target

Application of the Trophic Level 4 bioaccumulation factor in Section 5.2.4 of the PCB TMDL indicates that a water column PCB concentration of 56 pg/L would result in attainment of the tissue target of 0.06 mg/kg. This water column concentration corresponds to an atmospheric PCB concentration of 177 pg/m^3. Using the current concentration of 197 pg/m^3 and the target

34 This value was not available for the study are and Illinois EPA used Green Bay as a reference site for this value.

concentration of 177 pg/m^3 in Equation P 5-8 results in a required reduction percentage of 10 percent.

Final Percent Reduction Determination for PCBs

The results of the calculations above indicate that reductions vary depending upon the approach used, and whether or not the impacts of legacy PCBs were considered (Section 5.3.3 of the PCB TMDL). To ensure that the WQS and designated uses are attained, Illinois EPA chose the most conservative (greatest) reduction for PCBs. Illinois EPA determined that a 94.7 percent reduction resulting from the fish tissue-based approach for carp should be used as the basis for the PCB TMDL because:

- The uncertainty in these percent reduction estimates is high for several reasons including a limited availability of fish tissue samples. Using an upper bound of the range of reduction percentages, provides an implicit margin of safety (MOS) to account for this uncertainty.
- The GEM approach resulted in a lower calculated percent reduction, because GEM uses reference information rather than site specific data and considers only current atmospheric sources. The FTBP approach resulted in a calculated 94.7 percent reduction using site specific data which may reflect the influence of historical and non-atmospheric loads. Figure 5-3 in the TMDL indicates that the 94.7 percent reduction would reach the target fish tissue level of 0.06 mg/kg decades earlier than the 58 percent reduction in atmospheric PCB concentration estimated by the GEM approach[35] (Figure 5 in the Decision Document).

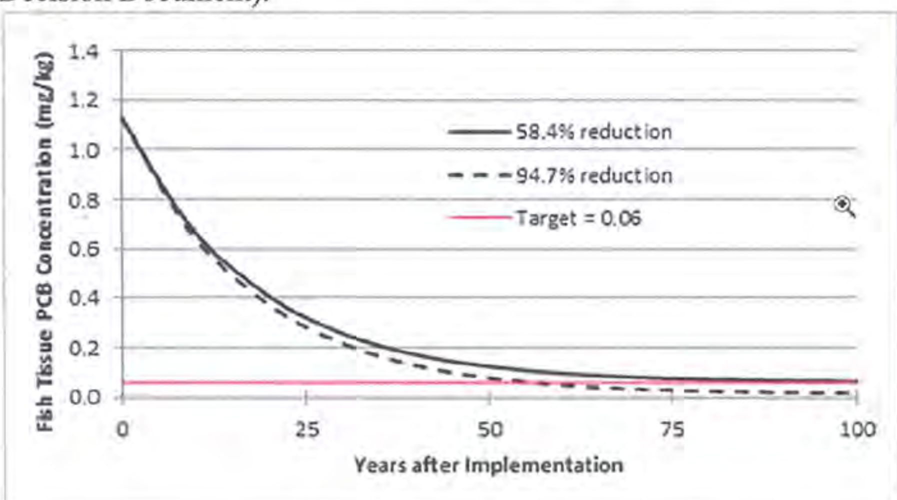


Figure 5. Fish Tissue PCB Concentration Over Time Under Two Reduction Scenarios

35 As illustrated in Figure 5-3 of the TMDL.

3.6 Calculating PCB Baseline Load and Annual Loading Capacity

Illinois used the equation to establish the loading capacity of receiving waters:

TMDL= Baseline Load x (1-RF) (P 6-2)

Where: Baseline load = total source load during the baseline year of 2005 (including all air sources and NPDES permitted discharges of PCBs);
RF = Reduction Factor (percent reduction of 94.7%)

The baseline load, also referred to as the current or existing load, represents the sum of existing nonpoint and point source loads of PCBs to the waters within the TMDL study area for the baseline year. The calculation is based upon the 2005 PCB source data, which coincided with the 2005 data used to calculate the existing fish tissue concentration value (see Section 3.2 in the Decision Document).

Illinois first used equation P 6-2 of the PCB TMDL to establish the total maximum annual load based on an annual average. Illinois calculated in Section 4.1 of the PCB TMDL that PCB loading from the main body of Lake Michigan to the study area (hydrodynamic transport) ranges from 4.6 to 13 kg of PCB per year. Direct atmospheric exchange to the study area was calculated to range from 2.1 to 5.8 kg/yr. These loads are expressed as ranges because atmospheric loads are decreasing over time.

Illinois EPA normalized the range of calculated loads using the baseline year of 2005, resulting in a hydrodynamic transport load to the study area of 7.4 kg/yr of PCB, and a direct atmospheric load of 4.9 kg/yr yielding totaling 12.3 kg/yr, the current nonpoint source load for 2005 (Section 6.1 of the PCB TMDL).

Illinois EPA used equation P 6-2 of the PCB TMDL to calculate the total maximum yearly load using the RF of .947 to yield a TMDL (loading capacity) of 0.65 kg/yr based on annual averages.

0.65 kg/yr = 12.3 kg/yr x (1 – 0.947) (P 6-3)

Point sources such as regulated wastewater and stormwater discharges, and discharges permitted under Phase I and Phase II of the NPDES stormwater (MS4) program, are not included in the baseline loading allocation. No data with detectable PCB concentrations were available for any of the NPDES permitted wastewater discharges in the study area, and no data are available for the stormwater discharges. The source assessment conducted in Section 4 of the PCB TMDL document indicated that these sources are likely a very small contributor to existing PCB loads to the study area (Table 4-2 of the PCB TMDL). Point sources will receive a WLA, however, to ensure that future loads do not lead to a WQS violation.

PCB Total Maximum Daily Load (Loading Capacity)

To express the maximum yearly load as a maximum daily load, the Illinois EPA assessed the intra-annual variability for the most significant source categories separately. The variability in atmospheric loading was calculated by taking the highest observed single-day atmospheric PCB concentration in Simcik et al. (1997), and dividing that concentration by the annual average concentration to get a ratio for daily maximum to annual average concentration of 2.1, using the equation:

(Total annual load) x Ratio of (atmospheric: total load) x Ratio of (daily maximum concentration: annual average concentration) ÷ 365 days/yr = Maximum daily atmospheric load[36] (P 6-4)

Illinois populates this equation as follows: The calculation of the total annual yearly PCB load of 0.65 kg/yr is found in Section 6.2 of the PCB TMDL and Section 3.6 of this Decision Document.

0.65 kg/yr x (4.9/12.3)
x 2.1*÷ 365 days/yr
= 0.0015 kg/day

* daily maximum concentration: annual average concentration

The components of the ratio of atmospheric to total load made up of the direct atmospheric load of 4.9 kg/yr and hydrodynamic transport of 7.3 kg/yr are found in Table 5 of the Decision Document. This results in a maximum daily load attributable to direct atmospheric exchange of 0.0015 kg/day.

In the case of the load from the open lake, Illinois EPA reasonably assumes that Lake Michigan PCB concentrations do not vary substantially over the course of a year, so the daily load for transport from Lake Michigan is calculated as the annual load divided by 365:

(Total annual load) x Ratio of (transport load: total load) ÷ 365 days/yr
= Maximum daily Lake Michigan transport load

(P 6-5)

Application of equation 6-5 in the PCB TMDL results in a maximum daily load attributable to transport from Lake Michigan of:

0.65 kg/yr x (7.4/12.3) ÷ 365 days/yr
= 0.0011 kg/day

The maximum daily loading capacity is the sum of those two loads, or 0.0026 kg/day. This daily allowable load of PCBs is expected to result in meeting the fish tissue target for PCBs of 0.06 mg/kg, and over time, to attain the WQS.

Table 5. PCB Loading Capacity Components

[36] Illinois EPA gives the example of a year where the average daily loading rate from atmospheric sources is 0.00071 kg/day. Under normal seasonal variations in atmospheric concentrations, this loading rate can be as high as 0.0015 kg/day on the worst day of the year, but seasonal variations dictate that atmospheric loading will be much less than the average value on other days of the year. PCB TMDL 2016, page 43.

TMDL Components	Result
Reduction Factor	94.7%
Final TMDL	
Loading Capacity (LC)	0.0026 kg/day
Margin of Safety (MOS)	Implicit
Wasteload Allocation (WLA)	0.000006 kg/day
Load Allocation (LA)	0.0026 kg/day

3.6 Illinois Nearshore Mercury TMDL Development

Fish Tissue-Based Approach for Mercury TMDL

Illinois used a fish tissue-based approach for linking pollutant loads directly to fish tissue concentrations for the mercury TMDL. This proportionality approach is based on the assumption that there is a linear relationship between mercury levels in air and water, along with a bioaccumulation factor (BAF) to relate fish tissue concentrations to water column concentrations. The basic assumptions for the mercury TMDL are similar to those that apply to the FTB approach used in the Lake Michigan Nearshore PCB TMDL (See Section 3.0 of this Decision Document for the 3 key assumptions regarding the relationship between air, water and fish tissue for this approach). The Illinois mercury TMDL is similar in approach to the Minnesota Statewide Mercury TMDL (MPCA, 2007).

The mercury concentrations in fish that result from the mercury loading to the Lake Michigan Nearshore waters are expressed as shown in equation Hg 5-1 in the mercury TMDL (USEPA, 2001; CDEP et al., 2007):

$$C_{fish_{t1}} = BAF \ x \ C_{water_{t1}} \quad \text{(Hg 5-1)}$$

Where:

$C_{fish_{t1}}$ and $C_{water_{t1}}$ represent mercury concentrations in fish (mg/kg) and water (mg/L) at time t1, respectively.

The mercury TMDL uses a bioaccumulation factor (BAF),[37] which relates the concentration of mercury in surface water to the corresponding concentration of mercury in fish as measured by mercury concentration in fish tissue. At a future time t2, equation Hg 5-1 of the mercury TMDL becomes:

$$C_{fish_{t2}} = BAF \ x \ C_{water_{t2}} \quad \text{(Hg 5-2)}$$

Where:

$C_{fish_{t2}}$ and $C_{water_{t2}}$ represent mercury concentrations in fish and water at that future time t2, respectively, and $C_{fish_{t2}}$ is for a fish that is the same age, length, and species as for $C_{fish_{t1}}$

[37] This is a constant when mercury concentrations change over time, but all other parameters (i.e., age, length, and species) remain constant.

Illinois EPA combined the equations mathematically and then rearranged them to get equation 5-3 of the mercury TMDL:

$$\frac{C_{fish_{t1}}}{C_{fish_{t2}}} = \frac{C_{water_{t1}}}{C_{water_{t2}}} \qquad \text{(Hg 5-3)}$$

Section 3.1 of this Decision Document explains Illinois EPA's key assumption under the proportionality approaches that water column mercury concentrations are proportional to mercury air deposition load. Based on that assumption the above equation can be expressed as shown in Equation Hg 5-4 of the mercury TMDL:

$$\frac{C_{fish_{t1}}}{C_{fish_{t2}}} = \frac{L_{air_{t1}}}{L_{air_{t2}}} \qquad \text{(Hg 5-4)}$$

Where:

$L_{air_{t1}}$ and $L_{air_{t2}}$ are the air deposition mercury loads to the waterbody at time t1 and t2, respectively.

Thus, EPA finds it reasonable that, assuming long-term steady-state conditions, a linear relationship exists between mercury levels in air, water, and fish concentrations, and that fish tissue reductions will likely occur in direct proportion to source load reductions. EPA has approved TMDLs where this approach has been used as an alternative to more complex models, which require a more robust dataset.[38]

Illinois EPA explains steady-state conditions as follows: The long-term fish tissue concentration reductions that are proportional to reductions in atmospheric deposition are not expected to occur immediately. Rather, Illinois EPA expects that the proportional response will be seen over the long term, once the systems have achieved a steady state. The simple modeling approach used in the mercury TMDL represents long-term average fish tissue concentrations expected to occur in response to long-term loading reductions. This is consistent with several more complex dynamic ecosystem scale models such as the Mercury Cycling Model (MCM) and IEM-2M model. Both models assume that, at steady state, reductions in fish concentrations will be proportional to reductions in mercury inputs (USEPA, 2001, Atkeson et al., 2003). The E-MCM6 model to the Florida Everglades predicted a linear relationship between atmospheric mercury deposition and mercury concentrations in largemouth bass (Atkeson et al., 2003). In this study, mercury levels in largemouth bass were predicted to attain 90 percent of their long-term steady state response in about 30 years, given continued reductions in mercury loads.[39]

Section 2.3 of the Decision Document explains how Illinois developed a target mercury concentration in fish (0.06 mg/kg). The following describes how Illinois determined a fish tissue baseline concentration to compare with the target fish tissue concentration and the percentage reduction needed to reduce levels to meet the goals of the TMDL.

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[38] Minnesota Mercury TMDL (2007), Michigan Statewide Mercury TMDL (2018), Northeast States Regional Mercury TMDL (2005)

[39] E-MCM is the modified version of MCM developed for the Florida Everglades.

Selection of an Appropriate Fish Species to Represent Current Mercury Load

Illinois EPA explains the species selection process in Section 5.1.1 of the mercury TMDL. Illinois chose largemouth bass as the target species for this TMDL because it represents a top-predator species and it has the highest mean mercury concentrations of the fish species that Illinois EPA evaluated (See Table 4, in Section 3.1 of the Decision Document). All three largemouth bass tissue samples (each are composites of 5 fish), which have a mean mercury concentration of 0.28 mg/kg, were collected in North Point Marina. Illinois EPA extrapolated the fish tissue mean mercury concentration values from the sites with available concentration data to the nearshore open water/shoreline zone and the harbor sites that lacked concentration data. EPA finds the use of largemouth bass as a target species to be reasonable given the data available, because largemouth bass had the highest mercury concentration and because it represents a top-predator species. Illinois also explained that setting a percent reduction that will reduce a largemouth bass mercury concentration from 0.28 mg/kg to the target concentration would result in fish with lower mercury concentrations meeting state water quality standards.

3.7 Calculating the Required Mercury Percent Reduction:

Illinois calculated the load reduction required to reach the fish tissue target concentration for mercury in Section 5.2 of the mercury TMDL. The first step in solving equation Hg 5-5* of the mercury TMDL (below) was to subtract the target fish tissue mercury concentration (of 0.06 mg/kg) from the existing mean mercury concentration in fish tissue (0.28 mg/kg, average mercury concentration of all largemouth bass). Solving equation Hg 5-5* resulted in a RF of 0.7857. Illinois EPA multiplied the RF by 100 resulting in a 78.57 percent reduction.

$$Reduction\ Factor\ (RF) = C_{fish,current} - C_{fish,target}) \big/ C_{fish,current} \quad (Hg\ 5-5)\ *$$

$$\%\ Reduction = 100\ x\ C_{fish,current} - C_{fish,target}) \big/ C_{fish,current} \quad (Hg\ 5-5)$$

$$78.57\ \% = 100\ x\ (\ 0.28mg/kg - .06\ mg/kg)\ /\ (.28mg/kg)$$

* The mercury TMDL associates both the calculation of the reduction factor and percent reduction with equation 5-5. EPA presents the equations for calculating these two values separately for clarity.

Where:

$C_{fish,current}$ = Current mercury concentrations in fish (mg/kg)
$C_{fish,target}$ = Target mercury concentrations in fish (mg/kg)

3.8 Calculation of Baseline Load and Annual Loading Capacity

A TMDL represents the assimilative capacity (LC) for a receiving water, expressed as the daily loads from nonpoint and point sources, as well as a margin of safety (MOS). Illinois EPA determined the maximum loading capacity for waters in the Illinois Lake Michigan Nearshore study area in Section 6 of the mercury TMDL. Illinois used equation Hg 6-2 in the Decision Document to calculate the loading capacity:

$$\text{TMDL} = \text{Baseline Load} \times (1 - \text{RF}) \qquad \text{(Hg 6 -2)}$$

The "reduction factor" (RF) is the amount the existing mean mercury fish tissue concentration must be decreased to achieve the target fish tissue mercury concentration (equation Hg 6-2 in this Decision Document). Illinois EPA describes in Section 6.1 in the mercury TMDL the steps it followed to calculate a baseline mercury load by adding the loads of mercury from point and nonpoint sources (including all air sources and NPDES-permitted discharges of mercury) to establish the mercury load for the baseline year (2001). Illinois EPA explained in Section 5.2 of the mercury TMDL that the year 2001 was selected as a baseline year based on the availability of atmospheric modeling results for 2001.

Illinois EPA notes in Section 6.1 of the mercury TMDL, that atmospheric sources of mercury can contribute directly to the study area via atmospheric deposition, or indirectly to the main body of Lake Michigan, with subsequent transport into the study area. The overall mercury baseline load is the sum of the existing nonpoint and point source loads of mercury for the baseline year. Table 4-3 of the Mercury TMDL displays the estimated loads from NPDES and Nonpoint mercury sources.

Available data reviewed by Illinois EPA contained no detectable mercury concentrations for any of the NPDES discharges in the study area. Illinois EPA explains that it did not include these sources in the baseline mercury load. The lack of detectable mercury concentration sample results in the study area made it difficult to estimate an accurate current/baseline NPDES load for the study area. Illinois EPA concluded from these estimates that these sources are likely a minor contributor as compared with the nonpoint sources (Table 4 of the Decision Document, Section 4.6 of the Mercury TMDL). Illinois EPA assumes that loads to the study area come mainly from the air, based on these estimates and because diffuse, or nonpoint, sources of mercury contributed to the study area largely consist of atmospheric deposition either falling directly to the study area or to the main body of Lake Michigan, with subsequent transport into the study area. Illinois EPA gives the stormwater point sources a WLA to ensure that these source loads do not lead to a WQS violation, as explained in the mercury WLA Section 5 of the Decision Document.

Illinois EPA selected 2001 as a baseline year, because atmospheric modeling results were available for 2001 (Section 5.2 of the mercury TMDL). Illinois EPA first calculated the baseline load as an annual average load. As explained in Section 6.6 of the mercury TMDL, the TMDL's goal is to address long-term mercury bioaccumulation in fish tissue, and there is a lag between the time that mercury enters the environment, and when it results in the bioaccumulation in fish. EPA finds using annual averages acceptable for calculating a baseline load, as the cumulative impacts are of greater concern for the consumption use than short term impacts. Illinois EPA expresses the results as a daily maximum in the final TMDL.

Illinois EPA presents its calculation of the hydrodynamic transport of mercury from the main body of Lake Michigan to the study area in Table 4-3 of the mercury TMDL. Illinois EPA calculates that transport as resulting in a load of 10.27 kg of mercury per year. Illinois EPA determined that direct atmospheric deposition contributed 23.24 kg/yr of mercury to the study area. The sum of these load values is the total nonpoint source load of 33.51 kg/yr for the baseline year of 2001.

Table 6. Baseline Mercury Load for 2001 (Mercury TMDL Table 6-1)

Portion of Baseline Mercury Load	Load
Point Source Load	No detectable concentration
Nonpoint Source Load	33.51 kg/yr
Total Baseline Load (2001)	33.51 kg/yr

Illinois also defined the percentage of atmospheric mercury nonpoint source loadings that come from anthropogenic and natural sources. Natural sources cannot be controlled and therefore cannot be counted toward the reductions needed to reach standards. Illinois EPA calculated the anthropogenic versus the natural portion of nonpoint source loading to the study area by using the 2001 deposition rate found in the REMSAD modeling results for the Lake Michigan Nearshore study area of 32.1 $\mu g/m^2$ (Section 6.1 of the mercury TMDL), and the Minnesota Mercury TMDL (2007) annual pre-industrial deposition rate of 3.7 $\mu g/m^2$ (Swain et al., 1992)[40]. to calculate the percentage of anthropogenic versus natural sources of mercury for the study area. Illinois EPA calculated mercury loading to the Illinois Lake Michigan nearshore to be 88 percent anthropogenic and 12 percent natural. Applying these percentages to the total nonpoint source load of 33.51, Illinois EPA estimated anthropogenic mercury loading contributions to be 29.49 kg/yr (0.081 kg/day), or 88 percent, and natural source contributions to be 4.02 kg/yr (0.0011 kg/day,) or 12 percent.

The baseline total source load is the sum of the point source load and the nonpoint source load for 2001. As discussed above, Illinois EPA determined that the most dominant sources of mercury to the study area are from the air and open lake (which can also be treated as air deposition to open waters) and treated the baseline load for 2001 as equivalent to the nonpoint source load. The baseline load for 2001 is 33.51 kg/yr (Table 6.1 of the mercury TMDL).

3.9 Mercury Total Maximum Daily Load (Loading Capacity)

In Section 6.2 of the mercury TMDL, Illinois EPA describes how it calculated the TMDL LC using the total baseline load above and the RF (defined in Section 5.2 of the mercury TMDL).

[40] 3.7 $\mu g/m^2$ is consistent with the Lake Michigan pre-industrial deposition rate of 3.1 $\mu g/m^2$ inferred by Rossmann (2010) in a study of the Lake Michigan nearshore. The study shows consistency between different venues of research. Illinois Lake Michigan Nearshore Mercury TMDL Report, 2016, LimnoTech, page 38.

Figure 1 of the Decision Document presents Illinois EPA's calculation applying equation Hg 6-2 in this Decision Document to obtain an annual load. The annual load is then divided by 365 days

TMDL* = Baseline Load* x (1-RF) (Hg 6-2)
7.18 kg/yr = 33.51kg/yr x (1 – 0.7857)
7.18 kg/yr/ (365 days/year) = 0.020 kg/day
* annual numbers are then expressed as a "daily load"

to translate the result to a daily load. This yields a TMDL of 0.020 kg/day (0.043 lbs./day).

Figure 6. Mercury TMDL Loading Capacity Calculation

Achieving the loading reductions in the TMDL is expected to result in in the waters within the study area meeting the fish tissue target for mercury of 0.06 mg/kg and attaining WQS. Illinois' method of dividing the annual load by 365 to determine a maximum allowable daily load is consistent with other Mercury TMDLs (MPCA, 2007, CDEP et al., 2007).

Table 7. Mercury TMDL Summary

TMDL Components	Result
Reduction Factor	78.57%
Final TMDL	
Loading Capacity (LC)	0.02 kg/day
Margin of Safety (MOS)	Implicit
Wasteload Allocation (WLA)	0.0004 kg/day
Load Allocation (LA)	0.02 kg/day

3.10. PCB and Mercury Seasonal Variation

EPA explains in Section 6.6 of the PCB and mercury TMDLs that both PCBs and mercury concentrations in the atmosphere and water column can fluctuate seasonally, but that because water and fish PCB and mercury concentrations respond very slowly to changes in atmospheric loads, essentially no variation in fish PCB and mercury concentrations occurs as a result of seasonal variations in atmospheric concentrations. However, due to the extremely slow response time of water and fish concentrations to changes in atmospheric loads, the PCB and mercury concentrations in the fish represent an integration of all temporal variation up to the time of sample collection. Variability in fish-tissue PCB and mercury concentrations are more likely influenced by differences in size, diet, habitat, and other undefined factors that are expected to be greater in sum than seasonal variability (MPCA, 2007).

Illinois EPA used a simple fish tissue based (FTB) proportionality model to establish a cause and effect relationship between the numeric target and identified pollutant sources. EPA finds the approach reasonable because the available data do not support a more complex modeling method. The FTB approach allowed Illinois EPA to link PCB and mercury loads to surface *water directly to accumulated concentrations measured in the tissues of select fish species, and to establish a target percent reduction in fish tissue for PCBs and mercury. Illinois EPA's explanation for selecting carp and largemouth bass to represent the current fish tissue concentrations and needed reductions in PCBs and mercury (respectively) in all fish is reasonable. Illinois EPA also translated the 94.7 percent and 78.6 percent reductions needed (for PCBs and Mercury, respectively) in the fish tissue into a proportionate reduction in air and water sources, expressing the result as daily loads.*

Illinois EPA compared the results from the FTB approach in the PCB TMDL with results from the GEM approach to explore the influence of historic sources, which are not accounted for in assumptions of the FTB approach. GEM combines theoretical and empirically-based equations and BAFs to link loads from the air to PCB concentrations in the water column and fish tissue. Illinois EPA noted that GEM does not require existing fish tissue concentration data and it is not influenced by the legacy effect inherent in the existing carp tissue data, which removes the influence of legacy sediment in determining a percent reduction. The GEM approach did not contraindicate the FTB method. Illinois EPA also used GEM to confirm that atmospheric load reductions would result in the water column meeting the Illinois WQS and the target for PCB concentrations in fish tissue. Illinois EPA adequately demonstrated that diffuse sources of gas phase PCBs and mercury in the atmosphere over the surface of the Lake Michigan Nearshore study area, and contributions transported into the study area from the waters of the open lake are the largest current contributors of PCBs and mercury to the study area. Illinois EPA provided adequate basis for deriving necessary percent reductions and the loading capacity from the sum of these nonpoint sources for both the PCBs and mercury TMDLs. Illinois EPA adequately supported its evaluation of the quantity and accuracy of available data and its estimation of loads from point sources of mercury and PCBs using data from similar areas and assigned a waste load allocation for these sources that is within the rounding error of the total LC. Illinois EPA adequately accounts for seasonal variation, and adequately discusses the approach to computing and allocating source loadings considering a variety of complex watershed characteristics. EPA finds that the Illinois Lake Michigan nearshore PCB and Mercury TMDLs adequately identify the loading capacities of 0.0026 kg/day for PCBs and 0.020 kg/day for mercury.

4. Load Allocations

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future non-point sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Where possible, load allocations should be described separately for natural background and non-point sources.

Comment:

4.1 PCB Load Allocation

Illinois EPA calculated a loading capacity of 0.0026 kg/day in Section 6.2 of the PCB TMDL. The loading capacity is based on a 94.7 percent reduction in atmospheric PCB concentration determined by Illinois EPA to be necessary to attain PCB levels that are protective of designated uses. There are two components of the loading capacity (LC): direct atmospheric exchange of PCBs to the study area and transport of PCBs into the study area from Lake Michigan (which also originate from atmospheric deposition). In Section 6.4 of the PCB TMDL, Illinois EPA equates the LA to the LC of 0.0026 kg/day as the data available for point sources in the study area are limited, and Illinois EPA estimates the loadings from such sources to be much smaller than the nonpoint sources. (Section 3.9 of the Decision Document).[41] EPA finds this assessment to be reasonable. Additionally, over 90% of the area is MS4, and reductions in atmospheric deposition would likely reduce contaminants washed off and carried into stormwater.

Table 8. PCBs Load Allocation
(PCB TMDL Table 6-3)

Portion of Load Allocation	Result
Direct atmospheric exchange	0.0015 kg/day
Transport from Lake Michigan	0.0011 kg/day
TOTAL	0.0026 kg/day

Illinois EPA pointed out that dynamic atmospheric mixing processes make it difficult to identify and quantify the origin of atmospheric PCBs from outside of Illinois. Instead, Illinois EPA calculated the portion of PCBs from inside the state to be 73 percent of the study area's atmospheric PCB loading. Illinois EPA determined, therefore, that 27 percent of the PCB load is coming from out-of-state sources.

4.2 Mercury Load Allocation

The mercury load allocation (LA) is presented in Section 6.4 of the mercury TMDL. The LA is essentially equivalent to the mercury LC of 0.02 kg/day calculated in Section 6.2 of the mercury TMDL.[42] Illinois EPA treated atmospheric deposition (including the hydrodynamic transport of deposited mercury into the study area from Lake Michigan) as the primary source of mercury to the study area, which is explained above in the Section entitled: Calculation of a Baseline Mercury Load and Relative Source Contributions in this Decision Document. This Section also explains why Illinois EPA used 89 percent as the anthropogenic portion of diffuse loadings from atmospheric and hydrodynamic transport of mercury to the study area. The mercury load attributed to natural sources is 0.011 kg/day[43] (Section 6.1 of the mercury TMDL, Section 3.9 of the Decision Document). Illinois EPA concluded that the reductions needed to achieve the LA for atmospheric deposition must be achieved by reducing the anthropogenic sources of mercury deposition. As discussed in Section 4.2 of the TMDL (and the Section 1 source review of this

[41] A portion of the load capacity will be allocated to point sources, but this portion is within the round-off error of load allocation

[42] "A portion of the loading capacity will be allocated to point sources, but this portion is within the round-off error of load allocation." (See 6-4 of the Mercury TMDL)

[43] The value 4.02 kg/yr divided by 365 d/yr

Decision Document), the contribution of both in-state and out-of-state sources of mercury deposition in Illinois is provided by the REMSAD modeling results.

Illinois EPA considered the anthropogenic components of the LA when assessing where mercury reductions are possible. Illinois calculates the required reductions from anthropogenic sources, by dividing the its determined reduction of 79 percent (Section 5.2 of the mercury TMDL) by the percentage of contribution from the anthropogenic sources (88 percent). Section 6-4 of the mercury TMDL calculates the required reduction in the anthropogenic deposition at 89.29 percent. The table below identifies the portion of the anthropogenic nonpoint source loads that can be attributed to in-state and out-of-state loads.

Table 9. Mercury Load Allocation (Mercury TMDL Table 6-5.)

Mercury Load Allocation for In-State and Out-of-State Deposition Sources	
In-State Contribution to LA[a]	0.0036 kg/day
Out-of-State Contribution to LA[b]	0.0160 kg/day
Necessary Reduction from Anthropogenic Emission Sources	89.29%

Note: numbers may not sum exactly due to rounding

[a] Anthropogenic sources only

[b] Anthropogenic and natural sources

Illinois EPA assumes that reductions from out-of-state sources will be consistent with those required for in-state sources to meet the reductions necessary to attain WQS. Illinois EPA also recognizes the importance of reducing in-state sources, even though reducing in-state mercury concentrations alone will not attain compliance with WQS.

Illinois EPA established the load allocation for PCBs and mercury as being equivalent to the loading capacity. Section 3 of the Decision Document provided the basis for treating atmospheric deposition as the primary source of PCBs and mercury to the study area. Illinois EPA includes in this category the deposition from the atmosphere to the open waters of Lake Michigan that is transported to the study area. Illinois EPA also considered the portion of the source load that could not be controlled from natural sources for mercury (there are no natural sources of PCBs). EPA finds that the simple approach used by Illinois EPA to set reductions is adequate. EPA agrees that the description of the LA and needed reductions, are reasonable. Illinois EPA describes a reasonable approach that will, over time, result in needed reductions in fish tissue PCBs and mercury to reach target reductions to achieve the appropriate water quality designated uses in waters covered by the TMDL.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40

C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass-based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

Comment:

A table identifying study area entities with individual PCB and mercury NPDES permits is included in Appendix B of the Decision Document. Appendix B also lists the MS4 permittees in the study area.

5.1 WLA for PCB -NPDES Permitted Facilities

Illinois EPA identified three individual NPDES-permitted dischargers with PCB permit conditions. in Section 6.3 of the PCB TMDL. The entities along with their associated permit numbers are listed in Appendix B of this Decision Document. Although measured data were limited in quantity or showed results below detection limits, Illinois EPA determined through estimation of potential relative loads that point source PCB loads were small compared to nonpoint source loads, either current or future loads. Illinois EPA established WLAs for these sources based on attainment of WQS at the point of discharge, to ensure that these sources maintain compliance with WQS and avoid causing or contributing to violation of the WQS.

As noted in Section 1 of this Decision Document, Illinois EPA explained in Section 4.5 in the PCB TMDL how the contributions of NPDES sources in the study area were considered for the TMDL. Three individual NPDES permits in the watershed have permit special conditions for PCBs: Zion Station (IL0002763), Winnetka Power Generation Station (IL0002364), and Midwest Generation LLC Waukegan (IL0002259). All of these permits state "There shall be no discharge of PCBs."

In addition to the "no discharge of PCBs" special permit condition, Zion Station (IL0002763) also has permit monitoring requirements for PCBs. All available effluent PCB measurements (2009-2015) for Zion Station were less than the 0.001 mg/ L (1000 ng/L or 1,000,000 pg/ L) detection limit. Illinois EPA multiplied the average facility flow of 3.6 MGD from Zion Station by the detection limit concentration of 0.001 mg/L.[44] Table 1 in the Decision Document shows the resulting upper bound load estimate as less than 5 kg/yr. Illinois EPA concluded that it could not accurately quantify current loads for these sources because data were not available for the three facilities.

Because of the "no discharge" requirement in the NPDES permits, the three facilities (Zion Station (IL0002763), Winnetka Power Generation Station (IL0002364), and Midwest Generation LLC Waukegan (IL0002259)) were assigned a WLA = 0.

Illinois EPA identified three NPDES-permitted facilities that have Special Conditions for PCBs. The three individual permits state, "there shall be no discharge of PCBs," and Illinois EPA set their WLA as zero, consistent with their existing permits.

WLA for PCB -Municipal Separate Storm Sewers (MS4s)

Stormwater discharges are regulated under the NPDES MS4 program (i.e., Phase I and Phase II communities). With the exception of Burnham, all of the municipalities listed above in this Decision Document's Spatial Extent and Scope Section have MS4 permits for stormwater discharges to Lake Michigan, and 100% percent of the study area watershed lies within an MS4 city or village or regulated entity. The MS4 permits include these municipalities, together with the MS4 permits for the Cook County Highway Department, Illinois Department of Transportation, Lake County, Shields Township, and Waukegan Township (permit numbers presented in Table B-1 in Appendix B of the Decision Document). Because the study area watershed has no site-specific data for stormwater PCB or mercury loads ((MWRDGC, 2015), Illinois EPA estimated the stormwater pollutant loads for both PCB and mercury based on the drainage area, stormwater runoff quantity, and stormwater pollutant concentration from samples outside the watershed. Runoff quantity was calculated using the method developed by the Metropolitan Washington Council of Governments (MWCG) (Schueler, 1987) as:

R = P x Pj x Rv

where:

R = Annual runoff (inches),
P = Annual rainfall (inches), estimated as 36.1 inches, based on the average annual rainfall reported for Chicago Midway Airport 3 SW for the 1929-2013 period
Pj = Fraction of annual rainfall events that produce runoff (set to the default of 0.9)
Rv = Runoff coefficient.

Rv is a function of impervious cover in the study area watershed calculated using Geographic Information System (GIS) analysis to determine land use categories: commercial (0.71), industrial (0.54), and residential (0.37). The following runoff coefficients resulted from these impervious cover values: commercial (0.69), industrial (0.54), and residential (0.38). The area of the contributing watershed was calculated as 99.6 square miles, broken down as 3.82 square

[44] David Dilkes, email 5/16/18.

miles commercial, 4.05 square miles industrial, and 91.73 square miles residential.

Illinois EPA determined an aggregate WLA for 20 MS4-permitted entities by multiplying the total daily stormwater flow delivered to the study area from the MS4 entities (calculated in Section 4.3 of the PCB TMDL) by a concentration equal to the water quality standard to convert it to a load. This results in a stormwater MS4 WLA of 0.0022 kg/yr (0.000006 kg/day). Illinois EPA did not assign individual WLAs to each MS4 entity; rather, Illinois EPA determined the WLA for all entities as an aggregate WLA (Table B-1 in Appendix B of the Decision Document).

Because the PCB WLA for the three individual permits is zero (consistent with their existing permits that state, "There shall be no discharge of PCBs"), the total PCB WLA was set equal to the MS4 WLA: 0.0022 kg/yr (0.000006 kg/day).

5.2 WLA for Mercury -NPDES Permitted Facility

Illinois EPA presents the mercury waste load allocations in Section 6.3 of the mercury TMDL. The NSWRD Waukegan Water Reclamation Facility (IL0030244) is the only individual NPDES permit in the TMDL study area with mercury limits (see Appendix B in this Decision document). The WLA for this facility is set equal to its permitted mercury load of 0.04 kg/year, which translates to 0.0001 kg/day at design average flow Table B-1 in Appendix B of the Decision Document.

WLA for Mercury - Municipal Separate Storm Sewers (MS4s)

Illinois EPA discusses MS4 permits in Section 4.3 of the mercury TMDL. The list of permits is presented in Table 6-2 in the TMDL and Appendix B in this Decision Document. Site-specific mercury data were not available for the permitted MS4 stormwater discharges in the study area watershed (MWRDGC, 2015). Illinois EPA estimated existing loads using the product of runoff, the study area drainage area, and an assumed mercury concentration from stormwater sampling conducted outside of the TMDL watershed. Illinois EPA assumed that all stormwater runoff generated within the TMDL watershed drains to Lake Michigan. The results indicated that runoff from MS4s is a very small contributor to existing mercury loads to the segments.

Section 6.3 of the mercury TMDL explains that some of the mercury in stormwater may originate from air deposition (accounted for under LA) or other sources that are not easily quantified. Illinois EPA assigned an aggregate wasteload allocation to entities with MS4 permits in the project study area, to ensure that MS4s do not cause or contribute to future violations of the water column standard of 1.3 ng/l. Illinois determined the MS4 WLA by multiplying the stormwater flow delivered to the study area from these sources (calculated in Section 4.3) by a concentration equal to the WQS to convert it to a load. This results in a stormwater MS4 WLA of 0.11 kg/yr or 0.0003 kg/day Table B-1 in Appendix B of the Decision Document. Illinois EPA's permitting process will address reductions and loads for permitted entities. Best management practices for MS4 mercury reductions are discussed in Section 7 of the TMDL.

EPA finds that the PCB and mercury WLAs submitted by Illinois EPA for the NPDES-permitted facilities in the Illinois Lake Michigan Nearshore TMDLs satisfy all requirements of this element. The contributions of PCBs and mercury to the TMDL study area from point sources are difficult to accurately quantify because existing sample results are limited, or below detection limits. Illinois EPA estimated the NPDES-permitted contributions for this TMDL to be a small portion of the total load in comparison to nonpoint sources, using PCB and mercury concentration data from areas outside the study area (discussed in Section 3 and 4 of the Decision Document). These areas had samples that were analyzed using sensitive analytical techniques capable of measuring results at a lower concentration. Small PCB and mercury WLAs are assigned to the NPDES sources to address any future exceedances of the TMDL targets in the event additional information, such as samples analyzed using a more sensitive detection limit or reductions from other sources, show point sources to be a larger proportion of the total load.

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

Comment:

6.1 PCB Margin of Safety

For this PCB TMDL, Illinois used an implicit MOS by selecting the method for calculating percent reduction that resulted in the higher and therefore more conservative reduction percentage. The MOS is implicit because carp tissue data were used as the basis for calculating required reduction percentages. Illinois also calculated the necessary percentage reduction in fish tissue, using lake trout tissue PCB concentrations. Lake trout are less likely to be influenced by legacy effects, spending less time feeding among bottom sediments, resulting in much lower tissue concentrations and required reduction percentages. Calculating the reductions to achieve the TMDL targets based on the species with highest average PCB tissue concentration incorporates an implicit MOS into the analysis, as the required reduction for other species will probably be less.

6.2 Mercury Margin of Safety

Illinois EPA used an implicit MOS for this mercury TMDL because the modeling approach being applied does not account for fish tissue concentration that may come from legacy effects, so percent reductions from the atmosphere could be higher than necessary to compensate for legacy effects. Illinois EPA selected the most recent available largemouth bass data for use in this TMDL. Because the average life span of largemouth bass is 16 years (TPWD, 2015), the fish tissue data likely reflect historically higher mercury loads to some extent, and a longer period to bioaccumulate resulting in a larger percent reduction than if shorter-lived species were used. Largemouth bass is also a large, high level predator species that concentrates a greater amount of mercury than other species, and some species will be below the target concentration level after reductions aimed at reducing concentrations in largemouth bass.

Illinois EPA explained how the MOS is implicit and based upon conservative assumptions used throughout the PCB and Mercury TMDLs. EPA finds that the TMDL document submitted by Illinois EPA adequately identifies the margin of safety for PCBs by using a 97.4 percent and an 88 percent mercury reduction, respectively, in current sources across the state which were derived using species that have higher value fish tissue PCB and mercury concentrations such that, when the reduction target us met, most species will be at or below the TMDL target concentrations in fish. EPA also finds that Illinois EPA adequately identified the margin of safety by its choice of high-level predator species with multiple characteristics that contribute to greater concentration of mercury.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variations. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)).

Comment:

7.1 PCBs Seasonal Variation

Illinois EPA's approach in the Lake Michigan Nearshore PCB TMDL accounted for the influence of seasonal variations because the fish tissue PCB concentration target incorporates the variation of PCB concentrations in the atmosphere and water column that occur over the seasons. Concentrations in the atmosphere and water column can fluctuate seasonally. PCBs accumulate in fish tissue more slowly than seasonal fluctuations in the water and air occur, because the bioconcentration of PCBs in fish tissue takes place over the course of years. The increases in fish do not correspond to seasonal variations. This represents an integration of all temporal variation up to the time of fish tissue sample collection. Variability in fish tissue PCB concentrations is more likely influenced by differences in size, diet, habitat, and other undefined factors that are expected to be greater in sum than seasonal variability (MPCA, 2007).

7.2 Mercury Seasonal Variation:

As described in section 6.6 of the Mercury TMDL, mercury concentrations in the atmosphere and water column can fluctuate seasonally related to a number of factors influenced by seasonal conditions; however, response time of water and fish concentrations to changes in atmospheric loads, is extremely slow. The mercury concentration in the fish represents an integration of all the variations in atmospheric mercury concentration up to the time of sample collection. Thus, seasonal variations are accounted for in Illinois EPA's approach. Certain waterbodies and fish species are more likely to bioaccumulate mercury because of individual water chemistry characteristics and the biochemistry of individual fish species. Variability in fish tissue mercury concentrations is more likely influenced by differences in size, diet, habitat, and other undefined factors that are expected to be greater in sum than seasonal variability (MPCA, 2007).

EPA finds that the Mercury and PCB TMDL documents submitted by Illinois EPA adequately accounts for seasonal variation for mercury and PCBs due to air deposition across the study area.

8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a National Pollutant Discharge Elimination System (NPDES) permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL.

When a TMDL is developed for waters impaired by both point and non-point sources, and the WLA is based on an assumption that non-point source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that non-point source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by non-point sources. However, EPA cannot disapprove a TMDL for non-point source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

Comment:

8.1 PCB TMDL and Mercury TMDL Reasonable Assurance

Illinois EPA identified air deposition as the most significant source of PCBs and mercury to the Lake Michigan Nearshore surface waters study area, either through direct deposition to the waters of the study area, or through deposition to portions of Lake Michigan's surface that are transported into the study area (hydrodynamic transport). Illinois EPA noted that atmospheric PCB and mercury loads can be reduced through the targeted reduction of PCBs in Illinois, limiting the amount of PCBs that volatilize into the atmosphere. Illinois EPA stated in the mercury TMDL that it is important to reduce all possible sources of mercury, as mercury cycles from atmosphere to surface water. Further, mercury from the atmosphere that is deposited on impervious area and runs off in stormwater can be intercepted by Best Management Practices (BMPs) and prevented from continuing to cycle through natural and engineered systems by adjusting existing controls that remove other stormwater pollutants (Section 7.1 of the Mercury TMDL). Similarly, Illinois EPA explains that point source stormwater loads of PCBs can be controlled either by reducing the amount of PCBs entering the stormwater system and/or treating the stormwater itself (Section 7.1 of the PCB TMDL). Mercury's behavior in the environment is different than PCBs because under certain conditions mercury is methylated in the environment which influences the rate of bioaccumulation in fish.[45] Illinois EPA recognized the importance of reducing all possible sources of PCBs and mercury to address the tendency of both contaminants to cycle between media and bio-accumulate in fish tissue.

Illinois EPA plans to identify locations where PCBs and mercury can be controlled, and to remove the contaminants via BMPs at the points where they can be used most effectively to provide reasonable assurance of attaining required reductions. (Section 7.1, PCB and mercury TMDLs). Illinois EPA has described monitoring that can identify areas likely to contain sinks or sources of PCBs and mercury in Section 9 of the Decision Document.

The details for identifying appropriate BMPs, community engagement and scheduling are presented in Section 10 (Implementation) of this Decision Document. Illinois EPA also provided an outline of actions for reducing PCBs in the study area with examples of how they plan to blend the BMP approach with existing programs and information generated by PCB and mercury reduction efforts.

MS4 Stormwater Reasonable Assurance for PCBs and Mercury

Illinois EPA established a WLA associated with MS4 stormwater discharges of 0.000006 kg/day for PCBs (Section 6.3 in the PCB TMDL), and 0.0003 kg/day for mercury (Section 6.3 in the mercury TMDL). "40 CFR 122.44 (k) provides states with the authority to establish conditions requiring (implementation of) BMPs in NPDES permits. Illinois EPA plans to initiate Minimum Control Measures for PCBs and mercury in their MS4 permits to achieve reductions in PCBs and mercury that are consistent with the Lake Michigan Nearshore TMDLs to prevent PCBs and mercury from reaching impaired waters via stormwater.

Illinois EPA explained in Section 7.4.1 in the PCB and mercury TMDLs that the MS4 General Permit IL40 requires all regulated construction sites to have a stormwater pollution prevention plan that meets the requirements of the MS4 General Permit ILR40. Part IV of General NPDES Permit No. ILR10 requires that management practices, controls, and other provisions be at least as protective as the requirements contained in the Illinois Urban Manual, 2014, or as amended, including green infrastructure techniques where appropriate and practicable. In addition, there are requirements for meeting TMDL allocations:

[45] Figure 2-2 in the mercury TMDL depicts how mercury enters and cycles through ecosystems, biomagnifies up the food web, and bioaccumulates in fish and wildlife (Evers et al., 2011).

"If a TMDL allocation or watershed management plan is approved for any waterbody into which you discharge, you must review your stormwater management program to determine whether the TMDL or watershed management plan includes requirements for control of stormwater discharges. If you are not meeting the TMDL allocations, you must modify your stormwater management program to implement the TMDL or watershed management plan within eighteen months of notification by Illinois EPA of the TMDL or watershed management plan approval."

Within 60 days of TMDL approval, Illinois EPA will mail copies of the approved TMDLs to MS4 communities and permittees along with a menu of best management practices for implementation of the TMDL. The General Permit Part III[46], Special Condition (C) requires the MS4 Permittee to comply with the WLA when a TMDL is developed for that particular watershed within 18 months following notification by Illinois EPA once the TMDL is approved. It should be noted that Federal TMDL regulations require that permits be consistent with TMDL WLAs, but do not specify how States should implement them in their permitting and other programs.

A "Menu of BMPs for MS4s and MS4 Communities" was proposed by Illinois EPA and can be found in Appendix D and C of the Illinois EPA PCB and Mercury TMDL, and in Appendix C of this Decision Document. Illinois EPA states that the BMPs can be adopted, as appropriate, as minimum measures for permits to be consistent with the WLA contained in the TMDL. Illinois EPA intends to incorporate them into the MS4 General Permit by reference.

Illinois EPA also described PCB and mercury BMPs in Sections 7.2 of the PCB and Mercury TMDLs. Illinois EPA noted in the TMDLs that appropriately identified and installed BMPs will prevent the release and transport of PCBs and mercury and reduce their presence in surface waters. For example, atmospheric mercury and PCBs that are deposited onto impervious materials, surface water or soils, can be transported via stormwater into Lake Michigan. Most of the BMPs can be implemented as part of local stormwater management plans or in MS4 permits and are further detailed in Section 10 of this Decision Document.

8.2 PCB Reasonable Assurance

Illinois EPA proposed to work in collaboration with others to reduce the number of potential PCB sources to Lake Michigan. Illinois EPA adapted a list of actions and BMPs proposed by the Washington Department of Ecology (2014) for identifying and addressing these sources. Illinois EPA's proposed actions and BMPs in Section 7.4.1 of the PCB TMDL are summarized below.

1. In partnership with communities and stakeholders in the study area, assessment of schools and other public buildings for the presence of PCB-containing building materials. Identification of buildings most likely to contain PCBs based on age, type of construction and scope of any past remodeling.

46 According to Illinois EPA the re-issued MS4 General Permit became effective on March 1, 2016.

a. Surveying and assessing PCB-containing lamp ballasts in schools and other public buildings. Encourage replacement with more energy efficient PCB–free fixtures. Use of data from item 1 above to identify those buildings where PCB-containing light ballasts are likely still in use, with schools as a priority. Visual inspection to identify lamp ballasts with PCBs. Combining PCB removal with increasing energy efficiency where possible.
b. Finding avenues to provide information to government building managers about the importance of removing ballasts and programs aimed at replacing fixtures with more energy efficient fixtures. Providing technical and informational reports for proper handling of PCB containing fixtures.

2. Identifying, developing and promoting BMPs for containment of PCB-containing materials in buildings currently in use and those slated for demolition.

    a. Working with USEPA Region 5, Illinois EPA, local governments, the Waukegan Harbor Advisory or other local citizen organizations in the TMDL study area to identify outreach materials developed to prevent PCB exposure from building materials and prevent their release into the environment.
    b. Identifying additional audiences for outreach and avenues for informational material distribution.
    c. Creating a connection to EPA's Green Demolition Initiative by providing added information on potential for PCB-containing materials in demolitions. Circulating through established channels for green demolition materials to appropriate contractors and businesses engaged in demolition activities in Illinois Nearshore Lake Michigan TMDL area.

3. Learning more about what products contain PCBs and promote the use of processes that do not inadvertently generate PCBs. (Unpermitted non-point releases, such as from consumer products, are becoming increasingly important to control to reduce overall PCB delivery).
    a. Starting with the EPA report (1982) identifying 70 manufacturing processes likely to inadvertently generate PCBs, and efforts in the Great Lakes to reduce PCBs. Identifying existing information about PCBs in pigments and dyes, which are potential sources of PCBs to the environment. Identifying potential audiences in the TMDL area for sharing information to develop alternative purchasing options that don't have potential to release PCBs [Note that a list is being developed by Washington Department of Ecology and Green Chemistry Northwest].
    b. Working with EPA and other government partners to promote alternatives to supplies that contain PCBs and share with partner green purchasing programs.

4. Surveying and identifying "retirement" dates of electrical equipment that contains more than 2 ppm PCB. (From 1929 to 1979 the production of PCBs in the US was

approximately 1.4 billion lbs. (600,000 metric tons), with the largest use for electrical equipment (EPA, 1994). Federal regulations focus on transformers with more than 500 ppm PCBs.) Identifying funding to collect and properly dispose of this equipment with concentrated PCBs.

5. Using a best management practices approach to reduce PCBs in the study area by effectively managing discharges of PCBs from NPDES permitted stormwater sources, including MS4s (see MS4 Stormwater Reasonable Assurance for PCBs and Mercury in Section 8.1 of the Decision Document for more detail.

6. Compiling a list of materials to use for conducting a public educational campaign. Identify and utilize avenues in cooperation with stakeholders for distributing to the public. (Refer to Appendix E of the PCB TMDL for resource information and Appendix E for a list of study area stakeholder groups.)

PCB Individual NPDES-Permitted Dischargers

Even though Illinois EPA estimates point source PCB loads to be small compared to current nonpoint source loads, they conclude that it is important to ensure that these loads will not cause or contribute to a violation of the WQS after reductions of nonpoint sources occur. Illinois EPA established WLAs of zero for the three individual NPDES-permitted dischargers, consistent with their existing permits that state "there shall be no discharge of PCBs." (Section 6.3 of the PCB TMDL)

PCBs Great Lakes Projects and Activities

In Section 7.4.2 Illinois EPA describes Great Lakes projects and activities that continue to achieve improvements in the water quality of the Great Lakes. The Great Lakes Water Quality Agreement between the United States and Canada (1972) was updated in 2012 to identify and manage current water quality threats to the Great Lakes. Several priority areas, called "Annexes," commit the U.S. and Canada to addressing specific issues relevant to this PCB TMDL:

- Annex 1 Areas of Concern: Restore beneficial uses at AOCs like Waukegan Harbor and implement Remedial Action Plans.
- Annex 2 Lake Management: Develop a Lake-wide Management Plan for Lake Michigan in 2019.
- Annex 3 Chemicals of Mutual Concern: Reduce anthropogenic release of certain chemicals. including PCBs. In February 2014, both the U.S. and Canada committed to the continued monitoring of PCBs in the Great Lakes and to coordinate PCB reduction efforts.

The Great Lakes Restoration Initiative has provided funding to U.S. agencies and stakeholders for investing in the Great Lakes. Eleven Federal agencies developed the GLRI Action Plan II for

2015 through 2019 and one of the plan's focuses is on cleaning up of AOCs, including PCBs in Waukegan Harbor. (Figure 7-1).

Waukegan Harbor AOC

Waukegan Harbor is the largest PCB-contaminated Superfund site on the Great Lakes and has undergone a series of clean up actions to reduce the total PCBs in the environment and achieve Superfund targets (see Section 1.2 of the Decision Document). The Waukegan Harbor AOC/OMC Superfund site consists of four cleanup units. PCBs are found in the Waukegan Harbor and on the OMC Plant 2 units. The history of ongoing clean up at the site includes:

- The cleanup of sediment with a PCB concentration of 50 ppm followed by lowering the goal to less than 1 ppm. The site will remain an AOC until the 1 ppm goal is met (IDNR, 2011); The continuing operation and maintenance of three PCB containment cells and associated treatment mechanisms by the City of Waukegan from 1992 to 2005, under EPA oversight;
- The Waukegan Harbor Area of Concern Habitat Management Plan (IDNR, 2012 which defines the PCB target for Waukegan Harbor open water unit as "reduce PCB levels in Waukegan Harbor sediments to 0.2 ppm;"
- Hydraulic dredging of sediment with residual contamination from the harbor by EPA completed in July 2013. The sediment was pumped to the OMC Plant 2 property for storage in a consolidation facility to fully clean the harbor.

Figure 7. Waukegan Harbor AOC (Source: USEPA, 2014)

EPA finds Illinois EPA's assurance that the continuing efforts to clean up Waukegan OMC site will result in reductions of PCB concentrations in and around the site is reasonable and that these efforts will contribute to achieving the PCB targets in the TMDL. It is also reasonable to assume that the site's regulatory status as both an AOC and Superfund site will result in clean up actions by EPA, Illinois EPA and partners that will continue until program goals for the sites are met.

8.3 Mercury TMDL Reasonable Assurance

In the Mercury TMDL, Illinois EPA concludes that the largest source of mercury to the study area is from the air. Emissions from coal-fired electric utilities (discussed in TMDL Section 4.2.2), which are the largest source of airborne mercury deposited to study area waters, are permitted through Federal and State clean air programs. The Reasonable Assurance discussion in Section 7.4 of the TMDL focuses on the mercury air reductions called for in the Mercury Air Toxics Standards (MATS) under the Federal Clean Air Act authority, Illinois State Regulation, and other air controls. Section 7.4 of the TMDL also identifies water, waste and other programs at the state and Federal level that reduce mercury emissions through a variety of controls.

In Section 7 of the TMDL Illinois EPA also identifies "potential sources to target for control" and a suite of appropriate BMPs for reducing mercury loads, implementation and existing activities to reduce mercury, funding opportunities, monitoring, and a schedule. Highlights of the schedule for these implementation activities are part of the Decision Document's Reasonable Assurance discussion.

Mercury - State Atmospheric Regulations

As Illinois EPA showed in Section 6 of the TMDL, reductions in anthropogenic sources outside of Illinois are needed to achieve the TMDL target mercury concentration for fish tissue of .06 mg/kg. Illinois EPA's achievement of the TMDL goal is dependent upon regional and global mercury emission reductions.

By 2005, mercury emissions from medical waste incinerators and municipal waste combustors had declined by more than 90 percent (Figure 4-3 from the TMDL) due to implementation of regulatory controls required by the Clean Air Act Amendments in the late 1990's (Section 4 of the TMDL). As a result, mercury emissions from power plants and coal-fired power plants became the single largest source of mercury emissions nationwide and in the Great Lakes region (Evers et al., 2011; Schmeltz et al., 2011).

In 2007, the State of Illinois promulgated the Illinois Mercury Rule (35 Ill. Adm. Code Part 225) to reduce mercury and other pollutants. The Illinois Mercury Rule required emissions to be reduced by approximately 90% statewide by 2015. Mercury emissions from coal-fired power plants in Illinois were estimated at 7,700 pounds per year in 2006 and are currently estimated to be less than 600 pounds per year, when also accounting for the retirement of 18 coal-fired units in Illinois since 2007. Each coal-fired electric generating unit at the NRG/Midwest Generation, LLC in Waukegan Illinois is equipped with a mercury control system consisting of activated carbon injection, an electrostatic precipitator, and a dry sorbent injection system. The facility currently operates two coal-fired electric generating units (numbered 7 and 8). In 2012, unit 8 was found to have around 94% efficiency in reducing mercury emissions. This facility is currently in compliance with the Illinois mercury rule. Illinois EPA expects that seven more units will be retired statewide or converted to natural gas, adding to mercury emission reductions by the end of the decade. Several of these units are in the Great Lakes Basin area. It is reasonable for Illinois EPA to anticipate that these changes in the control of mercury through installation of pollutant control improvements will result in mercury emission reductions, based on the response of other combustion source reductions as described above. Illinois EPA adequately supports its expectation that mercury reductions from these sources will be reflected in fish tissue over time, assuming a proportional relationship to emission reductions.

National Mercury and Air Toxics Standards (MATS)

Illinois EPA points out how air sources of mercury that are outside of State of Illinois regulatory authority may also be addressed over time through National level programs. On February 16, 2012, EPA published the first ever national standard, known as the Mercury and Air Toxics Standards (MATS)[47] to reduce mercury and other toxic air pollutants from coal- and oil-fired power plants covered by these standards. The final rule established power plant emission standards for mercury which EPA expects to result in preventing about 90 percent of the mercury in coal burned in power plants across the nation from being emitted to the air electric generating units (EGUs). Nationwide, there are about 1,400 coal and oil-fired EGUs. Existing sources were

[47] http://www3.epa.gov/mats/basic.html

given up to 4 years to comply with MATS. The MATS rule requires that installation of any needed treatment equipment be in operation and meeting emissions standards by the April 2015 deadline. The power plant operated by NRG/Midwest Generation, LLC in Waukegan, Illinois is currently in compliance with MATS.

Other large sources (See Source Assessment in the TMDL (Section 1), that were regulated under the Clean Air Act (CAA) of 1990, have shown major reductions in mercury emissions. EPA agrees with Illinois EPA's assertion that there is reasonable assurance that the reduction target for U.S. out-of-state and regional sources will be addressed over time, and that compliance with the Illinois mercury rule and the MATS will contribute significantly to reductions in fish tissue concentrations called for in this TMDL.

Figure 8. Total U.S. Anthropogenic Mercury Emissions 1990 vs. 2005 (Source: Evers et al., 2011)

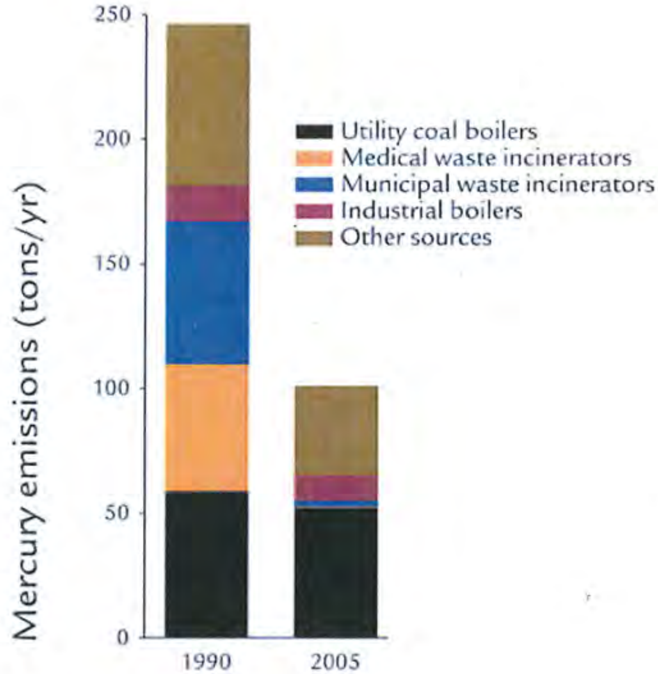

Table 10. Sources of Mercury Emissions in the U.S.

Industrial Category	1990 Emissions tons per year (tpy)	2005 Emissions (tpy)	Percent Reduction
Power Plants	59	53	10%
Municipal Waste Combustors	57	2	96%
Medical Waste Incinerators	51	1	98%

Source: https://www.epa.gov/mats/cleaner-power-plants#controls - Accessed 8/15/17

Water Programs – Potential Illinois Point Sources of Mercury

Illinois EPA summarizes the status of facilities that are controlled under the Clean Water Act, and other requirements in Section 6.3 of the mercury TMDL. The Waukegan Water Reclamation Facility (IL0030244) is described by Illinois EPA as having a permitted mercury load of 0.04

kg/year, which translates to 0.0001 kg/day (0.00024 lbs/day) at design average flow. The WLA in the TMDL for this facility is set equal to the permitted mercury load of 0.04 and therefore is consistent with the NPDES permit.

Section 4.5 of the mercury TMDL identifies five individual NPDES permits that contain mercury monitoring requirements (see Table 7-5, Schedule for Implementation). If mercury is measured above detection levels based upon the prescribed analysis methodology in the permit, for example method 1631E Section 11.1.1.2. digestion procedure (DL1.0 ng/L), the permittee will be required to implement mercury reduction actions and source analysis and meet mercury water quality standards. Illinois EPA will require these NPDES permit holders (through their permit) to determine if their facility adds to the mercury load. Facilities that add to the mercury load will receive an effluent limit and will be required to meet the limit or develop and implement a cost-effective mercury waste minimization plan if one is not already in place to ensure mercury discharges from point sources do not exceed the WLA (Mercury TMDL Section 7.4.1).

State Waste Programs

Several examples of Illinois state law and the date specific requirements affecting mercury in product waste are included below:

- 2004: Thermometers (except those in health care facilities) and novelty products (Illinois Public Act 093-0165)
- 2005: Limits purchase of mercury-containing products in schools (K-12) (Illinois Public Act 093-0964)
- 2007: Electrical switches and relays (Illinois Public Act 093-0964)
- 2008-2012: Prohibit Scientific instruments containing mercury (e.g., barometers, pressure transducers, pyrometers); cosmetics containing mercury (Mercury-added Product Prohibition Act 410 ILCS 46)
- 2008: Automobile switch removal associated with waste processing (Illinois Public Act 094-0732)
- 2008: Sale and installation of mercury climate control thermostats (Public Act 95-452)
- 2009: Sale and distribution of cosmetics, toiletries, or fragrances containing mercury (Illinois Public Act 95-1019)
- 2011: Requires manufacturers to supply collection points for recycling mercury-containing thermostats with goal of collecting 40,000 thermostats by 2020. (Illinois Public Act 096-1295).
- 2012: Mercury-added Product Prohibition Act (Illinois Public Act 97-1107) Amended to ban sale and distribution of zinc air button cell batteries (Environmental Protection Act 415 ILCS 5/22.23c);
- 2016: Requires removal of mercury thermostats from commercial buildings prior to demolition. (Illinois Public Act 99-122/Senate Bill 679)

Federal Waste Regulation - Coal Combustion Residuals

Section 7.4.2. of the TMDL discusses Coal Combustion Residuals (CCR) rules which regulate the disposal of CCR as solid waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA). The residues (or "coal ash") are created when power plants burn coal and are captured by pollution control technologies. Coal ash is known to contain mercury. EPA published a final rule on April 17, 2015 to regulate the waste from existing and new CCR units as solid waste under the RCRA's subtitle D which took effect on October 19, 2015[48]. Provisions within the rules address: 1) the risks from structural failures of CCR surface impoundments, 2) groundwater contamination from the improper management of CCR in landfills and surface impoundments and 3) fugitive dust, by requiring CCR Landfills or CCR surface impoundments be closed if they cannot meet performance or structural integrity criteria. Two coal combustion residual (CCR) surface impoundments (Waukegan (IL0002259, East Ash Pond and West Ash Pond) are located in the project study area at the Midwest Generation, LLC facility, and have self-reported as meeting the inspection criteria. The rule provides reasonable assurances that measures will be taken to prevent accidental catastrophic releases from potential sources of mercury to the study area.[49]

The Implementation and Monitoring Sections (10 and 9, respectively) of this Decision Document, and the corresponding Sections in the TMDL, supply supplemental information to support community outreach and actions, and contain the Illinois EPA's anticipated schedule for implementation steps, the reasonable assurance for this TMDL.

Illinois EPA adequately identified reasonable assurances that reductions needed to eliminate impairments due to PCBs and mercury, that result from air deposition, MS4s/stormwater, hydrodynamic transport, legacy and other sources impacting the study area will occur. Illinois EPA identified a community process for using numerous institutional actions and BMPs for addressing diffuse sources of PCBs and mercury, by enhancing existing regulatory programs such as the CWA MS4 permit process. Illinois EPA also provided detailed information about ongoing progress towards reducing the largest potential sources of PCBs and mercury cycling in the environment. These reduction activities involve both legacy sources that continue to contribute to air concentration of contaminants (the clean-up of Waukegan Harbor/OMC PCBs) and the reductions in contaminants through regulation of air sources of mercury, and management of combustion, and inadvertent generation of by-products from various industrial processes (waste containing mercury at the Waukegan Midwest Generation, LLC, pigment manufacturing). Recent reductions, or those scheduled to occur soon after the writing of this decision document, may not be reflected in target fish tissue concentrations immediately, but fish tissue is expected to meet the Illinois Mercury TMDL targets once mercury reductions work their way through the food web in the study area. Compliance and other programs designed to reduce mercury in the project area also contain monitoring requirements to track progress toward the achievement of the mercury TMDL targets.

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[48] Corrected in Federal Register/Vol. 80. No. 127/Thursday July 2, p 37989

[49] The rule is a "self-implementing rule" meaning that there is no direct federal oversight, and States and citizens are relied upon to monitor and report on rule implementation.

Additional information and best practices developed under other studies and efforts will be shared with Illinois EPA to enhance existing actions in the Lake Michigan Nearshore study area. As noted above, PCB gas phase levels have dropped since the PCB prohibition in 1977 and the Waukegan Harbor Clean-up. Similarly, mercury air emissions have dropped since air controls took effect. EPA agrees it is reasonable to conclude that these efforts and others will continue to result in the reduction of PCBs and mercury.

9. Monitoring Plan to Track TMDL Effectiveness

EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and non-point sources, and the WLA is based on an assumption that non-point source load reductions will occur. Such a TMDL should provide assurances that non-point source controls will achieve expected load reductions and such a TMDL should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

Comment:

9.0 Post TMDL Data Collection

Illinois EPA discusses the post-TMDL monitoring that will be used to evaluate progress towards attaining the TMDL targets in Sections 7.5 of both the PCB and mercury TMDLs. Illinois EPA will focus on monitoring for PCBs in: fish tissue, the atmosphere, air emissions, and surface water (through NPDES permits). Illinois EPA discusses future monitoring for mercury in: fish tissue, the atmosphere, air emissions, surface water and groundwater. The monitoring actions for PCBs and mercury are summarized in this Decision Document in Tables 14 and 15, respectively.

Illinois EPA suggested that institutional BMPs and pollution prevention efforts be applied to NPDES MS4, RCRA or TSCA regulated waste sources to prevent PCBs and mercury from reaching surface waters, and that monitoring for these programs be evaluated for contaminant reductions[50] There are several ongoing programs designed to reduce mercury and PCB loads in the Great Lakes that track and publish contaminant-specific trend information for contaminant clean-ups and remediation and pollution prevention projects such as Lakewide Management Plans and Areas of Concern/Superfund. These programs may be useful vehicles for funding and tracking PCB and mercury reduction efforts in water, soils, air, sediment, and fish.

<u>9.1 State PCB Fish Tissue Monitoring</u>

Illinois EPA describes the state's monitoring program (Illinois EPA 2014a) in Section 7.5.1 of

[50] For examples see: Section 7.2.1, Table 7-1, and Appendix B of the PCB TMDL; and Section 7.2.1, Section 7.4.3, and Table7- 1 of the mercury TMDL.

the PCB TMDL. Illinois EPA monitors fish tissue PCBs in predator species collected every 3-5 years from four Lake Michigan harbors as part of its FCMP. The results are used to assess the status of existing fish consumption advisories or issue new advisories. There are PCB consumption advisories for 10 species of fish in Lake Michigan and 4 species have advisories specific to Waukegan North Harbor. Fish tissue PCB data from the FCMP can be used to assess progress toward meeting the TMDL target. Illinois EPA will assess these data as they are available to determine if PCB concentrations are decreasing (see excerpt from monitoring Table 7-4 below).

National and International PCB Atmospheric Monitoring

The United States and Canada jointly maintain the Great Lakes IADN Program, which is one of GLNPO's long-term monitoring programs. PCB measurements have been collected for gas phase PCBs and precipitation at the Chicago site since 1993. Gas phase measurements are taken for 24 hours every 12 days, and precipitation samples are collected monthly using an automated sampler. PCB concentrations measured at this IADN station can be used to assess atmospheric PCB concentrations over time for the study area and Lake Michigan.

State PCB Water Monitoring

The Illinois EPA began implementing its redesigned Lake Michigan monitoring program (LMMP) in May 2010.[51] Illinois EPA conducts sampling as a part of this program which includes: a nearshore survey, harbor monitoring, public water supply/fixed station monitoring, and beach monitoring. PCBs are part of the laboratory and field parameter assessment and are analyzed as site specific parameters for all but groundwater and public water supply. Beach monitoring is conducted by local municipalities and county health departments. Section 7.5 of the PCB TMDL discusses post TMDL data collection and data for fish tissue, atmospheric PCBs, air emissions, and groundwater that will be used to evaluate progress towards attaining the TMDL target. Illinois EPA also provided a list monitoring actions for PCB permitted facilities. (See the Implementation Section in this Decision Document).

Table 1. PCB Schedule and Monitoring Components (PCB TMDL Table 7-4)

Monitoring Activity	Schedule
Illinois Fish Contaminant Monitoring Program	Each year, fish samples are collected from four Lake Michigan open water stations and analyzed for PCBs. In addition, every 3-5 years, fish samples are collected from four Lake Michigan harbor stations and analyzed for PCBs. Harbors targeted for sampling include Calumet, Jackson, Waukegan North and North Shore Marina.
Atmospheric Monitoring (IADN) at Chicago	PCB measurements have been collected since 1993, and no end date is planned. Gas phase measurements are made every 12 days. Precipitation samples are collected monthly.

[51] Illinois EPA, The Illinois Water Quality Monitoring Strategy for 2015-2020, Appendix A (2014a)

Mercury Atmospheric Monitoring

In Section 7.5.2 of the Mercury TMDL, Illinois EPA discusses post TMDL air data collection and use of the data to evaluate progress towards attaining the TMDL target. Total mercury in precipitation has been monitored weekly through the Mercury Deposition Network since 1996. The closest site to the study area watershed is at the Indiana Dunes National Lakeshore. Additional monitoring data for Lake Michigan atmospheric mercury deposition may also be available through the Canadian Atmospheric Mercury Measurement Network. Illinois EPA plans to rely on data collected, compiled and analyzed through these programs to assess changes in mercury concentrations over time. Illinois EPA will use a 2002 emissions inventory as the baseline to track progress in source reductions, as it is the closest in time to the MCM modeled year. EPA finds Illinois EPA's choice of the 2002 emissions inventory to be a reasonable choice for comparison, as it is closest in time to the 2001 baseline.

Waste Program Mercury Monitoring

Monitoring is required for CCRs that are regulated under the Federal RCRA Title D statute, but the rule is "self-implementing," meaning that there is no direct federal oversight. States and citizens are relied upon to monitor and report on rule implementation. Operators of CCR units must maintain a publicly available website of compliance information, including, for example, annual groundwater monitoring results, corrective action reports, fugitive dust control plans and closure completion notifications.

Table 2. Mercury Schedule and Monitoring Components (Mercury TMDL Table 7-5)

Monitoring Activity	Schedule
Water Permit Monitoring	
NSWRD Waukegan Water Reclamation Facility (IL00030244) Permit Schedule 2016 for a duration of 5 years.	Annual average mercury load of 0.04 kg/yr (0.00024 lbs/day) based on design average flow, which is consistent with the TMDL. This permit also includes a monitoring requirement of 1 day/month (composite sample), and calculation of a rolling annual monthly average mercury value.
Fort Sheridan Landfills 6 and 7 (IL0072231) Expired 11/30/14	Report quarterly stormwater sampling for mercury on DMRs
Calumet Transload Railroad, LLC (IL0002593) Expires 01/31/2017	Report quarterly stormwater sampling for mercury on DMRs. If mercury is measured above detection levels, the permittee would have to do mercury reduction and source analysis to meet mercury water quality standards. Any change in permit status would be addressed during the next permit renewal cycle

Advanced Disposal Services Zion Landfill, Inc. (IL0067725) Expires 09/30/2020	Report quarterly stormwater sampling for mercury on DMRs. If mercury is measured above detection levels, the permittee would have to do mercury reduction and source analysis to meet mercury water quality standards. Any change in permit status would be addressed during the next permit renewal cycle
Midwest Generation, LLC Waukegan (IL0002259) Expires 03/31/2020	Report quarterly sampling for mercury on DMRs. If mercury is measured above detection levels, the permittee would have to do mercury reduction and source analysis to meet mercury water quality standards. Any change in permit status would be addressed during the next permit renewal cycle.
KCBX Terminals Company (IL0071625) Expires 04/30/2018	Quarterly mercury sampling (with limitations described in Special Condition 11 of the NPDES Permit). If mercury is measured above detection levels, the permittee would have to do mercury reduction and source analysis to meet mercury water quality standards. Any change in permit status would be addressed during the next permit renewal cycle
Monitoring Programs	
Illinois Fish Contaminant Monitoring Program	Illinois EPA plans to start analyzing mercury in yellow perch collected from two Lake Michigan open water stations. In addition, every 3-5 years, predator fish samples are collected from four Lake Michigan harbor stations and analyzed for mercury. Calumet, Jackson, Waukegan North and North Shore Marina Harbors are targeted for sampling.
Groundwater monitoring	2010 – ongoing. Quarterly monitoring and Illinois EPA review of data from seven on-site groundwater wells at the Waukegan Power Station.
Mercury Deposition Network	1996 – ongoing. Weekly monitoring of total mercury in precipitation occurs through the Mercury Deposition Network. The closest site to the study area watershed is at the Indiana Dunes National Lakeshore.
National Emissions Inventory	Every three years, EPA prepares the NEI for every state, providing a comprehensive and detailed estimate of air emissions of both Criteria and Hazardous air pollutants from all air emissions sources. The NEI is based primarily on emission estimates and emission model inputs provided by state, local, and Tribal air agencies for sources in their jurisdictions, and is supplemented by data developed by the EPA.
Rule Compliance and Monitoring (Air)	
Mercury and Air Toxics Standards (MATS) Rule 40 CFR Part 63, Subpart UUUUU - National Emissions Standards for Hazardous Air Pollutants: Coal and Oil-Fired Electrical Utility Steam Generating Units	MATS standard compliance date: April 30, 2015 An affected source must maintain records of monthly mercury emissions and submit quarterly reports and semi-annual compliance reports to Illinois EPA. Any deviations from applicable 40 CFR Part 63, Subpart UUUUU requirements must be submitted with the semi-annual compliance reports. The source is required to keep records and conduct annual relative accuracy test audits (RATA) of the continuous monitoring systems and report the results of the RATA to the Illinois EPA within 45 days.
Illinois mercury rule, 35 IAC Part 225	Affected coal-fired sources are required to continuously monitor and record mercury emissions from each stack or common stack associated with an

90% Reduction Requirement	Electric Generating Unit. Affected sources of an EGU must maintain records of the monthly emissions of mercury from the EGU, and monthly allowable emissions of mercury from the EGU if complying with the 90% reduction requirement. An annual compliance certification must be submitted to Illinois EPA. EGUs must report deviations from applicable requirements within 30 days of their discovery. (See RA Section in Decision Document)
Waste Monitoring	
Resource Conservation and Recovery Act's Subtitle D. Coal Combustion Residual Rule	January 2016 – January 2019. Among other things, additional requirements related to structural integrity, groundwater monitoring and corrective action, demonstration of meeting location restrictions, closure of inactive units. Operators of CCR units must maintain a publicly available website of compliance information for example, annual groundwater monitoring results, corrective action reports, fugitive dust control plans and closure completion notifications.

Illinois has provided an adequate description of its monitoring to assess the progress towards meeting the targets in the TMDLs. Illinois will continue to rely on IADN Great Lakes Atmospheric Monitoring program and required monitoring that is a part of implementing regulatory control programs to assess progress in meeting water quality standards for PCBs and mercury. A well-developed FCMP is available to determine the extent of fish consumption impairments in the state to assess the progress toward TMDL fish tissue concentration targets. Illinois EPA, IDNR and IDPCH will continue to monitor fish tissue samples as part of the Illinois Fish Advisory effort.

10. Implementation

EPA policy encourages Regions to work in partnership with States/Tribes to achieve nonpoint load allocations established for 303(d)-listed waters impaired by non-point sources. Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that non-point source LAs established in TMDLs for waters impaired solely or primarily by non-point sources will in fact be achieved. In addition, EPA policy recognizes that other relevant watershed management processes may be used in the TMDL process.

Comment:

10.1 Implementing BMPs for Both Point and Nonpoint Sources

Illinois EPA described a number of BMPs as appropriate for use to reduce PCB and mercury loads from a variety of locations and sources in Section 7 of the TMDL. Illinois EPA selected BMPs that are designed to remove PCBs and mercury from both point and nonpoint sources, including from MS4 stormwater runoff (Section 7.2, PCB and Mercury TMDLs). Illinois EPA described the implementation points, and sources and pathways for PCBs and mercury BMPs in

Table 7.1[52] of both the PCBs and mercury TMDLs. Table 7.1 presents this information for two types of BMPS: institutional and treatment. Illinois EPA presented the effectiveness of institutional and treatment BMPs in reducing contaminant loads to receiving waters in Table 7-2 of both the TMDLs. The tables discussed in this paragraph can be found in this Decision Document's Appendix D. Further detail is provided below for different varieties of BMPs.[53]

Illinois EPA proposes in both the PCB and Mercury TMDLs, to establish a watershed workgroup with interested communities in the study area. The workgroup would develop a watershed plan and a more detailed schedule for selecting and implementing specific BMPs for a variety of problems. Working with partners, Illinois EPA believes it could use or adjust the existing budget and grant programs to implement appropriate mercury and PCB BMPs. Illinois EPA suggested that the Chicago Clean Sweep Pilot could serve as a model for educating Chicago-area businesses on the identification and proper management and disposal of mercury and PCBs at a reduced cost. Illinois EPA suggested that the program could be revitalized depending on community interest in pursuing funding.

10.2 Institutional BMPs for PCBs and Mercury

The purpose of institutional BMPs is to avoid the continued use, inadvertent production, release or volatilization of PCBs and mercury in the environment. Illinois EPA focused on information sharing and governmental practices to help businesses and the general public avoid, clean up and properly dispose of products containing PCBs and mercury. Illinois EPA plans to assist and work collaboratively with municipalities, community members, organizations and existing watershed workgroups when implementing institutional BMPs outlined in the PCB and mercury TMDLs. The PCB and mercury TMDLs contain information to help identify and remove legacy and current sources of PCBs and mercury to surface waters including: air sources, municipal stormwater systems, legacy sources, accidental releases and others. (Section 7.1 of both TMDLs). These materials also describe proper disposal of contaminants.

Illinois EPA proposed the following actions (Section 7.1-7.7 of the PCB and mercury TMDLs).

- Prevent the release of PCBs and mercury from buildings (for PCBs identify buildings by construction date, and for mercury, those scheduled for demolition) by educating school administrators and demolition contractors about locations where contaminants may be found in schools, and buildings slated for demolition.
- Disseminate information to the public about the potential sources of mercury and PCBs, what to do with them if discovered, and safer alternatives. Information should be shared with buyers and suppliers of industrial equipment, consumers, and residents who fish for recreation or subsistence, to increase their awareness of fish advisories and the fish species that contain the highest concentrations of PCBs and mercury. Educate those more

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52 BMP Application for Controlling PCBs in Urban Areas Relative to Sources, San Francisco Estuary Institute, 2010

53 Program Assessment Effectiveness for BMPs Source: San Francisco Estuary Institute, 2010

likely to come into contact with PCBs or mercury.

- Continue to implement existing collection programs for waste-containing PCBs or mercury that enable government- or non-profit-run programs to accept mercury and/or PCB-containing products and waste (Section 7.4.3 of the mercury TMDL).
- Clean up illegally dumped waste, such as old drums, electrical equipment, or building demolition material, for example caulk or paint that may contain PCB-contamination. Review local/regional laws regulating waste disposal, and revise as necessary: this could include implementing fines for improperly disposing of mercury and PCBs and sharing information on safer alternatives for lighting, paint, caulk, thermometers, etc.
- Conduct targeted street sweeping to target sources of PCBs or mercury to prevent from being washed down streets and entering storm drains.
- Identify or Create Educational Materials to support outreach, for example,
  - mercury dental amalgam management BMP brochure
  - fact sheet to show Illinois consumers what products contain mercury, what should be recycled, and where.
  - Removal of old equipment using appropriate disposal of PCB or mercury-containing materials from demolition of buildings.

Electrical Equipment

- Conduct a survey of the state's utilities and other owners of electrical equipment to confirm the presence of PCBs in transformers inventoried in the Illinois EPA database mentioned above (EPA 2011a). Provide technical assistance where requested for disposal and replacement of the contaminated fluid (Washington State Department of Ecology, 2014).
- Promote wider/higher use of recycling facilities to reduce the risk of mercury discharging from fluorescent light bulbs switches, instruments, etc. into Lake Michigan (can apply to homeowners and businesses).
- Help operators safely use drum top crushers according to regulation for volume reduction of spent fluorescent lamps.
- Reduce mercury use in hospitals (promote existing Green Health Partnership).

10.3 Treatment BMPs for PCBs and Mercury

MS4 Stormwater Systems

Illinois EPA will work with MS4 communities, to select feasible BMP s and implementation plans, considering practical and financial resources.

Treatment control BMPs will help MS4s meet permit requirements. These engineered options are installed or built within the existing storm sewer infrastructure to capture sediment containing PCBs and mercury and prevent them from being discharged to Lake Michigan

Federal TMDL regulations require that permits be consistent with TMDL WLAs, but do not specify how States should implement them in their permitting and other programs.

Many of the BMPs discussed in the TMDL and this Decision Document, particularly those applicable to stormwater, can be applied to both the PCB and Mercury TMDLs. BMPs are effective at treating a range of contaminants and are not limited to controlling mercury or PCB loads. For example, the stormwater MS4 and Treatment BMPs are found in Appendices C and D of this Decision Document.

Below are BMPs that can be applied at three different locations within the stormwater systems :

Pipe entrance

- Capture of pollutants before they enter stormwater pipes
- Includes infiltration trenches, basins, retention and reuse (rain barrels or underground tanks), ponds, detention basins, swales, buffer strips, bioretention

Installed within MS4 pipes:

- Includes filters, screens, wet vault[54], hydrodynamic separators
- Usually have high maintenance requirements and can sometimes back up flow when not maintained properly

End of pipe

- Includes sedimentation basins, constructed wetlands, or diversion of flow to treatment at wastewater treatment plants

Maintenance BMPs suggested by Illinois EPA include street sweeping, jet vacuuming separate stormwater systems, and mitigating stormwater flow from direct drainage areas by using green infrastructure measures.

Illicit Mercury Discharges

In Section 7.5.5 of the Mercury TMDL Illinois EPA proposes that an illicit discharge survey should be conducted on storm sewers and surface waters, emphasizing discharges to Lake Michigan, if occurrence of these discharges of mercury are suspected. The survey is a systematic screening of stormwater outfalls for illicit discharge and is required by Illinois' Stormwater NPDES General Permit for Discharges from Small MS4s. The outfall surveys are followed by investigations in the stormwater conveyance system to locate and address the source of any dry weather discharges.

10.4 Implementation Schedules

Illinois EPA provided an implementation schedule for both the PCB and Mercury TMDLs, respectively. Current NPDES permits (PCB TMDL Table 7-4) will remain in effect until the permits are re-issued, provided Illinois EPA receives the NPDES permit renewal application

[54] A wet vault is a permanent pool of water in a vault that rises and falls with storms and has a constricted opening to let runoff out. Its main treatment mechanism is settling of contaminated solids.

prior to the expiration date of the existing NPDES permit. Illinois EPA plans to incorporate the WLAs into the permits upon reissuance. The schedules, reproduced from the TMDLs, are presented below.

Table 13. Schedule for Implementation (PCB TMDL Table 7-4)

Activity	Schedule
Stakeholder Engagement	
Working with stakeholders and workgroups to engage partners in TMDL-recommended strategies.	Much of the TMDL area lies within an MS4 service area. Illinois EPA will encourage watershed groups to work with local permittees to prioritize problems, select BMPs and participate in the planning and design of the BMP projects that will meet TMDL target endpoints. Illinois EPA will share TMDL recommended implementation plans with other state agencies. BMPs are found in Section 10, and Decision Document and TMDL Appendices.
Permitting	
General NPDES Permit (No. ILR40) MS4 Stormwater Expires 02/28/21	Following notification by Illinois EPA of the TMDL approval, the permittee must modify their stormwater management program to implement the TMDL recommendation, if the permittee determines they are not meeting the TMDL allocations within eighteen months of the notification date. Additional details are found in the General NPDES Permit ILR40, Part III Special Conditions C.
Zion Station (IL0002763) Expires 02/28/18	Continue current PCB monitoring requirements and report results on monthly discharge monitoring report forms. Any change in permit requirements will be addressed during the next permit renewal cycle.
Winnetka Power Generation Station (IL0002364) Expires 08/31/18	In future permit renewal cycles, the permit may be revised to require monitoring to verify compliance with water quality standards.
Midwest Generation, LLC Waukegan (IL0002259) Expires 03/31/2020	In future permit renewal cycles, the permit may be revised to require monitoring to verify compliance with water quality standards.
Waukegan Harbor AOC	Ongoing regulatory action and funding until clean-up goals are met.

Potential Funding Sources

Illinois EPA includes the same table of available funding opportunities in Section 7.3 of both the PCBs and Mercury TMDLs. The table included EPA, National Institute of Health, National Oceanographic and Atmospheric Institute and Illinois EPA as possible sources of funding for implementing the BMPs discussed in the Implementation Section.

Table 14. Mercury TMDL Implementation Schedule (Table 7-5 in the mercury TMDL)

Stakeholder Engagement	
Working with stakeholders and workgroups to engage partners in TMDL-recommended strategies.	Much of the TMDL area lies within an MS4 service area. Illinois EPA will encourage watershed groups to work with local permittees to prioritize problems, select BMPs and participate in the planning and design of the BMP projects that will meet TMDL target endpoints. Illinois EPA will share TMDL recommended implementation plans with other state agencies. BMPs are found in Section 10, and Decision Document and TMDL Appendices.
Water Permitting	
General NPDES Permit (No. ILR40) MS4 Stormwater Expires 02/28/21	Following notification by Illinois EPA of the TMDL approval, the permittee must modify their stormwater management program to implement the TMDL recommendation, if the permittee determines they are not meeting the TMDL allocations within eighteen months of the notification date. Additional details are found in the General NPDES Permit ILR40, Part III Special Conditions, Subpart C.
NSWRD Waukegan Water Reclamation Facility (IL00030244) Permit expected to be issued in 2016 for a duration of 5 years.	Annual average mercury load of 0.04 kg/yr (0.00024 lbs/day) based on design average flow, which is consistent with the TMDL. This permit also includes a monitoring requirement of 1 day/month (composite sample), and calculation of a rolling annual monthly average mercury value.

EPA does not approve TMDL implementation plans. The plans outlined in the TMDL documents submitted by Illinois EPA offer a clear explanation of its ideas for the implementation efforts to address PCB and mercury source reductions in the study area and responds to concerns raised by the public (see Section 11 of this Decision Document. Illinois has a well-developed FCMP to determine the extent of fish consumption impairments in the state. Illinois EPA also provided BMP source identification in order to facilitate implementation. Illinois EPA provides a schedule for reaching out to the public, planning, and implementing actions that are expected to reduce PCBs and mercury from regulated and unregulated sources. EPA finds that Illinois EPA's implementation submission in this review element contains resources that will be useful for initiating a planning process with the public.

11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process (40 C.F.R. §130.7(c) (1) (ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. §130.7(d) (2)).

Provision of inadequate public participation may be a basis for disapproving a TMDL. If EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

Comment:

Illinois EPA held a public meeting on January 13, 2016 (6:00 pm) at Waukegan Public Library (Bradbury Room), Waukegan, Illinois, and on January 14, 2016 (10:00 am) at the EPA- Region 5 Office in Chicago, Illinois. Each meeting provided the public with an opportunity to comment on the final draft PCB and mercury TMDL reports, and to provide additional information for inclusion that could be used in the final TMDL development process.

Illinois EPA placed a public notice (PN) in the Chicago Tribune and the Waukegan Lake County Sun, announcing the availability of the TMDLs for public review and comments. Both papers circulate widely throughout the Chicago metropolitan area, and the Lake Michigan Nearshore Study area from the border of Cook County through the Wisconsin State line. The public notice gave the date, time, location, and purpose of the meetings. The announcements also provided reference for obtaining additional information about the study area watershed, the TMDL Program, and other related issues.

The PN was mailed to NPDES and MS4 Permittees, environmental groups, and other organizations in the watershed by first class mail. The draft TMDL Report was available for review at the Waukegan Public Library in Waukegan, Illinois and on the Illinois EPA's website at http://www.epa.illinois.gov/public-notices/index. Twenty-two people in Waukegan and six people in Chicago attended the public meetings.

Illinois EPA representatives, and an EPA staff member conducted the public meetings and the TMDL contractors assisted by providing the technical details for the public notice drafts of the PCB and Mercury TMDL reports. Comments were accepted during the public comment period from January 15 through February 16, 2016.

The responsiveness summaries in Appendix F of the PCB TMDL and Appendix E of the mercury TMDL address substantive questions and comments on the Public Notice version of the Illinois Lake Michigan Nearshore PCB and Mercury TMDLs that were provided for review during the public comment period. A summary of the comments is provided below along with Illinois EPA's response.

The Summary of Comments

The responsiveness summary in Appendix F of the TMDL addresses questions and comments on the Public Notice Version of the Illinois Lake Michigan Nearshore PCB and Mercury Total Maximum Daily Load (TMDL) Reports. Illinois EPA accepted comments during the public comment period from January 15 through February 16, 2016.

Illinois EPA responded to a total of 32 comments on topics including: methods for addressing the sources that contribute to water, air, and land-based concentrations of PCBs and mercury; and the applicability of permits to contaminant sources. The major comments are summarized below.

Air Source Targeting and Available Controls

Illinois EPA received several comments asserting that the draft TMDL did not adequately address mercury emissions from the NRG/Midwest Generation, LLC coal-fired power plant in Waukegan. Commenters believed the plant was still a significant contributor to the mercury pollution in Lake Michigan despite its installation of activated carbon injection treatment to reduce mercury air emissions. Commenters advocated for enhancing the plant's existing controls and installing a baghouse to capture mercury and small particulates and further reduce mercury loads.

The Illinois EPA Bureau of Air reported to the Bureau of Water that NRG/Midwest Generation, LLC (Waukegan-Power Plant) was in compliance with state and federal laws and regulations for air mercury emissions. In response to the Bureau of Water's status request, the Bureau of Air also reported that the Waukegan Power Plant units are complying with the federal Mercury and Air Toxics Standard (MATS) which requires power plants to use maximum achievable control technology (MACT) and achieve the degree of reduction associated with that technology. Each unit at the Waukegan facility is equipped with the required control systems to reduce mercury emissions by 90 percent in accordance with 35 Ill. Adm. Code Part 225. Illinois EPA reported that Both units are in compliance with all regulations and permit requirements regulating mercury releases to the environment.

Run-Off From Coal Piles And Coal Ash Storage

Commenters expressed a number of concerns to Illinois EPA regarding Waukegan coal plant's coal piles, coal transport system (conveyors, etc.), and the coal ash ponds at the Waukegan plant including: their proximity to Lake Michigan; precipitation weathering of coal in piles and in train cars adjacent to water bodies and groundwater; the transport and release of leachate from this area into the Lake Michigan watershed; the airborne release of mercury in dust from coal. Commenter recommendations included covering piles and train cars, installing monitoring wells, and monitoring and evaluating leachate for evidence of mercury releases. Illinois EPA responded that the coal pile is sprayed with water to control fugitive dust to meet air permit requirements and the runoff is collected and subject to sediment and oil removal prior to discharge. Groundwater monitoring data for mercury has been collected at NRG/Midwest Generation, LLC (Waukegan Power Plant) since November 2010. In addition, groundwater sampling results from seven on-site monitoring wells are submitted to Illinois EPA. Illinois EPA reported that all results for mercury have been non-detect, with a reporting limit of 0.0002 mg/L and results from groundwater monitoring from the coal pile area demonstrate no impact to groundwater associated with mercury. The coal ash pond water from the lined impoundments is treated, sampled and discharged in accordance with the NPDES permit, as is water contacting transfer equipment, and there is no indication of leachate discharge from the lined ash ponds. Two coal combustion residual (CCR) surface impoundments in the study area are covered by a final EPA rule effective October 19, 2015. The final rule requires that operators of CCR units maintain a publicly available website of compliance information and groundwater monitoring results, corrective action reports, fugitive dust control plans and closure completion notifications.

Commenters also asked Illinois EPA to investigate the potential for gas phase PCBs emissions from sludge piles, and sewage sludge drying beds to contribute to annual PCB emissions in the watershed. Illinois EPA agreed to follow up on this potential source to better understand and address this issue. Illinois EPA received a suggestion that the Chicago Clean Sweep program be revitalized to educate Chicago-area businesses about identifying, managing and properly disposing of PCBs and Mercury. Illinois EPA agreed that the program could serve as a model for interested communities. Illinois EPA placed information in Appendix D of the PCB TMDL, and the Reasonable Assurance and Implementation Sections of the TMDLs that could be useful to communities if they undertake efforts to safely dispose of PCB and mercury-containing wastes.

Available Controls of Water Sources and NPDES Permit Comments

Commenters made suggestions related to monitoring and controlling potential water sources of PCBs and mercury. Commenters requested that Illinois EPA set permit limits and monitoring requirements for potential sources of PCB and mercury loads to Lake Michigan and establish a process for identifying MS4 pipe discharges in need of contaminant controls and controlling mercury and PCB loads leaving these pipes. In addition, the commenters requested that IEPA include provisions in permits requiring new construction to place BMPs at the stormwater pipe entrance.

Illinois EPA responded that wastewater treatment facilities in the Illinois Lake Michigan TMDL Waters hed (refer to Table 6-2 in the TMDL reports) are not allowed to discharge PCBs, as stated in their individual NPDES permits and may be given effluent limits or monitoring requirements in their respective NPDES permits if they have the potential to discharge mercury to Lake Michigan and its tributaries. The current NPDES Permit No. IL0030244 for North Shore Water Reclamation District - Waukegan Water Reclamation Facility does not have mercury limits or monitoring requirements. However, the draft NPDES permit for this facility does contain mercury limits for a discharge to Waukegan North Ditch (Outfall BO2), which is a tributary to Lake Michigan and the TMDL report was revised to include a wasteload allocation to be consistent with the TMDL study and the draft NPDES permit.

Illinois EPA's general MS4 stormwater permit holders do not have limits or monitoring requirements for mercury or PCBs at this time (Section 4.3 of the mercury TMDL). However, the General Permit Part III- Special Condition (C) requires the MS4 permit to be consistent with a TMDL WLA within 18 months of notification by Illinois EPA of TMDL approval. Illinois EPA described the NPDES permit requirements for PCBs and Mercury in the study area in the Responsiveness Summaries and the PCBs and mercury TMDLs. Many of the BMPs suggested by the commenters (filters, screens, wet vault, and hydrodynamic separators, etc.) are contained in the MS4 General Permits and the Illinois Urban Manual (2014). Illinois EPA referred commenters to information on implementation of stormwater management practices in the TMDLs: Section 7 in both TMDLs, Appendix B of the mercury and C of the PCB TMDLs respectively, and the Reasonable Assurance and Implementation Sections in the TMDLs.

Monitoring

Commenters urged Illinois EPA to initiate new monitoring activities, and to develop a monitoring plan for the study area. Suggestions included: taking additional samples from wastewater, industrial sources, and groundwater; tracking waste stream data, and making data available to the public. Commenters suggested that Illinois EPA collect more fish tissue data and use activated carbon methods to measure mercury concentration in the ecosystem. Illinois EPA responded that they will continue to work with IDNR to conduct more fish monitoring (depending on funding) and explore other monitoring options when developing future Water Quality Monitoring Plans. Illinois EPA provided the web address of the monthly discharge monitoring reports (DMRs) for the regulated municipal and industrial wastewater treatment facilities in the watershed. http://dataservices.epa.illinois.gov/dmrdata/dmrsearch.asp
Illinois EPA's website provides information regarding air quality, drinking water quality, and land pollution control programs at http://www.epa.illinois.gov/citizens/index
IEPA made several changes to the draft TMDL as a result of the submitted comments. These changes included a new map of source locations, a schedule for implementation in Section 7 of the TMDLs, and revised language as necessary in the TMDL. These changes are discussed in Appendix E of the TMDL.

EPA finds that the TMDL document submitted by Illinois EPA adequately documents the public participation needed to develop the TMDL, and that Illinois EPA appropriately addressed comments received from the public. The comments are summarized in the TMDL's, Appendix E. The TMDLs were available to the public for 30 days following public meetings on January 13 and 14. Illinois EPA State Calendar.

12. Submittal Letter

A submittal letter should be included with the TMDL submittal and should specify whether the TMDL is being submitted for a technical review or final review and approval. Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the waterbody, and the pollutant(s) of concern.

Comment:

Illinois EPA submitted a package containing two Final Lake Michigan Nearshore TMDLs by email on April 25, 2016. The cover letter, signed by Ryan McCreery, Illinois EPA Deputy Director, explicitly stated that the enclosed documents were final and requested the review and approval of the Illinois Lake Michigan Nearshore PCB and mercury TMDLs in Appendix A of each TMDL, and as described under the TMDL scope in this Decision Document. The submittal also contained a response to public comments on the Public Notice Draft Illinois Lake Michigan Nearshore PCB and Mercury TMDL.

Illinois EPA's submittal addresses 56 Illinois Lake Michigan nearshore/beach/shoreline, harbor and open water segments that are impaired due to concentrations of mercury and PCBs in fish tissue, for a total of 112 impairments. The designated use that is impaired in each of these waters is fish consumption. One segment (Waukegan Harbor North) is also impaired for aquatic life use for PCBs and mercury. The Table in Appendix A of this Decision Document lists the impairments addressed by this TMDL.

EPA finds that Illinois EPA's letter and the final PCB and mercury TMDL Reports submitted by Illinois EPA, adequately identify the waterbodies submitted for approval, water quality impairments addressed by each TMDL, and a TMDL, WLA, LA and MOS to address the impairments found in Appendix B of the TMDL, and Appedix A o f this Decision Document.

13. Conclusion

The Illinois Lake Michigan Nearshore PCB and mercury TMDLs quantify pollutant load reductions needed to reduce PCB and mercury levels in fish tissue and the water column so that the waterbodies can meet WQS. Illinois EPA based each TMDL upon the assumption that fish tissue contaminant concentrations for PCBs and mercury respond proportionally to reductions in atmospheric PCBs and mercury loadings. This approach resulted in a fish tissue target concentration of 0.06 mg/kg for both PCBs and mercury. Illinois EPA described the sources of atmospheric deposition of PCBs and mercury in the study area as being local, regional, national and global. Illinois EPA determined that atmospheric PCB sources from Illinois must be reduced by 94.7% from 2005 levels to meet the fish tissue goal (Table ES-1). Illinois EPA also determined that atmospheric mercury sources from Illinois must be reduced by 78.57% from 2001 levels to meet a fish tissue target concentration (Table ES-1). Reductions are necessary from mercury sources within Illinois and in other U.S. states.

After a full and complete review, the EPA finds that the Illinois Lake Michigan Nearshore PCB and mercury TMDLs satisfy all the elements of approvable TMDLs. This approval is for a total of 112 TMDLs. The approval addresses nearshore, shoreline, harbor and open water segments that are impaired due to concentrations of PCBs and mercury in fish tissue and the water column (Illinois EPA, 2014).[55] One segment (Waukegan Harbor North) is also impaired for aquatic life use due to both PCBs and mercury. These impaired waters are included on the 2014 Draft Illinois Integrated Water Quality Report and Clean Water Act (CWA) Section 303(d) list (Illinois EPA, 2014).

EPA's approval of these TMDLs extends to the water bodies that are identified in Appendix A of this Decision Document with the exception of any portions of the water bodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. EPA is taking no action to approve or disapprove TMDLs for those waters at this time. EPA, or tribes with 303(d) TAS authority as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.

Table 15. Summary of the Illinois PCB TMDL Components

TMDL Components	Results
Target Level and Reduction Factor	
Target Fish PCB Concentration (Fish Tissue Residue Value)	0.06 mg/kg
Baseline PCB Concentration for Carp	1.13 mg/kg
Reduction Factor	94.7 %
PCB Load for Baseline Year 2005	
Point Source Load	No detectable load
Nonpoint Source Load	12.3 kg/yr
Transport from main body of Lake Michigan	7.4 kg/yr
Direct atmospheric load	4.9 kg/yr
Total Baseline Load	12.3 kg/yr
Final TMDL	
Loading Capacity (LC)	0.0026 kg/day
Necessary Reduction from Atmospheric Sources	94.7%
Margin of Safety (MOS)	Implicit
Wasteload Allocation (WLA)	0.000006 kg/day
Load Allocation (LA)	0.0026 kg/day
PCB Load Allocation for In-State and Out-of-State Deposition Sources	
In-State Contribution to LA[a]	0.0019 kg/day
Out-of-State Contribution to LA[b]	0.0007 kg/day

Numbers may not sum exactly due to rounding
[a] Calculated as 73% of LA [b] Calculated as 27% of LA

[55] Listed in Appendix A of this Decision Document, and in Appendix B of the Mercury

The components of the PCB TMDL are summarized in Table 5 of the Decision Document (Table 6-5 of the PCB TMDL). The components of the mercury TMDL are summarized in Table 7 of the Decision Document (Table 6-5 of the Mercury TMDL).

Table-16. Summary of Illinois Mercury TMDL Components

TMDL Components	Result
Target Level and Reduction Factor	
Target Fish Mercury Concentration (Fish Tissue Residue Value)	0.06 mg/kg
Baseline Mercury Concentration for Largemouth Bass	0.28 mg/kg
Reduction Factor	78.57%
Mercury Load for Baseline Year 2001	
Point Source Load	No detectable concentration
Nonpoint Source Load	33.51 kg/year
Total Baseline Load	33.51 kg/year
Final TMDL	
Loading Capacity (LC)	0.02 kg/day
Margin of Safety (MOS)	Implicit
Wasteload Allocation (WLA)	0.0004 kg/day
Load Allocation (LA)	0.02 kg/day
Mercury Load Allocation for In-State and Out-of-State Deposition Sources	
In-State Contribution to LA[a]	0.0036 kg/day
Out-of-State Contribution to LA[b]	0.0160 kg/day
Necessary Reduction from Anthropogenic Emission Sources	89.29%

Note: numbers may not sum exactly due to rounding

[a] Anthropogenic sources only

[b] Anthropogenic and natural sources

References can be found in Appendix H

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Appendix A: List of Waters Included in TMDL

Table A-1. PCB and Mercury-Impaired Segments Addressed by the Illinois Lake Michigan Nearshore TMDL Approval

TMDL Zone	HUC 10	Waterbody Name	Segment ID	Designated Use Impairment
Nearshore open water/shoreline	Lake Michigan Shoreline	North Point Beach	IL_QH-01	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	IL Beach State Park North	IL_QH-03	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Waukegan North Beach	IL_QH-04	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Waukegan South Beach	IL_QH-05	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	IL Beach State Park South	IL_QH-09	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Lake Bluff Beach	IL_QI-06	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Lake Forest Beach	IL_QI-10	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Rosewood Beach	IL_QJ	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Park Ave. Beach	IL_QJ-05	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Glencoe Beach	IL_QK-04	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Tower Beach	IL_QK-06	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Lloyd Beach	IL_QK-07	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Maple Beach	IL_QK-08	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Elder Beach	IL_QK-09	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Kenilworth Beach	IL_QL-03	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Gilson Beach	IL_QL-06	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Greenwood Beach	IL_QM-03	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Lee Beach	IL_QM-04	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Lighthouse Beach	IL_QM-05	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Northwestern University Beach	IL_QM-06	Fish consumption

TMDL Zone	HUC 10	Waterbody Name	Segment ID	Designated Use Impairment
Nearshore open water/shoreline	Lake Michigan Shoreline	Clark Beach	IL_QM-07	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	South Boulevard Beach	IL_QM-08	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Touhy (Leone) Beach	IL_QN-01	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Loyola (Greenleaf) Beach	IL_QN-02	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Hollywood/ Ostermann Beach	IL_QN-03	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Foster Beach	IL_QN-04	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Montrose Beach	IL_QN-05	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Juneway Terrace	IL_QN-06	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Rogers Beach	IL_QN-07	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Howard Beach	IL_QN-08	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Jarvis Beach	IL_QN-09	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Pratt Beach	IL_QN-10	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	North Shore/Columbia	IL_QN-11	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Albion Beach	IL_QN-12	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Thorndale Beach	IL_QN-13	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	North Ave. Beach	IL_QO-01	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Fullerton Beach	IL_QO-02	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Webster Beach	IL_QO-03	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Armitage Beach	IL_QO-04	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Schiller Beach	IL_QO-05	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Oak St. Beach	IL_QP-02	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Ohio St. Beach	IL_QP-03	Fish consumption

TMDL Zone	HUC 10	Waterbody Name	Segment ID	Designated Use Impairment
Nearshore open water/shoreline	Lake Michigan Shoreline	12th St. Beach	IL_QQ-01	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	31st St. Beach	IL_QQ-02	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	49th St. Beach	IL_QR-01	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Jackson Park/63rd Beach	IL_QS-02	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Rainbow	IL_QS-03	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	57th St. Beach	IL_QS-04	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	67th St. Beach	IL_QS-05	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	South Shore Beach	IL_QS-06	Fish consumption
Nearshore open water/shoreline	Lake Michigan Shoreline	Calumet Beach	IL_QT-03	Fish consumption
Nearshore open water/shoreline	Lake Michigan Open Water	Open waters Lake Michigan Nearshore	IL_QLM-01	Fish consumption
North Point Marina Harbor	North Point Marina Harbor	North Point Marina Harbor	IL_QH	Fish consumption
Waukegan Harbor	Waukegan Harbor	Waukegan Harbor North	IL_QZO	Fish consumption, Aquatic life
Calumet Harbor	Calumet Harbor	Calumet Harbor	IL_3S	Fish consumption
Diversey Harbor	Diversey Harbor	Diversey Harbor	IL_QZI	Fish consumption

Appendix B: Waste Load Allocations

NPDES Permitted Facilities That Are Part of the Illinois Lake Michigan Nearshore WLAs For Mercury and PCB TMDLs

Table B-1. (Summarized from the Illinois Lake Michigan Nearshore TMDL)

Type of Permit	Place Name (MS4 permit)	Permit Number	Contaminant WLA	
			Hg (kg/day)	PCBs (kg/day)
MS4	Beach Park	ILR400164	0.0003(b)	0.000006 (b)
MS4	Chicago	ILR400173		
MS4	Cook County Highway Department	ILR400485		
MS4	Evanston	ILR400335		
MS4	Glencoe	ILR400198		
MS4	Highland Park	ILR400352		
MS4	Highwood	ILR400353		
MS4	Kenilworth	ILR400214		
MS4	Lake Bluff	ILR400366		
MS4	Lake County	ILR400517		
MS4	Lake Forest	ILR400367		
MS4	North Chicago	ILR400402		
MS4	Shields Township	ILR400123		
MS4	Waukegan	ILR400465		
MS4	Waukegan Township	ILR400148		
MS4	Wilmette	ILR400473		
MS4	Winnetka	ILR400476		
MS4	Winthrop Harbor	ILR400477		
MS4	Zion	ILR400482		
MS4	Illinois Department of Transportation	ILR400493		
Individual	Zion Solutions LLC	IL0002763		NDA (0)

Type of Permit	Place Name (MS4 permit)	Permit Number	Contaminant WLA	
			Hg (kg/day)	PCBs (kg/day)
Individual	Winnetka Power Generation Station	IL0002364		NDA (0)
Individual	Midwest Generation LLC Waukegan	IL0002259		NDA (0)
Individual	NSWRD Waukegan Water Reclamation Facility (a)	IL L0030244	0.0001	

(a) At design average flow.
(b) An aggregate WLA (.0003 kg/day x total aggregate flow volume) is assigned to entities with MS4 permits in the project study area. NDA = No Discharge Allowed

The PCB TMDL establishes WLAs for MS4s and three individual NPDES-permitted dischargers, to ensure that PCB loadings from these sources attain WQS. Entities in the study area with MS4 permits are listed along with three individual NPDES permits for facilities which currently have PCB limits in their permits.

Appendix C Menu of BMPs in the Mercury and PCB TMDLs for MS4s and MS4 Communities

Taken from Appendix D of the PCB TMDL and Appendix C of the Mercury TMDL

In the Illinois Lake Michigan Nearshore Mercury TMDL, Illinois EPA is proposing an approach that uses best management practices (BMPs) to control and reduce discharges of PCBs and mercury. EPA has proposed this approach to effectively reduce discharges of PCBs and mercury from permitted sources, including MS4s. The authority to establish BMP conditions in NPDES permits is provided in 40CFR 122.44 (k).

ILLINOIS EPA proposes the following example language which can be incorporated into MS4 permits, as adapted from Appendix B 3.1 Specific Recommendations for Areas of Permitted MS4s Contributing to Surface Water Discharges to the Spokane River or Little Spokane River.

MS4-1. Evaluate levels of PCBs/mercury in stormwater in areas of the MS4 to identify areas more likely to contribute PCBs/mercury to surface waters based on any available information.

MS4-2. Evaluate levels of PCBs/mercury in solids, at a quantitation level for total PCBs/mercury appropriate for identifying these areas using an EPA-approved test method.

MS4-3. Prioritize BMPs that are related to reducing or eliminating PCBs/mercury in stormwater in areas of the MS4 more likely to contribute PCBs/mercury to surface waters, based on any available information, including but not limited to the following:

- -Previous and ongoing PCBs/mercury monitoring.
  - Includes monitoring for PCBs/ mercury in sediment traps, catch basins, and in stormwater suspended particulate matter (SSPM) at frequencies and locations adequate to assess and identify sources of PCBs/mercury to municipal stormwater.
- -Nearby toxics cleanup sites with PCBs/mercury as a known contaminant.
- -Business inspections and compliance records.

MS4-4. Remove accumulated solids from drain lines (including inlets, catch basins, sumps, conveyance lines, and oil/water separators) in priority areas of the MS4 at least once during the permit cycle.

MS4-5. Work with partners to remove of any identified legacy PCBs/ mercury sources within the MS4 as soon as practicable.

MS4-6. Purchase preferred products with the lowest practicable PCBs/mercury concentrations for products that are likely to contact municipal stormwater.

MS4-7. Collaborative efforts are encouraged to comply with PCBs/mercury source control requirements to achieve reductions sought in the TMDL.

MS4-8. The permits should include the following requirements for new development and redevelopment disturbing one acre or more:

-Site design to minimize impervious areas, preserve vegetation, and preserve natural drainage systems.

-On-site stormwater management.

CCMS4-1. The permits should address possible contributions of PCBs/mercury to the MS4 from businesses within the areas served by the MS4 as follows:

-The permits should require the establishment and maintenance of a database of inspections and status of compliance with applicable State and federal laws and local ordinance related to PCBs/mercury in stormwater, for businesses within the area served by the MS4.

-Based on the information in the database and other available information, the permits should require the permittees to identify businesses that are likely to contribute PCBs/ mercury to the MS4 and to follow up with such businesses and appropriate regulatory agencies to develop and implement BMPs to reduce contributions of PCBs/mercury to the MS4 from such businesses.

Appendix D: BMP Application for Controlling Mercury in Urban Areas Relative to Sources

Table 7-1. BMP Application for Controlling
Mercury in Urban Areas Relative to Sources (Source: San Francisco Estuary Institute, 2010)

	Implementation Points								Applicable sources and pathways	
	Dispersed								Hg	
Best Management Practice (BMP) Category	Private homes	Public lots, schools, hospitals, govt bldgs and research institutions	Private offices and businesses	Other private lots and industrial yards	On the street	Start of pipe	Within pipe	End of pipe	Sources	Pathways
Institutional BMPs										
Education and outreach	√	√	√	√					IUP,ID,HW,BDR	
Volunteer cleanup efforts	√	√	√	√	√				IUP,ID,HW,BDR	
Recycling	√	√	√	√					IUP,ID,HW,BDR	
Amnesties	√	√	√	√					IUP,ID,HW,BDR	
Product Bans/product replacement	√	√	√	√					IUP,ID,HW,BDR	
Enforcement			√	√					OI,IUP,ID,HW,BDR	
Sweeping		√	√	√	√				A,OI,RF,RD,BDR	RI,VT,FT,W
Washing (streets/footpaths)		√	√	√	√				RD,BDR	RI,VT,FT,W
Illicit waste dumping cleanup					√	√	√	√	OI	RI
Stormwater conveyance maintenance				√		√	√	√	A,ID,RF	RI,VT,FT,W
Treatment BMPs										
Infiltration trench		√	√	√		√			A,OL,RF	RI,VT,FT,W
Infiltration basin		√	√	√		√			A,OL,RF	RI,VT,FT,W
Retention and reuse/irrigation	√	√	√			√		√	A,OL,RF	RI,VT,FT,W
Wet Pond		√	√	√		√			A,OL,RF	RI,VT,FT,W
Constructed wetland		√	√	√		√		√	A,OL,RF	RI,VT,FT,W
Extended detention basin		√	√	√		√		√	A,OL,RF	RI,VT,FT,W
Vegetated swale		√	√	√		√			A,OL,RF	RI,VT,FT,W
Vegetated buffer strip		√	√	√		√			A,OL,RF	RI,VT,FT,W
Bioretention (rain garden/green roof)	√	√	√	√		√			A,OL,RF	RI,VT,FT,W
Media filter		√	√	√			√		A,OL,RF	RI,VT,FT,W
Water quality inlet		√	√	√			√		A,OL,RF	RI,VT,FT,W
Wet vault		√	√	√			√		A,OL,RF	RI,VT,FT,W
Hydrodynamic separation		√	√	√			√		A,OL,RF	RI,VT,FT,W
Drain insert		√	√	√			√		A,OL,RF	RI,VT,FT,W
Flow diversion to wastewater treatment								√	All sources	All pathways

True sources: deposition= A
Source areas: Old industrial - OI, Hg products still in use = IUP, Illegal disposal - ID, Recycling facilities = RF, Road deposits = RD, Home and work place = HW
Building demolition and remodeling = BDR
Transport pathways: Runoff from impervious surfaces = RI, Vehicle tracking = VT, Foot tracking = FT, Wind = W

Applicable sources and pathways	
PCBs	
Sources	Pathways
F,OI,IUP,ID,HW,BDR	
F,OI,IUP,ID,HW	
OI,IUP,HW	
F,OI,IUP,HW	
F,OI,IUP,ID,HW,BDR	
A,OI,RF,RD,BDR	RI,VT,FT,W
RD,BDR	RI,VT,FT,W
OI,ID	RI
A,OI,ID,RF	RI,VT,FT,W

Figure D-1 Sources and Pathways of PCBs

Table 7-2. BMP Application for Controlling Mercury in Urban Areas Relative to Sources (Source: San Francisco Estuary Institute, 2010)

Best management practice (BMP) category	Most applicable effectiveness assessment outcome levels					
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
	Documenting activities	Raising awareness	Changing behavior	Reducing loads from sources	Improving runoff quality	Protecting receiving water quality
Institutional BMPs						
Education and outreach	√	√	√			
Volunteer cleanup efforts	√			√		
Recycling	√			√		
Amnesties	√			√		
Product Bans / product replacement	√			√		
Enforcement	√	√	√	√		
Sweeping	√			√		
Washing (streets/footpaths)	√			√		
Illicit waste dumping cleanup	√			√		
Stormwater conveyance maintenance	√			√	√	
Treatment BMPs						
Infiltration trench	√			√	√	
Infiltration basin	√			√	√	
Retention and reuse / irrigation	√			√	√	
Wet Pond	√			√		
Constructed wetland	√			√		
Extended detention basin	√			√		
Vegetated swale	√			√	√	
Vegetated buffer strip	√			√	√	
Bioretention (Rain garden / green roof)	√			√	√	
Media filter	√			√		
Water quality inlet	√			√		
Wet vault	√			√		
Hydrodynamic separation	√			√		
Drain insert	√			√		
Flow diversion to wastewater treatment	√			√	√	√

True sources: deposition= A
Source areas: Old industrial - OI, Hg products still in use = IUP, Illegal disposal - ID, Recycling facilities = RF, Road deposits = RD, Home and work place = HW
Building demolition and remodeling = BDR
Transport pathways: Runoff from impervious surfaces = RI, Vehicle tracking = VT, Foot tracking = FT, Wind = W

Appendix E: Gas-Exchange Model (GEM) Proportionality Approach

Illinois used a second proportionality approach for PCBs, called a Gas-Exchange Model (GEM) Direct Proportionality Approach. This approach is based on a gas phase equilibrium equation combined with bioaccumulation factors (BAFs) and the result is independent of legacy sediment effects. The GEM proportionality approach also yields an estimate of needed percent reductions in PCBs for comparison with the FTB approach. Illinois uses the alternate approach to verify whether the reduction in loads to meet fish tissue numbers will also meet the 26 pg/L target for PCBs in the water column for the protection of human health that has been adopted by the State of Illinois as part of the Great Lakes Water Quality Initiative (GLI). These approaches are addressed separately in the PCB Section of the Decision Document below.

GEM Proportionality Approach to PCB TMDL Development
As explained in Section 3.1 of the Decision Document, Illinois used a second proportionality approach in the TMDL which applies theoretical and empirically-based equations to link atmospheric loading to the resulting PCB concentrations in fish tissue, as well as in the water column (Section 5.2 of the PCB TMDL). The approach does not require existing fish tissue concentrations and is therefore, not influenced by the legacy effect inherent in the existing carp tissue data. The GEM proportionality approach consists of the following steps:56

1. Determine atmospheric PCB concentration needed to comply with WQS (water column).
2. Define the relationship between sediment and water column PCB concentrations.
3. Use published biota-sediment accumulation factors to define the relationship between sediment and carp tissue PCB concentrations.
4. Use published bioaccumulation factors to define the relationship between water column PCB and lake trout tissue PCB concentrations

The application of each step to the Illinois Lake Michigan Nearshore PCB TMDL is described below.

1. Determine the Atmospheric PCB Concentration To Comply With WQS (water column).

Section 5.2.1 of the TMDL presents the linkage between atmospheric PCB concentrations and water column concentrations, identifying what the atmospheric concentration would be at steady state, when the water column PCB concentration is at the water quality criteria for the water column of 26 pg/L. Illinois with support from LimnoTech, used Henry's Law, a basic chemistry gas law, which states that the amount of a gas that dissolves in a liquid is directly proportional to the partial pressure (i.e. gas phase concentration) of that gas in equilibrium with that liquid. This is expressed mathematically in the TMDL as:

$p = kH\ c$ (5-3 of the PCB TMDL)

p = the partial pressure of the gas above the solution
kH = a chemical constant termed the Henry's Law constant
c = the concentration of the dissolved gas in solution

[56] All relationships are for steady-state concentrations.

Illinois and the contractor define the atmospheric PCB concentration that will result in compliance with WQS (26 pg/L) by adapting[57] equation 5-3 for PCBs and solving the equation58 to get a Henry's Law constant of 1.09 x10-04 atm*m3/mol at ambient temperature.

kH = p/c
=1.09 x 10-04 atm*m3/mol

Using 0.67 as the fraction of dissolved PCB in the water column (taken from the MICHTOX model, USEPA, 2006), Illinois EPA and Limnotech found this Henry's Law constant to result in an atmospheric concentration of 82 pg/m3 which is the equilibrium equivalent of a water column standard of 26 pg/L.

2. Define The Relationship Between Steady State Sediment PCB and Water Column Concentrations

In Section 5.2.2 of the TMDL Illinois defines the linkage between water column concentrations and sediment concentrations.

The ratio between sediment and water column PCB concentrations can be defined as shown in equation 5-4 (Chapra, 1997):

$$C2/C1 = (VsFp1 + VdFd1) / (k2Z2 + Vr + Vb + VdFd2) \quad (5\text{-}4)$$

C2/C1 = ratio of sediment PCB concentration to water column PCB concentration
Vs = solids settling velocity (m/day)
Fp1 = fraction of PCB in particulate form - water column
k2 = PCB decay rate in sediments (1/day)
Z2 = sediment layer thickness (m)
Vr = sediment resuspension velocity (m/day)
Vb = sediment burial velocity (m/day)
Vd = diffusion velocity
Fd1 = fraction of PCB in dissolved form - water column
Fd2 = fraction of PCB in dissolved form - sediments

Illinois populates equation 5-4 with steady state coefficient values estimated for Southern Lake Michigan during the development of the MICHTOX Lake Michigan Mass Balance Project (USEPA, 2006; Endicott, 2005; and Endicott et al., 2005). The values are listed in Table 5-3 in

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[57] The adaptations taken for this TMDL consisted of: 1) using a Henry's Law constant representative of the mixture of PCB congeners present in the Great Lakes (LimnoTech, 2004); 2) using an annual average temperature of 10 °C taken from USEPA (2006) MICHTOX model results for Lake Michigan; and 3) using fraction dissolved PCB in the water column of 0.67, also taken from the MICHTOX (USEPA, 2006) modeling. Further detail on this procedure can be found in section 5.2.1 in the TMDL.

[58] Henry's Law applies to a single chemical at a constant temperature, while PCBs represent a mixture of individual chemicals, and the temperature of Lake Michigan varies seasonally. It also predicts only the dissolved phase PCB concentration in water, while total PCB concentrations consist of both dissolved and particulate forms.

the TMDL. Illinois EPA used a number of these factors59 to calculate a steady state sediment/water column PCB ratio of 9.61 x 104. Illinois combined this ratio with the water column water quality standard for PCBs of 26 pg/L, resulting in a sediment PCB concentration of 2.50 x 10-3 g/m3.

3. Relationship between Steady State Sediment PCB and Fish Tissue PCB Concentrations

In Section 5.2.3 of the TMDL Illinois used a biota sediment accumulation factor (BSAF) to define the relationship between steady-state carp tissue PCB concentrations and sediment PCB concentrations. BASFs describe the bioaccumulation of sediment-associated organic compounds or metals into tissues of ecological receptors. Illinois used the following equation (Burkhard, 2009) to calculate concentrations of PCBs in fish tissue attributable to sediments:

$$C_{FISH} = \frac{BSAF.C_{SED}.F_L}{F_{SOC}} \qquad (5\text{-}5)$$

Where:

C_{FISH} = the chemical concentration in the organism (μg/kg wet weight)
$BSAF$ = the biota sediment accumulation factor (g organic carbon/g lipid)
C_{SED} = the chemical concentration in surficial sediment (μg/kg dry weight)
F_L = the lipid fraction of the organism (g lipid/g wet weight)
F_{SOC} = the fraction of the sediments as organic carbon (g organic carbon/g dry weight).

USEPA (2015d) has a database containing over 20,000 BSAFs for organic chemicals from 20 locations across the country. Illinois EPA uses a median BSAF of 3.3 g organic carbon/g lipid from the database for Lake Michigan at Green Bay, Wisconsin. Illinois EPA identified a median carp fillet lipid content of 8.85 percent using the carp data from the TMDL project database.

Illinois used Equation 5-5 of the PCB TMDL to calculate that a carp tissue PCB concentration of 0.0585 mg/kg would be expected for a water column PCB concentration equal to the water quality standard of 26 pg/L. Illinois notes that the TMDL is protective of the water column water quality standard and would also be protective of carp tissue concentrations (TMDL target 0.06 mg/kg).

The MICHTOX model indicated that results could vary within a factor of two (likely more when applied to harbors) and the lipid content of individual carp fillets used to calculate the average varied over several orders of magnitude.

4. Relationship between Steady State Water Column PCB and Lake Trout Tissue PCB Concentrations

In Section 5.2.4 of the PCB TMDL, Illinois EPA calculates a lake trout tissue PCB concentration of 0.028 mg/kg being expected in for a water column PCB concentration equal to the water quality standard of 26 pg/L (2.6 x 10-8 mg/L). Lake trout is not the species selected to determine fish tissue concentration reductions for this TMDL. However, quantifying the relationship

[59] solids settling, resuspension and burial velocities (m/day), fraction of PCB in the waterbody in dissolved and particulate forms, PCB rate of decay and sediment layer thickness

between lake trout tissue PCB content and the water column demonstrates that the FTB proportionality method would be protective of tissue concentrations in lake trout, a species that is largely influenced by exposure to PCBs in the water column.

Introduction to Percent Reduction calculation.

In Section 5.3 of the PCB TMDL, Illinois EPA calculates the required reduction percentage necessary to attain each TMDL target. It also provides a recommendation for which reduction percentage should serve as the basis for the PCB TMDL.

Illinois determined a baseline year of 2005 for this PCB TMDL for the following reasons:

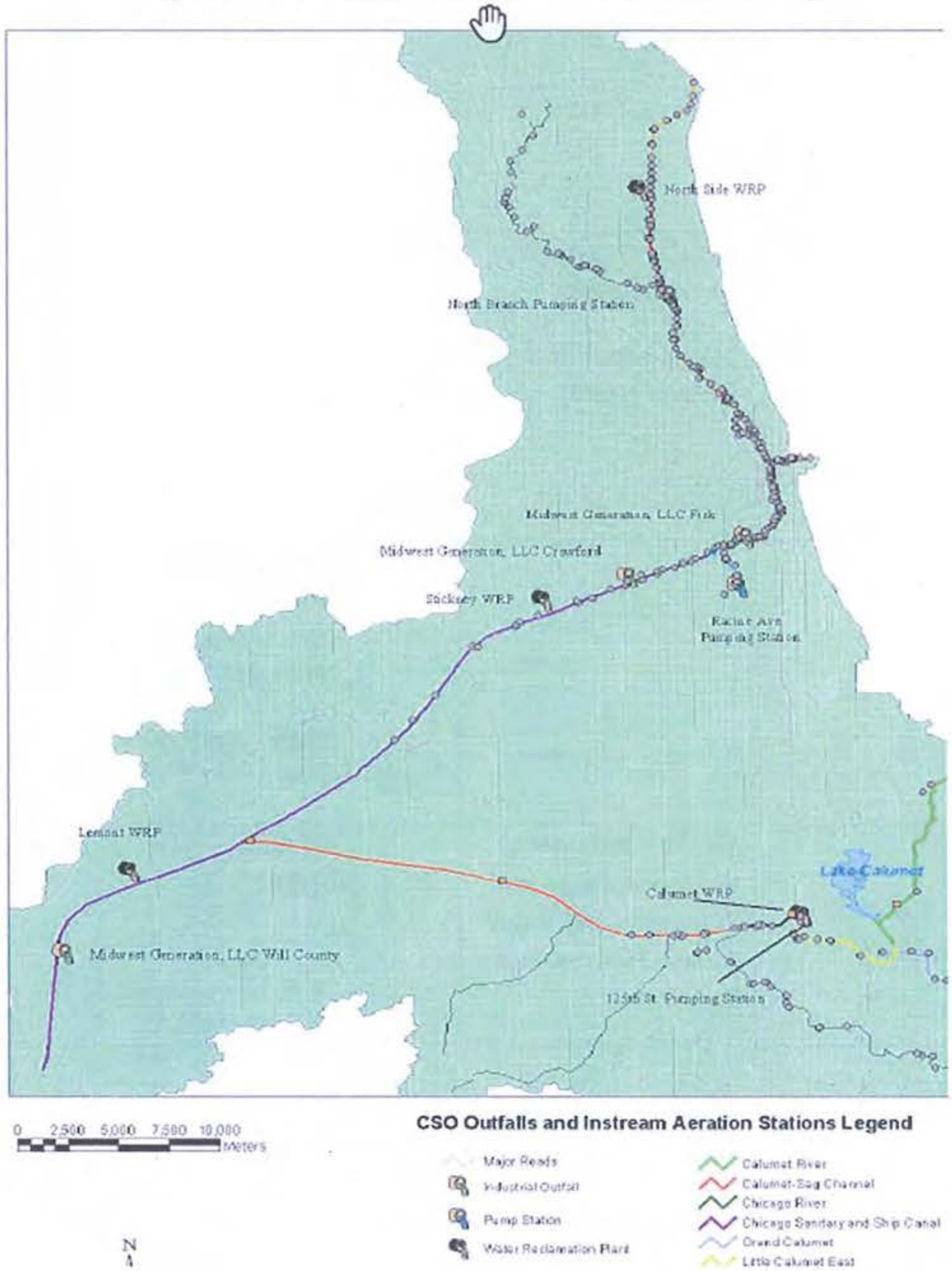
- The carp tissue data used in the fish tissue-based approach were all collected in 2005.
- The lake trout tissue data used in the fish tissue-based approach were all collected between 2000 and 2009.
- The two scientific papers that document the decline in atmospheric PCB concentrations since the 1979 PCB ban (Venier and Hites, 2010b; Sun et al., 2006) are based on data sets that end in 2007 and 2003, respectively. Using a baseline of 2005 is consistent with these studies.

Appendix F: Visual Representations of Chicago Area Waterways.

The Chicago UAA analysis of 2011, Section 4, pages 4-8

The map below identifies the location of instream aeration stations and significant point source inputs such as water reclamation plants, CSO pumping stations and power generating facilities. The impacts of wet weather and CSO discharges were evaluated using rainfall data from Midway and O'Hare airports and discharge volume data provided by the MWRD for the CSO pumping stations. The pumping station discharges to the waterways when the TARP CSO capture system is near capacity. Changes in dissolved oxygen concentrations were assessed in response to rainfall and/or CSO discharge events using continuous time series (hourly) plots of rainfall, DO and temperature data for 36 stations distributed throughout the waterways. Similar assessments were made using monthly grab E.coli bacteria data.

Figure 4-3 - CSO Outfalls and Instream Aeration Stations Legend



Appendix G: PCB and Mercury Analysis Methods and Their Detection Limits

Table G-1. EPA Analytical Methods for PCBs

EPA PCB Analytical Method Number	Procedure Name	Year	Method Detection Limit	Pico grams
608 608.3	gas chromatograph chromatograph/ halogen-specific detector (HSD)	1984 2014 1984	.065 μg/L 150 ng/L 30 -36μg/L	65,000.00 pg/ L 150,000 pg/L
8082 (select arochlors - cheaper)[60]			typical reporting limits 0.01 – 1.0 μg/L (low level limits 0.005 μg/L) 5 ng/L typical for water	10,000 pg/L - 1,000,000 pg/L 5,000 pg/L
1668A (All 209 PCB congeners)	Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry		.05 ng/L – 100 ng/L61	50 pg/L [62]

[60] EPA. 2017. CWA §136 Rule Update

[61] EPA. 2002Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry

[62] Pace Analytical Services, Inc., www.pacelabs.com accessed 2/4/2019, 1700 Elm Street, STE 200, Minneapolis, MN 55414.

Table G-2. EPA Analysis Methods for Mercury

EPA Hg Analytical Method Number	Procedure Name	Year	Method Detection Limit	Pico grams/L
245.3 245.7	Cold Vapor Technique Cold Vapor Absorption Spectrometry	(1974) (1994) (2005)	 0.2-10 µg /L. 1-50 ng/L	200,000 pg/L 10,000,000pg/L 1000 pg/L 50,000 pg/L
1631E	Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry	(2002)	.05 ng/L – 100 ng/L[63]	50 pg/L [64]

[63] Ibid.

[64] Pace Analytical Services, Inc., www.pacelabs.com accessed 2/4/2019, 1700 Elm Street, STE 200, Minneapolis, MN 55414.

Appendix H: Illinois Lake Michigan Nearshore PCB and Hg TMDL Review References (References can also be found in PCB and Hg TMDLs)

Atkeson, T., D. Axelrad, C. Pollman, and G. Keeler, 2003. Integrated Summary Integrating Atmospheric Mercury Deposition and Aquatic Cycling in the Florida Everglades: An approach for conducting a Total Maximum Daily Load analysis for an atmospherically derived pollutant. Prepared for: U.S. Environmental Protection Agency, October, 2002, Revised October 2003. http://www.dep.state.fl.us/water/sas/mercury/docs/everglades_hg_tmdl_oct03.pdf

Beletsky, D. and D. J. Schwab, 2001. Modeling circulation and thermal structure in Lake Michigan: Annual cycle and interannual variability. *Journal Geophysical Research,* 106 (C9): 19,745-19,771.

CAS Lab. accessed 2/27/2019 http://www.caslab.com/EPA-Methods/PDF/EPA-Method-2452.pdf

Endicott, D.D., W.L. Richardson, and D.J. Kandt, 2005. *1992 MICHTOX: A Mass Balance and Bioaccumulation Model for Toxic Chemicals in Lake Michigan. Part 1 and Part 2.* Rossmann, R. (ed.), *MICHTOX: A Mass Balance and Bioaccumulation Model for Toxic Chemicals in Lake Michigan.* U.S.EPA, Office of Research and Development, National Health and Environmental Effects Laboratory, Mid-Continent Ecology Division, Large Lakes and Rivers Forecasting Research Branch, Large Lakes Research Station, Grosse Ile, MI. EPA/600/R- 05/158, 140 pp.

EPA, 2018, Email record, between Christine Urban, EPA, David Dilkes, Limnotech, and Abel Haile, Illinois EPA May 11, 2018.

EPA Watershed Academy Web: Introduction to the Clean Water Act. United States Environmental Protection Agency (EPA), 2015.

EPA, 2016. Coal Ash Basics. Factsheet Accessed EPA intra net: https://www.epa.gov/coalash/coal-ash-basics

EPA, 2015 http://epa.gov/greatlakes/glindicators/fishtoxics/topfishb.html accessed prior to web updated January 19, 2017. https://www.epa.gov/great-lakes-aocs/about-waukegan-harbor-aoc

EPA, 2015. Personal communication with D. Atkinson EPA HQ, Mercury TMDL. April, 2015.

EPA, 2014. Outboard Marine Corporation Superfund Site.
http://www3.epa.gov/region5/cleanup/outboardmarine/index.htm
(Archived on January 19, 2017)
https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0500083

EPA, 2012. http://www.epa.gov/greatlakes/monitoring/fish/pcbs.html - (Archived on January 19, 2017). https://www.epa.gov/great-lakes-monitoring/great-lakes-fish-monitoring-and-surveillance

EPA, 2011a. PCB Transformer Registration Database February 2011- (Updated 2015) https://19january2017snapshot.epa.gov/sites/production/files/2015-10/documents/most_recent_registrations_excel_document.xls_.pdf

EPA, 2006. Results of the Lake Michigan Mass Balance Project: Polychlorinated biphenyls Modeling Report. Rossmann, R. (Ed.) United States Environmental Protection Agency. Development, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division-EPA-600/R-04/167, 579 pp.

EPA, 2008. Model-Based Analysis and Tracking of Airborne Mercury Emissions to Assist in Watershed Planning. Watershed Branch, Office of Wetlands, Oceans, and Watersheds. Washington, D.C. https://www.epa.gov/tmdl/model-based-analysis-and-tracking-airborne-mercury-emissions-assist-watershed-planning-report accessed 3/2019.

EPA, 2002. *Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry*. Office of Water 4303, EPA-821-R-02-019, Section 1.5, August 2002.

EPA, 1997. Compendium of Watershed-scale Models for TMDL Development Section 1.2, Classification of Watershed Scale Models. Pg. 2-3.

Fernandez, Arianne. 2012. Spokane River Urban Waters Source Investigation and Data Analysis Progress Report (2009-2011) Washington DOE Publication No. 12-04-025 September 18, pg 12.

Green, M.L., J.V. DePinto, C. Sweet, and K.C. Hornbuckle, 2000. Regional spatial and temporal interpolation of atmospheric PCBs: interpretation of Lake Michigan Mass Balance Data. *Environmental Science and Technology*. 34(9):1833-1841.

Illinois Department of Public Health website Factsheet "Fish Advisories in Illinois" "Designated Use Support" (Section 3.2 of the PCB TMDL).

Illinois Environmental Protection Agency (IEPA), 2015. Developing your Stormwater Pollution Prevention Plan: A Guide for Industrial Groups. Available on-line at http://www.epa.illinois.gov/topics/pollution-prevention/mercury/index

IEPA, 2018. Draft CWA Integrated Report, Table C-14 and C-15

IEPA, 2014. Illinois Integrated Water Quality Report and Section 303(d) List, 2014. Clean Water Act Sections 303(d), 305(b) and 314. Available online at: http://www.epa.state.il.us/water/tmdl/303-appendix/2014/iwq-report-surface-water.pdf

IEPA, 2006. Technical Support Document for Reducing Mercury Emission from Coal-fired Electric Generating Units. AQPSTR 06-02. IEPA Air Quality Planning Section, Division of Air Pollution Control, Bureau of Air.(Table 4.2 Current Human Health-Based Concentrations in Fish Tissue for issuing consumption Advisories due to Mercury, pg. 53.

LimnoTech, Dilkes, D. 2018 5/16/18 email to Christine Urban, EPA Clarification of calculation data used for (Zion) facility.

MWRDGC R &D Department. 2008. Report No. 08-15R Description of the Chicago Waterway System for the Use Attainability Analysis. (March 2008) CSO information is available at https://www.mwrd.org/irj/go/km/docs/documents/MWRD/internet/reports/Monitoring_and_Research/pdf/2008/08-15%20Description%20of%20CWS%20Report%20for%20UAA.pdf

MWRDGC Website, Flow Reversal Data 1985 to 2017 accessed last (March 5, 2019) http://www.mwrd.org/irj/go/km/docs/documents/MWRD/internet/protecting_the_environment/Combined_Sewer_Overflows/pdfs/Reversals.pdf

Miller, S.M., M.L. Green, J. V. DePinto, and K.C. Hornbuckle, 2001. Results from the Lake Michigan Mass Balance Study: Concentrations and Fluxes of Atmospheric Polychlorinated Biphenyls and *trans*- Nonachlor. *Environmental Science and Technology*. 35: 278-285.

Minnesota Pollution Control Agency (MPCA), 2007. Minnesota Statewide Mercury Total Maximum Daily Load. Minnesota Pollution Control Agency. March 27, 2007. http://www.pca.state.mn.us/index.php/view-document.html?gid=8507

San Francisco Estuary Institute (SFEI), 2010. A BMP Tool Box for Polychlorinated Biphenyls (PCBs) and Mercury (Hg) Municipal Stormwater San Francisco Estuary Institute, Oakland CA.

Schueler, T., 1987. Controlling Urban Runoff: A Manual for Planning and Designing Urban Stormwater Best Management Practices. Metropolitan Washington Council of Governments, Washington, DC.

Simcik, M.R., H. Zhang, S. J. Eisenreich, and T. P. Franz, 1997. Urban Contamination of the Chicago/Coastal Lake Michigan Atmosphere by PCBs and PAHs during AEOLOS. *Environmental Science & Technology*, Vol. 31, No. 7. pp. 2141 – 2147. (p.29 DD TMDL).

Sun, P, I. Basu, and R.A. Hites, 2006. Temporal Trends of polychlorinated Biphenyls in precipitation and air at Chicago. *Environ. Sci. Technol.*

Venier, M.A. and R.A. Hites, 2010a. Time Trend Analysis of Atmospheric POPs Concentrations in the Great Lakes Region Since 1990. *Environmental Science and Technology.* 44: 8050-8055.

Washington Department of Ecology, 2014. Draft PCB Chemical Action Plan. Publication no. 14-07-024. https://fortress.wa.gov/ecy/publications/documents/1407024.pdf

Zhang, H., S. Eisenreich, T. Franz, J. Baker, and J. Offenberg, 1999. Evidence of increased gaseous PCB fluxes to Lake Michigan from Chicago. *Environmental Science and Technology*. 33:2129-2137. November 2012. http://pubs.usgs.gov/fs/2012/3122/pdf/FS2012-3122_Web .pdf

EXHIBIT B

LimnoTech
Water | Environment | Scientists | Engineers

Statewide Michigan PCB Total Maximum Daily Load (TMDL)

August 2013

Prepared for:

Michigan Department of Environmental Quality
and
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Under Subcontract to:
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LIST OF ACRONYMS

AOC	Area of Concern
ATM	Atmospheric
AUID	Assessment Unit Identification
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
EDU	Ecological Drainage Unit
FCMP	Fish Contaminant Monitoring Program
GLRI	Great Lakes Restoration Initiative
g/mol	Grams per Molecule
HUC	Hydrologic Unit Code
IADN	Integrated Atmospheric Deposition Network
Km	Kilometer
LA	Load Allocation
LC	Loading Capacity
MCGI	Michigan Center for Geographic Information
MDCH	Michigan Department of Community Health
MDEQ	Michigan Department of Environmental Quality
MDNRE	Michigan Department of Natural Resources and Environment
mg/kg	Milligrams per Kilogram
MiSWIM	Michigan Surface Water Information Management System
MOS	Margin of Safety
MRLC	Multi-Resolution Land Characteristic Consortium
MS4	Municipal Separate Storm Sewer System
ng/L	Nanograms per Liter
ng/m^3	Nanograms per Cubic Meter
NHD	National Hydrography Dataset
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NREPA	Natural Resources and Environmental Protection Act
PCB	Polychlorinated biphenyl
POP	Population
PPM	Parts Per Million
RAD	Risk Associated Dose
SRD	Substantive Requirement Documents
TMDL	Total Maximum Daily Load
TSCA	Toxic Substance Control Act
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WLA	Waste Load Allocation
WQBEL	Water Quality-Based Effluent Limitations
WQS	Water Quality Standard

1.0 INTRODUCTION

Section 303(d) of the federal Clean Water Act and the United States Environmental Protection Agency's (USEPA) Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations [CFR] Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for all Category 5[1] water bodies that are not meeting Water Quality Standards (WQS) for a specific pollutant. These water bodies are included on a state's Section 303(d) list. The TMDL process establishes the allowable loadings of a pollutant to a water body based on the relationship between pollution sources and water quality conditions of a water body. This allowable loading represents the maximum quantity of a pollutant that the water body can receive without exceeding WQS. The TMDL process provides states with the basis for establishing water quality-based controls, which provide the pollutant reductions necessary for a water body to attain WQS (USEPA, 1991).

The 2012 Sections 303(d), 305(b), and 314 Integrated Report (Michigan Department of Environmental Quality[2] [MDEQ], 2012) identified 22,115 miles of rivers and streams and 144,692 acres of inland lakes and reservoirs as not supporting their designated use due to high concentrations of polychlorinated biphenyls (PCBs) in fish tissue. In addition, 49,691 miles of rivers and streams and 614 acres of lakes are not supporting their designated use due to PCBs in the water column (MDEQ, 2012).

The scope of this PCB TMDL covers inland water bodies in the state of Michigan, primarily impacted by atmospheric deposition of PCBs. These water bodies are described further in Section 2 and Appendix A. This document describes the statewide approach that Michigan has taken to develop a TMDL for PCBs. The report covers each step of the TMDL process and is organized as follows:

Section 2: Background
Section 3: Applicable WQS and Numeric Targets
Section 4: Modeling Approach
Section 5: Source Assessment
Section 6: TMDL Development
Section 7: Reasonable Assurance and Implementation
Section 8: Post-TMDL Monitoring

[1] Category 5 means available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed (MDEQ, 2012).
[2] For a short period of time (October 2009-March 2011) the MDEQ was reorganized and known as the Michigan Department of Natural Resources and Environment (MDNRE). For consistency, MDEQ is used throughout this document when referencing the agency.

2.0 BACKGROUND

This section provides background information for PCB TMDL development. It is divided into the following subsections:

- Problem Statement
- Data Collection and Assessment of Water Quality
- Scope of Water Bodies Considered Under this TMDL

2.1 PROBLEM STATEMENT

PCBs are a class of synthetic, chlorinated organic chemicals produced mainly for their excellent insulating capabilities and chemical stability. They were produced in the form of complex mixtures for industrial use in the United States from 1929 to 1977, mostly by the company, Monsanto, which produced approximately 640,000 tons. Peak production occurred in 1970, and over half of total United States production occurred between 1960 and 1974 (de Voogt and Brinkman, 1989). Production is difficult to estimate because there were 209 congeners, 9 homologs, many technical mixtures, and many different trade names used throughout the production period (e.g., Aroclor, Askarel, Inerteen). PCBs were used in the United States for a number of applications, but primarily consisted of closed system and heat transfer fluids (transformers, capacitors, fluorescent light ballasts, etc.; 60 percent), plasticizers (25 percent), hydraulic fluids and lubricants (10 percent), and other uses (5 percent) (Keeler et al., 1993). A major use in Michigan for PCBs was in the production of recycled carbonless copy paper. The National Cash Register Company purchased a specific mixture of PCBs (Aroclor 1242) from Monsanto to be used as an ink carrier or solvent between 1957 and 1971. The solvent was also licensed for use to several other paper manufacturers in the Great Lakes region. The total use of PCBs for this purpose was about 28 percent of total plasticizer use and just over 6 percent of total Monsanto sales for the time period 1957 to 1971 (USEPA, 1977).

The USEPA banned production of PCBs in 1979 due to their toxic properties, and this class of chemicals was ultimately phased out of new uses in 1983. PCBs have been shown to cause a variety of adverse health effects, notably cancer in animals. Non-cancer effects include impacts to the nervous, immune, reproductive, and endocrine systems, among other adverse effects (USEPA, 2004). PCBs are relatively persistent (i.e., do not readily degrade) and hydrophobic; consequently the higher chlorinated congeners tend to accumulate in suspended and bottom sediments of aquatic systems. Also, PCBs hydrophobicity means they generally have low water solubility and high solubility in most organic solvents, oils, and fats. Therefore, PCBs concentrate in the fatty tissues of organisms and bioaccumulate in living tissues. Thus, despite the United States ban of PCB production, PCBs remain in the environment in soil, water, air, animal tissue, and vegetation. Because the industrial use of PCBs has been banned, the primary sources of PCBs to water likely are historical sediment contamination and ongoing atmospheric deposition (MDEQ, 2012).

2.1.1 **TMDL Development Process**

Because of the widespread impairment of Michigan's waters due to PCBs, a statewide TMDL has been developed for inland waters primarily impacted by atmospheric deposition of PCBs, by providing the pollutant reductions necessary to attain WQS.

Considerations used to prioritize TMDL development include the existing TMDL schedule (i.e., the number of TMDLs currently scheduled for each year), Michigan's five-year rotating watershed monitoring cycle (Figure 1), available staff and monetary resources to complete TMDLs, data and supporting information on quality and quantity of the pollutant causing the impairment, complexity of the problem and severity of the pollution, and the USEPA's recommendation to develop TMDLs within 13 years of listing (MDEQ, 2012).

A scheduled completion date for TMDLs to address PCB impairment of inland water bodies was proposed for 2013 in the 2012 Integrated Report. Great Lakes and connecting channels are currently scheduled for TMDL development in 2015 (MDEQ, 2012).

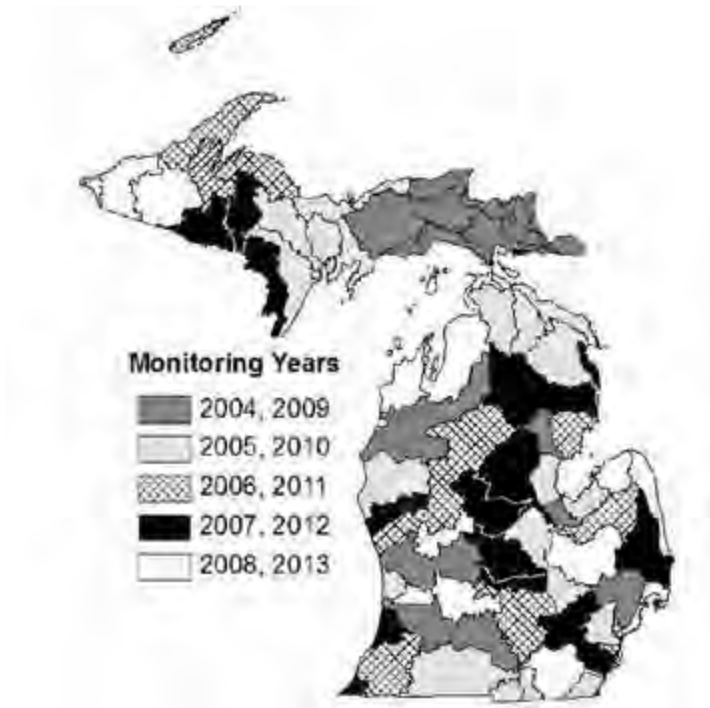


Figure 1. MDEQ's Five-year Rotating Watershed Monitoring Cycle.
(Source: MDEQ, 2008)

2.1.2 **Recent PCB Trends**

Overall, PCB concentrations in fish tissue and air are decreasing across Michigan. Trend analyses have been conducted on datasets for fish collected from inland water bodies at an interval of two to five years for Michigan's whole fish trend monitoring program (i.e., MDEQ Fish Contaminant Monitoring Program [FCMP]). These data include carp from five inland rivers, and lake trout, walleye, or largemouth bass from eight inland lakes. From 1990 to 2007, PCB concentrations in whole body fish samples from all 12 inland water bodies showed a statistically significant decrease, with an average annual decrease rate of 8.5 percent (Table 1; MDEQ, 2008).[3]

[3] Fish tissue PCB concentrations for whole fish were not used to calculate the PCB TMDL.

Table 1. Annual Rates of Change in Fish Tissue PCB Concentrations for Whole Fish Collected from Fixed Station Trend Monitoring Stations. (Source: MDEQ, 2008)

Water Body	**Species**	**Rate of Change (%)**	**P Value**
Inland Rivers			
Grand River	Carp	-3.1	<0.005
Kalamazoo River	Carp	-7.2	<0.001
Muskegon River	Carp	-13.4	<0.001
River Raisin	Carp	-14.1	<0.001
St. Joseph River	Carp	-2.9	<0.05
Inland Lakes			
Lake Gogebic	Walleye	-15.9	<0.001
South Manistique Lake	Walleye	-4.3	<0.001
Higgins Lake	Lake Trout	-10.3	<0.001
Houghton Lake	Largemouth Bass	-12.1	<0.001
Gull Lake	Largemouth Bass	-6.4	<0.001
Gun Lake	Largemouth Bass	-6.3	<0.001
Pontiac Lake	Largemouth Bass	-6.0	<0.005
	Average	-8.5	
	Median	-6.8	

Air concentrations of PCBs measured by the Integrated Atmospheric Deposition Network (IADN) also showed a general decrease from 1992 through 2002 (USEPA, 2012; Environment Canada and USEPA, 2000 and 2005; Figure 2).

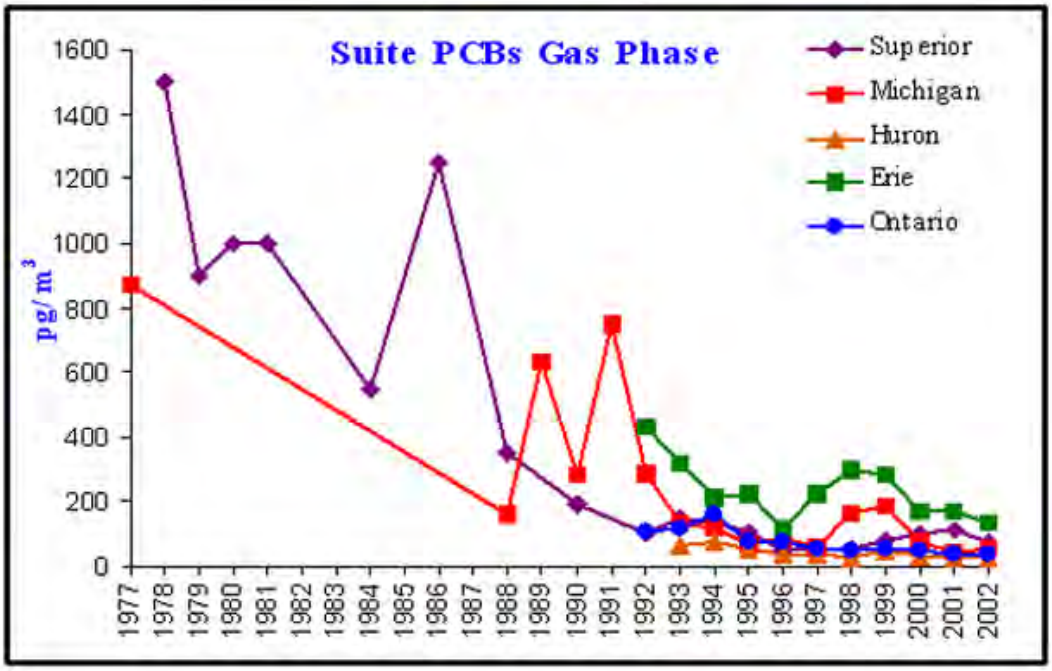


Figure 2. Time Trend of PCB Gas Phase Atmospheric Concentrations at Great Lakes IADN Stations. (Source: USEPA, 2012)

2.2 DATA COLLECTION AND ASSESSMENT OF WATER QUALITY

TMDLs must be developed for all water bodies contained on a state's Section 303(d) list. This section begins with a discussion of the state's data collection efforts used to support impairment determination, follows with a summary of waters impaired by PCBs, and concludes with a discussion of the scope of water bodies considered under this TMDL.

2.2.1 Data Collection and Summary Analysis

Michigan uses the National Hydrography Dataset (NHD) to organize and identify water bodies for the Section 303(d) list. A base assessment unit is a 12-digit hydrologic unit code (HUC), which may be split further into smaller assessment units depending on information such as land use, known areas of contamination, specific fish consumption advisories, physical barriers such as dams, etc. Each assessment unit is assigned an assessment unit identification (AUID) number and may consist of all water bodies in a 12-digit HUC (as a maximum) or specific stream segments or lakes located in that HUC (MDEQ, 2012).
Water column samples analyzed for PCBs are stored within the MDEQ Michigan Surface Water Information Management System (MiSWIM)[4]. PCBs were collected as part of the Water Chemistry Monitoring Program from the initiation of the program in 1998 through 2007. The goal of the sampling was to determine if PCBs were ubiquitous in Michigan. While concentrations varied widely, PCBs were present in all samples and only met the WQS of 0.026 nanograms per liter (ng/L) on one occasion (MDEQ, 2013). PCB water column concentrations ranged from 0.026 to 256 ng/L. PCB water column data are no longer collected due to the high cost of analyzing water samples, the knowledge that almost all waters exceed

[4] Available on the MDEQ's Web site at http://www.michigan.gov/miswim/.

the WQS, and because PCBs can be monitored accurately using fish tissue samples at a more reasonable cost.

Fish tissue samples are collected by a variety of agencies to provide data for assessment purposes as part of the FCMP. These agencies include, but are not limited to, the Michigan Department of Natural Resources, Fisheries Division; United States Fish and Wildlife Service, MDEQ, and tribal agencies. There are two major components of the FCMP: the edible portion monitoring program and the whole fish trend monitoring program. The edible portion program is used to make impairment determinations due to PCBs in fish tissue, since the primary objective of the edible-portion monitoring program is focused on developing sport fish consumption advisories and commercial fishing restrictions (Exponent, 2003). PCB concentrations in tissue are available from the FCMP for over 20 species collected between 1990 and 2009. The average statewide PCB concentration in edible portions of fish is 0.235 milligrams per kilogram (mg/kg), and exceeds the TMDL fish tissue target of 0.023 mg/kg for most of the species for the period 2000-2009 (Table 2). Because PCB concentrations in water and fish tissue have been declining since the early 1990s, it was determined that PCB data older than ten years starting from the 2010 Integrated Report would not be included in the evaluation of fish tissue data. In addition, total PCB concentrations in fish tissue prior to 2000 were analyzed as Aroclors but are now reported as total congeners. Therefore, fish tissue PCB data collected as part of the FCMP were summarized for the period 2000-2009 and used in the development of this TMDL.

It should be noted that different data periods are intentionally used for: (1) making an impairment determination; and (2) developing the TMDL. In general, PCB concentrations in air and fish are decreasing over time. This general knowledge is insufficient to remove a specific water body from the impaired waters list, as explicit demonstration of attainment is required to delist a water body. TMDL development, on the other hand, requires use of the most representative recent data to define the relationship between atmospheric concentration and fish tissue concentrations. For that reason, it is appropriate to use a more recent subset of the data for TMDL development than for impairment determination. An explanation of the development of the TMDL target for fish tissue can be found in Section 3.

Table 2. Average PCB Fish Tissue Concentration for Edible Portion of Fish Collected through FCMP 2000-2009. Results in bold exceed the TMDL target (0.023 mg/kg).

Species	Number of Samples	Average Concentration (mg/kg)[1]
Black Crappie	50	**0.073**
Brook Trout	12	**0.072**
Brown Bullhead	112	0.006
Brown Trout	40	**0.159**
Carp	733	**0.641**
Channel Catfish	120	**0.260**
Freshwater Drum	10	**0.267**
Lake Herring	5	0.001
Lake Trout	86	**0.147**
Lake Whitefish	20	**0.058**
Largemouth Bass	330	**0.034**
Northern Pike	331	**0.058**
Pumpkinseed	9	**0.060**
Rainbow Trout	20	0.020
Redhorse Sucker	129	**0.091**
Rock Bass	162	**0.102**
Smallmouth Bass	187	**0.106**
Splake	20	0.004
Walleye	316	**0.125**
White Bass	20	**1.106**
White Sucker	359	**0.179**
Yellow Bullhead	27	0.003
Yellow Perch	34	**0.026**
Total	*3,132*	*0.235*

[1]All data collected from inland water bodies in Michigan are in this table, including samples from sites influenced by the Great Lakes and/or legacy sources of PCBs. Concentrations are the average result for the number of samples collected per fish species.

The MDCH uses the fish tissue monitoring data and the United States Food and Drug Administration's 2.0 parts per million (ppm) (or mg/kg) trigger level for total PCB concentrations when developing advisories for the general population (Table 3). In addition to general population advisories, the MDCH advises women of child-bearing years, and children under 15 years of age, to eat no more than one meal per week if total median PCB concentrations exceed 0.05 ppm (or mg/kg), and no more than 1 meal per month if total PCB concentrations exceed 0.2 ppm (Table 3) (MDEQ, 2010).

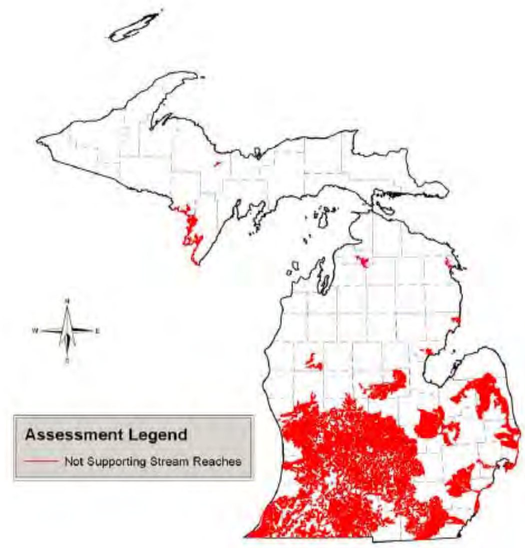
Table 3. Trigger Levels Used by the MDCH to Establish Fish Consumption Advisories[5]. (Source: MDEQ, 2010)

Group	Consumption Level	MDCH Trigger Level (Total PCB, ppm)
General Population	1 Meal Per Week	2.0
Women of Child-bearing Age and Children Under 15 Years	1 Meal Per Week	0.05
	1 Meal Per Month	0.2
	6 Meals Per Year	1.0
	No Consumption	1.9

2.2.2 Discussion of Section 303(d) Listings

The MDEQ used the data described in Section 2.2.1 to define all water bodies in the state that are impaired by PCBs. Out of the 7,316 water body assessment units (composed of inland lakes, streams, and river segments) across the state of Michigan, 4,709 have been assessed for some impairment. Of these assessed segments, 2,255 AUIDs are defined as impaired due to PCBs: 102 AUIDs are impaired due to PCBs in fish tissue (Figure 3), 1,164 AUIDs are impaired due to water column concentrations exceeding the ambient WQS for PCBs (Figure 4), and 989 AUIDs are impaired due to PCBs in both the water column and fish tissue. Figure 3 shows lakes, rivers, and streams impairments; however, Figure 4 only shows rivers and streams impairments due to a lack of lake data. Many AUIDs are listed as impaired due to exceedances of both the fish tissue advisory trigger levels and ambient water column WQS. A detailed discussion of the methodology used for assessing the fish consumption designated use can be found in Section 3.1.5.

[5] For additional information see: http://www.michigan.gov/documents/deq/wrd-swas-fcmp-2010report_361228_7.pdf. These values are expected to change in 2013.



a) Impaired Lakes b) Impaired Rivers and Streams

Figure 3. Impaired Lakes (a) Rivers and Streams (b) Based on Fish Tissue PCB Data. (Data Source: MDEQ, 2012)

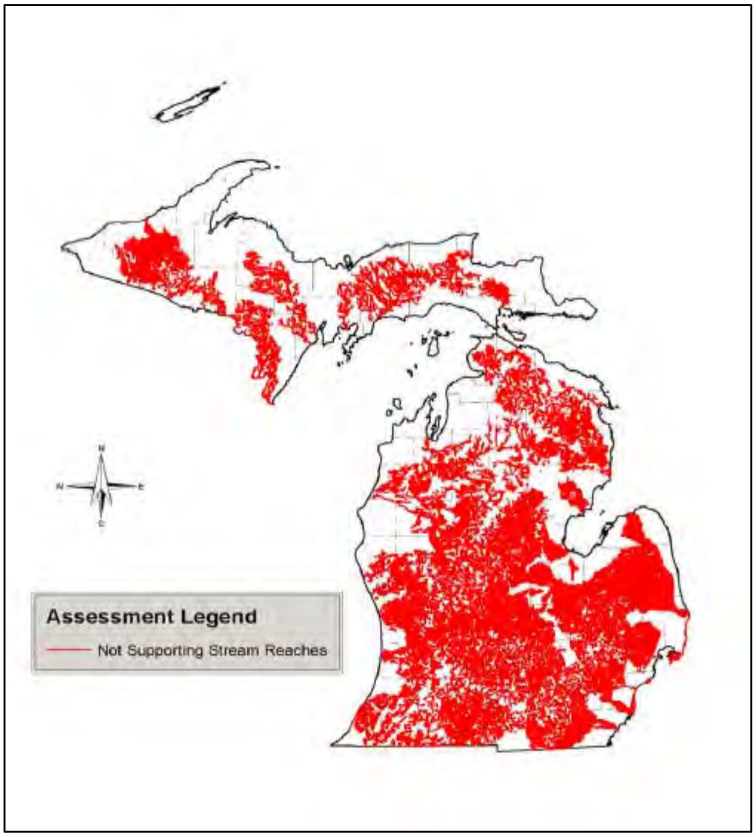


Figure 4. Impaired Rivers and Streams Based on Water Column PCB Data.
(Data Source: MDEQ, 2012)

2.3 SCOPE OF WATER BODIES CONSIDERED UNDER THIS TMDL

As discussed in Section 2.1, the 2012 Integrated Report proposed a schedule for completion of TMDLs to address PCB impairment of inland water bodies, Great Lakes, and connecting channels (MDEQ, 2012). The state of Michigan's plan for addressing waters impaired by PCBs is summarized below:

1. All of the inland water bodies of the state that were listed as impaired by PCBs were considered under this TMDL using an approach that will be discussed in Section 4 of this TMDL. The MDEQ (2012) lists 2013 as the target date for submittal of the PCB TMDL addressing inland waters. All but a few of the waters that were considered are expected to meet WQS after implementing source reductions, based on the fish tissue target detailed in Section 3 of this TMDL.

2. The following waters are not covered by this TMDL:

    a. The Great Lakes and connecting channels (i.e., Lake St. Clair, the St. Clair River, the St. Mary's River, the Detroit River, and the Keweenaw waterway) will likely benefit from the atmospheric reductions called for in this TMDL. The level of pollutant reduction required to achieve WQS will be different than for inland waters, due to different atmospheric deposition rates and much longer response times. These water bodies will be considered under a separate TMDL focused on the Great Lakes that is scheduled for development in 2015. Contaminated legacy sites (i.e., AOCs and Superfund sites) impacted by PCBs are not covered by this TMDL. Formal clean-up plans are in place at these sites, and the water bodies are expected to meet the TMDL target once clean-up plans are complete and reductions described in this TMDL are met.

b. Most inland water bodies impaired primarily by atmospheric sources are expected to meet WQS after the reductions in atmospheric loading called for in this TMDL are achieved. Separate TMDLs may be developed for the few water bodies not meeting WQS as needed.

A list of water bodies submitted for approval under this TMDL is included in Appendix A.

3.0 APPLICABLE WQS AND NUMERIC TARGETS

This section describes applicable WQS and target selection for this PCB TMDL. It consists of the following sections:

- WQS
- Numeric TMDL Target
- Applying the Numeric TMDL Target

3.1 WATER QUALITY STANDARDS

The Clean Water Act Section 303(c)(2)(A) requires states to identify appropriate water uses for all water bodies, and provide, where attainable, water quality (in the form of WQS) for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water. Designated uses describe the various uses of waters that are considered desirable, and identify those waters that should be protected. At a minimum, all surface waters in Michigan are designated and protected for all of the following uses: agriculture, navigation, industrial water supply, warm water fishery, other indigenous aquatic life and wildlife, partial body contact recreation, total body contact recreation (May 1 to October 31) and fish consumption. A select group of rivers and inland lakes, in addition to the Great Lakes and select connecting channels are designated and protected for coldwater fisheries and public water supply (R 323.1100, Designated Uses, of the Part 4 rules, WQS, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended [NREPA]).[6] The WQS for water column PCB concentrations are 0.12 ng/L for the protection of wildlife and 0.026 ng/L for the protection of human health.

3.1.1 **Designated Use Support**

Every two years, the state of Michigan evaluates the extent to which waters of the state are attaining their designated uses. The principle of independent applicability is used when making a support determination for each water body. For example, if data for more than one parameter are available (i.e., water column and fish tissue concentrations), and both are used to determine support for the same designated use, then each data type is evaluated independently to determine support for the designated use. If either data type indicates that the designated use is not supported, then the water body is normally listed as not supporting the designated use (MDEQ, 2012). Many of Michigan's surface waters are impaired due to PCBs and consequently, do not support the other indigenous aquatic life and wildlife designated use and/or the fish consumption designated use (MDEQ, 2012). These are the impaired designated uses addressed by this TMDL.

Michigan uses multiple assessment types and parameters to determine indigenous aquatic life and wildlife designated use support and fish consumption designated use support. Water column concentrations are used to assess support of the other indigenous aquatic life and wildlife designated use. Data considered for the assessment of the fish consumption use include the concentration of PCBs in the water column, and fish consumption advisories issued by the Michigan Department of Community Health (MDCH) (MDEQ, 2012).

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[6] See *(The link provided was broken and has been removed)*.

3.2 NUMERIC TMDL TARGET

TMDLs are established at a level that attains and maintains the applicable WQS, including designated uses, numeric and narrative criteria, and antidegradation policy (40 CFR §130.7[c][1]). TMDL submittals must include a description of any applicable WQS, and must also identify numeric water quality targets, which are quantitative values used to measure whether or not applicable WQS are being attained. Depending on the designated use being addressed by the TMDL, the criteria used for setting a TMDL target may include human health, aquatic life, and wildlife criteria (USEPA, 2011). Where possible, the water quality criterion for the pollutant causing impairment is used as the numeric water quality target when developing the TMDL. Michigan's WQS include ambient water column numeric criteria for PCBs, but do not contain a fish tissue numeric criterion. As stated previously, Michigan's narrative portion of R 323.1057(1) states, "toxic substances shall not be present in the surface waters of the state at levels that are or may become injurious to the public health, safety, or welfare, plant and animal life, or the designated uses of the waters." The presence of fish consumption advisories justifies the use of a fish tissue target to interpret this narrative standard (USEPA, 2011). **Therefore, a fish tissue residue value is recommended as the target for the statewide PCB TMDL, since the consumption of fish by humans and wildlife is the most significant route of exposure.**

Michigan derived a fish tissue residue value of 0.023 mg/kg (wet weight) in edible fish portions using the same Risk Associated Dose (RAD) (0.000005 mg/kg/day), body weight (70 kg), and fish consumption rate (0.015 kg/d) that was used to derive the WQS of 0.026 ng/L that protects human health. A RAD is defined as a dose of a known or presumed carcinogenic substance, in mg/kg/day, that, over a lifetime of exposure, is estimated to be associated with a plausible upper bound incremental cancer risk equal to 1 in 100,000. The fish tissue residue value of 0.023 mg/kg is therefore consistent with the WQS because they both use the same toxicity endpoint and fish consumption rate.

To verify that a fish tissue residue value would be consistent with the WQS for PCBs, the calculation of a resulting water concentration based on the fish tissue residue value of 0.023 mg/kg was made. A trophic level 4 bioaccumulation factor of 1,086,000 liters/kg, used in the calculation of the WQS of 0.026 ng/L for the protection of human health, was used to estimate a water concentration that would be associated with the trophic level 4 fish tissue residue value of 0.023 mg/kg. The resulting water concentration value (0.021 ng/L) was calculated to be lower than the WQS (0.026 ng/L) for PCBs, indicating that the fish tissue residue value would be consistent with the WQS.

3.3 APPLYING THE NUMERIC TMDL TARGET

The selection of a numeric fish tissue target requires the selection of a fish tissue residue value, an appropriate fish species, and a statistical level at which to base compliance with the TMDL once reductions of environmental PCB concentrations have been made. Load reductions in PCBs required by the TMDL will be based on the decrease of PCB concentrations in fish tissue that is necessary to meet a fish tissue residue value of 0.023 mg/kg in the 90^{th} percentile of an appropriate fish species. Achieving the target level for the 90^{th} percentile of the most impacted fish species ensures that the overwhelming majority of species in lower trophic levels will meet the target level.

Because the PCB TMDL is applied statewide and considers a wide range of fish tissue concentrations, it would not be practical to base TMDL reductions on the requirement that every fish in the state be in compliance with the fish tissue residue value of 0.023 mg/kg. A recommended approach is to base reductions in PCB concentrations in fish tissue on an appropriate level of protection. The 90th percentile has been deemed to provide an appropriate level of protection for the PCB TMDL, since 90 percent of the waters in the state would have a lower proportionality constant than the threshold value. Ninety percent of the waters of the state containing a top predator species with high bioaccumulation potential would be expected to attain WQS after the TMDL is implemented.

Several criteria for selecting a fish species on which to base PCB reductions were evaluated. Calculation of the load reduction necessary to attain the fish tissue residue value in the 90^{th} percentile of water bodies in the state requires a sufficient number of samples. In order for fish tissue data for a selected fish species to be considered representative, the data must have been collected during a time period deemed to be representative of the baseline year of the TMDL. Because PCB concentrations in water and fish tissue have been declining since the early 1990s, it was determined that PCB data older than ten years would not be included in the evaluation of fish tissue data. In addition, total PCB concentrations in fish tissue prior to 2000 were analyzed as Aroclors. After this time period, total PCBs were analyzed and summed as individual PCB congeners. Therefore, fish tissue PCB data collected as part of the FCMP were summarized for the period 2000-2009 (Table 2 in Section 2.2.1). Fish tissue PCB data after 2009 were not available when the data were being compiled for the development of the TMDL.

Figure 5. Photo of a Lake Trout. Photo Credit: Dan Rockafellow and Dick Mikula.

Based on a review of available fish tissue PCB data, lake trout (*Salvelinus namaycush*) (Figure 5) were use to determine PCB load reductions, and resulting compliance with the TMDL. Lake trout were selected because they have the second highest concentration of PCBs (when sites with legacy PCB sources and/or Great Lakes influence are excluded from the assessment), they are a native species, a trophic level 4 fish, and a preferred sport fish species in Michigan. Furthermore, since the WQS for the protection of human health assume that the majority (76 percent) of the fish consumed by humans are from trophic level 4, it was considered appropriate to apply the fish tissue target residue value to a trophic level 4 fish.

Lake trout PCB data are only available from a limited number of water bodies so it was necessary to verify that lake trout is an appropriate species on which to base compliance with the PCB TMDL. The ability of lake trout to predict compliance with the TMDL target in water bodies where lake trout are not found was assessed and is summarized in Section 4.5.2.

4.0 MODELING APPROACH

This section describes the modeling approach for calculating the PCB TMDL. It consists of the following sections:

- Estimating Atmospheric PCB Loading
- Relating Atmospheric Loading to Fish Tissue Concentration (Principle of Proportionality)
- Atmospheric PCB Concentrations
- Regionalization
- Threshold Proportionality Constant
- Required Reduction Percentage

4.1 ESTIMATING ATMOSPHERIC PCB LOADING

The goal of a TMDL is to define the maximum allowable loading for the pollutant of concern that will result in attainment of applicable WQS, including designated uses. In some cases, it is not feasible to directly estimate or measure the actual pollutant load, and a surrogate measure is used to indirectly represent that load (USEPA, 2002). The atmospheric gas phase concentration of total PCBs is being used as a direct surrogate for PCB loading to surface waters from atmospheric sources for this TMDL because the technology required to precisely measure loadings at the water/air interface does not exist. There are several lines of evidence that provide a scientific justification for using atmospheric gas phase PCB concentrations as a surrogate for atmospheric loading.

First, the gas phase is by far the largest source (or pathway) by which PCBs enter surface water. As a semi-volatile persistent organic chemical group, atmospheric deposition of PCBs to surface waters can take place via three mechanisms:

1. Absorption of gas phase PCBs into the water body by diffusion across the air-water interface and dissolution into a dissolved phase in the water (gas exchange)
2. Washout of atmospheric PCBs during precipitation (wet deposition)
3. Deposition of particulate phase atmospheric PCBs into surface waters by atmospheric mixing processes (for very fine particles that are not heavy enough to be deposited by gravity alone) or gravity settling (dry deposition)

Any of these mechanisms can also deliver PCBs to the land and vegetation in a watershed followed by a series of complex hydrologic processes that may deliver water and potentially associated PCBs to the receiving water body. There is an extensive body of literature containing research and observations of all three of these mechanisms for the Great Lakes region. This body of literature identifies gas phase absorption (mechanism 1 above) as the major source pathway of PCBs to surface waters (e.g., Swackhamer and Armstrong, 1986; Sweet et al., 1993; Jeremiason et al., 1994; Pearson et al., 1996; Hoff et al., 1996; Green et al., 2000; Buehler and Hites, 2002; Blanchard et al., 2008). The primary reason for this finding is that measurements of different forms of PCBs in the atmosphere indicate that ≥90 percent of the PCBs in the air are in the gas phase rather than sorbed to aerosols or water droplets (Cotham and Bidleman, 1995; Chen et al., 1996; Simcik et al., 1998).

The portion of total atmospheric PCB loadings (or flux) due to wet deposition is small (Hillery et al., 1998; Blanchard et al., 2008). In general, the absorption depositional fluxes (loadings) are an order of magnitude higher than the wet deposition fluxes, as exemplified for two urban sites in Figure 6. Dry deposition flux is even smaller than wet deposition flux.

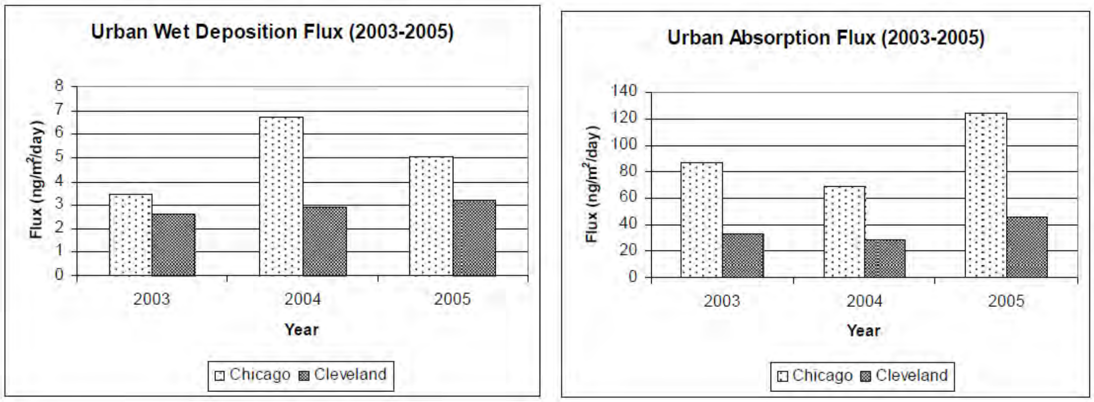

Figure 6. Wet Deposition and Absorption Fluxes of PCBs at Urban Sites.
(Source: Blanchard et al., 2008)

Second, the gas phase acts similarly to other phases such as wet deposition. Washout in precipitation (rain and snow) can also be important (Simcik et al., 2000); but because washout deposition rates are dependent on partitioning from the gas phase into the liquid phase in the atmosphere, this deposition mechanism is also driven by the atmospheric gas phase concentration. Simcik et al. (2000) found that the half-lives of PCB precipitation-related deposition in the Great Lakes are not significantly different from the corresponding atmospheric gas phase decline half-lives.

Third, and the most compelling justification for using atmospheric gas phase concentration of total PCBs as a measure of atmospheric deposition, is the Great Lakes IADN and its various monitoring and research outputs (Buehler and Hites, 2002). IADN is a joint United States-Canada venture, required under the 1990 Clean Air Act to measure atmospheric deposition of chemicals of concern throughout the Great Lakes basin, including PCBs. The network consists of five Master Stations and several Satellite Stations for which IADN collects gas and particle air samples for 24 hours every 12 days using high-volume air samplers (Figure 7). Precipitation samples are taken for every rain and snow event and composited for 14 (Canada) or 28 days (United States) for analysis. The IADN data were used to develop the population and temperature-based gas phase PCB relationship that is being used to provide spatial and temporal atmospheric PCB concentration trends in the state of Michigan (Venier and Hites, 2010a).

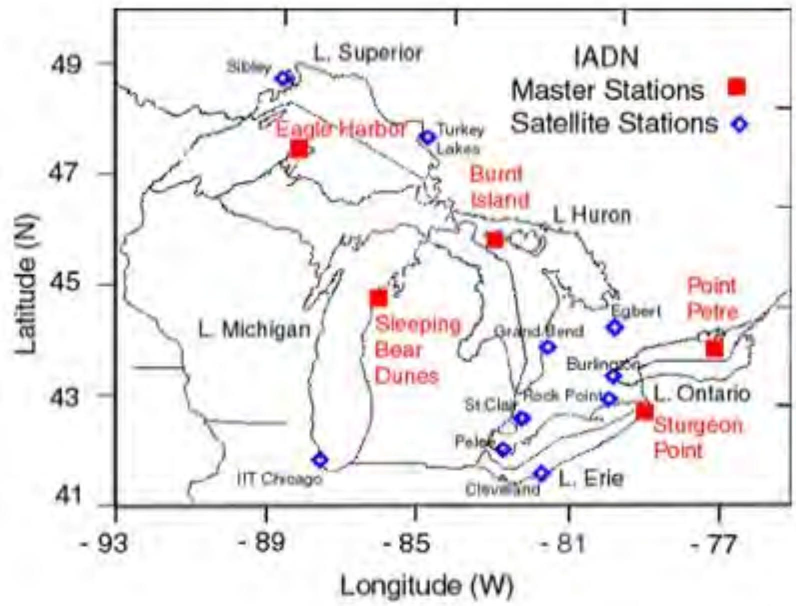

Figure 7. IADN Stations (Brule River not pictured).
(Source: Environment Canada and USEPA ,2012).

IADN also uses its data, supplemented with other data from surface water programs, to compute atmospheric deposition of chemicals of concern to the Great Lakes. Loadings of atmospheric deposition (L, in kg/yr) is calculated using the following equation that includes three processes: wet deposition, dry deposition, and net gas exchange (Blanchard et al., 2008):

$$L = C_p R_p A + C_a \emptyset_a v_d A + [k_{ol}(1 - \emptyset_a) C_a (^{RT}/_{H}) A - k_{ol}(1 - \emptyset_w) C_w A]$$

Atmospheric Deposition = Wet Deposition + Dry Deposition + Gas Phase Absorption – Volatilization **(1)**

The first term in the equation, wet deposition, is the product of the volume-weighted mean precipitation concentration, C_p (kg/m^3), the rate of precipitation, R_p (m/yr), and the area of the lake, A (m^2). The second term represents dry deposition, and is the product of the total atmospheric concentration of the pollutant, C_a (kg/m^3), obtained from measurements collected at the five master IADN stations (Figure 7), the fraction of the compound in the particle phase, φ_a, the deposition velocity of the particles, v_d (m/yr), which is represented as 0.2 cm/s for all chemicals, and the area of the lake, A (m^2).

The last term in the equation represents net gas exchange, and is divided into two components: absorption and volatilization. Absorption is the transfer of the compound in the gas phase from air to water. The variable, k_{ol} (m/yr) is the overall air-water mass transfer coefficient, R (atm m^3/K/mol) is the ideal gas constant, T (K) is the temperature at the air-water interface, H (mol/atm/m^3) is the Henry's Law constant, C_w (kg/m^3) is the concentration of the compound in water, and A (m^2) is the area of the lake. For absorption, (1 - φ_a)C_a is the air concentration of the compound in the gas phase. In the volatilization term, φ_w is the fraction of the compound on the particle phase in the water, thus making (1 - φ_w)C_w the dissolved phase concentration of the compound of interest. Volatilization can then be assumed to be the compound transferred from water to air.

The complete term of net gas exchange is the sum of the absorption and volatilization estimates. Positive net gas exchange indicates net absorption of the chemical from air to water, while negative net gas exchange indicates net volatilization from water to air. Gross atmospheric deposition (i.e., the sum of the three processes listed initially in this discussion) is computed with the above equation, but without the volatilization term at the end (Equation 2).

$$L = C_p R_p A + C_a Ø_a V_d A + [K_{ol} (1 - Ø_a) C_a (RT/H) A]$$

Atmospheric Deposition = Wet Deposition + Dry Deposition + Gas Phase Absorption **(2)**

Volatilization is excluded to represent only gross atmospheric deposition (what is being absorbed into the water bodies), and not the portion that volatilizes (leaves the water's surface). Given the above discussion, it is both scientifically and practically justified to use atmospheric gas phase PCB concentrations as a surrogate for atmospheric PCB loadings for the following reasons: (1) the portion of PCB loadings due to dry deposition as compared to wet deposition is small; (2) the gas phase concentration governs wet deposition; and (3) the gas phase absorption of PCBs in the atmosphere makes up greater than 90 percent of the total atmospheric deposition. Furthermore, even though the above argument was made using IADN data taken from stations around the Great Lakes, it is reasonable to believe that the relationship between atmospheric gas phase PCB concentrations over the state of Michigan (thereby inland lakes, rivers, and streams) and atmospheric PCB deposition would be the same as it is over the Great Lakes. Thus, it is appropriate to assume that a given percent reduction in atmospheric gas phase PCB concentration will produce an equivalent percent reduction in atmospheric PCB loading to surface waters in the state of Michigan.

4.2 RELATING ATMOSPHERIC LOADING TO FISH TISSUE CONCENTRATION (PRINCIPLE OF PROPORTIONALITY)

The approach for linking atmospheric pollutant loads to fish tissue concentrations for this TMDL is patterned after the statewide mercury TMDL developed by the Minnesota Pollution Control Agency (2007), which drew from the work of Jackson et al. (2000), and a regional mercury TMDL for the Northeast United States (New England Interstate Water Pollution Control Commission, 2007). The approach for this TMDL assumes that the steady-state pollutant concentration in a water body (and fish) is linearly proportional to the atmospheric load.

It is important to note that essentially all PCB modeling approaches (including all of the modeling approaches described in the USEPA TMDL guidance) are based upon the assumption of a linear relationship between PCB load and resulting environmental concentration. A PCB TMDL developed for an impaired reach of the Kawkawlin River[7] in Bay County, Michigan, similarly assumes a one-to-one relationship between PCB loadings and fish tissue (MDEQ, 2002). This approach is referred to in the USEPA (2011) guidance as a "Level 1" approach and is one of the recommended methods for developing PCB TMDLs.

The selection of a steady-state approach for this TMDL means that time variability is not considered. The ability to consider time variability can be useful in estimating system response time to reductions in load, but is not an essential requirement for TMDL development. In fact, models with the capability of simulating time variable conditions are often applied to represent

[7] This statewide TMDL will not supercede the existing PCB TMDLs for the Kawkawlin (2002) and Pere Marquette Rivers (2008).

steady-state conditions for purposes of TMDL application, and therefore provide results consistent with the Level 1 approach being used here.

The proportionality model used for this TMDL can be described mathematically in Equation 3 as:

$$\text{Pollutant concentration in water (or fish)} = a \times \text{Pollutant loading} \quad \textbf{(3)}$$

where:

a = Proportionality constant relating pollutant load to environmental (i.e., water or fish) concentration

The proportionality constant, *a,* is calculated from observed edible fish tissue data and estimated atmospheric PCB loading by rearranging Equation 3 as follows:

$$a = \text{Fish tissue concentration} / \text{Pollutant loading} \quad \textbf{(4)}$$

where:

a = Proportionality constant relating pollutant load to fish tissue concentration

Note that when site-specific characteristics (e.g., flushing rate, solids settling velocity, organic carbon content, bioaccumulation in fish) are available for a given water body, complex mechanistic water quality models can be used to calculate the proportionality constant between load and response for each water body under consideration. However, given the large number of water bodies that are being considered under this statewide TMDL, and the limited amount of data available across the state, it is not feasible to estimate unique proportionality constants for each water body requiring a TMDL.

Equation 4 was used to estimate proportionality constants for all of the water bodies where relevant fish tissue data exist. The variability of observed proportionality constants across the state for lake trout, a top predator fish species known to have high bioaccumulation potential, was evaluated to define an upper bound or threshold proportionality constant (i.e., one that represents a specified upper bound percentile of the observed distribution of proportionality constants for some target fish species). This proportionality constant was used to define the required level of load reduction necessary to achieve the TMDL targets for all impaired waters, as described below. The rationale for basing the TMDL on a threshold proportionality constant is that, by protecting waters where lake trout tissue PCB concentrations are high, the large majority of other waters in the state with fish containing lower levels of PCBs, will also be protected. An explanation of the calculation of the threshold proportionality constant can be found in Section 4.5.

4.2.1 **Approach for Calculating Maximum Allowable Load**

After a threshold proportionality constant has been defined, Equation 3 can be algebraically rearranged to define the maximum allowable pollutant loading rate that will achieve attainment of the desired water quality target in a given percentage of water bodies, i.e.:

$$\text{Pollutant loading}_{max} = \text{Pollutant concentration}_{target} / a_{thresh} \quad \textbf{(5)}$$

where:

$\text{Pollutant loading}_{max}$ = Maximum allowable pollutant loading that will attain the fish tissue target

$\text{Pollutant concentration}_{target}$ = Fish tissue target PCB concentration

a_{thresh} = Threshold proportionality constant, defining an upper bound of observed ratios of fish tissue concentration to pollutant load

4.3 ATMOSPHERIC PCB CONCENTRATIONS

Atmospheric PCB concentrations across Michigan were estimated based on the work described in Venier and Hites (2010b), who analyzed data for numerous persistent organic pollutants from the IADN. Samples were analyzed for the following locations (Figure 7) and time periods:

- Brule River, Wisconsin (1996-2002)
- Eagle Harbor, Michigan (1990-2007)
- Sleeping Bear Dunes, Michigan (1992-2007)
- Chicago, Illinois (1996-2007)
- Cleveland, Ohio (2003-2007)
- Sturgeon Point, New York (1992-2007)

Venier and Hites (2010b) converted observed gas-phase PCB concentrations to partial pressures using the Ideal Gas Law and the average atmospheric temperatures during the 24-hour sampling period measured at each site. They used the software package Minitab 15 to fit a linear regression to the logarithms of the atmospheric PCB partial pressures, resulting in the following equation (Equation 6):

$$\ln P = -14.1 - 1.5\times10^{-4} \cdot t - 5.31 \cdot (1000/T) + 0.0744 \cdot \log^2(pop) - 0.0744 \cdot WS - 0.0671 \cdot \cos(WD) \quad \textbf{(6)}$$

where:

P	= Atmospheric (atm) PCB
t	= time (Julian date after January 1, 1990)
T	= air temperature (^oK)
pop	= population within 25 kilometer (km) radius
WS	= wind speed (mph)
WD	= wind direction (radians)

Analysis of Equation 6 showed that time, air temperature, and population density were the primary factors controlling atmospheric PCB concentration, so the equation was truncated as follows (Equation 7) for purposes of the PCB TMDL:

$$\ln P = -14.1 - 1.5\times10^{-4} \cdot t - 5.31 \cdot (1000/T) + 0.0744 \cdot \log^2(pop) \quad \textbf{(7)}$$

Equation 7 is designed for application at a specific location, while the TMDL is required to consider the entire state either as a whole or divided into regions.

To evaluate the spatial differences in atmospheric PCB concentrations across the state, Ecological Drainage Units (EDUs; Higgins et al., 2005) were used to aggregate areas of the state containing similar atmospheric concentrations of PCBs. EDUs are a method of spatially organizing the state based on areas of similar biotic and abiotic characteristics such as freshwater fish and invertebrate species composition and distribution, climate, and physiography. They generally range in size from 1,000 to 10,000 km^2. Although the EDU boundaries align with watershed boundaries, such that no impaired stream segments will span multiple regions, they are not necessarily true watershed boundaries (Higgins et al., 2005). The EDUs in Michigan are shown in Figure 8.

Equation 7 was used to estimate average atmospheric PCB concentration for each EDU as follows:

The annual average air temperature for each EDU was calculated from spatial data obtained from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center[8]. The average population density (individuals per 25 km radius) was calculated for each EDU using 2010 census data from the Michigan Department of Technology, Management and Budget Center for Shared Solutions and Technology Partnerships[9]. Atmospheric gas phase PCB concentrations for 2010 were calculated as partial pressures (in units of atmospheres) for each EDU, based on population density and average temperature, using Equation 7. Atmospheric PCB partial pressures for each EDU were converted to concentration units (nanograms per cubic meter [ng/m^3]) based on the average air temperature determined in Step 1 using the following equation based on the Ideal Gas Law as follows:

> Mass Concentration, ng/m^3 = (Partial Pressure, atm) * (average molecular weight) * (10^{12} ng/kg) * (1 (kg/m^3)/(g/L) / (Henry's Law Constant 0.08205746 L atm K^{-1} mol^{-1}) / (Temperature °K).

An average molecular weight of 288 g/mol was based on an assumed mixture of 65 percent Aroclor 1242 at 266.5 and 35 percent Aroclor 1254 at 328, from the reported measurements for the city of Chicago by Hu et al. (2010). The temperature in °K was obtained as T + 273.15, where T is the temperature in °C associated with the partial pressure being converted.

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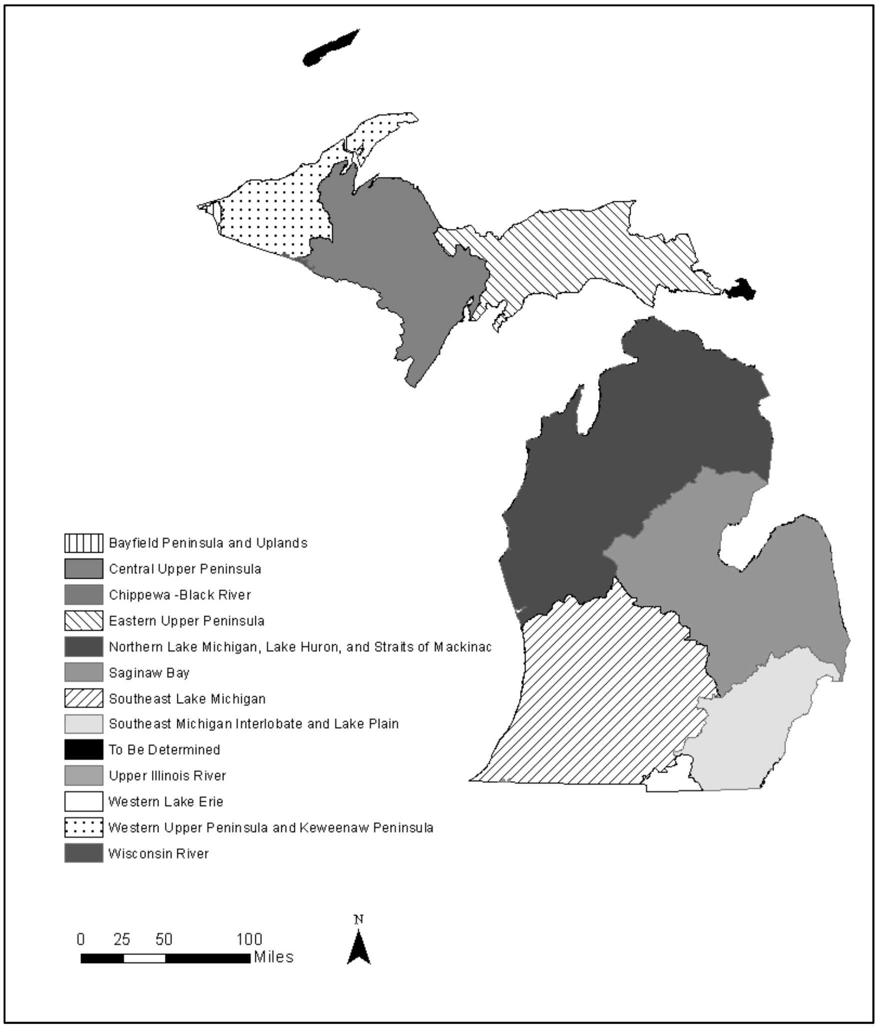

Figure 8. Ecological Drainage Units in Michigan.
(Data source: Higgins et al, 2005)

Table 4 summarizes the resulting atmospheric PCB concentration averaged across each EDU in the state. These concentrations are mapped by EDU in Figure 8.

Table 4. Estimated 2010 Annual Atmospheric PCB Concentration (ng/m^3) Averaged by EDU.

Ecological Drainage Unit (EDU)	Average Population Density (individuals per 25 km radius)	Average Total Gas Phase PCB Conc. (ng/m^3)	Daily Maximum Total Gas Phase PCB Conc. (ng/m^3)	Area of EDU (miles^2)
Bayfield Peninsula and Uplands	<1,000	0.017	0.259	91.72
Chippewa-Black River	<1,000	0.017	0.230	0.45
Upper Illinois River	<1,000	0.017	0.279	7.49
Wisconsin River	<1,000	0.017	0.230	41.70
To Be Determined (includes Isle Royale and Drummond Island)	6,213	0.050	0.246	349.58
Western Upper Peninsula and Keweenaw Peninsula	11,199	0.052	0.315	3,295.46
Eastern Upper Peninsula	10,640	0.057	0.284	5,875.56
Central Upper Peninsula	19,117	0.062	0.363	6,707.16
Northern Lake Michigan, Lake Huron, and Straits of Mackinac	41,265	0.087	0.453	14,723.62
Western Lake Erie	43,243	0.102	0.482	457.01
Saginaw Bay	114,819	0.133	0.636	10,295.58
Southeast Lake Michigan	176,980	0.159	0.739	11,318.04
Southeast Michigan Interlobate and Lake Plain	830,371	0.278	1.372	4,121.54

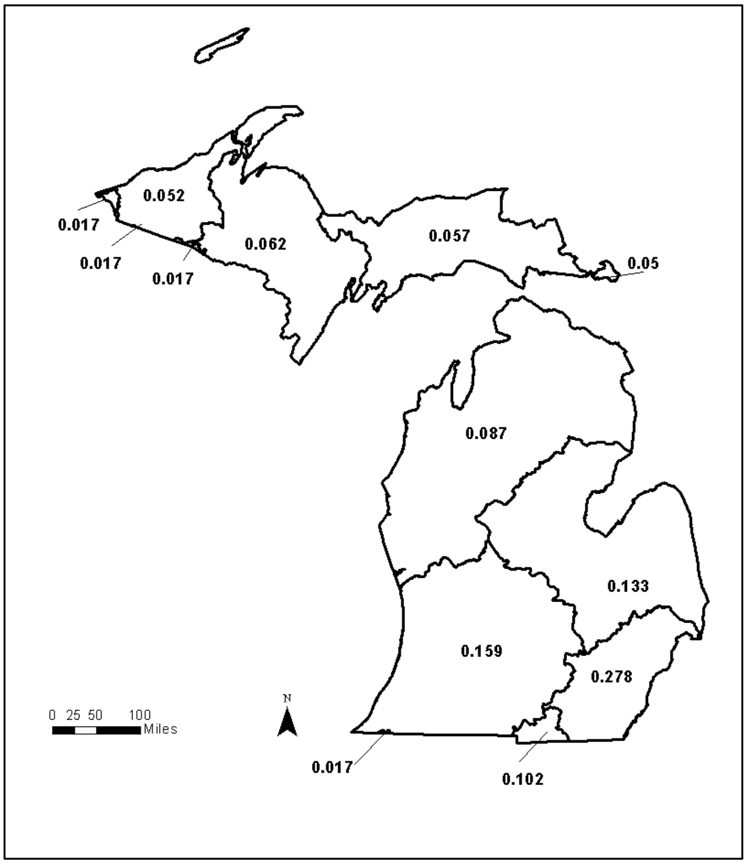

Figure 9. Annual Average Atmospheric Gas Phase PCB Concentration (ng/m^3) by EDU.

4.4 REGIONALIZATION

Statewide TMDLs can be structured to produce a single statewide average loading reduction; conversely, they can be structured by dividing the state into geographic regions and produce a loading reduction unique to each region. Although detailed investigations were made into a variety of potential regionalization schemes, a policy decision was made by the MDEQ and USEPA to calculate a single, statewide average required reduction percentage for PCBs. The primary basis for this decision is that a consistent pattern between fish tissue and air concentration of PCBs was lacking throughout the state. There was no discernible regional pattern to justify breaking up the state into different regions based on PCB concentrations. The concern that this approach may be under-protective in some regions of the state (i.e., those requiring greater than average percent reductions) will be addressed in Section 7 through the use of post-TMDL monitoring to identify specific waters across the state that still do not meet WQS as a result of this TMDL. These waters may have site-specific TMDLs developed in the future if necessary. Lastly, as discussed in Section 2.1.2, both fish and atmospheric concentrations of PCBs have been declining since 2000, and continued declines will enable all parts of the state to meet reduction targets.

4.5 THRESHOLD PROPORTIONALITY CONSTANT

Fish tissue PCB concentrations are related to atmospheric PCB loadings by a proportionality constant. In this TMDL, gas phase atmospheric PCB concentrations are used as a surrogate for atmospheric PCB loadings. Therefore, in theory, a proportionality constant could be calculated for each water body where relevant fish tissue data are available. However, relevant fish tissue data were not available for every water body impaired by PCBs on the Section 303(d) impaired waters list to derive a site-specific proportionality constant. For water bodies lacking fish tissue data, it was necessary to develop an approach for estimating a proportionality constant. The approach uses the observed variability in calculated proportionality constants for waters where fish tissue data exist for lake trout to represent the variability of proportionality constants for all water bodies across the state. Statistical methods are then used to calculate a statewide threshold proportionality constant.

4.5.1 **Selection of an Appropriate Upper Bound**

The threshold proportionality constant is defined as one that represents a specified upper bound percentile of the observed distribution of proportionality constants for a target fish species, in this case lake trout. The selection of a 90th percentile value to represent the threshold upper bound results in a large majority (i.e., 90 percent) of the waters in the state having a lower proportionality constant than the threshold proportionality constant calculated as a statewide value. Use of this 90th percentile threshold proportionality constant in Equation 5 to develop the TMDL would therefore result in 90 percent of the waters in the state containing a top predator species with high bioaccumulation potential being expected to attain the target goal of the TMDL (i.e., 0.023 mg/kg) after the required reductions are made.

The choice of a specific percentile PCB to represent the upper bound of a threshold proportionality constant is a state policy decision. Both the Minnesota and the Northeast United States mercury TMDLs used the 90th percentile as the basis of protection in these TMDLs. The justification given for selecting the 90th percentile included:

- The 90th percentile of samples from a given water body has been used as assessment guidance by the USEPA (i.e., no more than 10 percent of the samples can exceed the standard) (Minnesota Pollution Control Agency, 2007).
- Targets were based on PCB tissue concentrations for a fish species having one of the highest levels of contamination. Achieving the target level for the 90th percentile of a top predator species with observed high levels of contamination ensures that the overwhelming majority of species in lower trophic levels will meet the target level.
- As fish tissue levels are reduced and the 90th percentile approaches the target value, the concentration difference between the 90th and higher percentiles is likely to be very small.
- Use of the 90th percentile allows for outlier water bodies that may have unique circumstances. The outliers can be addressed individually as part of the adaptive watershed management approach to TMDL implementation through implementing as many elements of multi-media programs as possible to reduce PCB loadings (USEPA, 2011).

There are tradeoffs that need to be considered in selecting the percentile to be used. Use of the 90th percentile may result in the need to develop additional TMDLs for those water bodies with proportionality constants higher than the 90th percentile value. Conversely, selection of a higher percentile would result in required load reductions that would be larger than necessary to attain WQS for the large majority of water bodies.

4.5.2 Selection of a Target Fish Species

Michigan's FCMP database (including PCB data in fish tissue collected from 1980 to 2009) was used to identify the fish species to serve as the basis for required TMDL loading reductions. Only data from the edible portion monitoring program were considered since these are the data that support the fish consumption designated use. Fish tissue PCB concentrations have been sampled in a wide range of species across Michigan, and show varying degrees of bioaccumulation. Furthermore, multiple different species serve as the basis for fish consumption advisories across the state. For development of the statewide TMDL, lake trout was chosen as the target fish species and was used to determine from what levels PCBs in fish tissue would need to be reduced in order to meet the TMDL target.

Available fish tissue PCB concentration data for all species sampled across the state were evaluated to exclude sites with legacy PCB sources and/or Great Lakes influence. Based on this evaluation, it was determined that lake trout would be the species on which to base atmospheric load reductions to meet the fish tissue concentration target of 0.023 mg/kg for the TMDL.

PCB tissue levels in lake trout are among the highest observed for all species of fish throughout the state because of their location towards the top of the food chain, their high lipid content, and their relatively long life, and thus their potential for high bioaccumulation of toxic contaminants like PCBs. Load reductions based on using the 90th percentile of lake trout PCB tissue levels will be generally protective of tissue levels for other species of fish since lake trout tissue levels tend to be some of the highest. Furthermore, lake trout are a top predator, consistent with the trophic level of fish used to derive the human health water quality criterion of 0.026 ng/L.

4.5.3 Calculation of Threshold Proportionality Constant

Lake trout PCB tissue concentration data from Michigan were compiled and analyzed to calculate a statewide threshold proportionality constant for use in developing required PCB load reductions. The analysis consisted of:

- **Removing data collected prior to the year 2000:** Data collected prior to 2000 were judged to be non-representative of current conditions for two reasons. First, PCB concentrations in fish were much higher prior to 2000, and have since declined at a slower rate than pre-2000 (Table 1). Second, the analysis methodology for PCBs in fish changed in 2000 from reporting Total Aroclors (industrial mixtures) to Total Congeners. Data post-2000 for edible portions of fish tissue were available for seven water bodies (Table 5).

- **Calculating the mean PCB tissue concentration in lake trout for each water body:** Lake trout tissue PCB concentrations in an individual sample can depend upon the size of the fish. Potential length-related biases in the calculation of mean tissue PCB concentrations were removed by calculating the expected PCB concentration in a "standard length" fish in each water body. Statistical regressions between fish length and observed tissue concentrations were conducted for each water body. For those water bodies showing a statistically significant (α =0.01) regression between tissue concentration and length, the mean PCB concentration was calculated using the site-specific regression and a fish length of 24 inches. This length was selected as the standard length because it was the average length of all lake trout that were analyzed. For those water bodies not showing a statistically significant regression between tissue concentration and length, the mean concentration in a standard length fish was calculated as the average of all observed tissue concentration data for that water body. Resulting PCB concentrations in fish tissue for each water body are shown in Table 5.

- **Calculating the proportionality constant associated with each water body:** Calculation of a proportionality constant requires an estimate of atmospheric load and observed fish tissue concentration data. Atmospheric gas phase PCB concentrations are being used as a surrogate for atmospheric load in this TMDL, as discussed previously in Section 4.1. The regression of Venier and Hites (2010b) as shown in Equation 6 was applied to calculate an atmospheric PCB concentration corresponding to each lake trout sampling location specific to the year the lake trout were collected. A proportionality constant for each water body was generated by calculating the ratio of mean lake trout tissue PCB concentration to atmospheric gas phase PCB concentrations (Table 5).

- **Calculating the statewide threshold proportionality constant:** The observed proportionality constants shown in Table 5 were assessed using Minitab statistical software. Maximum likelihood estimation, as implemented in the Minitab program and based on an assumption of a log-normal distribution, was used to calculate a 90^{th} percentile value for the threshold proportionality constant. The 90^{th} percentile threshold proportionality constant determined to represent a statewide value was calculated to be 3.293 (mg/kg)/(ng/m^3).

Table 5. Lake Trout Data Used to Calculate a Threshold Proportionality Constant.

Water Body Name	Location	Collection Date	# Fish	Mean Tissue PCB (mg/kg)	Proportionality Constant (mg/kg)/(ng/m3)	Average Atmospheric PCB at Time of Fish Sample Collection (ng/m3)
Crystal Lake	Benzie County	9/6/2000	15	0.17	1.75	0.096
Elk Lake	Grand Traverse/ Antrim County	4/11/2006	9	0.12	1.24	0.095
Glen Lake	Leelanau County	6/1/2009	9	0.14	1.55	0.088
Green Lake	Grand Traverse County	6/4/2003	10	0.12	1.25	0.098
North Lake Leelanau	Leelanau County	10/21/2003	12	0.27	2.78	0.098
Siskiwit Lake	Isle Royale	6/29/2002	10	0.04	0.64	0.060
Torch Lake	Antrim County	3/15/2009	11	0.36	4.02	0.089
90th percentile value					3.293	

4.6 REQUIRED REDUCTION PERCENTAGE

The overall reduction percentage required to meet TMDL targets were determined through the following steps:

1. Calculating the average atmospheric PCB concentration in the state.
2. Combining the atmospheric PCB concentration with the threshold proportionality constant to calculate expected fish tissue concentrations for existing conditions.
3. Determining the percentage by which existing tissue concentration would need to be reduced to attain the 0.023 mg/kg fish tissue target statewide.

A single area-weighted average atmospheric gas phase PCB concentration was calculated to be 0.115 ng/m^3 for the entire state. This value was multiplied by the area-weighted threshold proportionality constant of 3.293 (mg/kg)/(ng/m^3) based on the 90^{th} percentile values to produce an estimated fish tissue PCB concentration of 0.378 mg/kg. This concentration represents the existing PCB concentration in fish. Based on this analysis, a 94 percent reduction in year 2010 atmospheric gas phase PCB concentrations would be required to meet the fish tissue target of 0.023 mg/kg, since a one-to-one ratio reduction in atmospheric gas phase PCB concentrations will result in a one-to-one reduction of fish tissue PCB concentrations.

5.0 SOURCE ASSESSMENT

5.1 SOURCES OF PCBS

Because PCBs are a synthetic, man-made compound, they have no natural sources. Before the USEPA's ban of PCB production in 1979, sources of PCBs were a wide variety of electrical equipment including fluorescent light ballasts and industrial oils, lubricants, and other fluids. Release into the environment occurred through sewers, smokestacks, stormwater runoff, and direct application. Most PCBs that still remain in the environment are stored in sediment or tissue from legacy use (as opposed to new production) and are introduced to water bodies through outdated or illegal landfills and scrap yards and leaks or explosions of electrical equipment and other equipment that still contain PCBs (Agency for Toxic Substances and Disease Registry, 2001). PCBs can also be reintroduced to water bodies through the movement of contaminated sediments, volatilization from water or soil, wet and dry atmospheric deposition and revolatilization (Hazardous Substances Data Bank, 2003). There are several facilities with permits that are authorized to release PCBs into the air in Michigan (Table 6). The total loadings of PCBs to the atmosphere from these facilities were estimated to be about 1.06 lbs/year.

Table 6. Permitted Air Releases of PCBs, 2008.
(Source: Michigan Air Emission Reporting System [MAERS])

Facility Name	Location	Release of PCBs to Air (lbs)
Decorative Panels International, Inc.	Alpena, MI	0.012907
Flint Water Pollution Control Facility	Flint, MI	0.203654
Warren Wastewater Treatment Plant	Warren, MI	0.343097
Empire Iron Mining Partnership	Palmer, MI	0.003503
Pontiac Wastewater Treatment Plant	Pontiac, MI	0.390172
City of Battle Creek Wastewater Treatment Plant	Battle Creek, MI	0.104457
Sekisul Voltek LLC.	Coldwater, MI	0.000003
Total*		1.057792

*Numbers do not sum exactly due to rounding.

5.1.1 **Compilation of Source Data**

To identify the current sources of PCBs to Michigan's inland water bodies, all readily available information describing point sources (e.g., Superfund and other contaminated sites, National Pollutant Discharge Elimination System (NPDES) permitted stormwater dischargers), and nonpoint sources (e.g., atmospheric deposition) was compiled. PCB data spanned the period 1980 to 2011, with coverage varying spatially and by media. Fish data were obtained for the period 1980 to 2009, water data were obtained for the period 1998 to 2003, air data were obtained for the period 1990 to 2007, and sediment data were available for the period 2000 to 2002. In addition to environmental data, geographic datasets were also obtained to understand the spatial variation in PCB impairment, and other relevant contributing factors such as land cover (Table 7). These data were used to identify a range of point and nonpoint source loadings of PCBs.

Table 7. Geographic Datasets Obtained.

Description of Data	Type of Dataset	Source
Streams and Rivers (lines) from version 10a of the Michigan Geographic Framework dataset.	Hydrography	Michigan Center for Geographic Information (MCGI)
Lakes and Rivers (polygons) from version 10a of the Michigan Geographic Framework dataset.	Hydrography	MCGI
Lake polygons for the State of Michigan.	Hydrography	MCGI
Lake contour data for lakes managed for recreational boating access	Hydrography	MCGI
Polygons representing the boundaries of cities in Michigan.	Political	MCGI
Polygons representing the boundaries of counties in Michigan.	Political	MCGI
Polygons representing Michigan village boundaries.	Political	MCGI
2006 National Land Cover data for the entire State of Michigan.		Multi-Resolution Land Characteristic Consortium (MRLC)
High resolution NHD data for the State of Michigan.	Hydrography	United States Geological Survey (USGS)
High resolution NHD data for the State of Michigan: HUC boundaries.	Watershed Boundaries	USGS
Assessment Unit IDs	Hydrography	MCGI
Impaired water body segments	Hydrography	MDEQ
Ecological drainage units	Ecoregion Boundaries	Kendra Cheruvelil (Michigan State University)

5.2 DATA GAP ANALYSIS

After compiling the appropriate databases, two major data gaps were identified: statewide atmospheric deposition of PCBs in populated regions of Michigan and specific load or concentration data from legacy point sources. The following steps were used to fill data gaps. The regression equation developed by Venier and Hites (2010b) was used to estimate atmospheric PCB concentrations as described previously in Section 4.

A subset of the impaired water bodies considered under this TMDL are impaired by legacy contaminated sources (e.g., Areas of Concern [AOCs], Superfund sites) (Figure 10). Those which have cleanup plans in place are expected to meet the TMDL target once the cleanup plan is complete and the reductions listed in this TMDL are met. These water bodies will be placed under the 4b category in Michigan's Integrated Report until monitoring reflects the waters are in compliance with the WQS. Category 4b is intended for water bodies with a pollution control program in place that is expected to solve the pollution problems, such as Superfund and AOC cleanup plans.

a) Superfund Sites with PCBs as a primary contaminant of concern.

b) AOCs in Michigan[10].

Figure 10. Location of Legacy Polluted Sites in Michigan. Note that the Deer Lake and Torch Lake AOCs are not impacted by PCBs.

5.2.1 Baseline Year Selection

Based on the available data, 2010 was chosen as the baseline year for PCBs. This was primarily based on the availability of population data from the 2010 census, which was required to estimate atmospheric deposition using the Venier and Hites (2010b) regression.

5.2.2 Nonpoint Source PCB Loads

Diffuse, or nonpoint sources of PCBs consist primarily of atmospheric deposition and stormwater runoff from the landscape. The original sources of PCBs are landfills, scrap yards, capacitors, transformers, and other electrical equipment, and PCBs from these sources are delivered to Michigan's water bodies through atmospheric deposition. As described in Section 4, PCBs from the atmosphere are deposited onto water bodies in three ways: wet deposition, dry deposition, and net gas exchange.

Since the gas phase of PCBs in the atmosphere makes up ≥ 90 percent of total PCB concentration, gas phase PCB concentration is used as a surrogate of total PCB atmospheric deposition. Atmospheric PCB loading to water bodies was estimated using the truncated Venier and Hites equation (Equation 7). Table 4 summarizes average regional atmospheric PCB concentrations for each EDU in the state for 2010.

5.2.3 Point Sources to Water

Point sources of PCBs under TMDL regulation consist of NPDES-permitted dischargers such as wastewater treatment plants and municipal stormwater discharges. Permitted air emissions (which are called point sources in air quality programs) are considered a nonpoint source PCB load and will be addressed under the Load Allocation (LA) portion of the TMDL. Similar to

[10] Source: Strategy for Delisting Michigan's Great Lakes AOCs. http://www.michigan.gov/documents/deq/wb-AOC-delisting-strategy_306163_7.pdf

nonpoint stormwater runoff, PCBs in municipal stormwater areas are primarily from atmospheric deposition (LimnoTech, 2011). NPDES dischargers that have water quality-based effluent limits (WQBELs) for PCBs, and which discharge to inland waters were identified by the MDEQ and are presented in Table 10. Even though stormwater regulated under the NPDES stormwater program (i.e., Phase I and Phase II) is traditionally considered to be a point source, available data from NPDES regulated stormwater discharges are not detailed enough to estimate PCB loadings for specific outfalls. In addition, since PCBs in municipal stormwater areas are primarily from atmospheric deposition, reductions to this loading source will be addressed under the LA portion of the TMDL.

6.0 TMDL DEVELOPMENT

A TMDL is defined by the equation:

TMDL (LC) = LA + WLA + MOS **(8)**

Where
TMDL = Total Maximum Daily Load (i.e., the Loading Capacity (LC) of the receiving water)
LA = sum of all Load Allocation for nonpoint sources
WLA = sum of all Waste Load Allocations for point sources
MOS = Margin of Safety

Development of TMDLs typically consists of two steps:

1. Determine the LC of the receiving water(s) (i.e., the maximum pollutant load that the water body can assimilate and attain WQS).

2. Allocate this LC among the three categories shown in Equation 8.

This statewide PCB TMDL is unique because it focuses on waters primarily impaired by atmospheric sources. As discussed in Section 4, atmospheric deposition of PCBs is not easily calculated, but can be suitably represented by the surrogate parameter of gas phase atmospheric PCB concentration. For this reason, the LA of the TMDL is specified in units of atmospheric PCB concentration instead of a load. In addition, those point sources suspected of containing significant levels of PCBs have been given WLAs at concentrations equal to the WQS, meaning that they will not be causing impairment.

The combination of the above factors, along with the use of an implicit MOS, means that the PCB reduction required to achieve the TMDL target is based entirely on the LA. This section presents the calculation of the TMDL, and is divided into the following sections:

- Load Allocation
- Waste Load Allocation
- Margin of Safety
- Critical Conditions/Seasonal Variation

A summary of Michigan's statewide PCB TMDL is provided in Table 8.

Table 8. Summary of Michigan's Statewide PCB TMDL.

TMDL Components	Units	Statewide
Target Level and Reduction Factor		
Target Fish PCB Concentration (Fish Tissue Residue Value)	mg/kg	0.023
PCB Concentration for Standard Length Lake Trout	mg/kg	0.378
Reduction Factor	94%	
PCB Load for Baseline Year 2010		
Point Source Load	lbs/day	1.48E-06
Maximum Daily Nonpoint Source Concentration	ng/m^3	0.571
Final TMDL		
Margin of Safety (MOS)	Implicit	
Waste Load Allocation (WLA)	lbs/day	1.48E-06
Load Allocation (LA) (Maximum Daily Concentration Used as a Surrogate)	ng/m^3	0.034
PCB LA for In-State and Out-of-State Deposition Sources		
In-State Contribution to LA		45%
Out-of-State Contribution to LA		55%
Necessary Reduction from Anthropogenic Emission Sources for both In-State and Out-of-State Contribution		94%

6.1 LOAD ALLOCATION

The calculations in Section 4 demonstrated that a 94 percent reduction in statewide atmospheric PCB concentration is necessary to attain PCB levels that are protective of designated uses. Given an existing atmospheric gas phase concentration of 0.115 ng/m^3, a 94 percent reduction results in an allowable annual average concentration of 0.007 ng/m^3. As discussed further in the Reasonable Assurance Section (Section 7) it will take the state approximately 50 years to reach the TMDL atmospheric deposition PCB goal.

This TMDL only has regulatory authority over PCBs originating from within the state of Michigan. For that reason, it is necessary to divide existing PCB concentrations into separate components corresponding to: (1) out-of-state sources; and (2) within-state sources. The separation of in-state and out-of-state sources was made using Equation 7 (Section 4.3), which bases total atmospheric PCB concentration on local population. The PCB contribution due to out-of-state sources was defined for this TMDL by the PCB concentration predicted by Venier and Hites (2010a) for local populations associated with wilderness levels (12,500 people per 25 km radius based on the definition of population density in wilderness areas worldwide (Mittermeier et al., 2003). It is difficult to predict the origin of atmospheric PCBs from out of the state. Atmospheric mixing processes are very complex and change constantly. Over time, PCBs depositing on Michigan's inland waters from out-of-state sources could come from other Great Lakes states, or as far away as China (University of Minnesota and LimnoTech, 2009; MacLeod et al., 2005). The PCB contribution due to in-state sources was defined as the difference between the total atmospheric PCB concentration and the concentration attributed to out-of-state sources. Results of this analysis are shown by EDU in Table 9. Several of the

EDUs in the state already had a population density <12,500 per 25 km radius, so for those EDUs, all atmospheric PCBs were assumed to be from out-of-state sources. Lastly, an average statewide contribution from in-state versus out-of-state atmospheric PCBs was estimated using a weighted average for each EDU by percentage of land area. **In-state sources make up 45 percent of the state's atmospheric PCB concentration, while out-of-state sources make up the remaining 55 percent.**

Table 9. Estimated Average Anthropogenic PCB Concentrations by EDU.

Ecological Drainage Unit	Average Population Density (individuals per 25 km radius)	Average Total PCB Conc. (ng/m^3)	Average In-State PCB Conc. (ng/m^3)	Average Out of State PCB Conc. (ng/m^3)
Bayfield Peninsula and Uplands	<1,000	0.017	-	0.017
Central Upper Peninsula	19,117	0.062	0.007	0.055
Chippewa-Black River	<1,000	0.017	-	0.017
Eastern Upper Peninsula	10,640	0.057	-	0.057
Northern Lake Michigan, Lake Huron, and Straits of Mackinac	41,265	0.087	0.025	0.062
Saginaw Bay	114,819	0.133	0.064	0.069
Southeast Lake Michigan	176,980	0.159	0.088	0.072
Southeast Michigan Interlobate and Lake Plain	830,371	0.278	0.207	0.072
To Be Determined (includes Isle Royale and Drummond Island)	6,213	0.050	-	0.050
Upper Illinois River	<1,000	0.017	-	0.017
Western Lake Erie	43,243	0.102	0.030	0.072
Western Upper Peninsula and Keweenaw Peninsula	11,199	0.052	-	0.052
Wisconsin River	<1,000	0.017	-	0.017
Area-weighted Statewide Average		0.115	0.051	0.064

If the TMDL was designed solely to reduce in-state sources, the necessary reductions from these sources would be calculated using Equation 9:

$$\%\ \text{reduction to in-state deposition} = RF / (1 - \%\ \text{out-of-state contribution}) \quad \mathbf{(9)}$$

Where

RF = Required reduction factor in overall concentration

Given a required reduction factor of 94 percent, and an out-of-state contribution of 55 percent, Equation 9 indicates that in-state sources would need to be reduced by 209 percent if no reductions were made to out-of-state sources. In-state reductions in PCB atmospheric deposition will not achieve the TMDL target alone. Therefore, this TMDL assumes that reductions from out-of-state sources will be consistent with those required for in-state sources (i.e., **94 percent reduction will be required for both in-state and out-of-state sources**). While there are currently no other states developing statewide PCB TMDLs, there are several site-specific TMDLs being implemented throughout the Great Lakes region, and a range of regional and statewide programs that are working on reductions to PCBs in other states (some of these are discussed in Section 7).

The observed and allowable atmospheric PCB concentrations have all been expressed so far in this document on an average annual basis, because annual averages appropriately reflect the long response time between changes in atmospheric concentration and changes in fish tissue concentrations. The USEPA encourages that TMDLs be expressed on a daily basis, so these annual average concentrations will also be expressed as daily maximum values in this TMDL. Atmospheric PCB concentrations are known to vary seasonally due to changes in air temperature, as indicated previously in Equation 7. Equation 7 was originally applied to define annual average atmospheric PCB concentrations across the state by using annual average temperatures for each EDU. It can also be used to define the daily maximum concentration associated with the annual average, by replacing the average temperature with the expected daily maximum temperature for each EDU.

Equation 7 was used to estimate daily maximum atmospheric PCB concentration for each EDU as follows:

1. The mean extreme maximum temperature (annual) for each EDU was calculated from spatial data obtained from the NOAA National Climatic Data Center[11].

2. The average population density (individuals per 25 kilometer radius) was calculated for each EDU using 2010 census data from the Michigan Department of Technology, Management and Budget Center for Shared Solutions and Technology Partnerships[12].

3. Atmospheric gas phase PCB concentrations for 2010 were calculated as partial pressures (in units of atmospheres) for each EDU, based on population density and average temperature, using Equation 7. Atmospheric PCBs partial pressures for each EDU were converted to concentration units (ng/m^3) based on the maximum air temperature determined in Step 1 using the following equation based on the Ideal Gas Law:

   Mass Concentration, ng/m^3 = (Partial Pressure, atm) * (average molecular weight) * (10^{12} ng/kg) * (1 [kg/m^3]/[g/L]) / (Henry's Law Constant 0.08205746 L atm K^{-1} mol^{-1}) / (Temperature °K).

   An average molecular weight of 288 g/mol was based on an assumed mixture of 65 percent Aroclor 1242 at 266.5 g/mol and 35 percent Aroclor 1254 at 328 g/mol, from the reported measurements for the city of Chicago by Hu et al. (2010). The temperature in °K was obtained as T + 273.15, where T is the temperature in °C associated with the partial pressure being converted.

Table 4 summarizes the resulting daily maximum atmospheric PCB concentration for each EDU. A single area-weighted daily maximum atmospheric PCB concentration was calculated for the entire state by weighting the EDU-average PCB concentration by the area of each EDU; this resulted in a concentration of 0.571 ng/m^3. It is noted that this value is the daily maximum

11 *(The link provided was broken and has been removed.)*
12 *(The link provided was broken and has been removed.)*

atmospheric PCB concentration that exactly corresponds with the annual average PCB concentration used as the basis for determining required load reductions. Specification of daily maximum concentrations in this manner does not change the required load reduction percentage of 94 percent. **When the 94 percent required reduction is applied to meet TMDL targets, the average daily maximum atmospheric PCB concentration is 0.034 ng/m^3.**

6.2 WASTE LOAD ALLOCATION

The WLA is defined as the portion of the LC attributed to existing and future permitted point sources. As discussed in Section 5 (Source Assessment), PCB loads for point sources consist of regulated wastewater (i.e., industrial, landfills, and Superfund sites), air, and stormwater discharges. Stormwater regulated under the NPDES Municipal Separate Storm Sewer System (MS4) program (i.e., Phase I and Phase II communities) is considered to be a point source under TMDL regulation. However, available data from NPDES regulated stormwater discharges are not detailed enough to estimate PCB loadings for specific outfalls. In addition, since PCBs in municipal stormwater areas are primarily from atmospheric deposition, this loading source will be considered under the LA portion of the TMDL, and will be addressed with controls to atmospheric loading necessary to meet the LA. Michigan has a well-developed program to address and control stormwater pollution through the implementation of Best Management Practices as required by the Clean Water Act. Any PCBs in stormwater that are not addressed by reductions in atmospheric sources will be addressed by state municipal and industrial NPDES stormwater permit regulations.

WLAs were calculated for the nine facilities that have PCB WQBELs in their NPDES permits or substantive requirement documents (SRD) and discharge to an inland water body (Table 10). Superfund sites that have current on-site remediation are exempt from obtaining NPDES permits under Section 121(e) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). However, the CERCLA does mandate attainment of all applicable or relevant and appropriate requirements. Therefore, SRDs are issued by the state of Michigan to provide necessary surface water protection for on-site Superfund site cleanups. The WLA for each facility listed in Table 10 is equal to the permitted PCB effluent concentration, which is the human health WQS (0.026 ng/L), multiplied by the facility's design flow as authorized by their NPDES permit. This results in a total WLA of 1.48E-06 lbs/day for all permitted facilities.

Table 10. PCB Point Source Loads.

Designated Name	Permit No. or SRD No.	Authorized Flow (MGD)	Load (lbs/day)
G and H LF PRP Group	MIU990012	0.558	1.21E-07
GM - Pontiac SW Facility	MI0058908	1.44	3.10E-07
GM-Powertrain Flint North	MI0001597	0.022	4.80E-09
Liquid Disposal Inc-SF Site	MIU990003	0.05	1.10E-08
Organic Chemicals-SF Site	MIU990002	0.3	5.00E-08
Rose Twp Settling Defendant-SF	MIU990014	0.65	1.10E-07
Saginaw Twp-Center Rd LF	MI0054739	0.024	5.20E-09
U.S. EPA-Shiawassee River SF	MIU990023	0.013	2.80E-09
Wayne Disposal Inc LF	MI0056413	4	8.70E-07
Total WLA			1.48E-06

6.3 MARGIN OF SAFETY

The MOS is a required part of the TMDL to account for any uncertainty in the relationship between pollutant loading and receiving water quality (40 CFR, Part 130.7(c)(1)). The MOS can be either explicit (e.g., stated as an additional percentage load reduction) or implicit (i.e., conservative assumptions in the TMDL calculations or overall approach) in the calculations of the TMDL, or a combination of the two. For this PCB TMDL, the MOS is implicit because of the following conservative assumptions used to calculate the TMDL:

- The 90th percentile fish tissue concentration of PCBs for lake trout was used as a basis for this TMDL. Lake trout are large piscivorous fish, meaning that they are relatively high in the food web and represent fish that are also relatively high in fish tissue PCB concentrations. Therefore, the 90th percentile PCB concentration for lake trout is a relatively high concentration of PCBs, and most fish in the state will likely have a lower tissue PCB concentration. Calculating the TMDL based on this relatively high PCB tissue concentration incorporates a MOS into determining the percent reduction required of fish tissue to meet the target goal.

- The United States Food and Drug Administration and MDCH fish tissue PCB fish advisory trigger value is 2.0 mg/kg for the general population. This TMDL uses 0.023 mg/kg as the fish tissue target concentration for PCBs (as discussed in Section 3.2). Therefore, the difference between the fish target concentration of 0.023 mg/kg and the higher MDCH advisory trigger level of 0.2 mg/kg for sensitive populations includes a substantial MOS.

6.4 CRITICAL CONDITIONS AND SEASONAL VARIATION

TMDL calculations are required to consider critical environmental conditions such as seasonal variations in stream flow, loadings, and water quality parameters (40 CFR, Part 130.7(c)(1)). PCB concentrations in the atmosphere and water column can fluctuate seasonally; however, fish slowly accumulate PCBs over time. Due to the extremely slow response time of water and fish concentrations to changes in atmospheric loads, essentially no seasonal variation occurs in fish PCB concentrations due to seasonal variations in atmospheric concentrations. The PCB concentration in the fish represents an integration of all temporal variation up to the time of sample collection. Variability among fish because of differences in size, diet, habitat, and other undefined factors are expected to be greater in sum than seasonal variability. Since organochlorine compounds, such as PCBs, are manifested over long periods of time (rather than seasonally), short-term variations in loading are not likely to result in significant variations in designated use effects (e.g., fish consumption) (USEPA, 2011).

There are critical conditions in the sense that certain water bodies and fish species are more likely to bioaccumulate PCBs because of individual water chemistry characteristics, and the biochemistry of individual fish species. This aspect of critical conditions has been addressed in this TMDL by using a top predator fish species known to have high bioaccumulation potential. Thus, the critical conditions are assumed to be adequately addressed in the existing analysis.

7.0 REASONABLE ASSURANCE AND IMPLEMENTATION

To achieve the PCB LC allocations described in Section 6.0, significant reductions in atmospheric nonpoint source must occur. This TMDL assumes that atmospheric nonpoint source PCB loads to Michigan waters will be reduced in the future and eventually meet the LA under this TMDL. TMDLs that allow for reduction in sources for which an NPDES permit is not required should provide a reasonable assurance that the controls will be implemented and maintained. As discussed below, there are numerous state and federal regulations and other activities that are expected to reduce future PCB concentrations to levels consistent with the TMDL.

This section addresses general implementation measures and reasonable assurances, for making progress towards achieving the water quality target in this TMDL. It is divided into separate discussions of:

- Observed Reductions in Atmospheric PCB Concentrations
- Cleanup of Legacy Sources
- Restriction of Landfill Disposal of PCBs
- Regulations Governing Transport of PCBs
- Federal Toxic Substances Control Act (TSCA)

7.1 OBSERVED REDUCTIONS IN ATMOSPHERIC PCB CONCENTRATIONS

This TMDL is designed to control PCB loads to inland Michigan waters from atmospheric deposition. Monitoring data over the last several decades have shown a steady and steep decline in atmospheric concentration of PCBs in the Great Lakes region (Figure 2).

This decline in atmospheric deposition of PCBs can be attributed to the ban on the manufacture and use of PCBs in the United States in the 1970s. As PCB containing equipment wears out and is replaced with non-PCB containing equipment; PCB containing oils and equipment are properly disposed of; and, processes which resulted in the manufacture of PCBs as a byproduct are identified and modified, PCBs are removed from the environment as evidenced in the downward trend of PCB atmospheric deposition monitoring data.

The regression developed by Venier and Hites (2010a) shows that atmospheric PCBs in the Great Lakes region are decreasing over time, with a half-life of approximately 12.5 years. If atmospheric concentrations maintain this rate of decline, they will achieve the TMDL reduction goal in approximately 50 years. The implementation actions discussed earlier in this section may accelerate this rate of decline, by actively removing historical sources of PCBs that have been previously volatilizing and contributing to elevated atmospheric PCB concentrations.

7.2 CLEANUP OF LEGACY SOURCES

Formal cleanup plans are in place at several sites influenced by legacy sources. The Great Lakes Legacy Act was signed into law in 2002, and authorized by Congress in 2008, to provide funding to clean up contaminated sediment in AOCs in the Great Lakes. While these AOCs focus on Great Lakes waters not considered by the TMDL, many of the cleanup plans extend inland to waters covered by this TMDL.

The CERCLA provides a federal "Superfund" to clean up uncontrolled or abandoned hazardous waste sites. Sites eligible for long-term cleanup action under the Superfund program are included on the National Priorities List, a list of environmentally contaminated sites, published by the USEPA, which pose an immediate or significant public health threat to the local community. Michigan currently has 86 sites on the National Priorities List[13] many of which include contamination by PCBs. Cleanup plans are in place for all of these sites. The remediation of these legacy sites will provide two mechanisms for helping to achieve the TMDL. First, these cleanups will allow designated uses to be attained at legacy sites after atmospheric PCB concentrations are reduced to levels required by the TMDL. Second, these cleanups will contribute to the necessary reduction of local atmospheric PCB concentrations, as volatilization of PCBs from legacy sites can serve as a source of PCBs to the atmosphere.

Three initiatives seek to support the cleanup of legacy sites and reduce PCB pollution of water in the Great Lakes region. While these efforts are directed towards the Great Lakes, it is likely that any PCB reductions in the region will also result in PCB reductions in inland waters (especially reductions in atmospheric PCB concentrations). The Great Lakes Restoration Initiative (GLRI) is a collaboration of 16 federal agencies. The GLRI Action Plan listed cleanup of legacy sources of toxics as one of the initiative's priorities. A major goal is to delist all the AOCs, including six AOCs in Michigan prioritized to be delisted by 2014 (GLRI, 2010). The Binational Toxics Strategy is a joint effort of the United States and Canada started in 1997 to address the effects of toxic pollutants in the Great Lakes basin through goal-setting and tracking to assess progress on reducing contamination (USEPA and Environment Canada, 2009). In addition, the Great Lakes Water Quality Agreement was updated in September 2012 to address current threats to Great Lakes water quality.

7.3 RESTRICTIONS OF LANDFILL DISPOSAL OF PCBS

Volatilization of PCBs from Michigan landfills is another source of PCBs contributing to high local atmospheric PCB concentrations (Breivik et al., 2002). R 324.11514 of Part 115, Solid Waste Management, of the NREPA, was amended by 2004 PA 34 to prohibit PCBs from being delivered to a landfill for disposal, and also prohibits a landfill owner or operator from permitting the disposal of PCBs in their landfill.[14] However, as mentioned in Section 5.1, there are certain regulated facilities that can still receive PCBs.

7.4 REGULATIONS GOVERNING TRANSPORT OF PCBS

Leakage and/or illegal dumping of PCB-contaminated liquid waste, and subsequent volatilization, are additional sources of PCBs to Michigan's atmosphere (ATSDR, 2001). Michigan regulations now require the use of uniform hazardous waste manifests for all regulated shipments of PCB waste as required in Part 147, PCB Disposal, of the NREPA as per the current Operational Memos 121-4 and 147-1[15].

[13] See *(The link provided was broken and has been removed.)*

[14] See http://www.michigan.gov/documents/deq/DEQ-WHMD-OpMemo_115-27_271593_7.pdf

[15] See http://www.michigan.gov/documents/deq/deq-whm-hwp-uniform-manifest-requirements_213003_7.pdf

7.5 FEDERAL TOXIC SUBSTANCES CONTROL ACT

The TSCA authorizes the USEPA to control any substance determined to cause unreasonable risk to public health or the environment. The TSCA includes, among other things, prohibitions on the manufacture, processing, and distribution in commerce of PCBs. Thus, the TSCA legislated from the manufacture to disposal management of PCBs in the United States. The current PCB regulations were published pursuant to this act and can be found at 40 CFR, Part 761[16].

[16] See *(The link provided was broken and has been removed.)*

8.0 POST-TMDL MONITORING

Post-TMDL monitoring consists of collecting and analyzing data to evaluate how well a TMDL is working towards attaining WQS. This monitoring can assist in determining whether planned control actions are sufficient to attain WQS, or whether further measures need to be implemented. This section describes monitoring to measure PCB concentrations in fish, water, and air to track trends in water quality and to determine TMDL effectiveness.

8.1 MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY MONITORING

Three of the four monitoring goals described in the MDEQ's Water Quality Monitoring Strategy directly align with post-TMDL monitoring goals. These are as follows: (1) assess the current status and condition of waters of the state and determine whether WQS are being met; (2) measure spatial and temporal water quality trends; and (3) evaluate the effectiveness of water quality prevention and protection programs. These goals are assessed through evaluation of a variety of types of data. For post-TMDL monitoring involving PCBs, it is recommended that fish contaminant data collected by state agencies be assessed for PCBs at a frequency that is consistent with what has historically been done by the state to track trends in water quality. In addition to the programs described below, PCB data collected through the MDEQ's Michigan Inland Sediment Trend Monitoring Program and Michigan Wildlife Contaminant Monitoring Program may also be used to assess trends.

8.1.1 **Fish Contaminant Monitoring Program**

The FCMP is part of the MDEQ's Water Quality Monitoring Strategy. Edible portion fish contaminant data are used by the MDCH to develop the Michigan Fish Advisory. Whole fish data are used to track contaminant trends and caged fish data are used to identify sources of pollutants and evaluate spatial trends of contaminant concentrations.[17] Both of these organizations will generate data that can be used to evaluate TMDL effectiveness.

8.1.2 **Water Chemistry Monitoring Program**

Until 2007, the MDEQ's Water Chemistry Monitoring Program included PCB analysis and was comprised of the elements listed below. These are relevant to post-TMDL monitoring if ambient water column PCB analysis is reinstated as they can be used to assess progress:

- Fixed station trend (Saginaw and Grand Traverse Bays, connecting channels, 31 tributaries).
- Watershed surveys (consistent with the 5-year basin cycle).
- Minimally impacted sites.
- Issue sites (TMDLs, nonpoint sources, etc.).

8.1.3 **Water Body NPDES Monitoring Program**

Effluent PCBs are measured and reported for those NPDES-permitted facilities that have effluent PCB WQBELs. These monitoring data are provided to the MDEQ and can be reviewed to determine whether the facilities are meeting WQBELs. In addition, caged-fish studies used to

[17] See *(The link provided was broken and has been removed.)*

identify new point sources of PCBs being discharged will be used to justify inclusion of WQBELs for PCBs in future NPDES permits.

8.1.4 **Legacy Site Cleanup and Follow-Up Monitoring**

A limited amount of water chemistry, sediment, and fish tissue data are collected as part of legacy site cleanup plans (i.e., Superfund sites) that address PCBs. The Allied Paper Inc./Portage Creek/Kalamazoo River Superfund Site, referred to as the Kalamazoo River Superfund Project, has a long-term monitoring plan to document and monitor levels of PCBs in sediment, soil, water, and biota after remediation activities have occurred. This information will be reviewed in the future, and used to evaluate the progress made in reductions of PCBs.

8.2 ATMOSPHERIC PCB MONITORING

The United States and Canada jointly maintain the Great Lakes IADN Program. The IADN has been designed with one Master Station on each of the five Great Lakes, supplemented by a number of Satellite Stations to provide more spatial detail for deposition (Figure 7). The Master Stations offer the complete range of measurements made in the Network, measuring wet and dry deposition of Semivolatile Organic Compounds and trace metals. Satellite Stations may contain only a portion of the measurements made at the Master Stations.

Continued monitoring will occur by reviewing PCB concentrations measured at IADN stations as data become available to assess whether atmospheric PCB concentrations continue to decline as projected by the Venier and Hites (2010b) equation.

8.3 NEW MONITORING AND ASSESSMENT DATA

As part of Michigan's monitoring and assessment programs, new data, including fish tissue data, and some limited water column data, will be collected. New fish tissue data are typically considered and evaluated during the state's two-year integrated reporting cycle pursuant to Sections 305(b) and 303(d) of the Clean Water Act. There are three possible outcomes of the state's assessment of new fish tissue and/or water column data for any lake or river assessment unit:

1. The assessment unit is determined to be addressed by this TMDL if the fish tissue target PCB concentration is less than or equal to the fish tissue target concentration (0.023 mg/kg) or ambient water column PCB concentrations less than or equal to the water column target concentration (0.026 ng/L).

2. The assessment unit is placed in Category 3 of Michigan's Integrated Report due to insufficient data.

3. The assessment unit is placed in Category 5 (i.e., not attaining) of Michigan's Integrated Report if the fish tissue PCB concentration meets the criteria in the future assessment methodology for an impaired water body and is greater than 0.023 mg/kg.

Upon consideration of new fish tissue PCB data and other relevant information, the state may revise this TMDL during future integrated reporting cycles through revisions to Appendix A of this TMDL, provided that the state did not make any revisions to the TMDL targets, reduction factors, LCs, LAs, reduction goals, or any other element established in this TMDL.

The state will not revise any other portion of the original TMDL, other than Appendix A (the list of lake and river assessment units addressed by the TMDL). All other elements of the original TMDL along with its supporting documentation remain unchanged.

9.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 2001. ToxFAQs™ for Polychlorinated Biphenyls (PCBs) *(The link provided was broken and has been removed.)* Accessed April 2012.

Blanchard, P., C.V. Audette, M.L. Hulting, I. Basu, K.A. Brice, C.H. Chan, H. Dryfhout-Clark, F. Froude, R.A. Hites, M. Neilson, and R. Wu. 2008. Atmospheric Deposition of Toxic Substances to the Great Lakes: IADN Results through 2005. Environment Canada and the United States Environmental Protection Agency. ISBN: 0-978-0-662-48287-1, Canada Catalogue No. En56-158/2005E, EPA Report No. EPA 905-R-08-001.

Breivik, K., A. Sweetman, J.M. Pacyna, and K.C. Jones. 2002. Towards a Global Historical Emission Inventory for Selected PCB Congeners - A Mass Balance Approach. 2. Emissions. *Science of the Total Environment*. 290, 199-224.

Buehler, S.S. and R.A. Hites. 2002. The Great Lakes Integrated Atmospheric Deposition Network. *Environmental Science and Technology*. 36: 354A-359A.

Chen, S., L. Hsieh, and P. Hwang. 1996. Concentration, Phase Distribution, and Size Distribution of Atmospheric Polychlorinated Biphenyls Measured in Southern Taiwan. *Environment International*. 22: 411-423.

Cotham, W.E. and T.F. Bidleman. 1995. Polycyclic Aromatic Hydrocarbons and Polychlorinated Biphenyls in Air at an Urban and a Rural Site near Lake Michigan. *Environmental Science and Technology*. 29: 2782-9.

de Voogt, P., Brinkman, U.A.T. 1989. Production, Properties and Usage of Polychlorinated Biphenyls. In: Kimbrough RD, Jensen AA, editors. Halogenated Biphenyls, Terphenyls, Naphtalenes, Dibenzodioxins and Related Products. Topics in Environmental Health. *Quoted in* Breivik (2002).

Environment Canada and USEPA. 2012. Great Lakes Monitoring: Air Indicators Atmospheric Deposition of Toxic Pollutants. *(The link provided was broken and has been removed.)* Last updated June 26, 2012.

Environment Canada and USEPA. 2005. Atmospheric Deposition of Toxic Substances to the Great Lakes: IADN Results through 2005. USEPA Report No. EPA-905-R-08-001.

Environment Canada and USEPA. 2000. Atmospheric Deposition of Toxic Substances to the Great Lakes: IADN Results through 2000. USEPA Report No. EPA-905-R-08-001.

Exponent. 2003. Fish Contaminant Monitoring Program: Review and Recommendations. Prepared for the Michigan Department of Environmental Quality. *(The link provided was broken and has been removed.)*

GLRI. 2010. Great Lakes Restoration Initiative Action Plan FY2010-FY2014. *(The link provided was broken and has been removed.)*

Green, M.L., J.V. DePinto, C. Sweet, and K.C. Hornbuckle. 2000. Regional Spatial and Temporal Interpolation of Atmospheric PCBs: Interpretation of Lake Michigan Mass Balance Data. *Environmental Science and Technology*. 34(9):1833-1841.

Hazardous Substance Data Bank. 2003. Polychlorinated Biphenyls. Compiled by the National Library of Medicine. *(The link provided was broken and has been removed.)*

Higgins, J.V., M.T. Bryer, M.L. Khoury, and T.W. Fitzhugh. 2005. A Freshwater Classification Approach for Biodiversity Conservation Planning. *Conservation Biology*. 19:432-445.

Hillery, B.R., M.F. Simcik, I. Basu, R.M. Hoff, W.M.J. Strachan, D. Burniston, C.H. Chan, K.A. Brice, C.W. Sweet, and R.A. Hites. 1998. Atmospheric Deposition of Toxic Pollutants to the Great Lakes as Measured by the Integrated Atmospheric Deposition Network. *Environmental Science Technology*. 32, 2216-2221.

Hoff, R.M., W.M.J. Strachan, C.W. Sweet, C.H. Chan, M. Shackleton, T.F. Bidleman, K.A. Brice, D.A. Burniston, S. Cussion, D.F. Gatz, K. Harlin, K., and W.H. Schroeder. 1996. Atmospheric Deposition of Toxic Chemicals to the Great Lakes: Review of Data through 1994. *Atmospheric Environment*. 30: 3505-3527.

Hu, D., H. Lehmler, A. Martinez, K. Wang, and K. C. Hornbuckle. 2010. Atmospheric PCB Congeners across Chicago. *Atmospheric Environment*. 44(12): 1550-1557.

Jackson, A.M., E.B. Swain, C.A. Andrews, and D. Rae. 2000. Minnesota's Mercury Contamination Reduction Initiative. *Fuel Processing Technology*. 65-66:79-99.

Jeremiason, J.D., K.C. Hornbuckle, and S.J. Eisenreich. 1994. PCBs in Lake Superior, 1978-1992; Decreases in Water Concentrations Reflect Loss by Volatization. *Environmental Science and Technology*. 28: 903-914.

Keeler G.J., J.M. Pacyna, T.F. Bidleman, J.O. Nriagu. 1993. Identification of Sources Contributing to the Contamination of the Great Waters (Revised) EPA/453/R-94/087. Washington, DC: United States Environmental Protection Agency, Office of Air Quality Planning and Standards.

LimnoTech. 2011. Draft TMDL Support Document for PCBs in Lake Ontario. Prepared for: USEPA Region 2. http://www.dec.ny.gov/docs/water_pdf/lakeontariopcbtmdl.pdf.

MacLeod, M., W.J. Riley, and T.E. McKone. 2005. Assessing the Influence of Climate Variability on Atmospheric Concentrations of Polychlorinated Biphenyls Using a Global-Scale Mass Balance Model (BETR-Global). *Environmental Science and Technology*. 39(17):6749-6756.

MDEQ. 2013. Water Chemistry Status and Trends in Michigan's Rivers and Streams, 1998-2008, January 2013 (Draft).

MDEQ. 2012. Water Quality and Pollution Control in Michigan 2010 Sections 303(d), 305(b), and 314 Integrated Report. MI/DEQ/WB-10/001.
(The link provided was broken and has been removed.)

MDEQ. 2010. Fish Contaminant Monitoring Program, 2010 Annual Edible Portion Report: Recommendations for Changes to the 2011 Michigan Department of Community Health Fish Consumption Advisory. MI/DEQ/WRD-11/028.

MDEQ. 2008. Michigan Fish Contaminant Monitoring Program, 2008 Annual Report. MI/DEQ/WB-09/044. http://www.michigan.gov/documents/deq/wb-swas-fcmp-2008report_284691_7.pdf.

MDEQ. 2002. Total Maximum Daily Load for Polychlorinated Biphenyls for the Kawkawlin River, Bay County, Michigan. Surface Water Quality Division. August 2002. *(The link provided was broken and has been removed.)*

Minnesota Pollution Control Agency. 2007. Minnesota Statewide Mercury Total Maximum Daily Load. March 27, 2007. http://www.pca.state.mn.us/index.php/view-document.html?gid=8507.

Mittermeier, R.A., C.G. Mittermeier, T.M. Brooks, J.D. Pilgrim, W.R. Konstant, G.A.B. da Fonseca, and C. Kormos. 2003. Wilderness and Biodiversity Conservation. *Proceedings of the National Academy of Sciences of the United States of America*. 100(18): 10309-10313.

New England Interstate Water Pollution Control Commission. 2007. Northeast Regional Mercury Total Maximum Daily Load.

Pearson, R.F., K.C. Hornbuckle, S.J. Eisenreich, and D.L. Swackhamer. 1996. PCBs in Lake Michigan Water Revisited. *Environmental Science and Technology*. 30: 1429-1436.

Simcik, M.F., R.M. Hoff, W.M. Strachan, C.W. Sweet, I. Basu, and R.A. Hites. 2000. Temporal Trends of Semivolatile Organic Contaminants in Great Lakes Precipitation. *Environmental Science and Technology*. 34: 361-367.

Simcik, M.F., T.P. Franz, H. Zhang. and S.J. Eisenreich. 1998. Gas-Particle Portioning of PCBs and PAHs in the Chicago Urban and Adjacent Coastal Atmosphere: States of Equilibrium. *Environmental Science and Technology*. 32: 251-257.

Swackhamer, D.L. and D.E. Armstrong. 1986. Estimation of the Atmospheric and Nonatmospheric Contribution and Losses of Polychlorinated Biphenyls to Lake Michigan on the Basis of Sediment Records of Remote Lakes. *Environmental Science and Technology*. 20:879-883.

Sweet, C.W., R.J. Murphy, J.H. Bannasch, C.A. Kelsey, and J.J. Hong. 1993. Atmospheric Deposition of PCBs into Green Bay. *Journal of Great Lakes Research*. 19: 109-128.

University of Minnesota and LimnoTech. 2009. Development of a Multi-Media Great Lakes Basin Model for Screening Chemicals of Emerging Concern --GLMOD. Prepared for the Great Lakes Commission.

USEPA, Office of Toxic Substances. 1977. PCBs Involvement in the Pulp and Paper Industry. EPA Report #560/6-77-005.

USEPA. 2002. Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1991. May 20, 2002 Memorandum. *(The link provided was broken and has been removed.)*

USEPA. 2012. Great Lakes Monitoring: Air Indicators, Atmospheric Deposition of Toxic Pollutants. *(The link provided was broken and has been removed.)*

USEPA. 2011. PCB TMDL Handbook EPA Report #841-R-11-006. http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/pcb_tmdl_handbook.pdf.

USEPA and Environment Canada. 2009. Great Lakes Binational Toxics Strategy, 2009 Biennial Report. *(The link provided was broken and has been removed.)*

USEPA. 2004. Polychlorinated Biphenyl Inspection Manual. Office of Enforcement and Compliance Assurance.

USEPA. 1991. Technical Support Document for Water Quality-Based Toxics Control. USEPA Report #505/2-90-001. http://www.epa.gov/npdes/pubs/owm0264.pdf.

Venier, M.A. and R.A. Hites. 2010a. Time Trend Analysis of Atmospheric POPs Concentrations in the Great Lakes Region Since 1990. *Environmental Science and Technology*. 44: 8050-8055.

Venier, M.A. and R. A. Hites. 2010b. Regression Model of Partial Pressures of PCBs, PAHs, and Organochlorine Pesticides in the Great Lakes' Atmosphere. *Environmental Science and Technology*. 44: 618-623.

APPENDIX A.

LIST OF PCB-IMPAIRED INLAND WATER BODIES SUBMITTED FOR APPROVAL UNDER THIS TMDL

AUID	Assessment Unit Name	Location Description	PCB Impairment
040201020101-01	Rivers/Streams in HUC 040201020101	Includes: Unnamed Tributaries to Michigan Bay	Water
040201020102-01	Rivers/Streams in HUC 040201020102	Includes: Tenderfoot Creek	Water
040201020103-01	Rivers/Streams in HUC 040201020103	Includes: Cisco Branch Ontonagon River, Grosbeck Creek and Langford Creek	Water
040201020104-01	Rivers/Streams in HUC 040201020104	Includes: Blair Creek and Twomile Creek	Water
040201020105-01	Rivers/Streams in HUC 040201020105	Includes: Iddings Creek, Tenmile Creek, Toles Creek and Weir Creek	Water
040201020106-01	Rivers/Streams in HUC 040201020106	Includes: Caddis Creek, Sisson-Lilley Creek, Tenmile Creek and Wanagan Creek	Water
040201020107-01	Rivers/Streams in HUC 040201020107	Includes: Cisco Branch Ontonagon River, Custer Creek, Ratford Creek and Snuffbox Creek	Water
040201020108-01	Rivers/Streams in HUC 040201020108	Includes: Bluff Creek, Matheson Creek and Paulding Creek	Water
040201020108-02	Rivers/Streams in HUC 040201020108	Includes: Bluff Creek and Roselawn Creek	Water
040201020109-01	Rivers/Streams in HUC 040201020109	Includes: Choate Creek, Redlight Creek, Scott and Howe Creek and Sucker Creek	Water
040201020109-02	Rivers/Streams in HUC 040201020109	Includes: Sucker Creek	Water
040201020110-01	Rivers/Streams in HUC 040201020110	Includes: Kostlenick Creek and South Branch Ontonagon River	Water
040201020111-01	Rivers/Streams in HUC 040201020111	Includes: Cedar Creek, Farmer Creek, Junco Creek, Maple Leaf Creek, Mulligan Creek and South Branch Ontonagon River	Water
040201020201-01	Rivers/Streams in HUC 040201020201	Includes: Duck Creek and Forty Five Creek	Water
040201020201-02	Rivers/Streams in HUC 040201020201	Includes: Duck Creek	Water
040201020202-01	Rivers/Streams in HUC 040201020202	Includes: Cowslip Creek, Henderson Creek, Marathon Creek, Middle Branch Ontonagon River, Snap Jack Creek, Teds Creek, Wolf Creek and Zigzag Creek	Water
040201020203-01	Rivers/Streams in HUC 040201020203	Includes: Cedar Creek, Imp Creek, Tamarack River and Taylor Creek	Water
040201020204-01	Rivers/Streams in HUC 040201020204	Includes: Bonifas Creek, Marion Creek, Middle Branch Ontonagon River, Morrison Creek and Sargents Creek	Water
040201020204-04	Rivers/Streams in HUC 040201020204	Includes: McGinty Creek	Water
040201020205-01	Rivers/Streams in HUC 040201020205	Includes: Aho Creek, Interior Creek and Middle Branch Ontonagon River	Water
040201020205-03	Rivers/Streams in HUC 040201020205	Includes: Deadman Creek	Water
040201020206-01	Rivers/Streams in HUC 040201020206	Includes: Dorrie Creek, Dover Creek, Emanuel Creek, Mannis Creek, Payseor Creek, Rolston Creek and Trout Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040201020207-01	Rivers/Streams in HUC 040201020207	Includes: Meto Creek, Middle Branch Ontonagon River, Nevala Creek, Payne Creek and Tom Creek	Water
040201020208-01	Rivers/Streams in HUC 040201020208	Includes: Baltimore River, Pietila Creek and Pine Creek	Water
040201020209-01	Rivers/Streams in HUC 040201020209	Includes: Clear Creek, House Creek and Mile and One-half Creek	Water
040201020210-01	Rivers/Streams in HUC 040201020210	Includes: Baltimore River, Clear Creek and Hide Creek	Water
040201020211-01	Rivers/Streams in HUC 040201020211	Includes: Champagne Creek, Darling Creek, Lane Creek, Longtime Creek, Middle Branch Ontonagon River, Slough Creek and Spring Creek	Water
040201020301-02	Rivers/Streams in HUC 040201020301	Includes: East Branch Ontonagon River, Glitter Creek, Johns Creek and Preston Creek	Water
040201020302-01	Rivers/Streams in HUC 040201020302	Includes: Dunn Creek, Passmore Creek and Stony Creek	Water
040201020303-03	Rivers/Streams in HUC 040201020303	Includes: Includes: Jumbo River, Shane Creek, Tepee Creek, Walton Creek, Jake Creek, West Branch Jumbo River and Wildman Creek	Water
040201020304-01	Rivers/Streams in HUC 040201020304	Includes: East Branch Ontonagon River	Water
040201020304-02	Rivers/Streams in HUC 040201020304	Includes: East Branch Ontonagon River, Lake Thirteen Creek and Smith Creek	Water
040201020304-03	Rivers/Streams in HUC 040201020304	Includes: Spargo Creek	Water
040201020305-02	Rivers/Streams in HUC 040201020305	Includes: Beaver Creek	Water
040201020306-01	Rivers/Streams in HUC 040201020306	Includes: Adrian Creek, Buritts Creek, Debutant Creek, Dogwood Creek, East Branch Ontonagon River, Kits Creek, Onion Creek and Skoglund Creek	Water
040201020307-01	Rivers/Streams in HUC 040201020307	Includes: Bob Lake Creek	Water
040201020307-02	Rivers/Streams in HUC 040201020307	Includes: Hubbell Creek, Jug Creek, Larochelle Creek, Newholm Creek and Pori Creek	Water
040201020307-03	Rivers/Streams in HUC 040201020307	Includes: Leveque Creek	Water
040201020308-02	Rivers/Streams in HUC 040201020308	Includes: Adventure Creek, Defoe Creek and Porterfield Creek	Water
040201020308-04	Rivers/Streams in HUC 040201020308	Includes: Bond Creek, East Branch Ontonagon River and Grade Creek	Water
040201020308-05	Rivers/Streams in HUC 040201020308	Includes: Adventure Creek	Water
040201020309-01	Rivers/Streams in HUC 040201020309	Includes: Deer Lick Creek, East Branch Ontonagon River and Tank Creek	Water
040201020309-02	Rivers/Streams in HUC 040201020309	Includes: East Branch Ontonagon River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040201020401-01	Rivers/Streams in HUC 040201020401	Includes: Nelson Creek	Water
040201020401-02	Rivers/Streams in HUC 040201020401	Includes: Marshall Creek	Water
040201020401-03	Rivers/Streams in HUC 040201020401	Includes: Gypo Creek, Santa Fe Creek, Slate River and Sparkling Creek	Water
040201020401-04	Rivers/Streams in HUC 040201020401	Includes: Banner Creek and Pelton River	Water
040201020402-01	Rivers/Streams in HUC 040201020402	Includes: Speckled Brook	Water
040201020402-02	Rivers/Streams in HUC 040201020402	Includes: Trout Brook	Water
040201020403-01	Rivers/Streams in HUC 040201020403	Includes: Merriweather Creek	Water
040201020403-02	Rivers/Streams in HUC 040201020403	Includes: Merriweather Creek	Water
040201020403-03	Rivers/Streams in HUC 040201020403	Includes: Unnamed Tributary to Merriweather Creek	Water
040201020404-01	Rivers/Streams in HUC 040201020404	Includes: Bingham Creek, Hendrick Creek, Knute Creek and Montgomery Creek	Water
040201020405-01	Rivers/Streams in HUC 040201020405	Includes: Cascade Creek and Sandhill Creek	Water
040201020406-01	Rivers/Streams in HUC 040201020406	Includes: Bebo Creek, Brown Creek, Livingston Creek, Match Creek, Mill Creek and Shoemaker Creek	Water
040201020407-01	Rivers/Streams in HUC 040201020407	Includes: Gleason Creek, Russell Creek, Stindt Creek, Trestle Creek, West Branch Ontonagon River, Whisky Hollow Creek and Woodpecker Creek	Water
040201020408-01	Rivers/Streams in HUC 040201020408	Includes: Cushman Creek, Erickson Creek, Johnson Creek, Schaat Creek and West Branch Ontonagon River	Water
040201020409-01	Rivers/Streams in HUC 040201020409	Includes: West Branch Ontonagon River, Austin Creek, East Branch Mill Creek, Gates Creek, Irish Creek, Mill Creek, Ontonagon River, Patty Creek, Plover Creek, Rockland Creek, Sandstone Creek and Sucker Creek	Water
040201020409-02	Rivers/Streams in HUC 040201020409	Includes: Unnamed Tributary to Ontonagon River	Water
040201020409-03	Rivers/Streams in HUC 040201020409	Includes: Ontonagon River	Water
040202020101-01	Rivers/Streams in HUC 040202020101	Includes: Kings Creek and Tahquamenon River	Water
040202020101-02	Rivers/Streams in HUC 040202020101	Includes: Tahquamenon River	Water
040202020101-03	Rivers/Streams in HUC 040202020101	Includes: Syphon Creek	Water
040202020102-01	Rivers/Streams in HUC 040202020102	Includes: Laketon Slough and Tahquamenon River	Water
040202020102-02	Rivers/Streams in HUC 040202020102	Includes: East Creek and Red Creek	Water
040202020103-01	Rivers/Streams in HUC 040202020103	Includes: Tahquamenon River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040202020103-02	Rivers/Streams in HUC 040202020103	Includes: Unnamed Tributary in HUC 040202020103	Water
040202020104-01	Rivers/Streams in HUC 040202020104	Includes: Teaspoon Creek	Water
040202020105-01	Rivers/Streams in HUC 040202020105	Includes: Carlson Creek and Petes Creek	Water
040202020105-02	Rivers/Streams in HUC 040202020105	Includes: McGraw Creek	Water
040202020105-04	Rivers/Streams in HUC 040202020105	Includes: East Lake Creek and Teaspoon Creek	Water
040202020106-02	Rivers/Streams in HUC 040202020106	Includes: Silver Creek and Tahquamenon River	Water
040202020107-01	Rivers/Streams in HUC 040202020107	Includes: Sixteen Creek, Tahquamenon River and Thirtynine Creek	Water
040202020201-01	Rivers/Streams in HUC 040202020201	Includes: Third Creek	Water
040202020202-01	Rivers/Streams in HUC 040202020202	Includes: First Creek and West Branch Sage River	Water
040202020203-01	Rivers/Streams in HUC 040202020203	Includes: East Branch Sage River	Water
040202020204-01	Rivers/Streams in HUC 040202020204	Includes: Sage River	Water
040202020301-01	Rivers/Streams in HUC 040202020301	Includes: Quinn Creek	Water
040202020301-02	Rivers/Streams in HUC 040202020301	Includes: Hendrie River and Naugle Creek	Water
040202020302-01	Rivers/Streams in HUC 040202020302	Includes: Anguilm Creek, South Branch Hendrie River, and Paquin Creek	Water
040202020303-01	Rivers/Streams in HUC 040202020303	Includes: West Branch Hendrie River	Water
040202020304-01	Rivers/Streams in HUC 040202020304	Includes: Unnamed Tributaries to Hendrie River	Water
040202020304-02	Rivers/Streams in HUC 040202020304	Includes: Hendrie River	Water
040202020305-01	Rivers/Streams in HUC 040202020305	Includes: Hendrie River	Water
040202020401-03	Rivers/Streams in HUC 040202020401	Includes: Creek Number Eight and East Branch Tahquamenon River	Water
040202020402-01	Rivers/Streams in HUC 040202020402	Includes: East Branch Tahquamenon River and Grants Creek	Water
040202020403-01	Rivers/Streams in HUC 040202020403	Includes: Creek Number Fourteen, East Branch Tahquamenon River and Riley Creek	Water
040202020404-01	Rivers/Streams in HUC 040202020404	Includes: Big Beaver Creek, East Branch Tahquamenon River, Little Beaver Creek and Riley Creek	Water
040202020501-01	Rivers/Streams in HUC 040202020501	Includes: Auger Creek	Water
040202020502-01	Rivers/Streams in HUC 040202020502	Includes: Gimlet Creek	Water
040202020503-01	Rivers/Streams in HUC 040202020503	Includes: Atwood Creek and Murphy Creek	Water
040202020503-02	Rivers/Streams in HUC 040202020503	Includes: North Branch Murphy Creek	Water
040202020504-01	Rivers/Streams in HUC 040202020504	Includes: Hiawatha Creek and Tahquamenon River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040202020505-01	Rivers/Streams in HUC 040202020505	Includes: Baird Creek, Freeman Creek, Penny Creek, Popps Creek and Tahquamenon River	Water
040202020506-01	Rivers/Streams in HUC 040202020506	Includes: Callam Creek, Linton Creek, Middle Branch Linton Creek, North Branch Linton Creek, Rose Creek, South Branch Linton Creek and Tahquamenon River	Water
040202020507-01	Rivers/Streams in HUC 040202020507	Includes: Anchard Creek and Bowers Creek	Water
040202020507-02	Rivers/Streams in HUC 040202020507	Includes: Tahquamenon River	Water
040202020508-01	Rivers/Streams in HUC 040202020508	Includes: Lynch Creek and Tahquamenon River	Water
040202020508-02	Rivers/Streams in HUC 040202020508	Includes: Cheney Creek	Water
040301060101-01	Rivers/Streams in HUC 040301060101	Includes: Mallard Creek, Mitigwaki Creek, North Branch Paint River, Paint Creek, Thirtythree Creek, Unnamed Tributaries to Mitigwaki Lake, and Unnamed Tributaries to Paint Lake	Water
040301060102-01	Rivers/Streams in HUC 040301060102	Includes: Holmes Creek, North Branch Paint River, Winslow Creek, and Unnamed Tributary to Winslow Lake	Water
040301060103-01	Rivers/Streams in HUC 040301060103	Includes: Cook's Run	Water
040301060104-02	Rivers/Streams in HUC 040301060104	Includes: South Branch Paint River and Unnamed Tributaries to South Branch Paint River	Water
040301060105-01	Rivers/Streams in HUC 040301060105	Includes: Lode Creek, McAllister Creek, McRae Creek, South Branch Paint River, and Unnamed Tributaries to South Branch Paint River	Water
040301060106-01	Rivers/Streams in HUC 040301060106	Includes: Golden Creek	Water
040301060106-02	Rivers/Streams in HUC 040301060106	Includes: Bush Creek	Water
040301060106-03	Rivers/Streams in HUC 040301060106	Includes: North Branch Paint River and Stump Creek	Water
040301060401-01	Rivers/Streams in HUC 040301060401	Includes: Silver Creek	Water
040301060401-02	Rivers/Streams in HUC 040301060401	Includes: Edna Creek, McColman Creek, Paint River, and Unnamed Tributary to Edna Creek	Water
040301060402-01	Rivers/Streams in HUC 040301060402	Includes: East Branch Hemlock River, Old Joe Creek, West Branch Hemlock River	Water
040301060403-01	Rivers/Streams in HUC 040301060403	Includes: Hemlock River, Manila Creek, and Unnamed Tributaries to Hemlock River	Water
040301060403-02	Rivers/Streams in HUC 040301060403	Includes: Little Hemlock River, Nelson Creek, and Youngers Creek	Water
040301060403-03	Rivers/Streams in HUC 040301060403	Includes: Railroad Creek	Water
040301060404-01	Rivers/Streams in HUC 040301060404	Includes: Barnetts Creek, Paint River, Parks Creek, and Unnamed Tributaries to Paint River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040301060404-02	Rivers/Streams in HUC 040301060404	Includes: Morrison Creek	Water
040301060405-01	Rivers/Streams in HUC 040301060405	Includes: Cedar Creek, Chicagon Slough, Gravel Pit Creek, Olson Creek, Unnamed Tributaries to Emily Lake, Unnamed Tributaries to Wagner Lake, and Wagner Creek	Water
040301060406-02	Rivers/Streams in HUC 040301060406	Includes: Crystal Spring Creek, Fire Lake Creek, Paint River, Peterson Creek, Unnamed Tributary to Paint River, and Unnamed Tirbutary to Peterson Creek	Water
040301060407-01	Rivers/Streams in HUC 040301060407	Includes: Mud Lakes Outlet, Paint River, Saint Paul Creek, Swan Lake Outlet, and Unnamed Tributary to Swan Lake	Water
040301060407-02	Rivers/Streams in HUC 040301060407	Includes: Paint River	Water
040301060407-04	Rivers/Streams in HUC 040301060407	Includes: Briar Hill Creek	Water
040301060408-01	Rivers/Streams in HUC 040301060408	Includes: Little Tobin Creek, Paint River, Tim Bowers Creek, and Unnamed Tributaries to Paint River	Water
040301060408-03	Rivers/Streams in HUC 040301060408	Includes: Paint River	Water
040301060408-04	Rivers/Streams in HUC 040301060408	Includes: Dunn Creek	Water
040301060409-01	Rivers/Streams in HUC 040301060409	Includes: Paint River	Water
040301060409-03	Rivers/Streams in HUC 040301060409	Includes: Stager Creek	Water
040301060504-01	Rivers/Streams in HUC 040301060504	Includes: Brule River	Water
040301080301-01	Rivers/Streams in HUC 040301080301	Includes: North Branch Sturgeon River	Water
040301080302-01	Rivers/Streams in HUC 040301080302	Includes: Gestner Branch and West Branch Sturgeon River	Water
040301080303-01	Rivers/Streams in HUC 040301080303	Includes: Schultz Creek, Tom Kings Creek and West Branch Sturgeon River	Water
040301080304-01	Rivers/Streams in HUC 040301080304	Includes: East Branch Sturgeon River	Water
040301080305-01	Rivers/Streams in HUC 040301080305	Includes: East Branch Sturgeon River	Water
040301080305-02	Rivers/Streams in HUC 040301080305	Includes: Sixmile Creek	Water
040301080306-01	Rivers/Streams in HUC 040301080306	Includes: East Branch Sturgeon River	Water
040301080306-02	Rivers/Streams in HUC 040301080306	Includes: East Branch Skunk Creek and Skunk Creek	Water
040301080307-01	Rivers/Streams in HUC 040301080307	Includes: East Branch Sturgeon River	Water
040301080308-01	Rivers/Streams in HUC 040301080308	Includes: Jansen Creek, Menominee River and Mitchell Creek	Water
040301080309-01	Rivers/Streams in HUC 040301080309	Includes: Anderson Creek, East Branch Sturgeon River, Hancock Creek, Pocans Creek, Quarry Creek and Schultz Creek	Water
040301080401-01	Rivers/Streams in HUC 040301080401	Includes: Steel Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040301080401-02	SOUTH GROVELAND POND	12 miles NE. of Iron Mountain in the Copper Country State Forest.	Water
040301080401-03	Rivers/Streams in HUC 040301080401	Includes: Pine Creek	Water
040301080402-01	Rivers/Streams in HUC 040301080402	Includes: Harding Creek, Hosking Creek and Pine Creek	Water
040301080402-02	Rivers/Streams in HUC 040301080402	Includes: Seiberts Creek	Water
040301080403-01	Rivers/Streams in HUC 040301080403	Includes: Sturgeon River	Water
040301080403-02	Rivers/Streams in HUC 040301080403	Includes: Breen Creek	Water
040301080404-01	Rivers/Streams in HUC 040301080404	Includes: Sturgeon River	Water
040301080404-02	Rivers/Streams in HUC 040301080404	Includes: Cassidy Creek	Water
040301080405-01	Rivers/Streams in HUC 040301080405	Includes: Beaver Creek, Lost Creek and Sturgeon River	Water
040301080406-01	Rivers/Streams in HUC 040301080406	Includes: Fern Creek	Water
040301080406-02	Rivers/Streams in HUC 040301080406	Includes: Pine Creek	Water
040301080406-03	Rivers/Streams in HUC 040301080406	Includes: Waterworks Creek	Water
040301080407-02	Rivers/Streams in HUC 040301080407	Includes: Hamilton Creek	Water
040301080407-03	Rivers/Streams in HUC 040301080407	Includes: Cheney Creek	Water
040301080407-04	Rivers/Streams in HUC 040301080407	Includes: Earle Brook, Fitzgerald Creek and Turners Creek	Water
040301080701-01	Rivers/Streams in HUC 040301080701	Includes: Badwater Creek, Browning Creek, First Creek and Menominee River	Water
040301080702-01	Rivers/Streams in HUC 040301080702	Includes: Menominee River and Twin Falls Creek	Water
040301080702-03	Rivers/Streams in HUC 040301080702	Includes: Antoine Creek	Water
040301080801-01	Rivers/Streams in HUC 040301080801	Includes: Holmes Creek	Water
040301080801-02	Rivers/Streams in HUC 040301080801	Includes: Poterfield Creek and Unnamed Tributary to Poterfield Creek	Water
040301080801-03	Rivers/Streams in HUC 040301080801	Includes: Poterfield Creek	Water
040301080802-01	Rivers/Streams in HUC 040301080802	Includes: Camp Two Creek, Laurin Creek, Little Cedar River and Schetter Creek	Water
040301080803-01	Rivers/Streams in HUC 040301080803	Includes: Boyle Creek and Hays Creek	Water
040301080804-01	Rivers/Streams in HUC 040301080804	Includes: Little Cedar River, Ross Creek and Snow Creek	Water
040301080901-01	Rivers/Streams in HUC 040301080901	Includes: Little Shakey Creek, Shakey River and Swanson Creek	Water
040301080911-01	Rivers/Streams in HUC 040301080911	Includes: Hanson Creek, Lindberg Creek and Little River	Water
040301080912-01	Rivers/Streams in HUC 040301080912	Includes: Little River	Water
040301080912-02	Rivers/Streams in HUC 040301080912	Includes: Big Spring Creek and Kelley Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040301090201-01	Rivers/Streams in HUC 040301090201	Includes: Tenmile Creek	Water
040301090202-01	Rivers/Streams in HUC 040301090202	Includes: Camp Creek and Ford River	Water
040301090202-02	Rivers/Streams in HUC 040301090202	Includes: Twentyfour Mile Creek and West Branch Twentyfour Mile Creek	Water
040301090203-01	Rivers/Streams in HUC 040301090203	Includes: Tenmile Creek	Water
040301090204-01	Rivers/Streams in HUC 040301090204	Includes: Ford River	Water
040301090205-01	Rivers/Streams in HUC 040301090205	Includes: Fenlon Creek, Fivemile Creek and Ford River	Water
040301100101-01	Rivers/Streams in HUC 040301100101	Includes: Brown Creek, Halfway Creek, Kipple Creek, Koops Creek, Middle Branch Escanaba River and Second River	Water
040301100102-01	Rivers/Streams in HUC 040301100102	Includes: Black River and Bruce Creek	Water
040301100103-01	Rivers/Streams in HUC 040301100103	Includes: Black River	Water
040301100104-01	Rivers/Streams in HUC 040301100104	Includes: Rocky Creek and West Branch Middle Branch Escanaba River	Water
040301100105-01	Rivers/Streams in HUC 040301100105	Includes: Bell Creek and Middle Branch Escanaba River	Water
040301100106-01	Rivers/Streams in HUC 040301100106	Includes: Ely Creek, Green Creek and Schweitzer Creek	Water
040301100107-01	Rivers/Streams in HUC 040301100107	Includes: Goose Lake Outlet	Water
040301100107-03	Rivers/Streams in HUC 040301100107	Includes: Goose Lake Inlet	Water
040301100108-01	Rivers/Streams in HUC 040301100108	Includes: East Branch Escanaba River and Fifteen Creek	Water
040301100108-02	Rivers/Streams in HUC 040301100108	Includes: Warner Creek downstream of M35 North of Palmer	Water
040301100108-03	Rivers/Streams in HUC 040301100108	Includes: Warner Creek upstream of M35 North of Palmer	Water
040301100109-01	Rivers/Streams in HUC 040301100109	Includes: Green Creek	Water
040301100110-01	Rivers/Streams in HUC 040301100110	Includes: East Branch Escanaba River, Halfway Creek, O'Neal Creek and Uncle Tom Creek	Water
040301100111-01	Rivers/Streams in HUC 040301100111	Includes: Bear Creek, Flopper Creek and Middle Branch Escanaba River	Water
040301100201-01	Rivers/Streams in HUC 040301100201	Includes: Flat Rock Creek and Wild West Creek	Water
040301100202-01	Rivers/Streams in HUC 040301100202	Includes: McGregor Creek, Schwartz Creek and West Branch Escanaba River	Water
040301100203-01	Rivers/Streams in HUC 040301100203	Includes: Big Brook, Camp Eleven Creek and Little Brook	Water
040301100204-01	Rivers/Streams in HUC 040301100204	Includes: Bass Creek, Bryan Creek, Clear Creek and Poplar Creek	Water
040301100205-01	Rivers/Streams in HUC 040301100205	Includes: Cady Creek and West Branch Escanaba River	Water
040301100206-01	Rivers/Streams in HUC 040301100206	Includes: Chandler Brook, Gleason Creek, Miller Creek and West	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Branch Escanaba River	
040301100301-01	Rivers/Streams in HUC 040301100301	Includes: Bobs Creek, Escanaba River and Wilson Creek	Water
040301100302-01	Rivers/Streams in HUC 040301100302	Includes: Mud Creek and Sawmill Creek	Water
040301100303-01	Rivers/Streams in HUC 040301100303	Includes: Chynes Creek, Lindsey Creek, Little West Branch Escanaba River and Lone Pine Creek	Water
040301100304-01	Rivers/Streams in HUC 040301100304	Includes: Escanaba River and Swimming Hole Creek	Water
040301100305-01	Rivers/Streams in HUC 040301100305	Includes: Squaw Creek and Summer Meadow Creek	Water
040301100306-01	Rivers/Streams in HUC 040301100306	Includes: Hunters Brook	Water
040301100307-01	Rivers/Streams in HUC 040301100307	Includes: Escanaba River, Indian Creek and Mosquito Creek	Water
040301100308-01	Rivers/Streams in HUC 040301100308	Includes: Bichler Creek, Escanaba River and Silver Creek	Water
040301100308-03	Rivers/Streams in HUC 040301100308	Includes: Escanaba River and Reno Creek	Water
040301120201-01	Rivers/Streams in HUC 040301120201	Includes: West Branch Sturgeon River	Water
040301120202-01	Rivers/Streams in HUC 040301120202	Includes: Camp R Creek and Sturgeon River	Water
040301120203-01	Rivers/Streams in HUC 040301120203	Includes: Sturgeon River	Water
040301120204-01	Rivers/Streams in HUC 040301120204	Includes: Eighteenmile Creek, Johnson Creek and Mink Creek	Water
040301120205-01	Rivers/Streams in HUC 040301120205	Includes: Black Creek, Little Black Creek and Sturgeon River	Water
040301120206-01	Rivers/Streams in HUC 040301120206	Includes: Mormon Creek, Moses Creek and Sturgeon River	Water
040301120207-01	Rivers/Streams in HUC 040301120207	Includes: Bull Run and Sturgeon River	Water
040301120207-02	Rivers/Streams in HUC 040301120207	Includes: Sturgeon River	Water
040500020302-03	Rivers/Streams in HUC 040500020302	Includes: Pigeon River and Sawyer Creek	Water
040500030103-01	Rivers/Streams in HUC 040500030103	Includes: North Branch Kalamazoo River from Spring Arbor & Concord Drain upstream to Cross Lake including all tributaies except Swains Lake Drain.	Water
040500030104-01	Rivers/Streams in HUC 040500030104	Includes: North Branch Kalamazoo River upstream from confluence with South Branch Kalamazoo River to Spring Arbor & Concord Drain	Water
040500030201-01	Rivers/Streams in HUC 040500030201	Includes: South Branch Kalamazoo River from tributary upstream of Grover Rd to headwaters including all tributaries	Water
040500030202-01	Rivers/Streams in HUC 040500030202	Includes: South Branch Kalamazoo River from Cobb Lake outlet confluence to tributary upstream of Grover Road	Water
040500030202-02	Rivers/Streams in HUC 040500030202	Includes: Unnamed Tributaries to Cobb Lake and Hastings Lake and Unnamed Tributary to South Branch Kalamazoo River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500030203-02	Rivers/Streams in HUC 040500030203	Includes: South Branch Kalamazoo River from Beaver Creek upstream to Cobb Lake outlet tributary (excludes Beaver Creek, Conger Drain, Cobb Lake outlet tribuatry, and UnNamed Tributary near Hanover Road)	Water
040500030204-04	Rivers/Streams in HUC 040500030204	Includes: South Branch Kalamazoo River from Swains Lake Drain upstream to Beaver Creek	Water
040500030205-01	Rivers/Streams in HUC 040500030205	Includes: Lampson Run Drain from confluence with South Branch Kalamazoo River and all tributaries upstream to headwaters.	Water
040500030206-01	Rivers/Streams in HUC 040500030206	Includes: South Branch Kalamazoo River, exclusive, from Lampson Run Drain upstream to Swains Lake Drain.	Water
040500030206-02	Rivers/Streams in HUC 040500030206	Includes: South Branch Kalamazoo River, exclusive, from confluence with North Branch Kalamazoo River upstream to Lampson Run Drain	Water
040500030406-01	Rivers/Streams in HUC 040500030406	Includes: Kalamazoo River from Rice Creek confluence upstream to Wilder Creek confluence.	Water
040500030406-02	Rivers/Streams in HUC 040500030406	Includes: Kalamazoo River from Wilder Creek confluence upstream to North Branch/ South Branch Kalamazoo River split.	Water
040500030407-01	Rivers/Streams in HUC 040500030407	Includes: Kalamazoo River from Rice Creek confluence downstream to Talmadge Creek	Water
040500030407-02	Rivers/Streams in HUC 040500030407	Includes: Kalamazoo River from Talmadge Creek confluence downstream to Squaw Lake Drain confluence.	Water
040500030508-04	Rivers/Streams in HUC 040500030508	Includes: WHITFORD LAKE OUTLET downstream to the Kalamazoo River.	Water
040500040506-03	Rivers/Streams in HUC 040500040506	Includes: North Branch Willow Creek, West Branch Willow Creek and Willow Creek	Water
040601010701-01	Rivers/Streams in HUC 040601010701	Includes: James Creek and South Branch White River	Water
040601010701-02	Rivers/Streams in HUC 040601010701	Includes: Mullen Creek	Water
040601010702-01	Rivers/Streams in HUC 040601010702	Includes: Fivemile Creek	Water
040601010703-01	Rivers/Streams in HUC 040601010703	Includes: South Branch White River	Water
040601010703-03	Rivers/Streams in HUC 040601010703	Includes: Flinton Creek	Water
040601010704-01	Rivers/Streams in HUC 040601010704	Includes: Rattlesnake Creek and South Branch White River	Water
040601010704-02	Rivers/Streams in HUC 040601010704	Includes: BLACK (DELONG) CREEK	Water
040601010704-03	Rivers/Streams in HUC 040601010704	Includes: BLACK (DELONG) CREEK	Water
040601010704-05	Rivers/Streams in HUC 040601010704	Includes: Robinson Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601010705-01	Rivers/Streams in HUC 040601010705	Includes: South Branch White River	Water
040601010705-02	Rivers/Streams in HUC 040601010705	Includes: Mena Creek	Water
040601010705-03	Rivers/Streams in HUC 040601010705	Includes: East Branch Heald Creek, Martin Creek and West Branch Heald Creek	Water
040601010706-01	Rivers/Streams in HUC 040601010706	Includes: South Branch White River	Water
040601010706-03	Rivers/Streams in HUC 040601010706	Includes: Brayton Drain	Water
040601010707-02	Rivers/Streams in HUC 040601010707	Includes: Cushman Creek	Water
040601010707-03	Rivers/Streams in HUC 040601010707	Includes: South Branch White River	Water
040601010707-04	Rivers/Streams in HUC 040601010707	Includes: Skeel Creek	Water
040601010801-02	Rivers/Streams in HUC 040601010801	Includes: North Branch White River	Water
040601010802-01	Rivers/Streams in HUC 040601010802	Includes: Robinson Creek	Water
040601010803-02	Rivers/Streams in HUC 040601010803	Includes: Swinton Creek and Osborn Creek	Water
040601010803-03	Rivers/Streams in HUC 040601010803	Includes: North Branch White River	Water
040601010804-01	Rivers/Streams in HUC 040601010804	Includes: BEAR (NEWMAN) CREEK	Water
040601010804-03	Rivers/Streams in HUC 040601010804	Includes: Knutson Creek	Water
040601010804-04	Rivers/Streams in HUC 040601010804	Includes: North Branch White River	Water
040601010901-04	Rivers/Streams in HUC 040601010901	Includes: Cleveland Creek and White River	Water
040601010901-05	Rivers/Streams in HUC 040601010901	Includes: Sand Creek	Water
040601010902-02	Rivers/Streams in HUC 040601010902	Includes: Carlton Creek and Unnamed Tributaries to White River	Water
040601010903-01	Rivers/Streams in HUC 040601010903	Includes: PIERSON DRAIN	Water
040601010903-02	Rivers/Streams in HUC 040601010903	Includes: PIERSON DRAIN	Water
040601010904-05	Rivers/Streams in HUC 040601010904	Includes: Silver Creek	Water
040601010904-07	Rivers/Streams in HUC 040601010904	Includes: Wildcat Creek	Water
040601010904-08	Rivers/Streams in HUC 040601010904	Includes: Birch Brook	Water
040601010904-09	Rivers/Streams in HUC 040601010904	Includes: BUSH CREEK	Water
040601010904-10	Rivers/Streams in HUC 040601010904	Includes: BUTTERMILK CREEK	Water
040601010904-11	Rivers/Streams in HUC 040601010904	Includes: RACCOON CREEK (LOWER)	Water
040601010904-12	Rivers/Streams in HUC 040601010904	Includes: Mill Pond Creek	Water
040601020101-01	Rivers/Streams in HUC 040601020101	Includes: Big Creek	Water
040601020102-01	Rivers/Streams in HUC 040601020102	Includes: Denton Creek and North Branch Denton Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601020103-01	Rivers/Streams in HUC 040601020103	Includes: Backus Creek and Cut, The	Water
040601020104-01	Rivers/Streams in HUC 040601020104	Includes: Denton Creek and Spring Brook	Water
040601020201-01	Rivers/Streams in HUC 040601020201	Includes: Unnamed Tributary to Dead Stream	Water
040601020202-01	Rivers/Streams in HUC 040601020202	Includes: Unnamed Tributary near Wilson Road	Water
040601020202-02	Rivers/Streams in HUC 040601020202	Includes: Addis Creek, Cole Creek and Deer Farm Creek	Water
040601020203-01	Rivers/Streams in HUC 040601020203	Includes: Unnamed Tributary near Seven Mile Road	Water
040601020203-02	Rivers/Streams in HUC 040601020203	Includes: Haymarsh Creek	Water
040601020204-01	Rivers/Streams in HUC 040601020204	Includes: Unnamed Tributaries near Loon Lake and Rhoby Road	Water
040601020204-02	Rivers/Streams in HUC 040601020204	Includes: West Branch Muskegon River	Water
040601020205-01	Rivers/Streams in HUC 040601020205	Includes: Unnamed Tributary near Gray Road	Water
040601020205-02	Rivers/Streams in HUC 040601020205	Includes: West Branch Muskegon River	Water
040601020206-01	Rivers/Streams in HUC 040601020206	Includes: Unnamed Tributaries near Eight Mile Road and Nine Mile Road	Water
040601020206-02	Rivers/Streams in HUC 040601020206	Includes: Butterfield Creek	Water
040601020207-01	Rivers/Streams in HUC 040601020207	Includes: Muskegon River	Water
040601020207-02	Rivers/Streams in HUC 040601020207	Includes: Muskegon River	Water
040601020208-01	Rivers/Streams in HUC 040601020208	Includes: Unnamed Tributary near Kelly Road	Water
040601020208-02	Rivers/Streams in HUC 040601020208	Includes: Butterfield Creek	Water
040601020209-01	Rivers/Streams in HUC 040601020209	Includes: Unnamed Tributary to Muskegon River	Water
040601020209-02	Rivers/Streams in HUC 040601020209	Includes: Muskegon River	Water
040601020301-01	Rivers/Streams in HUC 040601020301	Includes: Mitchell Creek	Water
040601020302-01	Rivers/Streams in HUC 040601020302	Includes: Unnamed Tributary near 29 Road	Water
040601020302-03	Rivers/Streams in HUC 040601020302	Includes: Unnamed Tributary between Lake Mitchell and Lake Cadillac	Water
040601020303-01	Rivers/Streams in HUC 040601020303	Includes: Clam River	Water
040601020304-01	Rivers/Streams in HUC 040601020304	Includes: Clam River	Water
040601020305-01	Rivers/Streams in HUC 040601020305	Includes: Unnamed Tributary to Twin Lake	Water
040601020305-05	Rivers/Streams in HUC 040601020305	Includes: Mosquito Creek	Water
040601020306-01	Rivers/Streams in HUC 040601020306	Includes: Clam River, Marks Creek, Stick Creek and Taylor Creek	Water
040601020307-01	Rivers/Streams in HUC 040601020307	Includes: Clam River	Water
040601020308-01	Rivers/Streams in HUC 040601020308	Includes: Middle Branch Creek and Ryan Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601020308-02	Rivers/Streams in HUC 040601020308	Includes: North Branch Creek	Water
040601020309-01	Rivers/Streams in HUC 040601020309	Includes: West Branch Clam River	Water
040601020309-02	Rivers/Streams in HUC 040601020309	Includes: Middle Branch Creek and West Branch Clam River	Water
040601020310-01	Rivers/Streams in HUC 040601020310	Includes: Unnamed Tributary near Mulder Road	Water
040601020310-02	Rivers/Streams in HUC 040601020310	Includes: Clam River	Water
040601020310-03	Rivers/Streams in HUC 040601020310	Includes: Clam River	Water
040601020401-01	Rivers/Streams in HUC 040601020401	Includes: East Branch Wolf Creek, Pup Creek and Wolf Creek	Water
040601020402-01	Rivers/Streams in HUC 040601020402	Includes: Muskegon River	Water
040601020402-02	Rivers/Streams in HUC 040601020402	Includes: Muskegon River	Water
040601020402-03	Rivers/Streams in HUC 040601020402	Includes: Bear Creek and Muskegon River	Water
040601020403-01	Rivers/Streams in HUC 040601020403	Includes: South Branch Town Line Creek	Water
040601020404-01	Rivers/Streams in HUC 040601020404	Includes: Town Line Creek and Townline Creek	Water
040601020405-01	Rivers/Streams in HUC 040601020405	Includes: Prestie Creek and Unnamed Tributary near Arnold Lake Road	Water
040601020405-02	Rivers/Streams in HUC 040601020405	Includes: Floodwood Creek	Water
040601020406-01	Rivers/Streams in HUC 040601020406	Includes: Unnamed Tributaries to Cranberry Lake	Water
040601020406-02	Rivers/Streams in HUC 040601020406	Includes: Cranberry Creek and Muskegon River	Water
040601020406-03	Rivers/Streams in HUC 040601020406	Includes: Muskegon River	Water
040601020501-01	Rivers/Streams in HUC 040601020501	Includes: Unnamed Tributary to Green Creek	Water
040601020501-02	Rivers/Streams in HUC 040601020501	Includes: Green Creek	Water
040601020502-01	Rivers/Streams in HUC 040601020502	Includes: Appleby Creek, Beebe Creek, Crocker Creek, Franz Creek, Hicks Creek and Middle Branch River	Water
040601020503-01	Rivers/Streams in HUC 040601020503	Includes: Unnamed Tributaries near 70th Avenue	Water
040601020503-02	Rivers/Streams in HUC 040601020503	Includes: Middle Branch River and West Branch Middle Branch River	Water
040601020503-03	Rivers/Streams in HUC 040601020503	Includes: Unnamed Tributary to Middle Branch River	Water
040601020504-01	Rivers/Streams in HUC 040601020504	Includes: Unnamed Trbiutary near Twin Lakes Avenue	Water
040601020504-02	Rivers/Streams in HUC 040601020504	Includes: Dishwash Creek, Giss-I-Was Creek, Halford Creek, Little Norway Creek, Muskegon River and Whisky Creek	Water
040601020505-01	Rivers/Streams in HUC 040601020505	Includes: Lost Lake Outlet	Water
040601020505-02	Rivers/Streams in HUC 040601020505	Includes: Doc And Tom Creek, Hemlock Creek and Shingle Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601020506-01	Rivers/Streams in HUC 040601020506	Includes: Grindstone Creek and Whetstone Creek	Water
040601020506-02	Rivers/Streams in HUC 040601020506	Includes: Kinney Creek, Muskegon River and Norway Creek	Water
040601020506-03	Rivers/Streams in HUC 040601020506	Includes: Muskegon River	Water
040601020507-01	Rivers/Streams in HUC 040601020507	Includes: Chippewa Creek	Water
040601020507-02	Rivers/Streams in HUC 040601020507	Includes: Chippewa Creek, Muskegon River, Posted Creek and Sandy Run	Water
040601020507-05	Rivers/Streams in HUC 040601020507	Includes: Unnamed Tributary to Muskegon River	Water
040601020601-01	Rivers/Streams in HUC 040601020601	Includes: Blanchard Lake Outlet and Unnamed Tributary to Lake Miramichi	Water
040601020601-02	Rivers/Streams in HUC 040601020601	Includes: Bull Kill Creek and Sherlock Creek	Water
040601020602-01	Rivers/Streams in HUC 040601020602	Includes: East Branch Hersey Creek and Olson Creek	Water
040601020603-01	Rivers/Streams in HUC 040601020603	Includes: Unnamed Tributary near Nine Mile Road	Water
040601020603-02	Rivers/Streams in HUC 040601020603	Includes: Indian Creek and Lincoln Creek	Water
040601020604-01	Rivers/Streams in HUC 040601020604	Includes: Burt Creek, Hersey Creek, Hersey River and Kissinger Creek	Water
040601020605-01	Rivers/Streams in HUC 040601020605	Includes: Mud Creek and Muskegon River	Water
040601020605-02	Rivers/Streams in HUC 040601020605	Includes: Twin Creek	Water
040601020606-01	Rivers/Streams in HUC 040601020606	Includes: Hersey River, Hewitt Creek, Jewitt Creek, Johnson Creek, Knuth Creek and Lawrence Creek	Water
040601020606-02	Rivers/Streams in HUC 040601020606	Includes: Shaw Creek	Water
040601020607-01	Rivers/Streams in HUC 040601020607	Includes: Bull Hill Creek, Cat Creek, Muskegon River and Polick Creek	Water
040601020607-02	Rivers/Streams in HUC 040601020607	Includes: Muskegon River	Water
040601020701-01	Rivers/Streams in HUC 040601020701	Includes: Brown Creek and Unnamed Tributaries near One Mile Road (Osceola County) and 130th Ave (Mecosta County)	Water
040601020701-02	Rivers/Streams in HUC 040601020701	Includes: Blodgett Creek, Buckhorn Creek and Muskegon River	Water
040601020702-01	Rivers/Streams in HUC 040601020702	Includes: Unnamed Tributary near 195th Avenue	Water
040601020702-02	Rivers/Streams in HUC 040601020702	Includes: Ford Creek, Muskegon River and Paris Creek	Water
040601020702-03	Rivers/Streams in HUC 040601020702	Includes: Unnamed Tributary near 18 Mile Road	Water
040601020702-04	Rivers/Streams in HUC 040601020702	Includes: Dalziel Creek	Water
040601020702-05	Rivers/Streams in HUC 040601020702	Includes: Dalziel Creek	Water
040601020703-01	Rivers/Streams in HUC 040601020703	Includes: Haymarsh Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601020703-02	Rivers/Streams in HUC 040601020703	Includes: Ryan Creek	Water
040601020704-01	Rivers/Streams in HUC 040601020704	Includes: Cold Spring Creek and Muskegon River	Water
040601020704-02	Rivers/Streams in HUC 040601020704	Includes: Byers Creek, Higginson Creek, Muskegon River and Winters Creek	Water
040601020704-05	Rivers/Streams in HUC 040601020704	Includes: Unnamed Tributary to Muskegon River	Water
040601020704-06	Rivers/Streams in HUC 040601020704	Includes: Mitchell Creek	Water
040601020705-01	Rivers/Streams in HUC 040601020705	Includes: Bennett Creek, Betts Creek, Hodgers Creek, Ladner Creek, Macks Creek and Muskegon River	Water
040601020705-02	Rivers/Streams in HUC 040601020705	Includes: Unnamed Tributary to Muskegon River	Water
040601020706-01	Rivers/Streams in HUC 040601020706	Includes: Laverne Creek, Muskegon River, Rosy Run, South Mitchell Creek and Thumser Creek	Water
040601020801-01	Rivers/Streams in HUC 040601020801	Includes: Unnamed Tributary near M-20	Water
040601020801-04	Rivers/Streams in HUC 040601020801	Includes: Gilbert Creek and West Branch Little Muskegon River	Water
040601020802-01	Rivers/Streams in HUC 040601020802	Includes: Dye Creek, East Branch Little Muskegon River and East Schrader Creek	Water
040601020803-01	Rivers/Streams in HUC 040601020803	Includes: Cedar Creek	Water
040601020803-02	Rivers/Streams in HUC 040601020803	Includes: Shinglebolt Creek	Water
040601020803-03	Rivers/Streams in HUC 040601020803	Includes: Little Muskegon River	Water
040601020803-04	Rivers/Streams in HUC 040601020803	Includes: BROCKWAY CREEK	Water
040601020803-05	Rivers/Streams in HUC 040601020803	Includes: Sylvester Creek	Water
040601020804-01	Rivers/Streams in HUC 040601020804	Includes: Tamarack Creek	Water
040601020805-01	Rivers/Streams in HUC 040601020805	Includes: Tamarack Creek	Water
040601020805-02	Rivers/Streams in HUC 040601020805	Includes: WEATHERBY DRAIN	Water
040601020806-01	Rivers/Streams in HUC 040601020806	Includes: Unnamed Tributary near West County Line Road	Water
040601020806-04	Rivers/Streams in HUC 040601020806	Includes: Unnamed Tributaries to Rice Creek and Unnamed Tributaries to Little Whitefish Lake and Whitefish Lake	Water
040601020807-01	Rivers/Streams in HUC 040601020807	Includes: Big Creek	Water
040601020808-01	Rivers/Streams in HUC 040601020808	Includes: Unnamed Tributary near Six Mile Road	Water
040601020808-02	Rivers/Streams in HUC 040601020808	Includes: Little Muskegon River	Water
040601020808-03	Rivers/Streams in HUC 040601020808	Includes: Quigley Creek	Water
040601020808-04	Rivers/Streams in HUC 040601020808	Includes: Little Muskegon River	Water
040601020809-01	Rivers/Streams in HUC 040601020809	Includes: Rice Creek and Tamarack Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601020810-01	Rivers/Streams in HUC 040601020810	Includes: Unnamed Tributaries to Little Muskegon River	Water
040601020810-02	Rivers/Streams in HUC 040601020810	Includes: Little Muskegon River	Water
040601020810-03	Rivers/Streams in HUC 040601020810	Includes: Handy Creek	Water
040601020810-04	Rivers/Streams in HUC 040601020810	Includes: Unnamed Tributaries to Little Muskegon River	Water
040601020901-01	Rivers/Streams in HUC 040601020901	Includes: Muskegon River excluding 1 mile stretch from Hardy Dam downstream	Water
040601020901-03	Rivers/Streams in HUC 040601020901	Includes: Muskegon River from Hardy Dam downstream 1 mile	Water
040601020902-01	Rivers/Streams in HUC 040601020902	Includes: Unnamed Tributary to Twinwood Lake	Water
040601020903-03	Rivers/Streams in HUC 040601020903	Includes: Penoyer Creek	Water
040601020904-06	Rivers/Streams in HUC 040601020904	Includes: WHEELER DRAIN	Water
040601020905-01	Rivers/Streams in HUC 040601020905	Includes: Unnamed Tributaries to Fourth Lake, Fremont Lake, Second Lake, and Third Lake	Water
040601020905-02	Rivers/Streams in HUC 040601020905	Includes: Unnamed Tributary to Fremont Lake	Water
040601020905-05	Rivers/Streams in HUC 040601020905	Includes: BROOKS CREEK	Water
040601020905-06	Rivers/Streams in HUC 040601020905	Includes: Daisy Creek and Spring Creek	Water
040601020905-07	Rivers/Streams in HUC 040601020905	Includes: Lorden Lake Outlet and Unnamed Tributary to Lorden Lake	Water
040601020905-08	Rivers/Streams in HUC 040601020905	Includes: UNNAMED TRIBUTARY (TO FREMONT LAKE, SE	Water
040601020905-09	Rivers/Streams in HUC 040601020905	Includes: Graham Creek	Water
040601020905-10	Rivers/Streams in HUC 040601020905	Includes: KEMPF SCHOOL CREEK	Water
040601020905-11	Rivers/Streams in HUC 040601020905	Includes: Butler Creek and Williams Creek	Water
040601021001-03	Rivers/Streams in HUC 040601021001	Includes: Cedar Creek, Little Cedar Creek and Sweeter Creek	Water
040601021001-04	Rivers/Streams in HUC 040601021001	Includes: Cedar Creek, Little Henna Creek and West Branch Cedar Creek	Water
040601021002-05	Rivers/Streams in HUC 040601021002	Includes: Mosquito Creek	Water
040601030101-01	Rivers/Streams in HUC 040601030101	Includes: Manistee River	Water
040601030101-02	Rivers/Streams in HUC 040601030101	Includes: Frenchman Creek	Water
040601030102-01	Rivers/Streams in HUC 040601030102	Includes: Goose Creek	Water
040601030103-02	Rivers/Streams in HUC 040601030103	Includes: Manistee River	Water
040601030104-01	Rivers/Streams in HUC 040601030104	Includes: Manistee River	Water
040601030104-02	Rivers/Streams in HUC 040601030104	Includes: Unnamed Tributary to Manistee River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601030104-03	Rivers/Streams in HUC 040601030104	Includes: Portage Creek	Water
040601030105-01	Rivers/Streams in HUC 040601030105	Includes: Manistee River	Water
040601030105-02	Rivers/Streams in HUC 040601030105	Includes: Unnamed Tributary to Manistee River	Water
040601030105-03	Rivers/Streams in HUC 040601030105	Includes: Black Creek	Water
040601030106-01	Rivers/Streams in HUC 040601030106	Includes: Pickerel Lake Outlet	Water
040601030106-02	Rivers/Streams in HUC 040601030106	Includes: North Branch Manistee River	Water
040601030107-01	Rivers/Streams in HUC 040601030107	Includes: Big Cannon Creek	Water
040601030107-02	Rivers/Streams in HUC 040601030107	Includes: Big Cannon Creek	Water
040601030107-03	Rivers/Streams in HUC 040601030107	Includes: Big Cannon Creek	Water
040601030108-01	Rivers/Streams in HUC 040601030108	Includes: Collar Creek, Morrison Creek, North Branch Manistee River and Sand Creek	Water
040601030109-01	Rivers/Streams in HUC 040601030109	Includes: Manistee River	Water
040601030109-02	Rivers/Streams in HUC 040601030109	Includes: Unnamed Tributaries to Manistee River	Water
040601030109-03	Rivers/Streams in HUC 040601030109	Includes: Little Devil Creek	Water
040601030109-04	Rivers/Streams in HUC 040601030109	Includes: Big Devil Creek	Water
040601030201-01	Rivers/Streams in HUC 040601030201	Includes: Little Cannon Creek and Silver Creek	Water
040601030202-01	Rivers/Streams in HUC 040601030202	Includes: Manistee River	Water
040601030202-02	Rivers/Streams in HUC 040601030202	Includes: Maple Creek	Water
040601030202-03	Rivers/Streams in HUC 040601030202	Includes: Pierson Creek	Water
040601030202-04	Rivers/Streams in HUC 040601030202	Includes: Willow Creek	Water
040601030203-01	Rivers/Streams in HUC 040601030203	Includes: Ham Creek	Water
040601030204-01	Rivers/Streams in HUC 040601030203	Includes: Hopkins Creek	Water
040601030205-01	Rivers/Streams in HUC 040601030204	Includes: Manistee River	Water
040601030205-02	Rivers/Streams in HUC 040601030204	Includes: Bourne Creek, Filer Creek, and Spring Creek	Water
040601030206-01	Rivers/Streams in HUC 040601030205	Includes: Fife Lake Outlet and Inlet Creek	Water
040601030207-01	Rivers/Streams in HUC 040601030206	Includes: Manistee River	Water
040601030207-02	Rivers/Streams in HUC 040601030206	Includes: Golden Creek and Morrisy Creek	Water
040601030207-03	Rivers/Streams in HUC 040601030206	Includes: Chase Creek	Water
040601030208-01	Rivers/Streams in HUC 040601030207	Includes: Manistee River	Water
040601030208-02	Rivers/Streams in HUC 040601030207	Includes: Walton Outlet	Water

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040601030208-03	Rivers/Streams in HUC 040601030207	Includes: Manton Creek	Water
040601030209-01	Rivers/Streams in HUC 040601030208	Includes: Manistee River	Water
040601030209-02	Rivers/Streams in HUC 040601030208	Includes: Sands Creek	Water
040601030209-03	Rivers/Streams in HUC 040601030208	Includes: Silver Creek	Water
040601030209-04	Rivers/Streams in HUC 040601030208	Includes: Buttermilk Creek	Water
040601030301-01	Rivers/Streams in HUC 040601030301	Includes: Anderson Creek and West Branch Anderson Creek	Water
040601030302-01	Rivers/Streams in HUC 040601030302	Includes: Manistee River	Water
040601030302-02	Rivers/Streams in HUC 040601030302	Includes: Filer Creek and Soper Creek	Water
040601030302-03	Rivers/Streams in HUC 040601030302	Includes: Blind Creek	Water
040601030302-04	Rivers/Streams in HUC 040601030302	Includes: Apple Creek	Water
040601030303-01	Rivers/Streams in HUC 040601030303	Includes: Manistee River	Water
040601030303-02	Rivers/Streams in HUC 040601030303	Includes: Unnamed Tributaries to Manisteee River	Water
040601030303-04	Rivers/Streams in HUC 040601030303	Includes: Cole Creek	Water
040601030303-05	Rivers/Streams in HUC 040601030303	Includes: Adams Creek	Water
040601030304-01	Rivers/Streams in HUC 040601030304	Includes: Cotton Creek and Fletcher Creek	Water
040601030305-02	Rivers/Streams in HUC 040601030305	Includes: Burkett Creek and Preston Creek	Water
040601030305-03	Rivers/Streams in HUC 040601030305	Includes: East Branch Wheeler Creek and Wheeler Creek	Water
040601030306-02	Rivers/Streams in HUC 040601030306	Includes: Cripple Creek, Seaton Creek and Tar Creek	Water
040601030306-04	Rivers/Streams in HUC 040601030306	Includes: Manistee River and Smail Creek	Water
040601030307-01	Rivers/Streams in HUC 040601030307	Includes: Perkins Creek and Slagle Creek	Water
040601030308-01	Rivers/Streams in HUC 040601030308	Includes: Manistee River	Water
040601030308-02	Rivers/Streams in HUC 040601030308	Includes: Eddington Creek	Water
040601030309-01	Rivers/Streams in HUC 040601030309	Includes: Johnson Creek, Sands Creek, and Peterson Creek	Water
040601030310-01	Rivers/Streams in HUC 040601030310	Includes: Manistee River	Water
040601030310-02	Rivers/Streams in HUC 040601030310	Includes: Unnamed Tributary near Pole Road and Unnamed Tributary to Manistee River	Water
040601030310-03	Rivers/Streams in HUC 040601030310	Includes: Hinton Creek	Water
040601030310-04	Rivers/Streams in HUC 040601030310	Includes: Arquilla Creek	Water
040601030310-05	Rivers/Streams in HUC 040601030310	Includes: Cedar Creek	Water
040601030401-01	Rivers/Streams in HUC 040601030401	Includes: Unnamed Tributary to North Branch Pine River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601030401-02	Rivers/Streams in HUC 040601030401	Includes: North Branch Pine River	Water
040601030401-03	Rivers/Streams in HUC 040601030401	Includes: Fairchild Creek	Water
040601030401-04	Rivers/Streams in HUC 040601030401	Includes: SPALDING CREEK	Water
040601030402-01	Rivers/Streams in HUC 040601030402	Includes: Unnamed Tributary to Rose Lake	Water
040601030402-03	Rivers/Streams in HUC 040601030402	Includes: East Branch Pine River	Water
040601030402-04	Rivers/Streams in HUC 040601030402	Includes: Diamond Lake Outlet Creek, Rose Lake Outlet and Rose Edgett Creek	Water
040601030403-01	Rivers/Streams in HUC 040601030403	Includes: Coe Creek and Dyer Creek	Water
040601030404-01	Rivers/Streams in HUC 040601030404	Includes: Little Beaver Creek and Sprague Creek	Water
040601030405-01	Rivers/Streams in HUC 040601030405	Includes: Sellers Creek	Water
040601030405-02	Rivers/Streams in HUC 040601030405	Includes: Dowling Creek and Poplar Creek	Water
040601030405-03	Rivers/Streams in HUC 040601030405	Includes: Silver Creek	Water
040601030405-04	Rivers/Streams in HUC 040601030405	Includes: Pine River	Water
040601030406-01	Rivers/Streams in HUC 040601030406	Includes: Hoxey Creek	Water
040601030406-02	Rivers/Streams in HUC 040601030406	Includes: Pine River	Water
040601030501-01	Rivers/Streams in HUC 040601030501	Includes: Dutchman Creek	Water
040601030501-02	Rivers/Streams in HUC 040601030501	Includes: Bear Creek, First Creek, Second Creek and Third Creek	Water
040601030502-01	Rivers/Streams in HUC 040601030502	Includes: Greens Creek and Little Bear Creek	Water
040601030503-01	Rivers/Streams in HUC 040601030503	Includes: Bear Creek and Lemon Creek	Water
040601030504-01	Rivers/Streams in HUC 040601030504	Includes: Bear Creek, Beaver Creek, Halls Creek, Horseshoe Creek and Little Beaver Creek	Water
040601030505-01	Rivers/Streams in HUC 040601030505	Includes: Bear Creek, Boswell Creek, Cedar Creek, Chicken Creek and Podunk Creek	Water
040601030601-01	Rivers/Streams in HUC 040601030601	Includes: North Branch Twin Creek, South Branch Twin Creek and Twin Creek	Water
040601030602-01	Rivers/Streams in HUC 040601030602	Includes: Lincoln Creek, Little Manistee River and Manistee Creek	Water
040601030602-02	Rivers/Streams in HUC 040601030602	Includes: Unnamed Tributary to Rockwell Lake	Water
040601030603-01	Rivers/Streams in HUC 040601030603	Includes: Cool Creek and Stronach Creek	Water
040601030604-01	Rivers/Streams in HUC 040601030604	Includes: Little Manistee River and Syers Creek	Water
040601030605-01	Rivers/Streams in HUC 040601030605	Includes: Little Manistee River	Water
040601030606-01	Rivers/Streams in HUC 040601030606	Includes: Little Manistee River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601030701-01	Rivers/Streams in HUC 040601030701	Includes: Manistee River	Water
040601030701-02	Rivers/Streams in HUC 040601030701	Includes: Manistee River	Water
040601030702-01	Rivers/Streams in HUC 040601030702	Includes: Manistee River	Water
040601030702-02	Rivers/Streams in HUC 040601030702	Includes: Pine Creek	Water
040601030702-03	Rivers/Streams in HUC 040601030702	Includes: Deer Lake Bayou, Sergant Bayou, and Unnamed Tributary to Manistee River	Water
040601030703-01	Rivers/Streams in HUC 040601030703	Includes: Manistee River	Water
040601030703-02	Rivers/Streams in HUC 040601030703	Includes: Chief Creek and Larson Creek	Water
040601030703-03	Rivers/Streams in HUC 040601030703	Includes: Sickle Creek	Water
040601030704-01	Rivers/Streams in HUC 040601030704	Includes: Manistee River	Water
040601030704-02	Rivers/Streams in HUC 040601030704	Includes: Claybank Creek and Anderson Bayou.	Water
040601030705-02	Rivers/Streams in HUC 040601030705	Includes: Manistee River	Water
040601030705-03	Rivers/Streams in HUC 040601030705	Includes: Manistee River	Water
040601030705-04	Rivers/Streams in HUC 040601030705	Includes: Manistee River	Water
040601050501-01	Rivers/Streams in HUC 040601050501	Includes: Crofton Creek, Failing Creek, Hauenstein Creek, North Branch Boardman River and Palmer Creek	Water
040601050502-01	Rivers/Streams in HUC 040601050502	Includes: South Branch Boardman River and Taylor Creek	Water
040601050503-01	Rivers/Streams in HUC 040601050503	Includes: North Branch Boardman River	Water
040601050504-01	Rivers/Streams in HUC 040601050504	Includes: Boardman River, Carpenter Creek and Twentytwo Creek	Water
040601050505-01	Rivers/Streams in HUC 040601050505	Includes: Bancroft Creek, East Creek, Jackson Creek and Parker Creek	Water
040601050506-03	Rivers/Streams in HUC 040601050506	Includes: Boardman River, Jaxon Creek and Swainston Creek	Water
040601050507-01	Rivers/Streams in HUC 040601050507	Includes: Kids Creek	Water
040601050507-03	Rivers/Streams in HUC 040601050507	Includes: Kids Creek	Water
040601050507-04	Rivers/Streams in HUC 040601050507	Includes: MILLER CREEK	Water
040601050507-06	Rivers/Streams in HUC 040601050507	Includes: Boardman River, Beitner Creek and Jack's Creek	Water
040601050507-08	Rivers/Streams in HUC 040601050507	Includes: Boardman River	Water
040601060101-02	Rivers/Streams in HUC 040601060101	Includes: Strom Creek	Water
040601060101-03	Rivers/Streams in HUC 040601060101	Includes: Shoepac River and Wolf Creek	Water
040601060101-04	Rivers/Streams in HUC 040601060101	Includes: Norton Creek	Water
040601060101-05	Rivers/Streams in HUC 040601060101	Includes: Taylor Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601060102-01	Rivers/Streams in HUC 040601060102	Includes: Black Creek	Water
040601060103-02	Rivers/Streams in HUC 040601060103	Includes: Fork Creek, Helmer Creek, Locke Creek and Portage Creek	Water
040601060201-01	Rivers/Streams in HUC 040601060201	Includes: Grass Creek, Loon Creek, Pelican Creek, and West Branch Fox River	Water
040601060202-01	Rivers/Streams in HUC 040601060202	Includes: Unnamed Tributaries to Pickerel Lake and Second Lake (Alger County), Unnamed Tributary to Stanley Lake, and Unnamed Lake Outlet (Schoolcraft County)	Water
040601060202-04	Rivers/Streams in HUC 040601060202	Includes: Little Fox River	Water
040601060202-05	Rivers/Streams in HUC 040601060202	Includes: Casey Creek and Fox River	Water
040601060203-01	Rivers/Streams in HUC 040601060203	Includes: Hudson Creek and Fox River	Water
040601060204-01	Rivers/Streams in HUC 040601060204	Includes: Camp Seven Creek, East Branch Fox River, Haymeadow Creek and Snyder Creek	Water
040601060204-03	Rivers/Streams in HUC 040601060204	Includes: Clear Creek	Water
040601060205-01	Rivers/Streams in HUC 040601060205	Includes: Cold Creek, Deer Creek, East Branch Fox River and Spring Creek	Water
040601060206-01	Rivers/Streams in HUC 040601060206	Includes: Bev Creek and East Branch Fox River	Water
040601060207-01	Rivers/Streams in HUC 040601060207	Includes: Dead Creek	Water
040601060301-02	Rivers/Streams in HUC 040601060301	Includes: Driggs River and Negro Creek	Water
040601060301-03	Rivers/Streams in HUC 040601060301	Includes: Bear Creek, Black Creek, Driggs River, Mahoney Creek and Ross Creek	Water
040601060302-01	Rivers/Streams in HUC 040601060302	Includes: Walsh Creek	Water
040601060303-01	Rivers/Streams in HUC 040601060303	Includes: Marsh Creek, Unnamed Tributaries to Marsh Creek, and Walsh Ditch	Water
040601060304-01	Rivers/Streams in HUC 040601060304	Includes: Unnamed Tributaries to Walsh Ditch and Walsh Ditch	Water
040601060305-01	Rivers/Streams in HUC 040601060305	Includes: Clarks Ditch, Holland Ditch, and Unnamed Tributaries to Holland Ditch	Water
040601060306-01	Rivers/Streams in HUC 040601060306	Includes: Delta Creek and Driggs River	Water
040601060307-02	Rivers/Streams in HUC 040601060307	Includes: Mead Creek and Tad Creek	Water
040601060307-03	Rivers/Streams in HUC 040601060307	Includes: Toms Creek	Water
040601060308-01	Rivers/Streams in HUC 040601060308	Includes: Unit Number 1 Diversion Ditch and Unit Number 2 Diversion Ditch	Water
040601060308-02	Rivers/Streams in HUC 040601060308	Includes: Grays Creek, Manistique River and Sand Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601060308-03	Rivers/Streams in HUC 040601060308	Includes: Holland Creek and Manistique River	Water
040601060309-01	Rivers/Streams in HUC 040601060309	Includes: Black Creek and Duck Creek	Water
040601060310-01	Rivers/Streams in HUC 040601060310	Includes: Boucher Creek, Dougal Creek and Manistique River	Water
040601060310-02	Rivers/Streams in HUC 040601060310	Includes: Mezik Creek	Water
040601060310-03	Rivers/Streams in HUC 040601060310	Includes: Marsh Creek and Unnamed Tributaries to Mezik Creek	Water
040601060401-01	Rivers/Streams in HUC 040601060401	Includes: Beaver Creek and North Branch Stutts Creek	Water
040601060402-01	Rivers/Streams in HUC 040601060402	Includes: Fenton Creek and Middle Branch Stutts Creek	Water
040601060403-01	Rivers/Streams in HUC 040601060403	Includes: North Branch Stutts Creek	Water
040601060404-01	Rivers/Streams in HUC 040601060404	Includes: South Branch Stutts Creek and Stutts Creek	Water
040601060405-01	Rivers/Streams in HUC 040601060405	Includes: Metser Creek and Star Creek	Water
040601060406-01	Rivers/Streams in HUC 040601060406	Includes: Creighton River, Shotgun Creek and Stoner Creek	Water
040601060407-01	Rivers/Streams in HUC 040601060407	Includes: Creighton River	Water
040601060408-01	Rivers/Streams in HUC 040601060408	Includes: Hickey Creek, Prairie Creek and Stony Creek	Water
040601060409-01	Rivers/Streams in HUC 040601060409	Includes: Commencement Creek, Pine Creek, Section Nineteen Creek and West Branch Manistique River	Water
040601060410-01	Rivers/Streams in HUC 040601060410	Includes: Hickey Creek and West Branch Hickey Creek	Water
040601060411-01	Rivers/Streams in HUC 040601060411	Includes: Bear Slough, Brace Creek, Hay Meadow Creek, Hiawatha Creek and Stutts Creek	Water
040601060412-01	Rivers/Streams in HUC 040601060412	Includes: Hay Meadow Creek and West Branch Manistique River	Water
040601060501-01	Rivers/Streams in HUC 040601060501	Includes: Indian River and Squaw Creek	Water
040601060502-01	Rivers/Streams in HUC 040601060502	Includes: Grassy Creek and Little Indian River	Water
040601060503-01	Rivers/Streams in HUC 040601060503	Includes: Deer Creek, Grassy Creek and Indian River	Water
040601060503-04	Rivers/Streams in HUC 040601060503	Includes: Delias Run	Water
040601060504-01	Rivers/Streams in HUC 040601060504	Includes: Indian River, Leg Creek and Little Murphy Creek	Water
040601060505-01	Rivers/Streams in HUC 040601060505	Includes: Bear Creek, Carr Creek, and Kilpecker Creek.	Water
040601060505-02	Rivers/Streams in HUC 040601060505	Includes: Big Murphy Creek	Water
040601060506-01	Rivers/Streams in HUC 040601060506	Includes: Indian River and Iron Creek	Water
040601060507-02	Rivers/Streams in HUC 040601060507	Includes: The Big Ditch and Unnamed Tributaries to The Big Ditch	Water
040601060508-01	Rivers/Streams in HUC 040601060508	Includes: Smith Creek	Water
040601060509-01	Rivers/Streams in HUC 040601060509	Includes: Dufour Creek	Water
040601060509-02	Rivers/Streams in HUC 040601060509	Includes: Indian River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601060601-01	Rivers/Streams in HUC 040601060601	Includes: East Branch Bear Creek, Little Bear Creek, Bear Creek, and Pelky Creek	Water
040601060602-01	Rivers/Streams in HUC 040601060602	Includes: Clemons Creek, Little Duck Creek, Manistique River and Merwin Creek	Water
040601060603-02	Rivers/Streams in HUC 040601060603	Includes: Sturgeon Hole Creek	Water
040700020201-01	Rivers/Streams in HUC 040700020201	Includes: Lumpson Creek and Pine River	Water
040700020202-01	Rivers/Streams in HUC 040700020202	Includes: Blind Biscuit Creek, Hemlock Creek and Pine River	Water
040700020203-01	Rivers/Streams in HUC 040700020203	Includes: Biscuit Creek and Trout Brook	Water
040700020204-01	Rivers/Streams in HUC 040700020204	Includes: North Pine River, Prey Creek and Sullivan Creek	Water
040700020205-01	Rivers/Streams in HUC 040700020205	Includes: Black Creek, South Branch Black Creek and Sweiger Creek	Water
040700020206-01	Rivers/Streams in HUC 040700020206	Includes: North Pine River	Water
040700020207-01	Rivers/Streams in HUC 040700020207	Includes: Bear Creek and Little Bear Creek	Water
040700020207-02	Rivers/Streams in HUC 040700020207	Includes: Bear Creek	Water
040700020208-01	Rivers/Streams in HUC 040700020208	Includes: Chub Creek	Water
040700020209-01	Rivers/Streams in HUC 040700020209	Includes: Pine River	Water
040700020210-01	Rivers/Streams in HUC 040700020210	Includes: Elmhirst Creek, Hiawatha Run, Pine River and Silver Creek	Water
040700020211-01	Rivers/Streams in HUC 040700020211	Includes: Crooked Creek, Garden Hill Creek, Home Creek, Pine River and Rock Spring Creek	Water
040700020211-02	Rivers/Streams in HUC 040700020211	Includes: Pine River	Water
040700030309-01	Rivers/Streams in HUC 040700030309	Includes: Newton Creek	Water
040700040101-01	Rivers/Streams in HUC 040700040101	Includes: Sturgeon River	Water
040700040102-01	Rivers/Streams in HUC 040700040102	Includes: Club Stream	Water
040700040103-02	Rivers/Streams in HUC 040700040103	Includes: West Branch Sturgeon River	Water
040700040104-01	Rivers/Streams in HUC 040700040104	Includes: Pickerel Creek and Sturgeon River	Water
040700040105-01	Rivers/Streams in HUC 040700040105	Includes: Allen Creek, Marl Creek and West Branch Sturgeon River	Water
040700040106-01	Rivers/Streams in HUC 040700040106	Includes: Allen Creek, Blackjack Creek, Stewart Creek and Sturgeon River	Water
040700040107-01	Rivers/Streams in HUC 040700040107	Includes: Beebe Creek and Sturgeon River	Water
040700040201-01	Rivers/Streams in HUC 040700040201	Includes: Minnehaha Creek, Silver Creek and West Branch Minnehaha Creek	Water
040700040202-01	Rivers/Streams in HUC 040700040202	Includes: Cedar Creek and Mud Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040700040203-01	Rivers/Streams in HUC 040700040203	Includes: Brush Creek	Water
040700040204-01	Rivers/Streams in HUC 040700040204	Includes: Maple River	Water
040700040205-01	Rivers/Streams in HUC 040700040205	Includes: Lancaster Creek	Water
040700040205-02	Rivers/Streams in HUC 040700040205	Includes: Certon Creek and Cope Creek	Water
040700040206-01	Rivers/Streams in HUC 040700040206	Includes: Cold Creek and Maple River	Water
040700040207-01	Rivers/Streams in HUC 040700040207	Includes: Maple River	Water
040700040208-02	Rivers/Streams in HUC 040700040208	Includes: Crooked River, McPhee Creek and Whites Creek	Water
040700040209-01	Rivers/Streams in HUC 040700040209	Includes: Hasler Creek, Little Carp River and Maple River	Water
040700040301-01	Rivers/Streams in HUC 040700040301	Includes: Pigeon River and South Branch Pigeon River	Water
040700040302-01	Rivers/Streams in HUC 040700040302	Includes: Pigeon River	Water
040700040303-01	Rivers/Streams in HUC 040700040303	Includes: Cornwall Creek and Pigeon River	Water
040700040304-01	Rivers/Streams in HUC 040700040304	Includes: Little Pigeon River	Water
040700040305-01	Rivers/Streams in HUC 040700040305	Includes: Little Pigeon River and Pigeon River	Water
040700040306-01	Rivers/Streams in HUC 040700040306	Includes: Kimberly Creek, Little Pigeon River, Middle Branch Little Pigeon River, Morrow Creek and North Branch Little Pigeon River	Water
040700040307-01	Rivers/Streams in HUC 040700040307	Includes: Pigeon River and Wilkes Creek	Water
040700040401-01	Rivers/Streams in HUC 040700040401	Includes: Johnson Creek and Little Sturgeon River	Water
040700040402-01	Rivers/Streams in HUC 040700040402	Includes: Mullett Creek	Water
040700040402-02	Rivers/Streams in HUC 040700040402	Includes: Mullett Creek	Water
040700040403-01	Rivers/Streams in HUC 040700040403	Includes: Indian River, Scott Creek and Sturgeon River	Water
040700040404-01	Rivers/Streams in HUC 040700040404	Includes: Cheboygan River, Huron, Lake, Laperell Creek and Tannery Gully	Water
040700040404-02	Rivers/Streams in HUC 040700040404	Includes: Cheboygan River	Water
040700050101-01	Rivers/Streams in HUC 040700050101	Includes: West Branch Upper Rainy River	Water
040700050102-01	Rivers/Streams in HUC 040700050102	Includes: Little Rainy River	Water
040700050103-01	Rivers/Streams in HUC 040700050103	Includes: East Branch Rainy River and Rainy River	Water
040700050104-01	Rivers/Streams in HUC 040700050104	Includes: Rainy River	Water
040700050104-02	Rivers/Streams in HUC 040700050104	Includes: Cold Creek	Water
040700050201-01	Rivers/Streams in HUC 040700050201	Includes: Black River and Saunders Creek	Water
040700050202-01	Rivers/Streams in HUC 040700050202	Includes: Black River	Water
040700050203-01	Rivers/Streams in HUC 040700050203	Includes: East Branch Black River and Rattlesnake Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040700050204-01	Rivers/Streams in HUC 040700050204	Includes: Black River and Stewart Creek	Water
040700050205-01	Rivers/Streams in HUC 040700050205	Includes: Little McMasters Creek, McMasters Creek and West McMasters Creek	Water
040700050206-01	Rivers/Streams in HUC 040700050206	Includes: Canada Creek, Montague Creek, Packer Creek and Van Hetton Creek	Water
040700050207-01	Rivers/Streams in HUC 040700050207	Includes: Canada Creek and Oxbow Creek	Water
040700050208-02	Rivers/Streams in HUC 040700050208	Includes: Tomahawk Creek	Water
040700050209-01	Rivers/Streams in HUC 040700050209	Includes: Black River	Water
040700050210-01	Rivers/Streams in HUC 040700050210	Includes: Gokee Creek, Lewis Branch Adair Creek, Milligan Creek and Weed Creek	Water
040700050211-01	Rivers/Streams in HUC 040700050211	Includes: Black River and Gregg Creek	Water
040700050212-01	Rivers/Streams in HUC 040700050212	Includes: Adair Creek, Milligan Creek and Stony Creek	Water
040700050213-01	Rivers/Streams in HUC 040700050213	Includes: Black River, Bowen Creek and Sturgis Creek	Water
040700050213-02	Rivers/Streams in HUC 040700050213	Includes: Black River and Welch Creek	Water
040700050301-01	Rivers/Streams in HUC 040700050301	Includes: Mud Creek	Water
040700050302-02	Rivers/Streams in HUC 040700050302	Includes: Black River, Fisher Creek and Stewart Creek	Water
040700050303-02	Rivers/Streams in HUC 040700050303	Includes: Black River, Long Lake Creek and Owens Creek	Water
040700050304-01	Rivers/Streams in HUC 040700050304	Includes: Black River and Myers Creek	Water
040700060101-01	Rivers/Streams in HUC 040700060101	Includes: Beaver Creek, Indian Creek and Rayburn Creek	Water
040700060102-01	Rivers/Streams in HUC 040700060102	Includes: Bruster Creek, McGinn Creek and Robbs Creek	Water
040700060103-01	Rivers/Streams in HUC 040700060103	Includes: Bear Creek, Little Wolf Creek, Mohr Creek, Silver Brook, Silver Creek, Wildcat Creek and Yoder Creek	Water
040700060104-01	Rivers/Streams in HUC 040700060104	Includes: Butterfield Creek, Davis Creek, Widner Creek and Wolf Creek	Water
040700060105-01	Rivers/Streams in HUC 040700060105	Includes: Evans Creek, Schmitt Creek and Wolf Creek	Water
040700060201-01	Rivers/Streams in HUC 040700060201	Includes: Marsh Creek, Unnamed Tributaries to Marsh Creek, and Unnamed Tributary near Weaver Road	Water
040700060202-01	Rivers/Streams in HUC 040700060202	Includes: Pike Creek and Upper South Branch Thunder Bay River	Water
040700060203-01	Rivers/Streams in HUC 040700060203	Includes: Bullock Creek, Cole Creek, Turtle Creek, Upper South Branch Thunder Bay River and Weber Creek	Water
040700060204-01	Rivers/Streams in HUC 040700060204	Includes: Upper South Branch Thunder Bay River	Water
040700060301-01	Rivers/Streams in HUC 040700060301	Includes: Barger Creek, Sheridan Creek, Stanniger Creek and	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Thunder Bay River	
040700060302-01	Rivers/Streams in HUC 040700060302	Includes: Smith Creek from Thunder Bay River confluence upstream to Voyer Lake	Water
040700060302-02	Rivers/Streams in HUC 040700060302	Includes: Smith Creek from Voyer Lake upstream to Headwaters and Thunder Bay River	Water
040700060302-03	Rivers/Streams in HUC 040700060302	Includes: Haymeadow Creek	Water
040700060303-01	Rivers/Streams in HUC 040700060303	Includes: Fuller Creek, Hunt Creek and Sage Creek	Water
040700060304-01	Rivers/Streams in HUC 040700060304	Includes: Crooked Creek and Thunder Bay River	Water
040700060305-01	Rivers/Streams in HUC 040700060305	Includes: Gilchrist Creek, Greasy Creek, Lockwood Creek and Nugent Creek	Water
040700060306-01	Rivers/Streams in HUC 040700060306	Includes: Miller Creek and Unnamed Tributaries to Miller Creek	Water
040700060307-01	Rivers/Streams in HUC 040700060307	Includes: Thunder Bay River	Water
040700060308-02	Rivers/Streams in HUC 040700060308	Includes: Brush Creek and Little Brush Creek	Water
040700060309-01	Rivers/Streams in HUC 040700060309	Includes: Sucker Creek and Thunder Bay River	Water
040700060310-01	Rivers/Streams in HUC 040700060310	Includes: Anchor Creek, Jewett Creek and Thunder Bay River	Water
040700060401-01	Rivers/Streams in HUC 040700060401	Includes: North Branch Thunder Bay River	Water
040700060402-01	Rivers/Streams in HUC 040700060402	Includes: Quinn Creek	Water
040700060403-01	Rivers/Streams in HUC 040700060403	Includes: North Branch Thunder Bay River	Water
040700060404-01	Rivers/Streams in HUC 040700060404	Includes: North Branch Thunder Bay River	Water
040700060405-01	Rivers/Streams in HUC 040700060405	Includes: Erskine Creek, North Branch Thunder Bay River and Thunder Bay River	Water
040700060501-01	Rivers/Streams in HUC 040700060501	Includes: Little North Creek	Water
040700060502-01	Rivers/Streams in HUC 040700060502	Includes: Buff Creek, Cold Creek, Comstock Creek and West Branch River	Water
040700060503-01	Rivers/Streams in HUC 040700060503	Includes: Fish Creek, Pettis Creek, Sucker Creek and Vincent Creek	Water
040700060504-01	Rivers/Streams in HUC 040700060504	Includes: Holcomb Creek, North Branch Holcomb Creek and Stevens Creek	Water
040700060505-01	Rivers/Streams in HUC 040700060505	Includes: Big Ravine Creek, Lower South Branch Thunder Bay River and Simmons Creek	Water
040700060506-01	Rivers/Streams in HUC 040700060506	Includes: Butterfield Creek, Lower South Branch Thunder Bay River and Robinson Creek	Water
040700060507-01	Rivers/Streams in HUC 040700060507	Includes: King Creek, Lower South Branch Thunder Bay River and Thunder Bay River	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040700060601-01	Rivers/Streams in HUC 040700060601	Includes: Truax Creek	Water
040700060602-01	Rivers/Streams in HUC 040700060602	Includes: Bean Creek	Water
040700060603-01	Rivers/Streams in HUC 040700060603	Includes: Gaffney Creek and Thunder Bay River	Water
040700060604-02	Rivers/Streams in HUC 040700060604	Includes: Kingsbury Creek and Thunder Bay River	Water
040700070101-01	Rivers/Streams in HUC 040700070101	Includes: Cameron Creek, Cedar Creek, Marsh Creek and Russell Creek	Water
040700070102-01	Rivers/Streams in HUC 040700070102	Includes: East Creek	Water
040700070103-01	Rivers/Streams in HUC 040700070103	Includes: South Branch Au Sable River and South Creek	Water
040700070104-01	Rivers/Streams in HUC 040700070104	Includes: Robinson Creek	Water
040700070105-01	Rivers/Streams in HUC 040700070105	Includes: Beaver Creek	Water
040700070106-01	Rivers/Streams in HUC 040700070106	Includes: Beaver Creek	Water
040700070106-02	Rivers/Streams in HUC 040700070106	Includes: Unnamed Tributary to South Branch Au Sable River	Water
040700070107-01	Rivers/Streams in HUC 040700070107	Includes: Asum Creek, Hudson Creek and South Branch Au Sable River	Water
040700070108-01	Rivers/Streams in HUC 040700070108	Includes: Thayer Creek	Water
040700070109-01	Rivers/Streams in HUC 040700070109	Includes: Douglas Creek, Hickey Creek and South Branch Au Sable River	Water
040700070110-01	Rivers/Streams in HUC 040700070110	Includes: Sauger Creek and South Branch Au Sable River	Water
040700070202-01	Rivers/Streams in HUC 040700070202	Includes: Chub Creek	Water
040700070203-01	Rivers/Streams in HUC 040700070203	Includes: North Branch Au Sable River and Turtle Creek	Water
040700070204-01	Rivers/Streams in HUC 040700070204	Includes: West Branch Big Creek	Water
040700070205-01	Rivers/Streams in HUC 040700070205	Includes: East Branch Big Creek	Water
040700070206-01	Rivers/Streams in HUC 040700070206	Includes: Middle Branch Big Creek	Water
040700070207-01	Rivers/Streams in HUC 040700070207	Includes: Crapo Creek and North Branch Au Sable River	Water
040700070208-01	Rivers/Streams in HUC 040700070208	Includes: West Branch Big Creek	Water
040700070209-01	Rivers/Streams in HUC 040700070209	Includes: Big Creek and East Branch Big Creek	Water
040700070209-02	Rivers/Streams in HUC 040700070209	Includes: Wright Creek	Water
040700070210-01	Rivers/Streams in HUC 040700070210	Includes: Carter Creek and North Branch Au Sable River	Water
040700070301-01	Rivers/Streams in HUC 040700070301	Includes: Kolke Creek inlet to Lake Tecon	Water
040700070302-01	Rivers/Streams in HUC 040700070302	Includes: Bradford Creek	Water
040700070303-01	Rivers/Streams in HUC 040700070303	Includes: Kolke Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040700070304-01	Rivers/Streams in HUC 040700070304	Includes: Unnamed Tributary to the East Branch Au Sable River	Water
040700070305-01	Rivers/Streams in HUC 040700070305	Includes: East Branch Au Sable River	Water
040700070305-02	Rivers/Streams in HUC 040700070305	Includes: East Branch Au Sable River	Water
040700070306-01	Rivers/Streams in HUC 040700070306	Includes: Au Sable River	Water
040700070306-02	Rivers/Streams in HUC 040700070306	Includes: Au Sable River and Simpson Creek	Water
040700070308-01	Rivers/Streams in HUC 040700070308	Includes: Au Sable River	Water
040700070309-01	Rivers/Streams in HUC 040700070309	Includes: Au Sable River, Barker Creek and Wakeley Creek	Water
040700070310-01	Rivers/Streams in HUC 040700070310	Includes: Au Sable River	Water
040700070401-01	Rivers/Streams in HUC 040700070401	Includes: Unnamed Tributary to the East Branch Big Creek	Water
040700070402-01	Rivers/Streams in HUC 040700070402	Includes: Unnamed Tributary to the East Branch Big Creek	Water
040700070403-01	Rivers/Streams in HUC 040700070403	Includes: Hunt Creek	Water
040700070404-01	Rivers/Streams in HUC 040700070404	Includes: West Branch Big Creek	Water
040700070405-01	Rivers/Streams in HUC 040700070405	Includes: East Branch Big Creek	Water
040700070406-01	Rivers/Streams in HUC 040700070406	Includes: Big Creek, Red Creek and West Branch Big Creek	Water
040700070501-01	Rivers/Streams in HUC 040700070501	Includes: Unnamed Tributary to Sohn Creek	Water
040700070501-02	Rivers/Streams in HUC 040700070501	Includes: Beaver Creek	Water
040700070501-03	Rivers/Streams in HUC 040700070501	Includes: Sohn Creek	Water
040700070501-04	Rivers/Streams in HUC 040700070501	Includes: Au Sable River, Gammey Creek and Whitewater Creek	Water
040700070502-01	Rivers/Streams in HUC 040700070502	Includes: Au Sable River, Honeywell Creek and Lost Creek	Water
040700070502-03	Rivers/Streams in HUC 040700070502	Includes: Antler Creek and Au Sable River	Water
040700070502-04	Rivers/Streams in HUC 040700070502	Includes: Au Sable River and Honeywell Creek	Water
040700070503-01	Rivers/Streams in HUC 040700070503	Includes: Gusler Creek, Joslin Creek and Perry Creek	Water
040700070503-02	Rivers/Streams in HUC 040700070503	Includes: Perry Creek	Water
040700070504-01	Rivers/Streams in HUC 040700070504	Includes: Au Sable River, Cauchy Creek and Cherry Creek	Water
040700070504-02	Rivers/Streams in HUC 040700070504	Includes: Loud Creek	Water
040700070504-03	Rivers/Streams in HUC 040700070504	Includes: Wolf Creek	Water
040700070504-04	Rivers/Streams in HUC 040700070504	Includes: Cherry Creek	Water
040700070505-01	Rivers/Streams in HUC 040700070505	Includes: Comins Creek	Water
040700070505-02	Rivers/Streams in HUC 040700070505	Includes: Au Sable River and Glennie Creek	Water
040700070601-01	Rivers/Streams in HUC 040700070601	Includes: Bryant Creek and Wallace Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040700070601-02	Rivers/Streams in HUC 040700070601	Includes Unnamed Tributary to Hunters Lake	Water
040700070602-01	Rivers/Streams in HUC 040700070602	Includes: McGillis Creek	Water
040700070602-02	Rivers/Streams in HUC 040700070602	Includes: Gimlet Creek	Water
040700070603-01	Rivers/Streams in HUC 040700070603	Includes: West Branch Pine River	Water
040700070603-02	Rivers/Streams in HUC 040700070603	Includes: Backus Creek	Water
040700070603-03	Rivers/Streams in HUC 040700070603	Includes: LOUD CREEK	Water
040700070604-01	Rivers/Streams in HUC 040700070604	Includes: Pine River	Water
040700070604-02	Rivers/Streams in HUC 040700070604	Includes: East Branch Pine River	Water
040700070604-03	Rivers/Streams in HUC 040700070604	Includes: East Branch Pine River	Water
040700070605-01	Rivers/Streams in HUC 040700070605	Includes: Kurtz Creek, McDonald Creek, Samyn Creek, South Branch Pine River and Vandercook Creek	Water
040700070606-01	Rivers/Streams in HUC 040700070606	Includes: Grey Creek	Water
040700070606-02	Rivers/Streams in HUC 040700070606	Includes: Roy Creek	Water
040700070607-01	Rivers/Streams in HUC 040700070607	Includes: Van Etten Creek	Water
040700070607-02	Rivers/Streams in HUC 040700070607	Includes: Tributaries to Van Etten Creek	Water
040700070608-01	Rivers/Streams in HUC 040700070608	Includes: Pine River	Water
040700070608-02	Rivers/Streams in HUC 040700070608	Includes: Duval Creek	Water
040700070609-01	Rivers/Streams in HUC 040700070609	Includes: Dry Creek, Phelan Creek and Van Etten Creek	Water
040700070609-02	Rivers/Streams in HUC 040700070609	Includes: Pine River	Water
040700070609-03	Rivers/Streams in HUC 040700070609	Includes: Coppler Creek and Hill Creek	Water
040700070701-01	Rivers/Streams in HUC 040700070701	Includes: BLOCKHOUSE CREEK	Water
040700070701-02	Rivers/Streams in HUC 040700070701	Includes: Ninemile Creek	Water
040700070701-03	Rivers/Streams in HUC 040700070701	Includes: Au Sable River	Water
040700070702-01	Rivers/Streams in HUC 040700070702	Includes: Au Sable River	Water
040700070703-01	Rivers/Streams in HUC 040700070703	Includes: Wilbur Creek	Water
040700070703-02	Rivers/Streams in HUC 040700070703	Includes: Wilbur Creek	Water
040700070704-02	Rivers/Streams in HUC 040700070704	Includes: Au Sable River	Water
040700070704-04	Rivers/Streams in HUC 040700070704	Includes: Bamfield Creek	Water
040700070705-02	Rivers/Streams in HUC 040700070705	Includes: Au Sable Creek, Harper Creek, Hubble Creek, Lime Creek, Mink Creek and South Branch River	Water
040700070706-02	Rivers/Streams in HUC 040700070706	Includes: Au Sable River, Baker Creek and Smith Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040700070706-03	Rivers/Streams in HUC 040700070706	Includes: Smith Creek	Water
040700070706-04	Rivers/Streams in HUC 040700070706	Includes: Hoppy Creek and Stewart Creek	Water
040700070707-01	Rivers/Streams in HUC 040700070707	Includes: Au Sable River	Water
040700070708-02	Rivers/Streams in HUC 040700070708	Includes: Au Sable River and Wildcat Creek	Water
040801010302-01	Rivers/Streams in HUC 040801010302	Includes: Hope Creek	Water
040801010302-02	Rivers/Streams in HUC 040801010302	Includes: Au Gres River	Water
040801010302-03	Rivers/Streams in HUC 040801010302	Includes: Nester Creek	Water
040801010303-01	Rivers/Streams in HUC 040801010303	Includes: Au Gres River, Latter Creek and Porterfield Creek	Water
040801010304-01	Rivers/Streams in HUC 040801010304	Includes: Johnson Creek	Water
040801010304-02	Rivers/Streams in HUC 040801010304	Includes: Johnson Creek	Water
040801010304-03	Rivers/Streams in HUC 040801010304	Includes: Whitney Creek	Water
040801010304-04	Rivers/Streams in HUC 040801010304	Includes: Crainer Creek	Water
040801010305-01	Rivers/Streams in HUC 040801010305	Includes: Au Gres River, County Line Drain and Scott Drain	Water
040801010305-02	Rivers/Streams in HUC 040801010305	Includes: Unnamed Tributary to the East Brach Au Gres River	Water
040801010305-03	Rivers/Streams in HUC 040801010305	Includes: Au Gres River	Water
040801010305-04	Rivers/Streams in HUC 040801010305	Includes: Elm Creek	Water
040801010306-01	Rivers/Streams in HUC 040801010306	Includes: Au Gres River	Water
040801010306-02	Rivers/Streams in HUC 040801010306	Includes: CEDAR CREEK DRAIN	Water
040801010307-01	Rivers/Streams in HUC 040801010307	Includes: Au Gres River and Burnt Drain	Water
040801010307-02	Rivers/Streams in HUC 040801010307	Includes: Old Channel East Branch Au Gres and Tributaries	Water
040801020201-01	Rivers/Streams in HUC 040801020201	Includes: Kawkawlin Creek and North Branch Kawkawlin River	Water
040801020202-01	Rivers/Streams in HUC 040801020202	Includes: Waldo Drain	Water
040801020203-01	Rivers/Streams in HUC 040801020203	Includes: Kawkawlin River	Water
040801020204-01	Rivers/Streams in HUC 040801020204	Includes: Bradford Creek, Dell Creek, Hoppler Creek, Kawkawlin River, Kindell Drain and Perry Creek	Water
040801020205-01	Rivers/Streams in HUC 040801020205	Includes: Crump Drain, Kawalski Drain, Monison Drain, North Branch Kawkawlin River and Renner Drain	Water
040801020205-02	Rivers/Streams in HUC 040801020205	Includes: Bedell Drain and North Branch Kawkawlin River	Water
040801020205-03	Rivers/Streams in HUC 040801020205	Includes: Hembling Drain, McNally Drain, and Unnamed Tributaries to Hembling Drain	Water
040801020206-01	Rivers/Streams in HUC 040801020206	Includes: Culver Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040801020206-02	Rivers/Streams in HUC 040801020206	Includes: Kawkawlin River	Water
040801030301-01	Rivers/Streams in HUC 040801030301	Includes: Bope Drain, Cameron Drain, Colfax Drain, Colona Drain, Linton Drain, McLean Drain, Pinnebog Drain, Rush Drain, Sandy Drain, Slack Drain, Unnamed Tributaries to Cameron Drain, Unnmamed Tributaries to Colfax Drain, Unnamed Tributaries to Colona D	Water
040801030302-01	Rivers/Streams in HUC 040801030302	Includes: Bad Axe Creek, Bad Axe Drain, Richardson Drain, Symons Drain, Unnamed Tributaries to Bad Axe Creek, Unnamed Tributaries to Bad Axe Drain, and Unnamed Tributaries to Symons Drain	Water
040801030302-02	Rivers/Streams in HUC 040801030302	Includes: Bad Axe Creek, Bad Axe Drain, Richardson Drain, Symons Drain, Unnamed Tributaries to Bad Axe Creek, Unnamed Tributaries to Bad Axe Drain, and Unnamed Tributaries to Symons Drain upstream of Thomas Road	Water
040801030303-01	Rivers/Streams in HUC 040801030303	Includes: Bortman Creek, Moore Creek and Schram Branch	Water
040801030304-01	Rivers/Streams in HUC 040801030304	Includes: Silver Creek	Water
040801030304-02	Rivers/Streams in HUC 040801030304	Includes: Harrison Drain, Musselman Drain, Pinnebog River, Unnamed Tributaries to Musselman Drain, and Unnamed Tributaries to Pinnebog River	Water
040802010101-01	Rivers/Streams in HUC 040802010101	Includes: Avery Creek, Chatman Creek, Edwards Creek, Indian Lake Creek, Mansfield Creek, Middle Branch Tittabawassee River, Noren Creek, Parren Creek and Perrys Creek	Water
040802010102-01	Rivers/Streams in HUC 040802010102	Includes: Cooks Creek, East Branch Tittabawassee River, LaPorte Creek, Ray Creek and Spring Creek	Water
040802010103-01	Rivers/Streams in HUC 040802010103	Includes: Lake Four Outlet, Muma Creek and West Branch Tittabawassee River	Water
040802010104-01	Rivers/Streams in HUC 040802010104	Includes: Elk Lake Creek and Tittabawassee River	Water
040802010201-01	Rivers/Streams in HUC 040802010201	Includes: Cedar River and Cranberry Creek	Water
040802010201-02	Rivers/Streams in HUC 040802010201	Includes: Popple Creek and West Branch Cedar River	Water
040802010201-03	Rivers/Streams in HUC 040802010201	Includes: Middle Branch Cedar River	Water
040802010202-01	Rivers/Streams in HUC 040802010202	Includes: North Branch Cedar River	Water
040802010203-01	Rivers/Streams in HUC 040802010203	Includes: Cedar River upstream of Wiggins Lake, Howland Creek and Smith Creek	Water
040802010204-01	Rivers/Streams in HUC 040802010204	Includes: Cedar River downstream of Wiggins Lake, Doone Creek	Water

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		and Silver Creek	
040802010301-01	Rivers/Streams in HUC 040802010301	Includes: Loon Lake Creek, Newton Creek and Runyon Creek	Water
040802010302-01	Rivers/Streams in HUC 040802010302	Includes: Elm Creek and South Branch Tobacco River	Water
040802010303-01	Rivers/Streams in HUC 040802010303	Includes: Five Lakes Creek, McCuran Creek and South Branch Tobacco River	Water
040802010303-02	Rivers/Streams in HUC 040802010303	Includes: Duncan Drain, Gorr Drain, McKinnon Drain, and Unnamed Tributary to South Branch Tobacco River	Water
040802010304-01	Rivers/Streams in HUC 040802010304	Includes: Bailey Creek, Davidson Creek and South Branch Tobacco River	Water
040802010304-02	Rivers/Streams in HUC 040802010304	Includes: Carrow Creek	Water
040802010305-01	Rivers/Streams in HUC 040802010305	Includes: Clear Creek and Middle Branch Tobacco River	Water
040802010305-02	Rivers/Streams in HUC 040802010305	Includes: Middle Branch Tobacco River	Water
040802010306-01	Rivers/Streams in HUC 040802010306	Includes: Beaver Creek, Jose Creek, Mostellar Creek, North Branch Tobacco River and Spike Horn Creek	Water
040802010307-01	Rivers/Streams in HUC 040802010307	Includes: North Branch Tobacco River	Water
040802010307-02	Rivers/Streams in HUC 040802010307	Includes: Howe Creek and North Branch Tobacco River	Water
040802010308-01	Rivers/Streams in HUC 040802010308	Includes: Dow Creek and Little Cedar River	Water
040802010309-01	Rivers/Streams in HUC 040802010309	Includes: Most Downstream Segment of the Tobacco River at Wixom Lake, and Nestor and Coolidge Drains	Water
040802010309-02	Rivers/Streams in HUC 040802010309	Includes: Tobacco River below Ross Lake, and Bear and Venison Creeks	Water
040802010401-01	Rivers/Streams in HUC 040802010401	Includes: Long Lake Creek and Sugar River	Water
040802010402-01	Rivers/Streams in HUC 040802010402	Includes: South Branch Little Sugar River	Water
040802010402-02	Rivers/Streams in HUC 040802010402	Includes: Sugar River	Water
040802010403-01	Rivers/Streams in HUC 040802010403	Includes: Tea Creek and Tittabawassee River	Water
040802010403-03	Rivers/Streams in HUC 040802010403	Includes: Little Tobacco River and Tittabawassee River	Water
040802010404-01	Rivers/Streams in HUC 040802010404	Includes: Fish Creek and Little Molasses River	Water
040802010405-01	Rivers/Streams in HUC 040802010405	Includes: Molasses River	Water
040802010406-01	Rivers/Streams in HUC 040802010406	Includes: Guernsey Creek, Larrabee Creek and Tittabawassee River	Water
040802010406-02	Rivers/Streams in HUC 040802010406	Includes: Black Creek	Water
040802010406-03	Rivers/Streams in HUC 040802010406	Includes: Larrabee Creek	Water
040802010407-01	Rivers/Streams in HUC 040802010407	Includes: Davids Drain, Fowley Drain, Hess Drain, Payne Creek and	Water

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		Tittabawassee River	
040802010501-01	Rivers/Streams in HUC 040802010501	Includes: Jordon Creek and Spring Creek	Water
040802010502-01	Rivers/Streams in HUC 040802010502	Includes: North Branch Salt River	Water
040802010503-01	Rivers/Streams in HUC 040802010503	Includes: South Branch Salt River	Water
040802010504-01	Rivers/Streams in HUC 040802010504	Includes: North Branch Salt River	Water
040802010505-01	Rivers/Streams in HUC 040802010505	Includes: Bickerton Drain, Bluff Creek, Bliss Drain, High Drain, Howe Drain, and Unnamed Tributaries to Bluff Creek	Water
040802010506-01	Rivers/Streams in HUC 040802010506	Includes: Howard Creek and Salt River	Water
040802010507-01	Rivers/Streams in HUC 040802010507	Includes: Salt River	Water
040802010604-04	Rivers/Streams in HUC 040802010604	Includes: Snake Creek	Water
040802020101-01	Rivers/Streams in HUC 040802020101	Includes: Three Lake Creek	Water
040802020102-02	Rivers/Streams in HUC 040802020102	Includes: Atkinson Creek, Benjamin Creek and North Branch Chippewa River	Water
040802020103-01	Rivers/Streams in HUC 040802020103	Includes: Butts Creek, North Branch Chippewa River and Rattail Creek	Water
040802020104-01	Rivers/Streams in HUC 040802020104	Includes: Chippewa Creek	Water
040802020104-02	Rivers/Streams in HUC 040802020104	Includes: Brown Creek, Helmer Creek and West Branch Chippewa River	Water
040802020201-01	Rivers/Streams in HUC 040802020201	Includes: Bamber Creek, Chippewa River, Sherman Creek, Tanner Creek and West Branch Chippewa River	Water
040802020202-01	Rivers/Streams in HUC 040802020202	Includes: Chippewa River, Indian Creek and Squaw Creek	Water
040802020203-01	Rivers/Streams in HUC 040802020203	Includes: Delaney Creek and Walker Creek	Water
040802020204-01	Rivers/Streams in HUC 040802020204	Includes: Coldwater River	Water
040802020204-02	Rivers/Streams in HUC 040802020204	Includes: Coldwater River	Water
040802020204-04	Rivers/Streams in HUC 040802020204	Includes: Coldwater River	Water
040802020204-05	Rivers/Streams in HUC 040802020204	Includes: Walker Creek	Water
040802020204-08	Rivers/Streams in HUC 040802020204	Includes: Sucker Creek	Water
040802020205-01	Rivers/Streams in HUC 040802020205	Includes: North Branch Chippewa River, Stevenson Lake Tributaries and outlet	Water
040802020205-02	Rivers/Streams in HUC 040802020205	Includes: North Branch Chippewa River	Water
040802020205-03	Rivers/Streams in HUC 040802020205	Includes: North Branch Chippewa River	Water
040802020205-05	Rivers/Streams in HUC 040802020205	Includes: Schofield Creek	Water

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040802020206-01	Rivers/Streams in HUC 040802020206	Includes: North Branch Chippewa River	Water
040802020206-02	Rivers/Streams in HUC 040802020206	Includes: Hogg Creek	Water
040802020206-03	Rivers/Streams in HUC 040802020206	Includes: North Branch Chippewa River	Water
040802020207-01	Rivers/Streams in HUC 040802020207	Includes: Chippewa River, Johnson Creek and Stony Brook	Water
040802020301-01	Rivers/Streams in HUC 040802020301	Includes: Pony Creek	Water
040802020301-03	Rivers/Streams in HUC 040802020301	Includes: Pony Creek	Water
040802020302-01	Rivers/Streams in HUC 040802020302	Includes: Miller Creek and Pine River	Water
040802020303-01	Rivers/Streams in HUC 040802020303	Includes: Pine River and Skunk Creek	Water
040802020303-02	Rivers/Streams in HUC 040802020303	Includes: Decker Creek and South Branch Pine River	Water
040802020303-03	Rivers/Streams in HUC 040802020303	Includes: Jewel Creek	Water
040802020304-01	Rivers/Streams in HUC 040802020304	Includes: Wolf Creek	Water
040802020305-01	Rivers/Streams in HUC 040802020305	Includes: Pine River	Water
040802020306-01	Rivers/Streams in HUC 040802020306	Includes: North Branch Pine River and Thatcher Creek	Water
040802020306-02	Rivers/Streams in HUC 040802020306	Includes: North Branch Pine River	Water
040802020306-03	Rivers/Streams in HUC 040802020306	Includes: Unnamed Tributary to the North Branch Pine River	Water
040802020307-01	Rivers/Streams in HUC 040802020307	Includes: Pine River and Tyman Branch	Water
040802020307-02	Rivers/Streams in HUC 040802020307	Includes: Mud Creek and Bass Lake Drain	Water
040802020308-01	Rivers/Streams in HUC 040802020308	Includes: Pine River	Water
040802020308-02	Rivers/Streams in HUC 040802020308	Includes: Carpenter Creek	Water
040802020309-01	Rivers/Streams in HUC 040802020309	Includes: Pine River	Water
040802020309-02	Rivers/Streams in HUC 040802020309	Includes: Unnamed Tributary to Pine River	Water
040802020310-01	Rivers/Streams in HUC 040802020310	Includes: Coles Creek and Unnamed Tributaries to Coles Creek	Water
040802020311-01	Rivers/Streams in HUC 040802020311	Includes: Honeyoey Creek	Water
040802020312-01	Rivers/Streams in HUC 040802020312	Includes: Pine River	Water
040802020312-02	Rivers/Streams in HUC 040802020312	Includes: Newark and Arcadia Drain and Unnamed Tributaries to Newark and Arcadia Drain	Water
040802020401-01	Rivers/Streams in HUC 040802020401	Includes: Upper Bush Creek, Rook Drain, Unnamed Tributaries to Bush Creek, and Unnamed Tributaries to Rook Drain	Water
040802020402-01	Rivers/Streams in HUC 040802020402	Includes: Lower Bush Creek, Taylor Drain, Unnamed Tributaries to Bush Creek, and Unnamed Tributaries to Taylor Drain	Water
040802020403-01	Rivers/Streams in HUC 040802020403	Includes: Pine River	Water

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040802020403-02	Rivers/Streams in HUC 040802020403	Includes: Sugar Creek	Water
040802020403-03	Rivers/Streams in HUC 040802020403	Includes: Pine River	Water
040802020403-05	Rivers/Streams in HUC 040802020403	Includes: Horse Creek	Water
040802020404-01	Rivers/Streams in HUC 040802020404	Includes: Pine River and Sucker Creek	Water
040802020404-02	Rivers/Streams in HUC 040802020404	Includes: Pine River	Water
040802030105-01	Rivers/Streams in HUC 040802030105	Includes: Cranberry Creek	Water
040802030105-02	Rivers/Streams in HUC 040802030105	Includes: YELLOW RIVER DRAIN	Water
040802030105-04	Rivers/Streams in HUC 040802030105	Includes: Unnamed Tributary to Fausett Lake and Unnamed Tributary to Indian Lake	Water
040802030106-01	Rivers/Streams in HUC 040802030106	Includes: North Ore Creek	Water
040802030107-02	Rivers/Streams in HUC 040802030107	Includes: Buckhorn Creek and Shiawassee River	Water
040802030107-07	Rivers/Streams in HUC 040802030107	Includes: Shiawassee River	Water
040802030108-02	Rivers/Streams in HUC 040802030108	Includes: Shiawassee River	Water
040802030109-02	Rivers/Streams in HUC 040802030109	Includes: North Ore Creek	Water
040802030201-01	Rivers/Streams in HUC 040802030201	Includes: Atherton Drain, Jones Creek and Porter Drain	Water
040802030203-01	Rivers/Streams in HUC 040802030203	Includes: Hovey Drain	Water
040802030203-02	Rivers/Streams in HUC 040802030203	Includes: THREE MILE CREEK	Water
040802030203-03	Rivers/Streams in HUC 040802030203	Includes: Burns and Vernon Drain, Holly Drain, Mikan Drain, Unnamed Tributaries to Burns and Vernon Drain, and Unnamed Tributaries to Holly Drain	Water
040802030204-01	Rivers/Streams in HUC 040802030204	Includes: Jones Creek and Webb Creek	Water
040802030204-02	Rivers/Streams in HUC 040802030204	Includes: WEBB CREEK	Water
040802030208-01	Rivers/Streams in HUC 040802030208	Includes: Mickles Creek and Unnamed Tributary to Mickles Creek	Water
040802030208-02	Rivers/Streams in HUC 040802030208	Includes: Sixmile Creek	Water
040802030208-03	Rivers/Streams in HUC 040802030208	Includes: North State Drain and Unnamed Tributaries to North State Drain	Water
040802030305-01	Rivers/Streams in HUC 040802030305	Includes: Potato Creek	Water
040802030305-02	Rivers/Streams in HUC 040802030305	Includes: Potato Creek	Water
040802030306-01	Rivers/Streams in HUC 040802030306	Includes: Bearwallow Creek and Potato Creek	Water
040802030307-01	Rivers/Streams in HUC 040802030307	Includes: Beaver Creek and Beaver Drain	Water
040802030308-01	Rivers/Streams in HUC 040802030308	Includes: Beaver Creek	Water

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040802030311-01	Rivers/Streams in HUC 040802030311	Includes: Beaver Creek and Morgan Creek	Water
040802030312-01	Rivers/Streams in HUC 040802030312	Includes: Pickerel Creek	Water
040802030401-01	Rivers/Streams in HUC 040802030401	Includes: Albert Drain, Bear Creek, East Branch Albert Drain, Fairchild Creek, Unnamed Tributaries to Albert Drain, Unnamed Tributaries to Bear Creek, Unnamed Tributaries to Fairchild Creek, Unnamed Tributaries to Wickham Drain, and Wickham Drain	Water
040802030402-01	Rivers/Streams in HUC 040802030402	Includes: SWAN CREEK	Water
040802030403-01	Rivers/Streams in HUC 040802030403	Includes: SWAN CREEK	Water
040802030404-01	Rivers/Streams in HUC 040802030404	Includes: Handy Creek and Whitmore Drain	Water
040802030405-01	Rivers/Streams in HUC 040802030405	Includes: Nelson Run, Weeks Drain and Whitmore Drain	Water
040802030406-01	Rivers/Streams in HUC 040802030406	Includes: Swan Creek	Water
040802030407-01	Rivers/Streams in HUC 040802030407	Includes: Unnamed Tributary near Gratiot Road	Water
040802030407-02	Rivers/Streams in HUC 040802030407	Includes: Beebe Drain and Unnamed Tributaries to Beebe Drain	Water
040802030407-03	Rivers/Streams in HUC 040802030407	Includes: Williams Creek	Water
040802030407-04	Rivers/Streams in HUC 040802030407	Includes: Swan Creek	Water
040802030407-05	Rivers/Streams in HUC 040802030407	Includes: MCCLELLAN RUN	Water
040802030408-01	Rivers/Streams in HUC 040802030408	Includes: Marsh Creek	Water
040802030409-01	Rivers/Streams in HUC 040802030409	Includes: Birch Run, Cole Drain and Horton Graham Drain	Water
040802030410-02	Rivers/Streams in HUC 040802030410	Includes: Ferguson Bayou	Water
040802030410-04	Rivers/Streams in HUC 040802030410	Includes: Unnamed Tributaries to Shiawassee River	Water
040802030410-05	Rivers/Streams in HUC 040802030410	Includes: Marsh Creek	Water
040802040101-01	Rivers/Streams in HUC 040802040101	Includes: South Branch Flint River and Whigville Creek	Water
040802040101-02	Rivers/Streams in HUC 040802040101	Includes: South Branch Flint River	Water
040802040102-01	Rivers/Streams in HUC 040802040102	Includes: Hunters Creek	Water
040802040102-02	Rivers/Streams in HUC 040802040102	Includes: Hunters Creek and Kintz Creek	Water
040802040103-01	Rivers/Streams in HUC 040802040103	Includes: Unnamed Tributary to the South Branch Flint River	Water
040802040103-02	Rivers/Streams in HUC 040802040103	Includes: Bishop Drain and Unnamed Tributary to Bishop Drain	Water
040802040103-03	Rivers/Streams in HUC 040802040103	Includes: Pine Creek	Water
040802040103-04	Rivers/Streams in HUC 040802040103	Includes: UNNAMED DRAINS, LAPEER TWP.	Water
040802040103-05	Rivers/Streams in HUC 040802040103	Includes: South Branch Flint River	Water
040802040103-06	Rivers/Streams in HUC 040802040103	Includes: South Branch Flint River	Water

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040802040103-07	Rivers/Streams in HUC 040802040103	Includes: South Branch Flint River	Water
040802040104-01	Rivers/Streams in HUC 040802040104	Includes: Farmers Creek	Water
040802040104-04	Rivers/Streams in HUC 040802040104	Includes: Farmers Creek and Poplar Creek	Water
040802040104-05	Rivers/Streams in HUC 040802040104	Includes: Mill Creek and Spring Bank Creek	Water
040802040104-06	Rivers/Streams in HUC 040802040104	Includes: South Branch Farmers Creek	Water
040802040105-01	Rivers/Streams in HUC 040802040105	Includes: Unnamed Tributaries to South Branch Flint River	Water
040802040105-02	Rivers/Streams in HUC 040802040105	Includes: South Branch Flint River	Water
040802040105-03	Rivers/Streams in HUC 040802040105	Includes: PLUM CREEK	Water
040802040106-01	Rivers/Streams in HUC 040802040106	Includes: Sand Hill Drain and South Branch Flint River	Water
040802040201-01	Rivers/Streams in HUC 040802040201	Includes: Cedar Creek and Elm Creek	Water
040802040202-02	Rivers/Streams in HUC 040802040202	Includes: Bottom Creek and North Branch Flint River	Water
040802040202-03	Rivers/Streams in HUC 040802040202	Includes: PLUM CREEK	Water
040802040202-04	Rivers/Streams in HUC 040802040202	Includes: Gravel Creek	Water
040802040203-01	Rivers/Streams in HUC 040802040203	Includes: Indian Creek	Water
040802040204-01	Rivers/Streams in HUC 040802040204	Includes: North Branch Flint River, Wilson Drain, North Branch Drain and Hobson Drain	Water
040802040205-01	Rivers/Streams in HUC 040802040205	Includes: Silver Creek and Squaw Creek	Water
040802040206-01	Rivers/Streams in HUC 040802040206	Includes: Evergreen Creek and Squaw Creek	Water
040802040207-01	Rivers/Streams in HUC 040802040207	Includes: North Branch Flint River and Fitch Drain	Water
040802040208-01	Rivers/Streams in HUC 040802040208	Includes: Forest Drain, Joslyn Drain, Kester Drain and North Branch Flint River	Water
040802040208-03	Rivers/Streams in HUC 040802040208	Includes: Crystal Creek	Water
040802040301-01	Rivers/Streams in HUC 040802040301	Includes: Kimball Drain, Lum Drain, and Unnamed Tributaries to Kimball Drain	Water
040802040302-01	Rivers/Streams in HUC 040802040302	Includes: Swartz Creek	Water
040802040303-01	Rivers/Streams in HUC 040802040303	Includes: Thread Creek and Zimmerman Branch	Water
040802040304-01	Rivers/Streams in HUC 040802040304	Includes: West Branch Swartz Creek, Hewitt Drain and Howland Drain	Water
040802040305-01	Rivers/Streams in HUC 040802040305	Includes: Swartz Creek and Seaver Drain	Water
040802040305-02	Rivers/Streams in HUC 040802040305	Includes: Indian Creek, Petry Branch and Dawe Drain	Water
040802040306-01	Rivers/Streams in HUC 040802040306	Includes: Thread Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040802040307-01	Rivers/Streams in HUC 040802040307	Includes: Includes: Swartz Creek, Carman Creek, Gibson Drain and Sherwood Drain	Water
040802040307-02	Rivers/Streams in HUC 040802040307	Includes: Call Creek	Water
040802040401-01	Rivers/Streams in HUC 040802040401	Includes: Clute Drain, Flint Riverand Hemmingway and Whipple Drain	Water
040802040403-02	Rivers/Streams in HUC 040802040403	Includes: Flint River and Hasler Creek	Water
040802040404-01	Rivers/Streams in HUC 040802040404	Includes: Duck Creek and Kearsley Creek	Water
040802040405-01	Rivers/Streams in HUC 040802040405	Includes: Cartwright Drain, Kearsley Creek and Paddison Drain	Water
040802040406-01	Rivers/Streams in HUC 040802040406	Includes: Simon Branch	Water
040802040406-03	Rivers/Streams in HUC 040802040406	Includes: Black Creek	Water
040802040406-04	Rivers/Streams in HUC 040802040406	Includes: BURDICK DRAIN	Water
040802040407-01	Rivers/Streams in HUC 040802040407	Includes: Barden Branch, Butternut Creek and Jackson Branch	Water
040802040408-01	Rivers/Streams in HUC 040802040408	Includes: Chipmunk Creek and Kearsley Creek	Water
040802040408-02	Rivers/Streams in HUC 040802040408	Includes: Kearsley Creek	Water
040802050201-01	Rivers/Streams in HUC 040802050201	Includes: North Branch White Creek	Water
040802050202-01	Rivers/Streams in HUC 040802050202	Includes: Mud Creek and North Branch White Creek	Water
040802050203-01	Rivers/Streams in HUC 040802050203	Includes: South Branch White Creek	Water
040802050203-02	Rivers/Streams in HUC 040802050203	Includes: Alder Creek and South Branch White Creek	Water
040802050204-01	Rivers/Streams in HUC 040802050204	Includes: White Creek	Water
040802050204-02	Rivers/Streams in HUC 040802050204	Includes: North Branch White Creek	Water
040802050206-01	Rivers/Streams in HUC 040802050206	Includes: Sucker Creek	Water
040802050206-02	Rivers/Streams in HUC 040802050206	Includes: Cox Drain, Phelps Lake Drain, Sucker Creek and Voght Drain	Water
040802050209-01	Rivers/Streams in HUC 040802050209	Includes: Cass River and H-M Drain	Water
040802050209-02	Rivers/Streams in HUC 040802050209	Includes: Evergreen Creek	Water
040802050209-03	Rivers/Streams in HUC 040802050209	Includes: Moore Drain	Water
040802050301-01	Rivers/Streams in HUC 040802050301	Includes: Goodings Creek	Water
040802050302-01	Rivers/Streams in HUC 040802050302	Includes: Cole Creek and Perry Creek	Water
040802050303-01	Rivers/Streams in HUC 040802050303	Includes: Millington Creek	Water
040802050303-02	Rivers/Streams in HUC 040802050303	Includes: Cass River	Water
040900010101-02	Rivers/Streams in HUC 040900010101	Includes: Doggan Drain	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040900010102-02	Rivers/Streams in HUC 040900010102	Includes: MCMANUS DRAIN	Water
040900010103-01	Rivers/Streams in HUC 040900010103	Includes: Baerwolf Drain, Custer County Drain, Dwight Drain, Fye Drain, Kinney Drain, Stone Drain, Unnamed Tributaries to Custer County Drain, Unnamed Tributaries to Dwight Drain, Unnamed Tributaries to Fye Drain, and Unnamed Tributaries to Stone Drain	Water
040900010103-02	Rivers/Streams in HUC 040900010103	Includes: Berry Drain	Water
040900010105-01	Rivers/Streams in HUC 040900010105	Includes: Elk Creek, Hydorn Drain, Lapeer and Sanilac Drain, Scott Drain, Valley Center Drain, Varney Drain, Winters Drain, Witmer Drain, York Drain, Unnamed Tributaries to Elk Creek, Unnamed Tributaries to Lapeer and Sanilac Drain, Unnamed Tributaries to	Water
040900010106-01	Rivers/Streams in HUC 040900010106	Includes: Elk Creek, East Branch Speaker and Maple Valley Drain, Fletcher Drain, Bowers Drain, McGauley Drain, Shell Drain, Macklen Drain, Mullaney Drain and Weston Drain.	Water
040900010107-01	Rivers/Streams in HUC 040900010107	Includes: Elk Creek, McDonald Drain, Phillips Drain, Eagle Drain, Setter Drain, Welch Drain, and Unnamed Tributaries.	Water
040900010108-01	Rivers/Streams in HUC 040900010108	Includes: Elk Creek, Powers Drain, Elk Flynn and Maple Valley Drain, Jones Drain, Omard Drain, Smafield Drain, and Unnamed Tributaries.	Water
040900010109-01	Rivers/Streams in HUC 040900010109	Includes: Elk Creek, Beals and Fizzle Drain, Eggert Drain, Hale Drain, Severance Drain, Cummer Drain, Johns Barrett Drain, McElhinney Drain, Barr Drain, and Unnamed Tributaries.	Water
040900010110-01	Rivers/Streams in HUC 040900010110	Includes: Cork Drain, Engle Drain, French Drain, Hunt Drain, Potts Drain, Rickett Drain, Roskey Drain, Spring Creek Drain, Topping Drain, Unnamed Tributary to Cork Drain, Unnamed Tributaries to Engle Drain, Unnamed Tributaries to Potts Drain, Unnamed Trib	Water
040900010201-01	Rivers/Streams in HUC 040900010201	Includes: Black Creek, Jackson Creek, Lavell Drain, Livergood Drain, Robertson Drain, Unnamed Tributaries to Black Creek, Unnamed Tributaries to Jackson Creek, and Unnamed Tributaries to Lavell Drain	Water
040900010202-01	Rivers/Streams in HUC 040900010202	Includes: ELK CREEK	Water
040900010203-01	Rivers/Streams in HUC 040900010203	Includes: Eves Drain, Fueslin Drain, Hayes Drain, Jackson Drain, Silver Creek, Unnamed Tributaries to Eves Drain, Unnamed Tributaries to Jackson Drain, Unnamed Tributaries to Silver Creek, and Wilson Drain	Water
040900010204-01	Rivers/Streams in HUC 040900010204	Includes: Brant Lake Drain, Elk Lake Drain, Swamp Coners Drain, Unnamed Tributaries to Brant Lake Drain, Unnamed Tributaries to	Water

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		Elk Lake Drain, and Unnamed Tributary to Swamp Corners Drain	
040900010205-01	Rivers/Streams in HUC 040900010205	Includes: Elk Lake Creek, Madison Drain, North Branch Mill Creek, Stony Creek, Unnamed Tributaries to Madison Drain, Unnamed Tributaries to North Branch Mill Creek, and Unnamed Tributaries to Stony Creek	Water
040900010206-01	Rivers/Streams in HUC 040900010206	Includes: South Branch Mill Creek, Galley Drain, Kolb Drain, Sidel Drain, Franklin Drain, Mudcat Drain, Wendt Drain, Weitzig Drain, Jurn Drain, Bunde Drain, Brandy Drain, and Unnamed Tributaries.	Water
040900010207-01	Rivers/Streams in HUC 040900010207	Includes: Black Segate Reid Drain, Frasier Drain, Lynn Mussey Drain, South Branch Mill Creek, Unnamed Tributaries to Frasier Drain, Unnamed Tributaries to Lynn Mussey Drain, and Unnamed Tributaries to South Branch Mill Creek	Water
040900010208-01	Rivers/Streams in HUC 040900010208	Includes: Courter Drain, Flansburg Drain, North Branch Mill Creek, Root Drain, Unnamed Tributaries to Couter Drain, Unnamed Tributaries to North Branch Mill Creek, Unnamed Tributaries to Willoughby Drain, Watt Drain, and Willoughby Drain	Water
040900010209-01	Rivers/Streams in HUC 040900010209	Includes: Mill Creek, Sanilac and St. Clair Drain, Cole Drain, Downey Drain.	Water
040900010209-02	Rivers/Streams in HUC 040900010209	Includes: Mill Creek, Thompson Drain, Unnamed Tributaries.	Water
040900010209-03	Rivers/Streams in HUC 040900010209	Includes: MILL CREEK	Water
040900010209-04	Rivers/Streams in HUC 040900010209	Includes: Meharg Drain, Middleton Drain, Mill Creek, Unnamed Tributaries to Meharg Drain, and Unnamed Tributaries to Mill Creek	Water
040900010210-01	Rivers/Streams in HUC 040900010210	Includes: Mill Creek, Sheehy Drain, Thody Drain, and Unnamed Tributaries.	Water
040900010210-02	Rivers/Streams in HUC 040900010210	Includes: Mill Creek, White Drain, and Unnamed Tributaries.	Water
040900010212-01	Rivers/Streams in HUC 040900010212	Includes: MILL CREEK	Water
040900030108-34	Rivers/Streams in HUC 040900030108	Includes: Murphy Creek	Water
040900030110-05	Rivers/Streams in HUC 040900030110	Includes: Trout Creek	Water
040900030111-02	Rivers/Streams in HUC 040900030111	Includes: Galloway Creek, Galloway Drain, and Unnamed Tributaries to Galloway Creek	Water
040900030311-02	Rivers/Streams in HUC 040900030311	Includes: Miller Drain	Water
040900030312-02	Rivers/Streams in HUC 040900030312	Includes: McBride Drain, and Unnamed Tributary to McBride Drain	Water
040900050101-01	Rivers/Streams in HUC 040900050101	Includes: Big Lake, Huron River, and Unnamed Tributaries to	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Huron River	
040900050102-01	Rivers/Streams in HUC 040900050102	Includes: Haven Hill Lake Outlet, Huron River, Unnamed Tributaries to Brendel Lake ,Unnamed Tributary to Oxbow Lake, and Unnamed Tributaries to Huron River	Water
040900050102-09	Rivers/Streams in HUC 040900050102	Includes: Fox Lake Outlet, Hayes Creek, Huron River, and Straits Lakes Outlet	Water
040900050103-03	Rivers/Streams in HUC 040900050103	Includes: CONGDON DRAIN	Water
040900050103-04	Rivers/Streams in HUC 040900050103	Includes: NORTON CREEK	Water
040900050103-05	Rivers/Streams in HUC 040900050103	Includes: Unnamed Tributaries to Norton Creek	Water
040900050104-03	Rivers/Streams in HUC 040900050104	Includes: Pettibone Creek and Unnamed Tributary to Pettibone Creek	Water
040900050105-08	Rivers/Streams in HUC 040900050105	Includes: Huron River from Hubbell Pond outlet downstream to the Kent Lake inlet to include General Motors Road site.	Water
040900050106-01	Rivers/Streams in HUC 040900050106	Includes: Huron River and Unnamed Tributaries to Kent Lake	Water
040900050106-05	Rivers/Streams in HUC 040900050106	Includes: Huron River upstream of Dawson Road and Unnamed Tributaries to Huron River	Water
040900050107-01	Rivers/Streams in HUC 040900050107	Includes: WOODRUFF CREEK	Water
040900050107-03	Rivers/Streams in HUC 040900050107	Includes: Mann Creek, Unnamed Tributary near Proving Ground, and Unnamed Tributary to Sloan Lake	Water
040900050108-01	Rivers/Streams in HUC 040900050108	Includes: Blackwood Drain, Davis Creek, Novi Lyon Drain, Unnamed Tributaries to Blackwood Drain, and Unnamed Tributaries to Novi Lynn Drain	Water
040900050108-02	Rivers/Streams in HUC 040900050108	Includes: DAVIS CREEK	Water
040900050109-02	Rivers/Streams in HUC 040900050109	Includes: Unnamed Tributary Nichwagh Lake Outlet (Yerkes Drain)	Water
040900050110-01	Rivers/Streams in HUC 040900050110	Includes: Sandy Bottom Lake Outlet, Ten Mile Lake Outlet, Tobin Lake Outlet, Unnamed Tributary to Sandy Bottom Lake Outlet, Unnamed Tributary to Tobin Lake, and Unnamed Tributaries to Tobin Lake Outlet	Water
040900050110-02	Rivers/Streams in HUC 040900050110	Includes: Davis Creek, Lyon Lake Outlet, and Unnamed Tributary to Davis Creek	Water
040900050111-01	Rivers/Streams in HUC 040900050111	Includes: Maxfield Lake Outlet, South Ore Creek, Unnamed Tributary to Grubb Lake, and Unnamed Tributary South Ore Creek	Water
040900050111-05	Rivers/Streams in HUC 040900050111	Includes: SOUTH ORE CREEK	Water
040900050112-01	Rivers/Streams in HUC 040900050112	Includes: Huron River and Spring Mill Creek	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040900050112-02	Rivers/Streams in HUC 040900050112	Includes: Dibrova Lake Outlet, Huron River, Maltby Lake Outlet, and Ore Lake Outlet	Water
040900050201-01	Rivers/Streams in HUC 040900050201	Includes: Pleasant Lake Drain Tributary to Mill Creek	Water
040900050202-01	Rivers/Streams in HUC 040900050202	Wilkinson Drain at Old US-12	Water
040900050202-02	Rivers/Streams in HUC 040900050202	Includes: Letts Creek watershed tributary to the N. Fork Mill Creek.	Water
040900050203-01	Rivers/Streams in HUC 040900050203	Includes: Mill Creek, North Fork	Water
040900050204-01	Rivers/Streams in HUC 040900050204	Includes: Mill Creek and Unnamed Tributaries to Mill Creek	Water
040900050204-02	Rivers/Streams in HUC 040900050204	Includes: MILL CREEK	Water
040900050301-01	Rivers/Streams in HUC 040900050301	Includes: O Connor Creek, Unnamed Tributary to Horseshoe Lake, and Unnamed Tributary to O Connor Creek	Water
040900050301-03	Rivers/Streams in HUC 040900050301	Includes: Horseshoe Lake Drain from the Huron River confluence upstream to just upstream of the Northfield Township WWTP outfall.	Water
040900050301-05	Rivers/Streams in HUC 040900050301	Includes: Horseshoe Lake Drain from just upstream of the Northfield WWTP to the legal lake level weir Horseshoe Lake outlet.	Water
040900050302-01	Rivers/Streams in HUC 040900050302	Includes: ARMS CREEK	Water
040900050303-01	Rivers/Streams in HUC 040900050303	Includes: Honey Creek and Unnamed Tributary to Honey Creek	Water
040900050303-03	Rivers/Streams in HUC 040900050303	Includes: HONEY CREEK	Water
040900050304-01	Rivers/Streams in HUC 040900050304	Includes: Lowe Lake Drain, Portage Creek, Unnamed Tributaries to Lowe Lake, Unnamed Tributary near Morton Road, Unnamed Tributary to Nichols Lake, and Unnamed Tributary to Sharp Lake	Water
040900050304-02	Rivers/Streams in HUC 040900050304	Includes: PORTAGE CREEK	Water
040900050304-03	Rivers/Streams in HUC 040900050304	Includes: Portage Creek	Water
040900050305-01	Rivers/Streams in HUC 040900050305	Includes: Portage Creek	Water
040900050305-02	Rivers/Streams in HUC 040900050305	Includes: PORTAGE CREEK	Water
040900050305-03	Rivers/Streams in HUC 040900050305	Includes: UNADILLA STOCKBRIDGE DRAIN	Water
040900050306-01	Rivers/Streams in HUC 040900050306	Includes: North Lake Outlet, South Lake Outlet, Unnamed Tributary to Bruin Lake, Unnamed Tributaries to South Lake, and Unnamed Tributary to Snyder Lake	Water
040900050306-02	Rivers/Streams in HUC 040900050306	Includes: PORTAGE River, Livermore Creek	Water
040900050307-01	Rivers/Streams in HUC 040900050307	Includes: Bass Lake Outlet, Cordley Lake Outlet, Hay Creek, Huron River, Unnamed Tributaries to East Crooked Lake, Unnamed	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Tributaries to Hay Creek, and Unnamed Tributaries to Huron River	
040900050307-02	Rivers/Streams in HUC 040900050307	Includes: Huron River	Water
040900050307-03	Rivers/Streams in HUC 040900050307	Includes: PORTAGE CREEK	Water
040900050307-04	Rivers/Streams in HUC 040900050307	Includes: Bishop Lake Outlet, Chilson Creek, and Unnamed Tributary to Chilson Creek	Water
040900050307-05	Rivers/Streams in HUC 040900050307	Includes: Bass Lake Outlet, Hay Creek, Rush Lake Outlet, and Tioga Lake Outlet	Water
040900050309-02	Rivers/Streams in HUC 040900050309	Includes: Huron River	Water
040900050309-03	Rivers/Streams in HUC 040900050309	Includes: Huron River, Unnamed Tributary to Barton Pond, and Unnamed Tributaries to Huron River	Water
040900050309-04	Rivers/Streams in HUC 040900050309	Includes: Unnamed Tributaries to Bridgeway Lake and Green Oak Lake and Unnamed Tributary to Huron River	Water
040900050309-05	Rivers/Streams in HUC 040900050309	Includes: Honey Creek upstream from Huron River confluence to including all tributaries	Water
040900050309-06	Rivers/Streams in HUC 040900050309	Includes: Unnamed Tributary to Huron River	Water
040900050401-01	Rivers/Streams in HUC 040900050401	Includes: Nelson Drain, Unnamed Tributary to Nelson Drain, and Wagner Drain	Water
040900050401-02	Rivers/Streams in HUC 040900050401	Fleming Creek and tributaries	Water
040900050402-02	Rivers/Streams in HUC 040900050402	Includes: Travers Creek, tributary to Huron River	Water
040900050402-03	Rivers/Streams in HUC 040900050402	Includes: Unnamed Tributary to Huron River	Water
040900050402-04	Rivers/Streams in HUC 040900050402	Includes: Malletts Creek from Huron River confluence upstream to Brown Park Pond dam.	Water
040900050402-05	Rivers/Streams in HUC 040900050402	Includes: SWIFT RUN CREEK	Water
040900050402-06	Rivers/Streams in HUC 040900050402	Includes: Huron River and Malletts Creek headwaters, near Ann Arbor Saline Road, and tributary to the Huron River.	Water
040900050403-03	Rivers/Streams in HUC 040900050403	Includes: Huron River/Ford Lake Impoundment reach.	Water
040900050403-04	Rivers/Streams in HUC 040900050403	Includes: Huron River, Snidecar Drain, and Superior Number One Drain	Water
040900050404-01	Rivers/Streams in HUC 040900050404	Includes: WILLOW RUN DRAIN	Water
040900050404-04	Rivers/Streams in HUC 040900050404	Includes: Unnamed Tributaries to Belleville Lake and Unnamed Tributary near Rawsonville Road	Water
040900050405-01	Rivers/Streams in HUC 040900050405	Includes: Huron River, Bunton Drain, Griggs Drain, Head Drain, Hubbard Drain, Jewett Drain, Throop Number One Drain, Unnamed Tributaries to Griggs Drain, and Unnamed Tributaries to	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Throop Number One Drain	
040900050406-01	Rivers/Streams in HUC 040900050406	Includes: Adams Drain, Cass Drain, Groh Drain, Hand Drain, Hubert Drain, Morrison Drain, Odette Drain, Reiser Drain, Silver Creek, Smith Creek, Unnamed Tributaries to Morrison Drain, Unnamed Tributaries to Silver Creek, and Unnamed Tributaries to Smith Cr	Water
040900050406-02	Rivers/Streams in HUC 040900050406	Includes: Smith Creek, Reh Drain and Unnamed Tributaries to Smith Creek upstream of Van Horn Road.	Water
040900050406-03	Rivers/Streams in HUC 040900050406	Includes: Silver Creek from Woodruff Road upstream	Water
040900050406-04	Rivers/Streams in HUC 040900050406	Includes: Smith Creek from Silver Creek confluence upstream to -02	Water
040900050407-01	Rivers/Streams in HUC 040900050407	Includes: WAGNER-PINK DRAIN	Water
040900050407-02	Rivers/Streams in HUC 040900050407	Includes: Huron River, Bancroft Noles Drain, Brook Drain, Hale Drain, Regan Drain, Vandecar Drain, Unnamed Tributary to Huron River, and Warner Drain	Water
040900050407-03	Rivers/Streams in HUC 040900050407	Includes: Huron River	Water
040900050407-04	Rivers/Streams in HUC 040900050407	Includes: Huron River	Water
040900050407-05	Rivers/Streams in HUC 040900050407	Includes: Baker and Green Drain, Port Creek, Unnamed Tributary to Port Creek, and Van Hountin Drain	Water
041000020206-03	Rivers/Streams in HUC 041000020206	Includes: Beaver Creek, Stevenson Drain, Harkness Drain, Slater Creek, Treat Drain, Cook Drain, and Unnamed Tributaries	Water
041000060101-01	Rivers/Streams in HUC 041000060101	Includes: BEAN CREEK	Water
041000060102-01	Rivers/Streams in HUC 041000060102	Includes: FISK DRAIN AND KEMPTON DRAIN	Water
041000060102-02	Rivers/Streams in HUC 041000060102	Includes: BRANCH CREEK	Water
041000060102-03	Rivers/Streams in HUC 041000060102	Includes: BEAN CREEK	Water
041000060102-04	Rivers/Streams in HUC 041000060102	Includes: BEAN CREEK	Water
041000060103-01	Rivers/Streams in HUC 041000060103	Includes: BEAN CREEK	Water
041000060104-01	Rivers/Streams in HUC 041000060104	Includes: POSEY LAKE AND SEELEY DRAIN	Water
041000060105-01	Rivers/Streams in HUC 041000060105	Includes: PRATVILLE DRAIN	Water
041000060105-02	Rivers/Streams in HUC 041000060105	Includes: LIME CREEK	Water
041000060105-03	Rivers/Streams in HUC 041000060105	Includes: LIME CREEK	Water
041000060105-04	Rivers/Streams in HUC 041000060105	Includes: DURFEE CREEK (DURFEE LAKE OUTLET)	Water
041000060106-01	Rivers/Streams in HUC 041000060106	Includes: BEAN CREEK	Water

AUID	Assessment Unit Name	Location Description	PCB Impairment
041000060106-02	Rivers/Streams in HUC 041000060106	Includes: BEAN CREEK	Water
041000060106-03	Rivers/Streams in HUC 041000060106	Includes: MEDINA DRAIN	Water
041000060201-01	Rivers/Streams in HUC 041000060201	Includes: BEAN CREEK	Water
041000060201-02	Rivers/Streams in HUC 041000060201	Includes: SILVER CREEK	Water
041000060204-01	Rivers/Streams in HUC 041000060204	Includes: UNNAMED TRIB TO MILL CREEK	Water
040201030304-01	TORCH LAKE	In the vicinity of the communities of Hubbell and Lake Linden.	Fish
040201030307-08	PORTAGE LAKE	Vicinity of Houghton and Hancock.	Fish
040202010101-05	Rivers/Streams in HUC 040202010101	Includes: Silver Lead Creek and West Branch Chocolay River	Fish
040203000001-02	SISKIWIT LAKE	Isle Royale.	Fish
040301100107-02	GOOSE LAKE	SE of Neguanee and Ishpeming.	Fish
040400010201-01	Rivers/Streams in HUC 040400010201	Includes: Beaverdam Creek and Dowling Creek	Fish
040400010202-01	Rivers/Streams in HUC 040400010202	Includes: East Branch Galien River and Judy Lake Drain	Fish
040400010203-01	Rivers/Streams in HUC 040400010203	Includes: Blue Jay Creek and Galien River	Fish
040400010204-01	Rivers/Streams in HUC 040400010204	Includes: Spring Creek	Fish
040400010206-01	Rivers/Streams in HUC 040400010206	Includes: Deer Creek	Fish
040400010206-02	Rivers/Streams in HUC 040400010206	Includes: South Branch Galien River and Squaw Creek	Fish
040400010207-01	Rivers/Streams in HUC 040400010207	Includes: Galien River	Fish
040400010207-02	Rivers/Streams in HUC 040400010207	Includes: Kirktown Creek	Fish
040400010207-03	Rivers/Streams in HUC 040400010207	Includes: Galien River	Fish
040400010208-01	Rivers/Streams in HUC 040400010208	Includes: Galien River	Fish
040500010403-03	UNION LAKE	Vicinity of Union City u/s of Dunk Rd. dam.	Fish
040500010503-02	BARTON LAKE	SW of Vicksburg.	Fish
040500012405-05	MAPLE LAKE	Vicinity of Paw Paw.	Fish
040500012603-02	LAKE CHAPIN	Vicinity of Berrien Springs.	Fish
040500020208-01	Rivers/Streams in HUC 040500020208	Includes: Merriman Lake Outlet, Bangor Impoundment, School Section Lake Outlet, South Branch Black River, and Unnamed Tributaries to South Branch Black River	Fish
040500020209-01	Rivers/Streams in HUC 040500020209	Includes: South Branch Black River and Unnamed Tributaries to South Branch Black River	Fish
040500020210-01	Rivers/Streams in HUC 040500020210	Includes: South Branch Black River and Unnamed Tributaries to South Branch Black River	Fish

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500020211-01	Rivers/Streams in HUC 040500020211	Includes: Black River	Fish
040500020408-01	LAKE MACATAWA	Vicinity of Holland (Park and Holland Twps.).	Fish
040500030408-02	CERESCO IMPOUNDMENT	Vicinity of Ceresco u/s of 12 Mile Road.	Fish
040500030507-04	GULL LAKE	Vicinity of Midland Park, Yorkville and MSU's Kellogg Biological Station.	Fish
040500030509-02	MORROW POND	Located in the vicinity of Galesburg (36th Street) and Comstock.	Fish
040500030702-01	FENNER LAKE	NW of Martin (T2N, R11W, S15).	Fish
040500030811-03	HAMILTON IMPOUNDMENT (RABBIT RIVER)	Vicinity of Hamilton at M-40.	Fish
040500040703-02	MOORES PARK IMPOUNDMENT	Vicinity of Lansing from the Moores Park Dam u/s to Waverly Road.	Fish
040500060311-03	MORRISON LAKE	S. of Rt. 96 due S. of Saranac.	Fish
040500060507-07	REEDS LAKE	Vicinity of E. Grand Rapids.	Fish
040601010509-05	PERE MARQUETTE LAKE	Vicinity of Ludington.	Fish
040601010904-01	WHITE LAKE	Vicinity of Montague and Whitehall.	Fish
040601011010-01	Rivers/Streams in HUC 040601011010	Includes: BLACK CREEK	Fish
040601011011-01	Rivers/Streams in HUC 040601011011	Includes: BLACK CREEK	Fish
040601011011-03	MONA LAKE	Tributary to Lake Michigan.	Fish
040601020101-02	HIGGINS LAKE	Vicinity of Roscommon.	Fish
040601020104-02	HOUGHTON LAKE	Vicinity of Houghton Lake, Houghton Heights and Prudenville.	Fish
040601020904-05	HESS LAKE	SE of Newaygo.	Fish
040601020905-03	FREMONT LAKE	SHERIDAN TWP., near city of Freemont (T12N, R14W, S2,3,4,9,10,11)	Fish
040601021003-01	BEAR LAKE	Tributary to Muskegon Lake located north of Muskegon Lake, Laketon Twp.	Fish
040601030705-01	MANISTEE LAKE	East of Manistee, Filer Twp.	Fish
040601040103-04	NORTH LAKE LEELANAU	Vicinity of Leland.	Fish
040601040302-03	GREEN LAKE	Vicinity of Interlochen.	Fish
040601040305-03	CRYSTAL LAKE	Vicinity of Benzonia and Beulah.	Fish
040601040402-01	GLEN LAKE	South of Glen Arbor.	Fish
040601040405-02	PORTAGE LAKE	Vicinity of Onekama.	Fish
040601050205-01	Rivers/Streams in HUC 040601050205	Includes: Boyne River, Moyer Creek and South Branch Boyne River	Fish

AUID	Assessment Unit Name	Location Description	PCB Impairment
040601050207-01	LAKE CHARLEVOIX	Vicinity of Boyne City.	Fish
040601050305-01	TORCH LAKE	Vicinity of Eastport.	Fish
040601050404-02	ELK LAKE	Vicinity of Elk Rapids.	Fish
040700070609-04	VAN ETTEN LAKE	NE of Wurtsmith Air Force Base.	Fish
040801010105-02	Rivers/Streams in HUC 040801010105	Includes: Tawas River	Fish
040801010411-01	Rivers/Streams in HUC 040801010411	Includes: Saverine Creek and Unnamed Tributaries to Saverine Creek	Fish
040801010412-01	Rivers/Streams in HUC 040801010412	Includes: Rifle River and Unnamed Tributaries to Rifle River	Fish
040801010412-03	Rivers/Streams in HUC 040801010412	Includes: Rifle River	Fish
040801010502-01	Rivers/Streams in HUC 040801010502	Includes: Old Channel (Rifle River) and Unnamed Tributaries to Old Channel (Rifle River)	Fish
040801020106-04	Rivers/Streams in HUC 040801020106	Includes: Unnamed Tributary to Kawkawlin River	Fish
040801020106-05	TOBICO MARSH (WETLAND)	NE of Kawkawlin.	Fish
040801030110-02	Rivers/Streams in HUC 040801030110	Includes: Sebewaing River	Fish
040802010408-03	SANFORD LAKE	NW of Midland at Sanford.	Fish
040802020312-03	ALMA IMPOUNDMENT	Impoundment of the Pine River in the vicinity of Alma.	Fish
040802020403-04	ST. LOUIS IMPOUNDMENT	St. Louis Impoundment of Pine River in the vicinity of St. Louis.	Fish
040802030104-02	THOMPSON LAKE	Vicinity of Howell.	Fish
040802030108-08	LAKE PONEMAH	NW of Fenton.	Fish
040802030109-05	LOBDELL LAKE	2 miles SW of Linden (Argentine Twp.).	Fish
040802040306-03	THREAD LAKE	Upstream of Rt. 475. Vicinity of Flint.	Fish
040802040403-05	HOLLOWAY RESERVOIR	NE of Richfield Center (Flint area).	Fish
040802040408-03	KEARSLEY RESERVOIR	Flint River confluence just u/s of Western Road.	Fish
040802050208-02	CARO IMPOUNDMENT	Vicinity of Caro u/s.	Fish
040900010114-03	CROSWELL IMPOUNDMENT (BLACK RIVER)	Black River in the vicinity of Croswell (Croswell Impoundment u/s to the confluence of Elk Cr.).	Fish
040900010302-01	Rivers/Streams in HUC 040900010302	Includes: Apply Drain, Campbell Drain, Cowhy Drain, Green Drain, Johnson Drain, Moore Creek, Parker Drain, Riley-Wales Drain, South Branch Pine River, Unnamed Tributaries to Apply Drain, Unnamed Tributaries to Campbell Drain, Unnamed Tributaries to Johns	Fish
040900010303-01	Rivers/Streams in HUC 040900010303	Includes: Smiths Creek from Pine River confluence upstream to	Fish

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Palms Road	
040900010304-01	Rivers/Streams in HUC 040900010304	Includes: Big Creek, Holland Drain, London Drain, Nelson Drain, Pine River, Unnamed Tributaries to Big Creek, Unnamed Tributaries to Holland Drain, Unnamed Tributaries to Nelson Drain, Unnamed Tributaries to Pine River, and Wolvin Drain	Fish
040900010305-01	Rivers/Streams in HUC 040900010305	Includes: Big Hand Drain, Dawson Drain, Mackley Drain, Rattle Run, Sheldon Drain, Tinsman Drain, Unnamed Tributary to Dawson Creek, Unnamed Tributary to Mackley Drain, and Unnamed Tributaries to Rattle Run	Fish
040900010306-01	Rivers/Streams in HUC 040900010306	Includes: Angel Creek, Barringer Drain, Bowman Drain, Brandywine Creek, Jordan Creek, Moak Drain, Pine River, Wolf Drain, Unnamed Tributaries to Jordan Creek, Unnamed Tributaries to Moak Drain, and Unnamed Tributaries to Pine River	Fish
040900030103-08	MACEDAY LAKE	Vicinity of Waterford.	Fish
040900040203-09	NEWBURGH LAKE	Middle River Rouge impoundment in the vicinity of Plymouth.	Fish
040900040203-10	Phoenix Lake	Rouge River, Middle Branch	Fish
040900050101-04	PONTIAC LAKE	NW of Pontiac in the headwaters of the Huron River.	Fish
040900050111-03	WOODLAND LAKE	N. of Brighton.	Fish
040900050301-02	WHITMORE LAKE	Vicinity of Whitmore Lake.	Fish
040900050309-01	BARTON POND	Impoundment of Huron River in vicinity of Barton Hills (suburb of Ann Arbor). From dam u/s to Conrail RR bridge crossing.	Fish
040900050403-01	UNNAMED LAKE	S. of Ford Lake in the NE corner of Sec. 26, T3S, R7E (Textile Road and Burton Road).	Fish
040900050403-02	Ford Lake	Impoundment of the Huron River located between the cities of Ypsilanti and Romulus.	Fish
040900050404-02	Belleville Lake	Ypsilanti, MI.	Fish
041000010308-01	Rivers/Streams in HUC 041000010308	Includes: Ottawa River	Fish
040301080408-01	Rivers/Streams in HUC 040301080408	Includes: Black Creek and Sturgeon River	Fish and water
040301080705-01	Rivers/Streams in HUC 040301080705	Includes: Fumee Creek and Menominee River	Fish and water
040301080706-01	Rivers/Streams in HUC 040301080706	Includes: Menominee River	Fish and water
040301080706-02	Rivers/Streams in HUC 040301080706	Includes: White Creek and Unnamed Tributary to Menominee River	Fish and water
040301080707-01	Rivers/Streams in HUC 040301080707	Includes: Brandts Creek, Carlson Creek, Harter Creek, Menominee River, Mullen Creek and Seynor Creek	Fish and water

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040301080707-02	Rivers/Streams in HUC 040301080707	Includes: Faithorn Creek	Fish and water
040301080708-01	Rivers/Streams in HUC 040301080708	Includes: Bird Creek, Blom Creek, DeHaas Creek, Hammond Brook and Pemene Creek	Fish and water
040301080710-01	Rivers/Streams in HUC 040301080710	Includes: Goodman Brook, Kading Creek and Menominee River	Fish and water
040301080710-02	Rivers/Streams in HUC 040301080710	Includes: Miscauna Creek	Fish and water
040301080711-02	Rivers/Streams in HUC 040301080711	Includes: Menominee River, Rosebush Creek and Sawbridge Creek	Fish and water
040301080712-01	Rivers/Streams in HUC 040301080712	Includes: Menominee River	Fish and water
040301080805-01	Rivers/Streams in HUC 040301080805	Includes: Hugos Brook, Little Cedar River and Little Kelley Creek	Fish and water
040301080902-01	Rivers/Streams in HUC 040301080902	Includes: Longrie Creek and Shakey River	Fish and water
040301080906-01	Rivers/Streams in HUC 040301080906	Includes: Menominee River	Fish and water
040301080907-01	Rivers/Streams in HUC 040301080907	Includes: Harding Creek, Phillips Creek and Woods Creek	Fish and water
040301080908-01	Rivers/Streams in HUC 040301080908	Includes: Koss Creek and Menominee River	Fish and water
040301080908-02	Rivers/Streams in HUC 040301080908	Includes: Burke Creek	Fish and water
040301080909-01	Rivers/Streams in HUC 040301080909	Includes: Menominee River	Fish and water
040301080913-01	Rivers/Streams in HUC 040301080913	Includes: Chappee Creek, Menominee River, Pine Creek and Sobiesky Creek	Fish and water
040400010101-01	Rivers/Streams in HUC 040400010101	Includes: Lake Michigan Shoreline from Bridgman to Saint Joseph	Fish and water
040500010101-01	Rivers/Streams in HUC 040500010101	Includes: Unnamed Tributaries to Allen Lake, Berry Lake, Carpenter Lake, Hemlock Lake, Lime Lake, Long Lake, Look Lake, Paw Paw Lake, Round Lake, and Suckey Lake	Fish and water
040500010102-01	Rivers/Streams in HUC 040500010102	Includes: South Branch Hog Creek from UnNamed Tributary downstream of US 12 upstream to Carpenter Lake, including Little Hog Creek and all tributaries.	Fish and water
040500010103-01	Rivers/Streams in HUC 040500010103	Includes: Tallahassee Creek from Mud Lake confluence upstream to headwaters.	Fish and water
040500010104-01	Rivers/Streams in HUC 040500010104	Includes: Unnamed Tributaries to Coldwater Lake, East Long Lake, Little Coldwater Lake, and Wright Lake	Fish and water
040500010105-01	Rivers/Streams in HUC 040500010105	Includes: Unnamed Tributaries to Archer Lake, Bartholemew Lake, Marble Lake, Middle Lake, and Wright Lake	Fish and water
040500010105-04	Rivers/Streams in HUC 040500010105	Includes: Fisher Creek from Marble Lake confluence upstream to headwaters.	Fish and water
040500010106-01	Rivers/Streams in HUC 040500010106	Includes: Sauk River and tributaries from South Lake confluence upstream to Marble Lake.	Fish and water

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040500010107-01	Rivers/Streams in HUC 040500010107	Includes: Coldwater River and tributaries from South lake confluence upstream to Coldwater Lake and Lake of the Woods.	Fish and water
040500010108-01	Rivers/Streams in HUC 040500010108	Includes: Cold Creek (Mud Creek) and tributaries from North Lake confluence upstream to headwaters.	Fish and water
040500010109-01	Rivers/Streams in HUC 040500010109	Includes: South Branch Hog Creek and tributaries (Bagley & Bowen Creek) from confluence with North Branch Hog Creek upstream to UnNamed Tributary downstream of US 12.	Fish and water
040500010110-01	Rivers/Streams in HUC 040500010110	Includes: Hog Creek and tributaries from Coldwater River confluence upstream to confluence of North and South Branches of Hog Creek.	Fish and water
040500010110-02	Rivers/Streams in HUC 040500010110	Includes: North Branch Hog Creek and tributaries from Hog Creek confluence upstream to headwaters.	Fish and water
040500010111-01	Rivers/Streams in HUC 040500010111	Includes: Coldwater River and all tributaries, except Hog Creek and Cold Creek, from St Joseph River confluence upstream to the inlet of South Lake.	Fish and water
040500010201-01	Rivers/Streams in HUC 040500010201	Includes: Beebe Creek and all tributaries from Impoundment upstream of Lake Pleasant Road to headwaters.	Fish and water
040500010202-01	Rivers/Streams in HUC 040500010202	Includes: Beebe Creek and all tributaries from St. Joseph River confluence upstream to Impoundment at Lake Pleasant Road.	Fish and water
040500010203-01	Rivers/Streams in HUC 040500010203	Includes: Boot Lake Outlet, Fourth Lake Outlet, and Unnamed Tributary to Baw Beese (First) Lake	Fish and water
040500010203-02	Rivers/Streams in HUC 040500010203	Includes: St Joseph River from Beebe Creek confluence upstream to Mill Pond in Hillsdale.	Fish and water
040500010203-05	Rivers/Streams in HUC 040500010203	Includes: Baw Beese (First) Lake Outlet, King Lake Outlet, and Unnamed Tributary to King Lake	Fish and water
040500010204-01	Rivers/Streams in HUC 040500010204	Includes: Unnamed Tributaries to Middle Sand Lake, North Sand Lake, and South Land Lake	Fish and water
040500010204-02	Rivers/Streams in HUC 040500010204	Includes: Sand Creek and tributaries from St. Joseph River confluence upstream to North Sand Lake.	Fish and water
040500010205-01	Rivers/Streams in HUC 040500010205	Includes: Saint Joseph River and all tributaries, except Sand Creek, from Soap Creek upstream to unNamed Tributary upstream of Sterling Road.	Fish and water
040500010205-02	Rivers/Streams in HUC 040500010205	Includes: Soap Creek from St.Joseph River confluence upstream to headwaters.	Fish and water
040500010205-03	Rivers/Streams in HUC 040500010205	Includes: Saint Joseph River from UnNamed Trib upstream of Sterling Road upstream to Beebe Creek.	Fish and water

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040500010206-01	Rivers/Streams in HUC 040500010206	Includes: St. Joseph River and all tributaries from Clarendon Drain upstream to Soap Creek.	Fish and water
040500010207-01	Rivers/Streams in HUC 040500010207	Includes: Tekonsha Creek and tributaries from St. Joseph River confluence upstream to headwaters.	Fish and water
040500010208-01	Rivers/Streams in HUC 040500010208	Includes: St Joseph River and all tributaries, except Tekonsha Creek, from UnNamed Trib upstream of 13 Mile Rd upstream to Clarendon Drain.	Fish and water
040500010209-01	Rivers/Streams in HUC 040500010209	Includes: St Joseph River and all tributaries from Coldwater River confluence upstream to UnNamed Trib upstream of 13 Mile Road.	Fish and water
040500010301-01	Rivers/Streams in HUC 040500010301	Includes: Nottawa headwaters upstream of Nottawa Lake (Goose Pond Drain, Nottawa Drain, Unnamed Tributary to Klingaman Lake, Unnamed Tributary to Nottawa Drain, and Unnamed Tributary to Nottawa Lake).	Fish and water
040500010302-01	Rivers/Streams in HUC 040500010302	Includes: Nottawa Creek and all tributaries from Mud Creek (included) confluence upstream to Nottawa Lake.	Fish and water
040500010303-01	Rivers/Streams in HUC 040500010303	Includes: Alder Creek and all tributaries from Nottawa Creek confluence upstream to headwaters.	Fish and water
040500010304-01	Rivers/Streams in HUC 040500010304	Includes: Unnamed Tributaries to Pine Creek	Fish and water
040500010304-02	Rivers/Streams in HUC 040500010304	Includes: Pine Creek and all tributaries from Nottawa Creek confluence upstream to headwaters.	Fish and water
040500010305-01	Rivers/Streams in HUC 040500010305	Includes: Bear Creek and all Tributaries from Nottawa Creek confluence upstream to headwaters.	Fish and water
040500010306-02	Rivers/Streams in HUC 040500010306	Includes: Nottawa Creek and all tributaries, except Pine and Bear Creeks, from St. Joseph River confluence upstream to Athens.	Fish and water
040500010306-03	Rivers/Streams in HUC 040500010306	Includes: Nottawa Creek and all tributaries, except Alder Creek, from Athens upstream to Mud Creek confluence.	Fish and water
040500010401-01	Rivers/Streams in HUC 040500010401	Includes: Swan Creek and all tributaries from County Drain # 30 confluence upstream to headwaters.	Fish and water
040500010402-01	Rivers/Streams in HUC 040500010402	Includes: Little Swan Creek and all tributaries from St. Joseph River confluence upstream to headwaters.	Fish and water
040500010403-01	Rivers/Streams in HUC 040500010403	Includes: St Joseph River and all tributaries from Kilbourn Drain (included) upstream to Coldwater River confluence.	Fish and water
040500010404-01	Rivers/Streams in HUC 040500010404	Includes: Swan Creek and all tributaries, except Little Swan Creek from St. Joseph River confluence upstream to Long Lake inlet.	Fish and water
040500010404-05	Rivers/Streams in HUC 040500010404	Includes: Swan Creek from Long Lake inlet upstream to UnNamed Trib just upstream of Branch/St Joseph County Line.	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500010404-06	Rivers/Streams in HUC 040500010404	Includes: Swan Creek and all tributaries from UnNamed Trib upstream of Branch/St.Joseph Co. Line upstream County Drain #30.	Fish and water
040500010405-01	Rivers/Streams in HUC 040500010405	Includes: St Joseph River and all tributaries from Swan Creek confluence upstream to Kilbourn Drain	Fish and water
040500010406-01	Rivers/Streams in HUC 040500010406	Includes: Ainsley Drain, McCauley Drain, and Unnamed Tributary near Covey Road	Fish and water
040500010406-02	Rivers/Streams in HUC 040500010406	Includes: St Joseph River and all tributaies from Nottawa Creek confluence upstream to Swan Creek	Fish and water
040500010501-01	Rivers/Streams in HUC 040500010501	Includes: Portage River and all tributaries from Indian Lake confluence upstream to headwaters.	Fish and water
040500010502-01	Rivers/Streams in HUC 040500010502	Includes: Headwaters of Gourdneck Creek and Lake connections	Fish and water
040500010502-08	Rivers/Streams in HUC 040500010502	Includes: Gourdneck Creek from Austin Lake Drain upstream to Gourdneck Lake outlet.	Fish and water
040500010503-03	Rivers/Streams in HUC 040500010503	Includes: Gourdneck and Portage Creeks and tributary from Barton Lake inlet upstream to Austin Lake Drain	Fish and water
040500010503-04	Rivers/Streams in HUC 040500010503	Includes: Portage Creek from Portage River confluence upstream to Barton Lake. Also includes UnNamed Trib to Barton Lake	Fish and water
040500010504-01	Rivers/Streams in HUC 040500010504	Includes: Bear Creek and tributaries from Portage Lake confluence upstream to headwaters	Fish and water
040500010505-01	Rivers/Streams in HUC 040500010505	Includes: Sagamaw Lake inlet and outlet from Indian Lake confluence upstream to headwaters	Fish and water
040500010505-03	Rivers/Streams in HUC 040500010505	Includes: Dorrance Creek and tributaries from Indian Lake confluence upstream to headwaters	Fish and water
040500010505-04	Rivers/Streams in HUC 040500010505	Includes: Portage River and all tributaries, except Portage Creek, from Portage Lake confluence upstream to Indian Lake	Fish and water
040500010506-03	Rivers/Streams in HUC 040500010506	Includes: Goose Lake Drain from Portage River confluence upstream to headwaters.	Fish and water
040500010506-04	Rivers/Streams in HUC 040500010506	Includes: Garman Foster Drain from Portage River confluence upstream to headwaters.	Fish and water
040500010506-05	Rivers/Streams in HUC 040500010506	Includes: Portage River and all tributaries, except Goose Lake Drain and Garman Foster Drain, from St. Joseph River confluence upstream to Portage Lake.	Fish and water
040500010601-01	Rivers/Streams in HUC 040500010601	Includes: Flowerfield Creek and all tributaries from upstream of Unnamed trib, upstream of YZ Ave, upstream to headwaters	Fish and water

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040500010602-01	Rivers/Streams in HUC 040500010602	Includes: Unnamed Tributary to Flowerfield Creek	Fish and water
040500010603-01	Rivers/Streams in HUC 040500010603	Includes: Unnamed Tributaries to Rocky River Headwaters	Fish and water
040500010603-02	Rivers/Streams in HUC 040500010603	Includes: Rocky River from Sheldon Creek upstream to headwaters, also includes UnNamed Trib from Marcellus.	Fish and water
040500010604-01	Rivers/Streams in HUC 040500010604	Includes: Flowerfield Creek from Rocky River confluence upstream to Spring Creek and Spring Creek upstream to headwaters	Fish and water
040500010605-02	Rivers/Streams in HUC 040500010605	Includes: Rocky River from Flowerfield Creek confluence upstream to Sheldon Creek	Fish and water
040500010605-04	Rivers/Streams in HUC 040500010605	Includes: Sheldon Creek from from Rocky confluence upstream to headwaters.	Fish and water
040500010605-05	Rivers/Streams in HUC 040500010605	Includes: FOUR COUNTY DRAIN and tributaries from Rocky River confluence upstream to headwaters.	Fish and water
040500010606-01	Rivers/Streams in HUC 040500010606	Includes: Rocky River and tributaries from St. Joseph River confluence upstream to Flowerfield Creek.	Fish and water
040500010701-01	Rivers/Streams in HUC 040500010701	Includes: Prairie River and all tributaries from UnNamed Trib upstream of Bowers Road upstream to headwaters	Fish and water
040500010702-01	Rivers/Streams in HUC 040500010702	Includes: Prairie River and all tributaries from UnNamed Trib upstream of US 12 (Chicago Rd) upstream to UnNamed Trib upstream of Bowers Road.	Fish and water
040500010703-01	Rivers/Streams in HUC 040500010703	Includes: Stewart Lake Creek and Unnamed Tributaries to Prairie River upstream & downstream of Burr Oak	Fish and water
040500010703-02	Rivers/Streams in HUC 040500010703	Includes: Prairie River (only) from Stewart Lake Drain upstream to UnNamed Trib east of Burr Oak.	Fish and water
040500010703-03	Rivers/Streams in HUC 040500010703	Includes: Prairie River (only) from UnNamed Trib east of Burr Oak upstream to UnNamed Trib upstream of US 12 (Chicago Rd).	Fish and water
040500010704-01	Rivers/Streams in HUC 040500010704	Includes: Bryant Lake Outlet, Perrin Lake Outlet, Unnamed Tributaries to Prairie River, and Unnamed Tributaries to Eight Foot Lake, Fish Lake, Grey Lake, Hawkins Lake, and Omena Lake	Fish and water
040500010704-03	Rivers/Streams in HUC 040500010704	Includes: Prairie River (only) from Lake Templene upstream to Stewart Lake Drain	Fish and water
040500010705-01	Rivers/Streams in HUC 040500010705	Includes: Spring Creek and all tributaries from UnNamed Trib upstream of M-66 to headwaters.	Fish and water
040500010705-02	Rivers/Streams in HUC 040500010705	Includes: Spring Creek and all tributaries from Prairie River confluence upstream to UnNamed Tributary upstream of M-66.	Fish and water
040500010706-01	Rivers/Streams in HUC 040500010706	Includes: Unnamed Tributary to Prairie River just upstream of Lake	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Templene	
040500010706-04	Rivers/Streams in HUC 040500010706	Includes: Prairie River from Spring Creek confluence upstream to second UnNamed Trib upstream of Filmore Road.	Fish and water
040500010707-01	Rivers/Streams in HUC 040500010707	Includes: Prairie River from St. Joseph River confluence upstream to Spring Creek	Fish and water
040500010801-01	Rivers/Streams in HUC 040500010801	Includes: Follette Creek and Little Fawn River	Fish and water
040500010805-01	Rivers/Streams in HUC 040500010805	Includes: UnNamed Tributary to Fawn River	Fish and water
040500010805-02	Rivers/Streams in HUC 040500010805	Includes: Fawn River and all tributaries from Hinebaugh Drain upstream to Indiana line.	Fish and water
040500010806-01	Rivers/Streams in HUC 040500010806	Includes: INDIANA WATERBODIES	Fish and water
040500010806-02	Rivers/Streams in HUC 040500010806	Includes: Fawn River	Fish and water
040500010806-03	Rivers/Streams in HUC 040500010806	Includes: Unnamed Tributary to Fawn River	Fish and water
040500010806-04	Rivers/Streams in HUC 040500010806	Includes: Fawn River and all tributaries in Michigan in this AUID south and east of Surgis.	Fish and water
040500010807-01	Rivers/Streams in HUC 040500010807	Includes: Fawn River	Fish and water
040500010807-02	Rivers/Streams in HUC 040500010807	Includes: Fawn River and all Tributaries in Michigan, including Nye Drain, in this AUID southwest of Sturgis.	Fish and water
040500010807-03	Rivers/Streams in HUC 040500010807	Includes: Fawn River	Fish and water
040500010808-01	Rivers/Streams in HUC 040500010808	Includes: Sherman Mill Creek and all tributaries from Fawn River confluence upstream to headwaters	Fish and water
040500010809-01	Rivers/Streams in HUC 040500010809	Includes: Fawn River and all tributaries, except Sherman Mill Creek, from St. Joseph River confluence upstream to Pickerel Lake outlet.	Fish and water
040500010901-01	Rivers/Streams in HUC 040500010901	Includes: Little Portage Creek and all tributaries from UnNamed Tributary downstream of X Avenue upstream to headwaters.	Fish and water
040500010902-01	Rivers/Streams in HUC 040500010902	Includes: Little Portage Creek and all tributaries from St. Joseph River confluence upstream to UnNamed tributary downstream of X Avenue.	Fish and water
040500010903-01	Rivers/Streams in HUC 040500010903	Includes: St Joseph River from Sturgis Dam Impoundment upstream to Little Portage Creek	Fish and water
040500010903-02	Rivers/Streams in HUC 040500010903	Includes: St Joseph River from Little portage Creek upstream to Nottawa Creek	Fish and water
040500010904-01	Rivers/Streams in HUC 040500010904	Includes: St Joseph River from Pigeon River upstream to Fawn River	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500010904-03	Rivers/Streams in HUC 040500010904	Includes: St Joseph River From Prairie River upstream to Portage River	Fish and water
040500011107-01	Rivers/Streams in HUC 040500011107	Includes: Pigeon River and all tributaries in Michigan from St. Joseph River confluence upstream to Indiana stateline.	Fish and water
040500011301-01	Rivers/Streams in HUC 040500011301	Includes: Mill Creek and all tributaries, including Profile Lake Drain, from UnNamed Tributary downstream of Profile Lake Drain upstream to headwaters.	Fish and water
040500011302-01	Rivers/Streams in HUC 040500011302	Includes: Mill Creek and all tribtaries from St. Joseph River confluence upstream to and including UnNamed Tributary downstream of Profile Lake Drain	Fish and water
040500011303-01	Rivers/Streams in HUC 040500011303	Includes: Trout Creek and all tributaries, including Mud Creek, from Indiana stateline upstream to headwaters.	Fish and water
040500011304-01	Rivers/Streams in HUC 040500011304	Includes: St Joseph River from Mill Creek upstream to Fawn River confluence, includes Black Run.	Fish and water
040500011304-02	Rivers/Streams in HUC 040500011304	Includes: St Joseph River from Pigeon River upstream to Mill Creek	Fish and water
040500011305-01	Rivers/Streams in HUC 040500011305	Includes: All in INDIANA	Fish and water
040500011305-02	Rivers/Streams in HUC 040500011305	Includes: St Joseph River from Indiana stateline upstream to Pigeon River	Fish and water
040500011401-01	Rivers/Streams in HUC 040500011401	Includes: Christiana Creek and all tributaries from Diamond Lake Drain upstream to headwaters.	Fish and water
040500011402-01	Rivers/Streams in HUC 040500011402	Includes: Christiana Creek and all tributaries from Painter lake inlet upstream to and including Diamond Lake Drain	Fish and water
040500011403-01	Rivers/Streams in HUC 040500011403	Includes: Christiana Creek from Indiana stateline upstream to Christiana Lake, includes tributary to Juno Lake.	Fish and water
040500012001-01	Rivers/Streams in HUC 040500012001	Includes: Township Ditch from Indiana stateline upstream to headwaters.	Fish and water
040500012003-01	Rivers/Streams in HUC 040500012003	Includes: Unnamed Tributaries from Indiana stateline upstream to headwaters (tribs are east and west of Kessington Road)	Fish and water
040500012004-01	Rivers/Streams in HUC 040500012004	Includes: UnNamed Tributary to Simonton Lake in Indiana, from Indiana stateline upstream to headwaters.	Fish and water
040500012201-01	Rivers/Streams in HUC 040500012201	Includes: Cobus Creek and Gast Ditch from Indiana stateline upstream to headwaters. Streams are southeast of Edwardsburg.	Fish and water
040500012206-01	Rivers/Streams in HUC 040500012206	Includes: Judy Creek	Fish and water
040500012207-01	Rivers/Streams in HUC 040500012207	Includes: Saint Joseph River	Fish and water
040500012208-01	Rivers/Streams in HUC 040500012208	Includes: Saint Joseph River	Fish and water

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040500012209-01	Rivers/Streams in HUC 040500012209	Includes: Brandywine Creek	Fish and water
040500012209-02	Rivers/Streams in HUC 040500012209	Includes: Brandywine Creek	Fish and water
040500012210-01	Rivers/Streams in HUC 040500012210	Includes: Saint Joseph River	Fish and water
040500012301-01	Rivers/Streams in HUC 040500012301	Includes: Dowagiac Drain, Red Run, Unnamed Tributaries to Dowagiac Drain, and Unnamed Tributary to Lake of the Woods	Fish and water
040500012301-02	Rivers/Streams in HUC 040500012301	Includes: Dowagiac River	Fish and water
040500012301-04	Rivers/Streams in HUC 040500012301	Includes: Lake of the Woods Drain	Fish and water
040500012302-01	Rivers/Streams in HUC 040500012302	Includes: Priest Lake Outlet and Silver Creek	Fish and water
040500012303-01	Rivers/Streams in HUC 040500012303	Includes: DOWAGIAC CREEK	Fish and water
040500012304-01	Rivers/Streams in HUC 040500012304	Includes: Dowagiac Creek	Fish and water
040500012305-01	Rivers/Streams in HUC 040500012305	Includes: Dowagiac River	Fish and water
040500012305-02	Rivers/Streams in HUC 040500012305	Includes: Osborn Drain	Fish and water
040500012305-03	Rivers/Streams in HUC 040500012305	Includes: Unnamed Tributary to Dowagiac River	Fish and water
040500012306-01	Rivers/Streams in HUC 040500012306	Includes: Pokagon Creek	Fish and water
040500012307-01	Rivers/Streams in HUC 040500012307	Includes: Dowagiac River	Fish and water
040500012307-02	Rivers/Streams in HUC 040500012307	Includes: Dowagiac River	Fish and water
040500012307-03	Rivers/Streams in HUC 040500012307	Includes: Peavine Creek and Unnamed Tributaries to Peavine Creek	Fish and water
040500012308-01	Rivers/Streams in HUC 040500012308	Includes: Unnamed Tributary to McKinzie Creek	Fish and water
040500012308-02	Rivers/Streams in HUC 040500012308	Includes: McKinzie Creek	Fish and water
040500012308-03	Rivers/Streams in HUC 040500012308	Includes: Dowagiac River	Fish and water
040500012308-04	Rivers/Streams in HUC 040500012308	Includes: McKinzie Creek	Fish and water
040500012401-01	Rivers/Streams in HUC 040500012401	Includes: Gates Extension Drain, Lawton Drain and South Branch Paw Paw River	Fish and water
040500012402-01	Rivers/Streams in HUC 040500012402	Includes: East Branch Paw Paw River	Fish and water
040500012403-01	Rivers/Streams in HUC 040500012403	Includes: North Branch Paw Paw River	Fish and water
040500012403-03	Rivers/Streams in HUC 040500012403	Includes: Campbell Creek	Fish and water
040500012404-01	Rivers/Streams in HUC 040500012404	Includes: Brandywine Creek and North Extension Drain	Fish and water
040500012405-01	Rivers/Streams in HUC 040500012405	Includes: South Branch Paw Paw River from the Three Mile Lake Drain confluence to 60th Avenue, including Three Mile Lake Drain	Fish and water
040500012405-06	Rivers/Streams in HUC 040500012405	Includes: South Branch Paw Paw River upstream to 60th Avenue	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500012405-08	Rivers/Streams in HUC 040500012405	Includes: South Branch Paw Paw River downstream to Three Mile Lake Drain	Fish and water
040500012405-09	Rivers/Streams in HUC 040500012405	Includes: Eagle Lake Drain	Fish and water
040500012406-01	Rivers/Streams in HUC 040500012406	Includes: North Branch Paw Paw River and Paw Paw River	Fish and water
040500012406-02	Rivers/Streams in HUC 040500012406	Includes: Hayden Creek and Unnamed Tributary to Hayden Creek	Fish and water
040500012501-02	Rivers/Streams in HUC 040500012501	Includes: Brush Creek, Red Creek and White Creek	Fish and water
040500012502-01	Rivers/Streams in HUC 040500012502	Includes: Carter Creek and Paw Paw River	Fish and water
040500012503-03	Rivers/Streams in HUC 040500012503	Includes: Mud Lake Drain, Unnamed Tributaries to Mud Lake Drain, and Unnamed Tributaries to Sassafras Lake and Van Auken Lake	Fish and water
040500012504-02	Rivers/Streams in HUC 040500012504	Includes: Hog Creek	Fish and water
040500012504-03	Rivers/Streams in HUC 040500012504	Includes: Paw Paw River	Fish and water
040500012505-02	Rivers/Streams in HUC 040500012505	Includes: Paw Paw Lake Outlet, Unnamed Tributaries to Little Paw Paw Lake and Paw Paw Lake	Fish and water
040500012506-01	Rivers/Streams in HUC 040500012506	Includes: Mill Creek	Fish and water
040500012506-02	Rivers/Streams in HUC 040500012506	Includes: Mill Creek	Fish and water
040500012507-01	Rivers/Streams in HUC 040500012507	Includes: Paw Paw River and Ryno Drain	Fish and water
040500012507-02	Rivers/Streams in HUC 040500012507	Includes: Pine Creek from the Paw Paw River confluence upstream to 66th Avenue.	Fish and water
040500012507-03	Rivers/Streams in HUC 040500012507	Includes: Pine Creek from 66th Ave upstream to headwaters.	Fish and water
040500012508-01	Rivers/Streams in HUC 040500012508	Includes: Blue Creek and Yellow Creek	Fish and water
040500012508-02	Rivers/Streams in HUC 040500012508	Includes: Granger Drain and Paw Paw River	Fish and water
040500012509-01	Rivers/Streams in HUC 040500012509	Includes: Paw Paw River	Fish and water
040500012509-02	Rivers/Streams in HUC 040500012509	Includes: Ox Creek	Fish and water
040500012509-03	Rivers/Streams in HUC 040500012509	Includes: Paw Paw River and Sand Creek	Fish and water
040500012601-01	Rivers/Streams in HUC 040500012601	Includes: Clear Lake Outlet and Unnamed Tributary to Clear Lake Outlet	Fish and water
040500012601-02	Rivers/Streams in HUC 040500012601	Includes: McCoy Creek	Fish and water
040500012602-01	Rivers/Streams in HUC 040500012602	Includes: Saint Joseph River and Spring Valley Drain	Fish and water
040500012604-02	Rivers/Streams in HUC 040500012604	Includes: Eau Claire Extension Drain	Fish and water
040500012604-03	Rivers/Streams in HUC 040500012604	Includes: Farmers Creek	Fish and water
040500012604-04	Rivers/Streams in HUC 040500012604	Includes: Farmers Creek	Fish and water

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040500012604-05	Rivers/Streams in HUC 040500012604	Includes: Lemon Creek	Fish and water
040500012605-01	Rivers/Streams in HUC 040500012605	Includes: Pipestone Creek	Fish and water
040500012605-02	Rivers/Streams in HUC 040500012605	Includes: Pipestone Creek	Fish and water
040500012606-01	Rivers/Streams in HUC 040500012606	Includes: Love Creek	Fish and water
040500012606-02	Rivers/Streams in HUC 040500012606	Includes: Love Creek and Saint Joseph River	Fish and water
040500012607-01	Rivers/Streams in HUC 040500012607	Includes: Hickory Creek, Lemon Creek and North Branch Hickory Creek	Fish and water
040500012608-02	Rivers/Streams in HUC 040500012608	Includes: Saint Joseph River	Fish and water
040500012608-03	Rivers/Streams in HUC 040500012608	Includes: BIG MEADOW DRAIN	Fish and water
040500012608-05	Rivers/Streams in HUC 040500012608	Includes: Unnamed Tributary to Lake Michigan (Saint Joseph)	Fish and water
040500020302-01	Rivers/Streams in HUC 040500020302	Includes: Unnamed Tributary to Bass Creek and Unnamed Tributary to Pigeon River	Fish and water
040500020302-02	Rivers/Streams in HUC 040500020302	Includes: BLENDON AND OLIVE DRAIN (PIGEON RIVER HEADWATERS)	Fish and water
040500030101-01	Rivers/Streams in HUC 040500030101	Includes: Unnamed Tributaries to Farewell Lake	Fish and water
040500030102-01	Rivers/Streams in HUC 040500030102	Includes: SPRING ARBOR & CONCORD DRAIN	Fish and water
040500030203-01	Rivers/Streams in HUC 040500030203	Includes: Unnamed Tributary near Hanover Road	Fish and water
040500030203-03	Rivers/Streams in HUC 040500030203	Includes: Beaver Creek and Unnamed Tributaries to Beaver Creek	Fish and water
040500030203-04	Rivers/Streams in HUC 040500030203	Includes: Conger Drain and Unnamed Tributary to Conger Drain	Fish and water
040500030204-03	Rivers/Streams in HUC 040500030204	Includes: Swains Lake Drain	Fish and water
040500030301-01	Rivers/Streams in HUC 040500030301	Includes: Duck Lake Outlet and Unnamed Tributary to Narrow Lake	Fish and water
040500030301-02	Rivers/Streams in HUC 040500030301	Includes: Battle Creek Drain from Hoggle & Miller Drain (included) upstream to Narrow Lake Outlet	Fish and water
040500030302-01	Rivers/Streams in HUC 040500030302	Includes: Battle Creek River from UnNamed Tributary (included) upstream of Brookfield Road to Battle Creek Drain confluence with Hoggle & Miller Drain. Includes Relaid Mills Drain and all other tributaies in reach.	Fish and water
040500030303-01	Rivers/Streams in HUC 040500030303	Includes: Big Creek and all tributaries to headwaters upstream from confluence with Battle Creek River.	Fish and water
040500030304-01	Rivers/Streams in HUC 040500030304	Includes: State & Indian Creek Drain from confluence with Indian Creek south of S Drive upstream to headwaters.	Fish and water
040500030305-01	Rivers/Streams in HUC 040500030305	Includes: Indian Creek and tributaries from confluence with Battle Creek River upstream to State & Indian Creek Drain just south of S	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Drive	
040500030306-01	Rivers/Streams in HUC 040500030306	Includes: Battle Creek River and tributaries from Spicerville Hwy (west) upstream to tributary upstream of Brookfield Road	Fish and water
040500030306-02	Rivers/Streams in HUC 040500030306	Includes: Battle Creek River and tributaries from Indian Creek (not included) upstream to Spicerville Hwy	Fish and water
040500030307-01	Rivers/Streams in HUC 040500030307	Includes: Battle Creek River all tributaries from and including the tributary in the northwest corner of the City of Bellevue upstream to Indian Creek	Fish and water
040500030307-02	Rivers/Streams in HUC 040500030307	Includes: Townline Brook Drain from Battle Creek River confluence upstream to headwaters.	Fish and water
040500030308-01	Rivers/Streams in HUC 040500030308	Includes: Battle Creek River and tributaries from and including Ackley Creek upstream to tributary in City of Bellevue.	Fish and water
040500030308-03	Rivers/Streams in HUC 040500030308	Includes: Ackley Creek	Fish and water
040500030309-01	Rivers/Streams in HUC 040500030309	Includes: Battle Creek River and Tributaries from second UnNamed Tributary (included) downstream of Burrows Road upstream to Ackley Creek.	Fish and water
040500030310-01	Rivers/Streams in HUC 040500030310	Includes: Wanadoga Creek and all tributaries upstream of Ellis Creek confluence to headwaters.	Fish and water
040500030310-02	Rivers/Streams in HUC 040500030310	Includes: Ellis Creek and all tributaries upstream of Wanadoga Creek confluence.	Fish and water
040500030311-01	Rivers/Streams in HUC 040500030311	Includes: Wanadoga Creek and one UnNamed Tributary from Crooked Creek confluence upstream to Ellis Creek.	Fish and water
040500030311-02	Rivers/Streams in HUC 040500030311	Includes: Wanadoga Creek from Battle Creek River confluence upstream to Crooked Creek confluence.	Fish and water
040500030311-03	Rivers/Streams in HUC 040500030311	Includes: Crooked Brook Creek and tributaries upstream from confluence with Wanadoga Creek to headwaters.	Fish and water
040500030312-01	Rivers/Streams in HUC 040500030312	Includes: Battle Creek River from near Fruin Corners, just upstream of the City of Battle Creek, to the second tributary downstream of Burrows Road.	Fish and water
040500030312-02	Rivers/Streams in HUC 040500030312	Includes: Battle Creek River from Kalamazoo River confluence upstream to Fruin Corners area.	Fish and water
040500030401-01	Rivers/Streams in HUC 040500030401	Includes: South Branch Rice Creek and tributaries from tributary upstream of 29 Mile Road to headwaters.	Fish and water
040500030402-01	Rivers/Streams in HUC 040500030402	Includes: South Branch Rice Creek and tributaries from confluence with North Branch Rice Creek upstream to and including tributary upstream of 29 Mile Road.	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500030403-01	Rivers/Streams in HUC 040500030403	Includes: North Branch Rice Creek from Prairie Lake outlet upstream including all tributaries to headwaters.	Fish and water
040500030403-03	Rivers/Streams in HUC 040500030403	Includes: North Branch Rice Creek from confluence with South Branch Rice Creek upstream to Prairie Lake outlet.	Fish and water
040500030404-01	Rivers/Streams in HUC 040500030404	Includes: Wilder Creek and all tributaries from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030405-01	Rivers/Streams in HUC 040500030405	Includes: Rice Creek from Kalamazoo River confluence upstream North and South Branch split.	Fish and water
040500030405-02	Rivers/Streams in HUC 040500030405	Includes: Eaton and Baker Drain from confluence with Rice Creek upstream to headwaters	Fish and water
040500030407-03	Rivers/Streams in HUC 040500030407	Includes: Bear Creek from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030407-04	Rivers/Streams in HUC 040500030407	Includes: Talmadge Creek from Enbridge impact zone downstream to Kalamazoo River.	Fish and water
040500030407-05	Rivers/Streams in HUC 040500030407	Includes: Squaw Lake Drain and tributaries from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030407-06	Rivers/Streams in HUC 040500030407	Includes: Talmadge Creek from Enbridge impact zone upstream.	Fish and water
040500030408-01	Rivers/Streams in HUC 040500030408	Includes: Kalamazoo River from Dickinson Creek confluence upstream to Squaw Lake Drain(excluding the Ceresco Imoundment)	Fish and water
040500030408-03	Rivers/Streams in HUC 040500030408	Includes: Unnamed Tributary to Ceresco Impoundment	Fish and water
040500030408-04	Rivers/Streams in HUC 040500030408	Includes: Easterly Dibble Drain from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030408-05	Rivers/Streams in HUC 040500030408	Includes: Pigeon Creek from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030408-06	Rivers/Streams in HUC 040500030408	Includes: Crooked Creek from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030409-01	Rivers/Streams in HUC 040500030409	Includes: Severence Creek from Graham Lake upstream to headwaters.	Fish and water
040500030409-02	Rivers/Streams in HUC 040500030409	Includes: Harper Creek and all tribuaties upstream from Minges Brook confluence. Includes Barnum Creek upstream to Graham Lake.	Fish and water
040500030410-01	Rivers/Streams in HUC 040500030410	Includes: Minges Brook from Kalamazoo River confluence upstream to headwaters. Includes all tributaries except Brickyard Creek and Harper Creek.	Fish and water

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040500030410-02	Rivers/Streams in HUC 040500030410	Includes: Brickyard Creek from Minges Brook confluence upstream to headwaters.	Fish and water
040500030411-01	Rivers/Streams in HUC 040500030411	Includes: Dickinson Creek from Kalamazoo River confluence upstream to headwaters. East of Battle Creek.	Fish and water
040500030411-02	Rivers/Streams in HUC 040500030411	Includes: Willow Creek and Unnamed Tributary from Hall Lake.	Fish and water
040500030411-03	Rivers/Streams in HUC 040500030411	Includes: Kalamazoo River from Battle Creek River confluence upstream to Dickinson Creek.	Fish and water
040500030501-01	Rivers/Streams in HUC 040500030501	Includes: Wabascon Creek headwaters upstream of Taylor Lake.	Fish and water
040500030501-02	Rivers/Streams in HUC 040500030501	Includes: Wabascon Creek and tributaries from Foster Lake upstream to Taylor Lake	Fish and water
040500030502-01	Rivers/Streams in HUC 040500030502	Includes: Wabascon Creek and tributaries from Kalamazoo River confluence upstream to Foster Lake.	Fish and water
040500030503-01	Rivers/Streams in HUC 040500030503	Includes: Tributaries to the Kalamazoo River from Custer Drive upstream to the Battle Creek River confluence.	Fish and water
040500030503-02	Rivers/Streams in HUC 040500030503	Includes: Tributaries to the Kalamazoo River between Custer Drive and the Battle Creek River, excluding Wabascon Creek.	Fish and water
040500030503-03	Rivers/Streams in HUC 040500030503	Includes: Kalamazoo River from Wabascon Creek upstream to the Battle Creek River confluence.	Fish and water
040500030504-01	Rivers/Streams in HUC 040500030504	Includes: Sevenmile Creek from Kalamazoo River confluence upstream to Spring Brook confluence	Fish and water
040500030504-02	Rivers/Streams in HUC 040500030504	Includes: Sevenmile Creek and tributary upstream from Spring Brook confluence to headwaters.	Fish and water
040500030504-03	Rivers/Streams in HUC 040500030504	Includes: Spring Brook from confluence with Seven Mile Creek upstream to headwaters.	Fish and water
040500030505-01	Rivers/Streams in HUC 040500030505	Includes: Augusta Creek and tributaries upstream from Hamilton Lake outlet confluence to headwaters (Fair & Little Gilkey lake).	Fish and water
040500030506-01	Rivers/Streams in HUC 040500030506	Includes: Augusta Creek and tributaries from Kalamazoo River confluence upstream to and including Hamilton Lake O.utlet	Fish and water
040500030507-01	Rivers/Streams in HUC 040500030507	Includes: Unnamed Tributary to Gull Lake, Prairieville Creek	Fish and water
040500030507-06	Rivers/Streams in HUC 040500030507	Includes: Gull Creek from Kalamazoo River confluence upstream to Gull Lake.	Fish and water
040500030508-01	Rivers/Streams in HUC 040500030508	Includes: Kalamazoo River tributaries from Gull Creek upstream to Wabascon Creek Confluence.	Fish and water
040500030508-05	Rivers/Streams in HUC 040500030508	Includes: Unnamed Tributary to Kalamazoo River in Ft. Custer.	Fish and water
040500030508-07	Rivers/Streams in HUC 040500030508	Includes: Kalamazoo River (only-no tributaries) from Gull Creek	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		upstream to Wabascon Creek Confluence.	
040500030508-08	Rivers/Streams in HUC 040500030508	Includes: Eagle Creek	Fish and water
040500030509-01	Rivers/Streams in HUC 040500030509	Includes: Kalamazoo River tributaries from Morrow Pond Dam upstream to Gull Creek.	Fish and water
040500030509-03	Rivers/Streams in HUC 040500030509	Includes: Kalamazoo River from Morrow Pond Dam upstream to Gull Creek (Morrow Pond is excluded).	Fish and water
040500030601-01	Rivers/Streams in HUC 040500030601	Includes: Comstock Creek from Kalamazoo River confluence upstream to Campbell Lake.	Fish and water
040500030601-02	Rivers/Streams in HUC 040500030601	Includes: Comstock Creek from Campbell Lake upstream to headwaters.	Fish and water
040500030602-01	Rivers/Streams in HUC 040500030602	Includes: West Fork Portage Creek from Portage Creek confluence upstream to headwaters (Fish Camp Pond).	Fish and water
040500030603-01	Rivers/Streams in HUC 040500030603	Includes: Portage Creek from Hampton Lake upstream to headwaters.	Fish and water
040500030603-03	Rivers/Streams in HUC 040500030603	Includes: Portage Creek headwater area downstream of Hampton Lake and tributary in Gourdneck State Game Area.	Fish and water
040500030603-04	Rivers/Streams in HUC 040500030603	Includes: Portage Creek from West Fork Portage Creek confluence upstream to tributary downstream of Hampton Lake.	Fish and water
040500030603-05	Rivers/Streams in HUC 040500030603	Includes: Axtell Creek	Fish and water
040500030604-02	Rivers/Streams in HUC 040500030604	Includes: Davis Creek from Kalamazoo River confluence to Cork Street	Fish and water
040500030604-03	Rivers/Streams in HUC 040500030604	Includes: Davis Creek from Cork Street upstream	Fish and water
040500030605-01	Rivers/Streams in HUC 040500030605	Includes: Spring Brook and tributaries from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030606-04	Rivers/Streams in HUC 040500030606	Includes: Arcadia Creek	Fish and water
040500030607-03	Rivers/Streams in HUC 040500030607	Includes: Unnamed Tributary to Kalamazoo River downstream of Kalamazoo at the Kalamazoo Nature Center	Fish and water
040500030607-04	Rivers/Streams in HUC 040500030607	Includes: Silver Creek from Kalamazoo River confluence upstream to headwaters	Fish and water
040500030607-05	Rivers/Streams in HUC 040500030607	Includes: Unnamed Tributary to Kalamazoo River (Chart Creek)	Fish and water
040500030701-11	Rivers/Streams in HUC 040500030701	Includes: Barlow Lake Outlet, Cobb Lake Outlet, Fawn Lake Outlet, Mill Pond Outlet, and Unnamed Tributaries to Baker Lake, Boot Lake, Chief Noonday Lake, Gun Lake, Payne Lake, and Williams Lake	Fish and water
040500030702-02	Rivers/Streams in HUC 040500030702	Includes: Lake Sixteen Outlet downstream to Fenner Lake	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500030702-03	Rivers/Streams in HUC 040500030702	Includes: Fenner Creek from Gun River confluence upstream to Fenner Lake.	Fish and water
040500030702-04	Rivers/Streams in HUC 040500030702	Includes: Greggs Brook and tributaries from Gun River confluence upstream to headwaters	Fish and water
040500030702-05	Rivers/Streams in HUC 040500030702	Includes: Gun River from Orangeville Creek confluence upstream to Gun Lake.	Fish and water
040500030702-06	Rivers/Streams in HUC 040500030702	Includes: Gun River and all tributaries, except Fenner Creek and Greggs Brook, from Culver Drain (included) upstream to and including Orangeville Creek.	Fish and water
040500030702-07	Rivers/Streams in HUC 040500030702	Includes: Orangeville Creek from Mill Pond upstream to Fish Lake	Fish and water
040500030702-09	Rivers/Streams in HUC 040500030702	Includes: Unnamed Tributary to Gun River and Unnamed Tributaries to Adams Lake, Crystal Lake, Fish Lake, Horseshoe Lake, and Lime Lake	Fish and water
040500030703-01	Rivers/Streams in HUC 040500030703	Includes: Gun River and tributaries from Kalamazoo River confluence upstream to Culver Drain	Fish and water
040500030801-01	Rivers/Streams in HUC 040500030801	Includes: GREEN LAKE CREEK	Fish and water
040500030801-02	Rivers/Streams in HUC 040500030801	Includes: Tollenbar Drain	Fish and water
040500030802-01	Rivers/Streams in HUC 040500030802	Includes: Rabbit River and Hooker and Harvey Drain.	Fish and water
040500030803-02	Rivers/Streams in HUC 040500030803	Includes: Miller Creek	Fish and water
040500030803-04	Rivers/Streams in HUC 040500030803	Includes: Miller Creek	Fish and water
040500030804-01	Rivers/Streams in HUC 040500030804	Includes: Bear Creek	Fish and water
040500030805-01	Rivers/Streams in HUC 040500030805	Includes: Rabbit River	Fish and water
040500030805-02	Rivers/Streams in HUC 040500030805	Includes: Buskirk Creek	Fish and water
040500030805-03	Rivers/Streams in HUC 040500030805	Includes: Silkirk Creek and other tributaries to the Rabbit River.	Fish and water
040500030806-02	Rivers/Streams in HUC 040500030806	Includes: Red Run	Fish and water
040500030806-03	Rivers/Streams in HUC 040500030806	Includes: Dorr and Byron Drain and Unnamed Tributaries to Dorr and Byron Drain	Fish and water
040500030807-01	Rivers/Streams in HUC 040500030807	Includes: Little Rabbit River	Fish and water
040500030808-01	Rivers/Streams in HUC 040500030808	Includes: Rabbit River	Fish and water
040500030808-02	Rivers/Streams in HUC 040500030808	Includes: Pigeon and Fiest Creek	Fish and water
040500030809-01	Rivers/Streams in HUC 040500030809	Includes: Black Creek	Fish and water
040500030810-02	Rivers/Streams in HUC 040500030810	Includes: Silver Creek	Fish and water
040500030810-03	Rivers/Streams in HUC 040500030810	Includes: Miller Creek	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500030810-04	Rivers/Streams in HUC 040500030810	Includes: Unnamed Tributaries to Rabbit River	Fish and water
040500030811-01	Rivers/Streams in HUC 040500030811	Includes: Rabbit River	Fish and water
040500030811-05	Rivers/Streams in HUC 040500030811	Includes: Lohman Drain, Lugten Drain, Unnamed Tributaries to Lohman Drain, and Unnamed Tributaries to Rabbit River	Fish and water
040500030901-01	Rivers/Streams in HUC 040500030901	Includes: Pine Creek and tributaries from Baseline Creek confluence upstream to headwaters including Sand Creek.	Fish and water
040500030902-02	Rivers/Streams in HUC 040500030902	Includes: Base Line Creek and tributaries from Pine Creek confluence upstream to headwaters (lakes)	Fish and water
040500030903-01	Rivers/Streams in HUC 040500030903	Includes: Pine Creek and tributaries from Kalamazoo River confluence upstream to Baseline Creek.	Fish and water
040500030904-02	Rivers/Streams in HUC 040500030904	Includes: Miner Creek and tributaries, except School Section Brook, from Schnable Brook confluence upstream to headwaters or Miner Lake.	Fish and water
040500030904-03	Rivers/Streams in HUC 040500030904	Includes: School Section Brook and tributaries from Miner Creek confluence upstream to headwaters.	Fish and water
040500030904-04	Rivers/Streams in HUC 040500030904	Includes: Schnable Brook and tributaries, except Miner Creek, from Kalamazoo River confluence upstream to headwaters	Fish and water
040500030904-05	Rivers/Streams in HUC 040500030904	Includes: Unnamed Tributaries to Miner Lake	Fish and water
040500030905-01	Rivers/Streams in HUC 040500030905	Includes: Osgood Drain from Kalamazoo River confluence upstream to Osgood Lake.	Fish and water
040500030907-02	Rivers/Streams in HUC 040500030907	Includes: Dumont Creek and tributaries from Kalamazoo River confluence upstream to Dumont Lake.	Fish and water
040500030907-03	Rivers/Streams in HUC 040500030907	Includes: Rossman Creek and tributaries from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030907-05	Rivers/Streams in HUC 040500030907	Includes: Tributaries upstream of Dumont Lake	Fish and water
040500030908-04	Rivers/Streams in HUC 040500030908	Includes: Swan Creek and tributaries from Swan Creek Pond upstream to headwaters.	Fish and water
040500030908-07	Rivers/Streams in HUC 040500030908	Includes: Swan Creek from Kalamazoo River confluence upstream to Swan Creek Pond.	Fish and water
040500030909-03	Rivers/Streams in HUC 040500030909	Includes: Sand Creek and tributaries from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030909-04	Rivers/Streams in HUC 040500030909	Includes: Unnamed Tributary to isolated Unnamed Lake	Fish and water
040500030910-01	Rivers/Streams in HUC 040500030910	Includes: Mann Creek and tributaries from Kalamazoo River confluence upstream to headwaters.	Fish and water
040500030912-02	Rivers/Streams in HUC 040500030912	Includes: Goshorn Creek	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500040101-01	Rivers/Streams in HUC 040500040101	Includes: Unnamed Tributary to Willow Creek and Unnamed Tributaries to Little Wolf Lake and Wolf Lake	Fish and water
040500040102-01	Rivers/Streams in HUC 040500040102	Includes: Grass Lake Drain, Unnamed Tributaries to Grass Lake Drain, Unnamed Tributaries to Center Lake, Grass Lake, Leoni Millpond, and Tims Lake	Fish and water
040500040103-01	Rivers/Streams in HUC 040500040103	Includes: North Branch Grand River from confluence with Main Branch of Grand River to Center Lake outlet, and Unnamed Tributary to Little Olcott Lake	Fish and water
040500040103-05	Rivers/Streams in HUC 040500040103	Includes: Unnamed Tributary to Gilletts Lake	Fish and water
040500040104-01	Rivers/Streams in HUC 040500040104	Includes: Grand River	Fish and water
040500040105-01	Rivers/Streams in HUC 040500040105	Includes: Grand River and Sharp Creek	Fish and water
040500040106-01	Rivers/Streams in HUC 040500040106	Includes: Grand River	Fish and water
040500040106-03	Rivers/Streams in HUC 040500040106	Includes: Grand River	Fish and water
040500040201-01	Rivers/Streams in HUC 040500040201	Includes: Cahaogan Creek	Fish and water
040500040202-01	Rivers/Streams in HUC 040500040202	Includes: Portage River	Fish and water
040500040203-01	Rivers/Streams in HUC 040500040203	Includes: Thornapple Creek	Fish and water
040500040204-01	Rivers/Streams in HUC 040500040204	Includes: Honey Creek and Portage River	Fish and water
040500040205-01	Rivers/Streams in HUC 040500040205	Includes: Batteese Creek	Fish and water
040500040206-01	Rivers/Streams in HUC 040500040206	Includes: Batteese Creek and Portage River	Fish and water
040500040207-01	Rivers/Streams in HUC 040500040207	Includes: Portage River and Wildcat Creek	Fish and water
040500040208-01	Rivers/Streams in HUC 040500040208	Includes: Huntoon Creek	Fish and water
040500040209-01	Rivers/Streams in HUC 040500040209	Includes: Grand River, Pleasant Lake Drain, Shaw Branch, Western Creek and Whitney Drain	Fish and water
040500040210-01	Rivers/Streams in HUC 040500040210	Includes: Albrow Creek and Grand River	Fish and water
040500040210-02	Rivers/Streams in HUC 040500040210	Includes: Albrow Creek	Fish and water
040500040301-01	Rivers/Streams in HUC 040500040301	Includes: Sandstone Creek	Fish and water
040500040302-01	Rivers/Streams in HUC 040500040302	Includes: Mackey Brook and Sandstone Creek	Fish and water
040500040303-01	Rivers/Streams in HUC 040500040303	Includes: Sandstone Creek	Fish and water
040500040304-01	Rivers/Streams in HUC 040500040304	Includes: North Onondaga Drain	Fish and water
040500040305-01	Rivers/Streams in HUC 040500040305	Includes: Otter Creek and Spring Brook	Fish and water
040500040306-01	Rivers/Streams in HUC 040500040306	Includes: Spring Brook and Willow Creek	Fish and water
040500040307-01	Rivers/Streams in HUC 040500040307	Includes: Booth Drain and Spring Brook	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500040307-02	Rivers/Streams in HUC 040500040307	Includes: Spring Brook	Fish and water
040500040308-01	Rivers/Streams in HUC 040500040308	Includes: Grand River and Spring Brook	Fish and water
040500040308-02	Rivers/Streams in HUC 040500040308	Includes: Grand River	Fish and water
040500040401-01	Rivers/Streams in HUC 040500040401	Includes: Red Cedar River	Fish and water
040500040401-02	Rivers/Streams in HUC 040500040401	Includes: Red Cedar River	Fish and water
040500040402-01	Rivers/Streams in HUC 040500040402	Includes: Middle Branch Red Cedar River	Fish and water
040500040403-01	Rivers/Streams in HUC 040500040403	Includes: Red Cedar River	Fish and water
040500040403-02	Rivers/Streams in HUC 040500040403	Includes: Red Cedar River	Fish and water
040500040404-01	Rivers/Streams in HUC 040500040404	Includes: West Branch Red Cedar River	Fish and water
040500040405-01	Rivers/Streams in HUC 040500040405	Includes: West Branch Red Cedar River	Fish and water
040500040405-02	Rivers/Streams in HUC 040500040405	Includes: West Branch Red Cedar River	Fish and water
040500040406-01	Rivers/Streams in HUC 040500040406	Includes: Kalamink Creek	Fish and water
040500040407-01	Rivers/Streams in HUC 040500040407	Includes: Red Cedar River	Fish and water
040500040407-02	Rivers/Streams in HUC 040500040407	Includes: Wolf Creek	Fish and water
040500040407-03	WOLF CREEK	From Morrice Road upstream to headwaters.	Fish and water
040500040408-01	Rivers/Streams in HUC 040500040408	Includes: Doan Creek	Fish and water
040500040409-01	Rivers/Streams in HUC 040500040409	Includes: Dietz Creek	Fish and water
040500040410-01	Rivers/Streams in HUC 040500040410	Includes: Doan Creek and Doan Deer Creek	Fish and water
040500040411-01	Rivers/Streams in HUC 040500040411	Includes: Red Cedar River and Sullivan Creek	Fish and water
040500040411-02	Rivers/Streams in HUC 040500040411	Includes: Red Cedar River	Fish and water
040500040411-03	Rivers/Streams in HUC 040500040411	Includes: Squaw Creek	Fish and water
040500040501-01	Rivers/Streams in HUC 040500040501	Includes: Deer Creek	Fish and water
040500040502-01	Rivers/Streams in HUC 040500040502	Includes: Sloan Creek	Fish and water
040500040502-02	Rivers/Streams in HUC 040500040502	Includes: Sloan Creek	Fish and water
040500040503-01	Rivers/Streams in HUC 040500040503	Includes: Unnamed Tributary to Red Cedar River	Fish and water
040500040503-02	Rivers/Streams in HUC 040500040503	Includes: Deer Creek	Fish and water
040500040503-03	Rivers/Streams in HUC 040500040503	Includes: Coon Creek and Red Cedar River	Fish and water
040500040504-01	Rivers/Streams in HUC 040500040504	Includes: Pine Lake Outlet	Fish and water
040500040505-01	Rivers/Streams in HUC 040500040505	Includes: Mud Creek	Fish and water
040500040506-01	Rivers/Streams in HUC 040500040506	Includes:Talmadge Drain and Sycamore Creek	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500040506-04	Rivers/Streams in HUC 040500040506	Includes: Cook and Thorburn Drain from Cedar Lake upstream	Fish and water
040500040507-01	Rivers/Streams in HUC 040500040507	Includes: Banta Drain and Sycamore Creek	Fish and water
040500040508-01	Rivers/Streams in HUC 040500040508	Includes: Herron Creek	Fish and water
040500040508-02	Rivers/Streams in HUC 040500040508	Includes: Red Cedar River	Fish and water
040500040508-03	Rivers/Streams in HUC 040500040508	Includes: Red Cedar River	Fish and water
040500040601-01	Rivers/Streams in HUC 040500040601	Includes: Looking Glass River	Fish and water
040500040602-01	Rivers/Streams in HUC 040500040602	Includes: Grub Creek and Looking Glass River	Fish and water
040500040603-02	Rivers/Streams in HUC 040500040603	Includes: Osborn Creek and Looking Glass River	Fish and water
040500040603-03	Rivers/Streams in HUC 040500040603	Includes Perry Drain No. 2 and Austin Drain (Kellogg Drain)	Fish and water
040500040604-01	Rivers/Streams in HUC 040500040604	Includes: Buck Branch and Vermilion Creek	Fish and water
040500040604-02	Rivers/Streams in HUC 040500040604	Includes: Vermilion Creek and its tributaries downstream to Hidden Lake	Fish and water
040500040605-03	Rivers/Streams in HUC 040500040605	Includes: Looking Glass River and Vermilion Creek	Fish and water
040500040606-02	Rivers/Streams in HUC 040500040606	Includes: Looking Glass River	Fish and water
040500040607-01	Rivers/Streams in HUC 040500040607	Includes: Looking Glass River and Mud Creek	Fish and water
040500040608-01	Rivers/Streams in HUC 040500040608	Includes: Remey Chandler Drain and Unnamed Tributaries to Remey Chandler Drain	Fish and water
040500040609-01	Rivers/Streams in HUC 040500040609	Includes: Ives Drain and Looking Glass River	Fish and water
040500040609-03	Rivers/Streams in HUC 040500040609	Includes: Clise Drain	Fish and water
040500040610-01	Rivers/Streams in HUC 040500040610	Includes: Looking Glass River, Prairie Creek, and Watson and Summers Drain.	Fish and water
040500040611-01	Rivers/Streams in HUC 040500040611	Includes: Looking Glass River and Husted and Landenberg Drain	Fish and water
040500040612-02	Rivers/Streams in HUC 040500040612	Includes: Looking Glass River, McCausey Branch, and Kramer Drain	Fish and water
040500040701-01	Rivers/Streams in HUC 040500040701	Includes: Columbia Creek	Fish and water
040500040702-01	Rivers/Streams in HUC 040500040702	Includes: Grand River	Fish and water
040500040702-02	Rivers/Streams in HUC 040500040702	Includes: Harris Drain, Skinner Extension Drain and Spicer Creek	Fish and water
040500040703-01	Rivers/Streams in HUC 040500040703	Includes: Grand River upstream of Waverly Rd	Fish and water
040500040703-03	Rivers/Streams in HUC 040500040703	Includes: Grand River	Fish and water
040500040704-01	Rivers/Streams in HUC 040500040704	Includes: Unnamed Tributaries to the Grand River	Fish and water
040500040704-02	Rivers/Streams in HUC 040500040704	Includes: Carrier Creek	Fish and water
040500040704-03	Rivers/Streams in HUC 040500040704	Includes: Grand River downstream of Waverly Rd, extending to	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		confluence of Carrier Creek	
040500040705-01	Rivers/Streams in HUC 040500040705	Includes: Miller Creek	Fish and water
040500040705-02	Rivers/Streams in HUC 040500040705	Includes: Grand River	Fish and water
040500040705-03	Rivers/Streams in HUC 040500040705	Includes: Sandstone Creek	Fish and water
040500040706-01	Rivers/Streams in HUC 040500040706	Includes: Grand River	Fish and water
040500040706-03	Rivers/Streams in HUC 040500040706	Includes: Frayer Creek and Grand River	Fish and water
040500040707-01	Rivers/Streams in HUC 040500040707	Includes: Sebewa Creek, Winchell and Union Drains	Fish and water
040500040708-01	Rivers/Streams in HUC 040500040708	Includes: Sebewa Creek	Fish and water
040500040709-01	Rivers/Streams in HUC 040500040709	Includes: Grand River	Fish and water
040500040710-02	Rivers/Streams in HUC 040500040710	Includes: Goose Creek	Fish and water
040500050101-01	Rivers/Streams in HUC 040500050101	Includes: Maple River and Spring Brook	Fish and water
040500050102-01	Rivers/Streams in HUC 040500050102	Includes: Bear Creek and Coon Creek	Fish and water
040500050103-01	Rivers/Streams in HUC 040500050103	Includes: Alder Creek and Alder Creek Drain	Fish and water
040500050103-02	Rivers/Streams in HUC 040500050103	Includes: Alder Creek Drain	Fish and water
040500050104-01	Rivers/Streams in HUC 040500050104	Includes: Little Maple River	Fish and water
040500050104-02	Rivers/Streams in HUC 040500050104	Includes: Little Maple River	Fish and water
040500050105-01	Rivers/Streams in HUC 040500050105	Includes: Unnamed Tributaries to Maple River	Fish and water
040500050105-02	Rivers/Streams in HUC 040500050105	Includes: Maple River	Fish and water
040500050105-03	Rivers/Streams in HUC 040500050105	Includes: Maple River	Fish and water
040500050201-01	Rivers/Streams in HUC 040500050201	Includes: Baker Creek and Wise Creek	Fish and water
040500050202-01	Rivers/Streams in HUC 040500050202	Includes: Maple River	Fish and water
040500050202-02	Rivers/Streams in HUC 040500050202	Includes: Maple River	Fish and water
040500050202-03	Rivers/Streams in HUC 040500050202	Includes: Maple River	Fish and water
040500050203-01	Rivers/Streams in HUC 040500050203	Includes: Bear Creek	Fish and water
040500050204-01	Rivers/Streams in HUC 040500050204	Includes: Halterman Creek	Fish and water
040500050204-02	Rivers/Streams in HUC 040500050204	Includes: Ferdon Creek and Maple River	Fish and water
040500050204-03	Rivers/Streams in HUC 040500050204	Includes: Maple River	Fish and water
040500050205-01	Rivers/Streams in HUC 040500050205	Includes: Unnamed Tributaries to Pine Creek	Fish and water
040500050205-02	Rivers/Streams in HUC 040500050205	Includes: Newark Drain	Fish and water
040500050205-03	Rivers/Streams in HUC 040500050205	Includes: River Styx	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500050205-04	Rivers/Streams in HUC 040500050205	Includes: Pine Creek	Fish and water
040500050206-01	Rivers/Streams in HUC 040500050206	Includes: Knowles Drain, North Shade Drain, and Unnamed Tributaries to North Shade Drain	Fish and water
040500050207-01	Rivers/Streams in HUC 040500050207	Includes: Pine Creek	Fish and water
040500050207-02	Rivers/Streams in HUC 040500050207	Includes: Pine Creek	Fish and water
040500050207-03	Rivers/Streams in HUC 040500050207	Includes: Otter Creek	Fish and water
040500050208-01	Rivers/Streams in HUC 040500050208	Includes: Maple River	Fish and water
040500050208-02	Rivers/Streams in HUC 040500050208	Includes: Collier Creek and Maple River	Fish and water
040500050301-01	Rivers/Streams in HUC 040500050301	Includes: Holland Lake Outlet and Unnamed Tributaries to Lampman Lake, Mitchell Lake, Rosa Lake, Twin Lakes, and Twin Stone Lakes	Fish and water
040500050301-04	Rivers/Streams in HUC 040500050301	Includes: West Branch Fish Creek	Fish and water
040500050302-01	Rivers/Streams in HUC 040500050302	Includes: Fish Creek	Fish and water
040500050303-01	Rivers/Streams in HUC 040500050303	Includes: Unnamed Tributary to Fish Creek	Fish and water
040500050304-01	Rivers/Streams in HUC 040500050304	Includes: Butternut Creek	Fish and water
040500050305-02	Rivers/Streams in HUC 040500050305	Includes: Fish Creek	Fish and water
040500050305-03	Rivers/Streams in HUC 040500050305	Includes: Fish Creek	Fish and water
040500050306-01	Rivers/Streams in HUC 040500050306	Includes: Fifield Creek	Fish and water
040500050306-02	Rivers/Streams in HUC 040500050306	Includes: Fish Creek and Stoughton Creek	Fish and water
040500050306-03	Rivers/Streams in HUC 040500050306	Includes: Stoughton Creek	Fish and water
040500050401-01	Rivers/Streams in HUC 040500050401	Includes: Stony Creek	Fish and water
040500050401-02	Rivers/Streams in HUC 040500050401	Includes: Stony Creek	Fish and water
040500050402-01	Rivers/Streams in HUC 040500050402	Includes: Bad Creek	Fish and water
040500050403-01	Rivers/Streams in HUC 040500050403	Includes: Hamilton Drain, Holden Drain and Stony Creek	Fish and water
040500050404-01	Rivers/Streams in HUC 040500050404	Includes: Muskrat Creek and Tibbetts Drain	Fish and water
040500050405-01	Rivers/Streams in HUC 040500050405	Includes: Kloeckner and Fuller Creek and Stony Creek	Fish and water
040500050406-01	Rivers/Streams in HUC 040500050406	Includes: Stony Creek	Fish and water
040500050406-02	Rivers/Streams in HUC 040500050406	Includes: Lost Creek	Fish and water
040500050406-03	Rivers/Streams in HUC 040500050406	Includes: Stony Creek	Fish and water
040500050501-01	Rivers/Streams in HUC 040500050501	Includes: Unnamed Tributaries to North Swargart Creek	Fish and water
040500050501-02	Rivers/Streams in HUC 040500050501	Includes: Kneeland Branch and South Fork Hayworth Creek	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500050502-01	Rivers/Streams in HUC 040500050502	Includes: Unnamed Tributaries to Hayworth Creek	Fish and water
040500050502-02	Rivers/Streams in HUC 040500050502	Includes: Hayworth Creek	Fish and water
040500050502-03	Rivers/Streams in HUC 040500050502	Includes: Doty Brook	Fish and water
040500050503-01	Rivers/Streams in HUC 040500050503	Includes: Hayworth Creek	Fish and water
040500050503-02	Rivers/Streams in HUC 040500050503	Includes: Peet Creek	Fish and water
040500050503-03	Rivers/Streams in HUC 040500050503	Includes: Cox Drain and Unnamed Tributary to Cox Drain	Fish and water
040500050504-01	Rivers/Streams in HUC 040500050504	Includes: Maple River	Fish and water
040500050505-01	Rivers/Streams in HUC 040500050505	Includes: Maple River	Fish and water
040500060101-01	Rivers/Streams in HUC 040500060101	Includes: Black Creek	Fish and water
040500060102-01	Rivers/Streams in HUC 040500060102	Includes: Stony Creek	Fish and water
040500060102-02	Rivers/Streams in HUC 040500060102	Includes: Unnamed Tributary to Sixth Lake	Fish and water
040500060103-01	Rivers/Streams in HUC 040500060103	Includes: Brimmer Creek, Flat River, Horseshoe Creek, Townline Creek and Wolf Creek	Fish and water
040500060103-02	Rivers/Streams in HUC 040500060103	Includes: Unnamed Tributary to Little Penny Lake	Fish and water
040500060104-01	Rivers/Streams in HUC 040500060104	Includes: Flat River	Fish and water
040500060104-02	Rivers/Streams in HUC 040500060104	Includes: Unnamed Tributary to Flat River	Fish and water
040500060105-02	Rivers/Streams in HUC 040500060105	Includes: Flat River	Fish and water
040500060106-01	Rivers/Streams in HUC 040500060106	Includes: Black Creek	Fish and water
040500060107-01	Rivers/Streams in HUC 040500060107	Includes: Clear Creek	Fish and water
040500060108-01	Rivers/Streams in HUC 040500060108	Includes: Coopers Creek	Fish and water
040500060108-02	Rivers/Streams in HUC 040500060108	Includes: Butternut Creek	Fish and water
040500060108-03	Rivers/Streams in HUC 040500060108	Includes: Coopers Creek	Fish and water
040500060109-01	Rivers/Streams in HUC 040500060109	Includes: Flat River	Fish and water
040500060201-01	Rivers/Streams in HUC 040500060201	Includes: Beaver Dam Creek and Wabasis Creek	Fish and water
040500060201-03	Rivers/Streams in HUC 040500060201	Includes: Wabasis Creek	Fish and water
040500060201-04	Rivers/Streams in HUC 040500060201	Includes: Beaver Dam Creek	Fish and water
040500060202-01	Rivers/Streams in HUC 040500060202	Includes: Unnamed Tributary to Dickerson Lake	Fish and water
040500060202-05	Rivers/Streams in HUC 040500060202	Includes: Dickerson Creek	Fish and water
040500060203-01	Rivers/Streams in HUC 040500060203	Includes: Dickerson Creek	Fish and water
040500060203-02	Rivers/Streams in HUC 040500060203	Includes: TRIBUTARY TO DICKERSON CREEK	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500060204-01	Rivers/Streams in HUC 040500060204	Includes: Unnamed Tributary to Dickerson Creek and Unnamed Tributary to Long Lake	Fish and water
040500060205-01	Rivers/Streams in HUC 040500060205	Includes: Dickerson Creek	Fish and water
040500060206-01	Rivers/Streams in HUC 040500060206	Includes: Flat River	Fish and water
040500060206-02	Rivers/Streams in HUC 040500060206	Includes: Flat River	Fish and water
040500060207-01	Rivers/Streams in HUC 040500060207	Includes: Seely Creek	Fish and water
040500060207-04	Rivers/Streams in HUC 040500060207	Includes: Seely Creek	Fish and water
040500060208-01	Rivers/Streams in HUC 040500060208	Includes: Flat River	Fish and water
040500060209-01	Rivers/Streams in HUC 040500060209	Includes: Flat River	Fish and water
040500060209-02	Rivers/Streams in HUC 040500060209	Includes: Page Creek	Fish and water
040500060301-01	Rivers/Streams in HUC 040500060301	Includes: Libhart Creek	Fish and water
040500060302-01	Rivers/Streams in HUC 040500060302	Includes: Libhart Creek	Fish and water
040500060302-02	Rivers/Streams in HUC 040500060302	Includes: Ayers Branch and Little Libhart Creek	Fish and water
040500060302-03	Rivers/Streams in HUC 040500060302	Includes: Libhart Creek	Fish and water
040500060303-01	Rivers/Streams in HUC 040500060303	Includes: Bacon Creek and Prairie Creek	Fish and water
040500060304-01	Rivers/Streams in HUC 040500060304	Includes: Prairie Creek	Fish and water
040500060304-02	Rivers/Streams in HUC 040500060304	Includes: Prairie Creek	Fish and water
040500060305-01	Rivers/Streams in HUC 040500060305	Includes: Unnamed Tributary to Prairie Creek and Unnamed Tributary near Meade Road	Fish and water
040500060306-01	Rivers/Streams in HUC 040500060306	Includes: Prairie Creek	Fish and water
040500060307-01	Rivers/Streams in HUC 040500060307	Includes: Grand River	Fish and water
040500060308-01	Rivers/Streams in HUC 040500060308	Includes: Sessions Creek	Fish and water
040500060308-03	Rivers/Streams in HUC 040500060308	Includes: Sessions Creek	Fish and water
040500060308-04	Rivers/Streams in HUC 040500060308	Includes: Sessions Creek	Fish and water
040500060309-01	Rivers/Streams in HUC 040500060309	Includes: Bellamy Creek, Grand River and Tibbetts Creek	Fish and water
040500060309-02	Rivers/Streams in HUC 040500060309	Includes: Bellamy Creek	Fish and water
040500060310-01	Rivers/Streams in HUC 040500060310	Includes: Grand River	Fish and water
040500060310-02	Rivers/Streams in HUC 040500060310	Includes: Crooked Creek	Fish and water
040500060310-03	Rivers/Streams in HUC 040500060310	Includes: Red Creek	Fish and water
040500060310-04	Rivers/Streams in HUC 040500060310	Includes: Timberland Creek	Fish and water
040500060311-01	Rivers/Streams in HUC 040500060311	Includes: Leary Drain, Unnamed Tributary to Morrison Lake, and	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Unnamed Tributary near Clarksville Road	
040500060311-02	Rivers/Streams in HUC 040500060311	Includes: Lake Creek and Little Creek	Fish and water
040500060312-01	Rivers/Streams in HUC 040500060312	Includes: Grand River	Fish and water
040500060312-02	Rivers/Streams in HUC 040500060312	Includes: Toles Creek	Fish and water
040500060313-01	Rivers/Streams in HUC 040500060313	Includes: Grand River	Fish and water
040500060313-02	Rivers/Streams in HUC 040500060313	Includes: Lee Creek	Fish and water
040500060313-03	Rivers/Streams in HUC 040500060313	Includes: Unnamed Tributary to Grand River	Fish and water
040500060313-04	Rivers/Streams in HUC 040500060313	Includes: Unnamed Tributary to Grand River	Fish and water
040500060401-02	Rivers/Streams in HUC 040500060401	Includes: Rogue River (Ransom Creek)	Fish and water
040500060401-04	Rivers/Streams in HUC 040500060401	Includes: Hickory Creek	Fish and water
040500060402-01	Rivers/Streams in HUC 040500060402	Includes: Duke Creek	Fish and water
040500060402-02	Rivers/Streams in HUC 040500060402	Includes: Duke Creek and Forest Creek	Fish and water
040500060402-03	Rivers/Streams in HUC 040500060402	Includes: White Creek	Fish and water
040500060402-04	Rivers/Streams in HUC 040500060402	Includes: Frost Creek	Fish and water
040500060403-01	Rivers/Streams in HUC 040500060403	Includes: Walter Creek	Fish and water
040500060403-02	Rivers/Streams in HUC 040500060403	Includes: Spring Creek	Fish and water
040500060403-03	Rivers/Streams in HUC 040500060403	Includes: Rogue River	Fish and water
040500060404-01	Rivers/Streams in HUC 040500060404	Includes: Nash Creek	Fish and water
040500060405-02	Rivers/Streams in HUC 040500060405	Includes: Ball Creek	Fish and water
040500060405-05	Rivers/Streams in HUC 040500060405	Includes: Rogue River	Fish and water
040500060406-02	Rivers/Streams in HUC 040500060406	Includes: Cedar Creek and Unnamed Tributary to Cedar Creek	Fish and water
040500060406-03	Rivers/Streams in HUC 040500060406	Includes: Little Cedar Creek	Fish and water
040500060407-01	Rivers/Streams in HUC 040500060407	Includes: Rogue River	Fish and water
040500060407-02	Rivers/Streams in HUC 040500060407	Includes: Unnamed Tributary near US 131	Fish and water
040500060408-01	Rivers/Streams in HUC 040500060408	Includes: Becker Creek	Fish and water
040500060408-03	Rivers/Streams in HUC 040500060408	Includes: Stegman Creek	Fish and water
040500060408-04	Rivers/Streams in HUC 040500060408	Includes: Shaw Creek	Fish and water
040500060408-05	Rivers/Streams in HUC 040500060408	Includes: Rogue River and Unnamed Tributary to Rogue River	Fish and water
040500060408-06	Rivers/Streams in HUC 040500060408	Includes: Barkley Creek	Fish and water
040500060408-07	Rivers/Streams in HUC 040500060408	Includes: Rum Creek	Fish and water

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040500060501-01	Rivers/Streams in HUC 040500060501	Includes: Bear Creek and Waddell Creek	Fish and water
040500060501-02	Rivers/Streams in HUC 040500060501	Includes: Armstrong Creek, Bear Creek and Stout Creek	Fish and water
040500060502-01	Rivers/Streams in HUC 040500060502	Includes: Bear Creek and Grand River	Fish and water
040500060502-02	Rivers/Streams in HUC 040500060502	Includes: Honey Creek	Fish and water
040500060502-03	Rivers/Streams in HUC 040500060502	Includes: Egypt Creek	Fish and water
040500060502-04	Rivers/Streams in HUC 040500060502	Includes: Unnamed Tributary to Grand River	Fish and water
040500060502-05	Rivers/Streams in HUC 040500060502	Includes: Sunny Creek	Fish and water
040500060503-01	Rivers/Streams in HUC 040500060503	Includes: Unnamed Tributary to Mill Creek	Fish and water
040500060503-02	Rivers/Streams in HUC 040500060503	Includes: Strawberry Creek	Fish and water
040500060503-03	Rivers/Streams in HUC 040500060503	Includes: Mill Creek	Fish and water
040500060503-04	Rivers/Streams in HUC 040500060503	Includes: Mill Creek	Fish and water
040500060504-01	Rivers/Streams in HUC 040500060504	Includes: Brandywine Creek and Indian Mill Creek	Fish and water
040500060504-02	Rivers/Streams in HUC 040500060504	Includes: Indian Mill Creek	Fish and water
040500060505-01	Rivers/Streams in HUC 040500060505	Includes: Unnamed Tributaries to Plaster Creek	Fish and water
040500060505-02	Rivers/Streams in HUC 040500060505	Includes: Plaster Creek	Fish and water
040500060506-01	Rivers/Streams in HUC 040500060506	Includes: Echo Lake Outlet and Unnamed Tributary to Unnamed Lake	Fish and water
040500060506-02	Rivers/Streams in HUC 040500060506	Includes: Little Plaster Creek, Plaster Creek and Whisky Creek	Fish and water
040500060507-01	Rivers/Streams in HUC 040500060507	Includes: Grand River	Fish and water
040500060507-02	Rivers/Streams in HUC 040500060507	Includes: York Creek	Fish and water
040500060507-03	Rivers/Streams in HUC 040500060507	Includes: Scott Creek	Fish and water
040500060507-04	Rivers/Streams in HUC 040500060507	Includes: Lamberton Creek	Fish and water
040500060507-05	Rivers/Streams in HUC 040500060507	Includes: LAMBERTON CREEK	Fish and water
040500060507-06	Rivers/Streams in HUC 040500060507	Includes: Grand River	Fish and water
040500060508-01	Rivers/Streams in HUC 040500060508	Includes: Buck Creek and Sharps Creek	Fish and water
040500060509-01	Rivers/Streams in HUC 040500060509	Includes: East Branch Rush Creek	Fish and water
040500060509-02	Rivers/Streams in HUC 040500060509	Includes: East Branch Rush Creek	Fish and water
040500060510-01	Rivers/Streams in HUC 040500060510	Includes: Unnamed Tributary to Buck Creek	Fish and water
040500060510-02	Rivers/Streams in HUC 040500060510	Includes: Buck Creek and Pine Hill Creek	Fish and water
040500060511-01	Rivers/Streams in HUC 040500060511	Includes: Rush Creek	Fish and water

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040500060511-02	Rivers/Streams in HUC 040500060511	Includes: Rush Creek	Fish and water
040500060511-04	Rivers/Streams in HUC 040500060511	Includes: Unnamed Tributary to Rush Creek	Fish and water
040500060512-01	Rivers/Streams in HUC 040500060512	Includes: Grand River	Fish and water
040500060512-02	Rivers/Streams in HUC 040500060512	Includes: Unnamed Tributary to Grand River	Fish and water
040500060512-03	Rivers/Streams in HUC 040500060512	Includes: Grand River	Fish and water
040500060601-03	Rivers/Streams in HUC 040500060601	Includes: North Branch Crockery Creek, west of Newaygo Rd.	Fish and water
040500060601-04	Rivers/Streams in HUC 040500060601	Includes: North Branch Crockery Creek	Fish and water
040500060601-05	Rivers/Streams in HUC 040500060601	Includes: North Branch Crockery Creek, east of Newaygo Rd	Fish and water
040500060602-01	Rivers/Streams in HUC 040500060602	Includes: Crockery Creek	Fish and water
040500060602-04	Rivers/Streams in HUC 040500060602	Includes: Unnamed Tributary to Crockery Creek	Fish and water
040500060602-05	Rivers/Streams in HUC 040500060602	Includes: Crockery Creek and Ovidhall Lake Creek	Fish and water
040500060602-06	Rivers/Streams in HUC 040500060602	Includes: Crockery Creek	Fish and water
040500060603-01	Rivers/Streams in HUC 040500060603	Includes: Crockery Creek	Fish and water
040500060603-02	Rivers/Streams in HUC 040500060603	Includes: Rio Grande Creek	Fish and water
040500060604-01	Rivers/Streams in HUC 040500060604	Includes: Crockery Creek	Fish and water
040500060604-02	Rivers/Streams in HUC 040500060604	Includes: Crockery Creek	Fish and water
040500060605-01	Rivers/Streams in HUC 040500060605	Includes: Brandy Creek and Crockery Creek	Fish and water
040500060701-01	Rivers/Streams in HUC 040500060701	Includes: East Fork Sand Creek and Unnamed Tributaries to East Fork Sand Creek	Fish and water
040500060702-01	Rivers/Streams in HUC 040500060702	Includes: Sand Creek	Fish and water
040500060703-01	Rivers/Streams in HUC 040500060703	Includes: Sand Creek	Fish and water
040500060704-01	Rivers/Streams in HUC 040500060704	Includes: Beaver Creek, Deer Creek and Little Deer Creek	Fish and water
040500060705-03	Rivers/Streams in HUC 040500060705	Includes: Ottawa Creek	Fish and water
040500060706-01	Rivers/Streams in HUC 040500060706	Includes: Bass Creek	Fish and water
040500060707-01	Rivers/Streams in HUC 040500060707	Includes: Bass Creek, Bass River and Little Bass Creek	Fish and water
040500060707-02	Rivers/Streams in HUC 040500060707	Includes: Bear Creek	Fish and water
040500060708-01	Rivers/Streams in HUC 040500060708	Includes: Grand River, not including tributaries	Fish and water
040500060708-02	Rivers/Streams in HUC 040500060708	Includes: Tributaries to Grand River	Fish and water
040500060709-01	Rivers/Streams in HUC 040500060709	Includes: Unnamed Tributaries to Pottawattomie Bayou	Fish and water
040500060710-01	Rivers/Streams in HUC 040500060710	Includes: Norris Creek	Fish and water

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040500060711-02	Rivers/Streams in HUC 040500060711	Includes: Beckwith Brook, Stevens Creek, Vincent Creek and Willow Hill Creek	Fish and water
040500060711-03	Rivers/Streams in HUC 040500060711	Includes: Norris Creek	Fish and water
040500060712-02	Rivers/Streams in HUC 040500060712	Includes: Black Creek, Grand River and Lloyd Bayou	Fish and water
040500070101-01	Rivers/Streams in HUC 040500070101	Includes: Butternut Creek	Fish and water
040500070102-01	Rivers/Streams in HUC 040500070102	Includes: Thornapple River	Fish and water
040500070102-02	Rivers/Streams in HUC 040500070102	Includes: Unnamed Tributary to Butternut Creek	Fish and water
040500070103-01	Rivers/Streams in HUC 040500070103	Includes: Sharp Drain, Thornapple Drain, and Unnamed Tributaries to Thornapple Drain	Fish and water
040500070104-01	Rivers/Streams in HUC 040500070104	Includes: Little Thronapple River	Fish and water
040500070105-01	Rivers/Streams in HUC 040500070105	Includes: Thornapple River	Fish and water
040500070105-02	Rivers/Streams in HUC 040500070105	Includes: Thornapple River	Fish and water
040500070201-01	Rivers/Streams in HUC 040500070201	Includes: Thornapple River	Fish and water
040500070201-03	Rivers/Streams in HUC 040500070201	Includes: Darken and Boyer Drain, Cole Wright Helms Drain, and Unnamed Tributaries to Darken and Boyer Drain	Fish and water
040500070202-01	Rivers/Streams in HUC 040500070202	Includes: Lacey Creek and Unnamed Tributary near Carlisle Highway	Fish and water
040500070202-02	Rivers/Streams in HUC 040500070202	Includes: Lacey Creek	Fish and water
040500070203-01	Rivers/Streams in HUC 040500070203	Includes: Thornapple River	Fish and water
040500070203-02	Rivers/Streams in HUC 040500070203	Includes: Thompson Creek	Fish and water
040500070204-01	Rivers/Streams in HUC 040500070204	Includes: Hayon Creek and Shanty Brook	Fish and water
040500070205-01	Rivers/Streams in HUC 040500070205	Includes: Quaker Brook	Fish and water
040500070206-01	Rivers/Streams in HUC 040500070206	Includes: Scipio Creek	Fish and water
040500070206-02	Rivers/Streams in HUC 040500070206	Includes: Thornapple River	Fish and water
040500070207-01	Rivers/Streams in HUC 040500070207	Includes: Mud Creek	Fish and water
040500070208-01	Rivers/Streams in HUC 040500070208	Includes: Gravel Brook, Hagar Creek and Mud Creek	Fish and water
040500070209-01	Rivers/Streams in HUC 040500070209	Includes: High Bank Creek	Fish and water
040500070209-02	Rivers/Streams in HUC 040500070209	Includes: Mud Creek	Fish and water
040500070209-03	Rivers/Streams in HUC 040500070209	Includes: High Bank Creek and Thornapple River	Fish and water
040500070210-03	Rivers/Streams in HUC 040500070210	Includes: Cedar Creek, Kellie Creek and North Branch Cedar Creek	Fish and water
040500070211-03	Rivers/Streams in HUC 040500070211	Includes: Thornapple River	Fish and water

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040500070301-01	Rivers/Streams in HUC 040500070301	Includes: Tupper Creek	Fish and water
040500070302-01	Rivers/Streams in HUC 040500070302	Includes: Little Thornapple River and Woodland Creek	Fish and water
040500070303-01	Rivers/Streams in HUC 040500070303	Includes: Coldwater River, Kart Creek and Messer Brook	Fish and water
040500070303-02	Rivers/Streams in HUC 040500070303	Includes: Coldwater River	Fish and water
040500070304-01	Rivers/Streams in HUC 040500070304	Includes: Duck Creek	Fish and water
040500070304-02	Rivers/Streams in HUC 040500070304	Includes: Duck Creek	Fish and water
040500070305-01	Rivers/Streams in HUC 040500070305	Includes: Kilgus Branch	Fish and water
040500070305-02	Rivers/Streams in HUC 040500070305	Includes: Pratt Lake Creek	Fish and water
040500070305-03	Rivers/Streams in HUC 040500070305	Includes: Pratt Lake Creek	Fish and water
040500070306-01	Rivers/Streams in HUC 040500070306	Includes: Bear Creek	Fish and water
040500070306-02	Rivers/Streams in HUC 040500070306	Includes: Bear Creek	Fish and water
040500070307-01	Rivers/Streams in HUC 040500070307	Includes: Clarke and Bunker Drain and Unnamed Tributaries to Clarke and Bunker Drain	Fish and water
040500070307-02	Rivers/Streams in HUC 040500070307	Includes: Coldwater River	Fish and water
040500070307-03	Rivers/Streams in HUC 040500070307	Includes: Coldwater River	Fish and water
040500070401-01	Rivers/Streams in HUC 040500070401	Includes: Fall Creek	Fish and water
040500070402-01	Rivers/Streams in HUC 040500070402	Includes: Thornapple River	Fish and water
040500070402-02	Rivers/Streams in HUC 040500070402	Includes: Thornapple River	Fish and water
040500070402-03	Rivers/Streams in HUC 040500070402	Includes: Butler Creek	Fish and water
040500070402-04	Rivers/Streams in HUC 040500070402	Includes: Pratt Creek and Unnamed Tributary to Pratt Creek	Fish and water
040500070403-01	Rivers/Streams in HUC 040500070403	Includes: Glass Creek	Fish and water
040500070404-01	Rivers/Streams in HUC 040500070404	Includes: Thornapple River	Fish and water
040500070405-01	Rivers/Streams in HUC 040500070405	Includes: Duncan Lake Outlet and Wilson Drain	Fish and water
040500070405-03	Rivers/Streams in HUC 040500070405	Includes: Hanna Lake Outlet and Unnamed Tributary to Hanna Lake	Fish and water
040500070405-04	Rivers/Streams in HUC 040500070405	Includes: Duncan Creek	Fish and water
040500070406-01	Rivers/Streams in HUC 040500070406	Includes: Hill Creek and Thornapple River	Fish and water
040500070406-02	Rivers/Streams in HUC 040500070406	Includes: Bassett Creek and Turner Creek	Fish and water
040500070407-01	Rivers/Streams in HUC 040500070407	Includes: Thornapple River	Fish and water
040500070407-02	Rivers/Streams in HUC 040500070407	Includes: Krafts Lake Outlet	Fish and water
040500070407-03	Rivers/Streams in HUC 040500070407	Includes: McCords Creek	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040500070407-04	Rivers/Streams in HUC 040500070407	Includes: UNNAMED TRIBUTARY TO THORNAPPLE RIVER	Fish and water
040500070408-01	Rivers/Streams in HUC 040500070408	Includes: Thornapple River	Fish and water
040500070408-02	Rivers/Streams in HUC 040500070408	Includes: UNNAMED TRIBUTARY TO THORNAPPLE	Fish and water
040500070408-03	Rivers/Streams in HUC 040500070408	Includes: Unnamed Tributary to Thornapple River upstream of Gerald Ford Airport	Fish and water
040601010301-01	Rivers/Streams in HUC 040601010301	Includes: Ewing Creek and McDuffee Creek	Fish and water
040601010302-01	Rivers/Streams in HUC 040601010302	Includes: Little South Branch Pere Marquette River	Fish and water
040601010303-02	Rivers/Streams in HUC 040601010303	Includes: Baker Creek, Blood Creek and Middle Branch Pere Marquette River	Fish and water
040601010304-01	Rivers/Streams in HUC 040601010304	Includes: Little South Branch Pere Marquette River and Pease Creek	Fish and water
040601010304-02	Rivers/Streams in HUC 040601010304	Includes: Little South Branch Pere Marquette River	Fish and water
040601010304-03	Rivers/Streams in HUC 040601010304	Includes: Unnamed Rivers/Streams in HUC 040601010304	Fish and water
040601010401-01	Rivers/Streams in HUC 040601010401	Includes: Beaver Creek	Fish and water
040601010401-02	Rivers/Streams in HUC 040601010401	Includes: Beaver Creek	Fish and water
040601010401-03	Rivers/Streams in HUC 040601010401	Includes: Beaver Creek and South Beaver Creek	Fish and water
040601010401-04	Rivers/Streams in HUC 040601010401	Includes: Tributary to Beaver Creek	Fish and water
040601010402-01	Rivers/Streams in HUC 040601010402	Includes: Tank Creek	Fish and water
040601010402-02	Rivers/Streams in HUC 040601010402	Includes: West Michigan Creek	Fish and water
040601010402-03	Rivers/Streams in HUC 040601010402	Includes: Bear Creek	Fish and water
040601010402-04	Rivers/Streams in HUC 040601010402	Includes: Winnepesaug Creek	Fish and water
040601010402-05	Rivers/Streams in HUC 040601010402	Includes: Big South Branch Pere Marquette River	Fish and water
040601010403-01	Rivers/Streams in HUC 040601010403	Includes: Cedar Creek and Triple Lakes Creek	Fish and water
040601010404-01	Rivers/Streams in HUC 040601010404	Includes: Freeman Creek and Unnamed Tributaries to Freeman Creek	Fish and water
040601010404-02	Rivers/Streams in HUC 040601010404	Includes: Big South Branch Pere Marquette River	Fish and water
040601010405-01	Rivers/Streams in HUC 040601010405	Includes: Allen Creek	Fish and water
040601010405-02	Rivers/Streams in HUC 040601010405	Includes: WOODY CREEK	Fish and water
040601010405-03	Rivers/Streams in HUC 040601010405	Includes: Big South Branch Pere Marquette River and Ruby Creek	Fish and water
040601010406-01	Rivers/Streams in HUC 040601010406	Includes: Big South Branch Pere Marquette River	Fish and water
040601010406-02	Rivers/Streams in HUC 040601010406	Includes: Carr Creek	Fish and water

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040601010501-01	Rivers/Streams in HUC 040601010501	Includes: Baldwin River, Cole Creek, North Branch Cole Creek and South Branch Cole Creek	Fish and water
040601010502-01	Rivers/Streams in HUC 040601010502	Includes: Sanborn Creek	Fish and water
040601010503-02	Rivers/Streams in HUC 040601010503	Includes: Baldwin River and Bray Creek	Fish and water
040601010503-03	Rivers/Streams in HUC 040601010503	Includes: Sanborn Creek	Fish and water
040601010504-01	Rivers/Streams in HUC 040601010504	Includes: Pere Marquette River	Fish and water
040601010504-02	Rivers/Streams in HUC 040601010504	Includes: Danaher Creek and Jenks Creek	Fish and water
040601010504-05	Rivers/Streams in HUC 040601010504	Includes: Pere Marquette River	Fish and water
040601010505-01	Rivers/Streams in HUC 040601010505	Includes: Sweetwater Creek	Fish and water
040601010505-02	Rivers/Streams in HUC 040601010505	Includes: Pere Marquette River	Fish and water
040601010505-03	Rivers/Streams in HUC 040601010505	Includes: Kinney Creek	Fish and water
040601010505-05	Rivers/Streams in HUC 040601010505	Includes: Pere Marquette River	Fish and water
040601010506-01	Rivers/Streams in HUC 040601010506	Includes: Pere Marquette River, not including tributaries	Fish and water
040601010506-02	Rivers/Streams in HUC 040601010506	Includes: Pere Marquette River	Fish and water
040601010506-03	Rivers/Streams in HUC 040601010506	Includes: Weldon Creek	Fish and water
040601010506-04	Rivers/Streams in HUC 040601010506	Includes: Weldon Creek	Fish and water
040601010507-01	Rivers/Streams in HUC 040601010507	Includes: Unnamed Tributary to Pere Marquette River	Fish and water
040601010507-02	Rivers/Streams in HUC 040601010507	Includes: Black Creek and Hatting Creek	Fish and water
040601010507-03	Rivers/Streams in HUC 040601010507	Includes: Pere Marquette River	Fish and water
040601010508-01	Rivers/Streams in HUC 040601010508	Includes: Pere Marquette River	Fish and water
040601010508-02	Rivers/Streams in HUC 040601010508	Includes: Swan Creek	Fish and water
040601010508-03	Rivers/Streams in HUC 040601010508	Includes: India Creek	Fish and water
040601010508-04	Rivers/Streams in HUC 040601010508	Includes: Pere Marquette River	Fish and water
040601010509-01	Rivers/Streams in HUC 040601010509	Includes: Pere Marquette River upstream from Pere Marquette Highway, and Swanson Creek	Fish and water
040601010509-02	Rivers/Streams in HUC 040601010509	Includes: Lichte Creek	Fish and water
040601010509-03	Rivers/Streams in HUC 040601010509	Includes: Mosquito Creek	Fish and water
040601010509-04	Rivers/Streams in HUC 040601010509	Includes: Saint Clair Creek	Fish and water
040601010509-06	Rivers/Streams in HUC 040601010509	Includes: Pere Marquette River from the Lake Michigan confluence upstream to Pere Marquette Highway	Fish and water
040601020902-02	Rivers/Streams in HUC 040601020902	Includes: Bigelow Creek and Cold Creek	Fish and water

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040601020903-01	Rivers/Streams in HUC 040601020903	Includes: Muskegon River excluding 1 mile stretch below Croton Dam	Fish and water
040601020903-05	Rivers/Streams in HUC 040601020903	Includes: Muskegon River from Croton dam downstream 1 mile	Fish and water
040601020904-01	Rivers/Streams in HUC 040601020904	Includes: Fourmile Creek and Muskegon River	Fish and water
040601020904-02	Rivers/Streams in HUC 040601020904	Includes: Brooks Creek	Fish and water
040601020905-04	Rivers/Streams in HUC 040601020905	Includes: Brooks Creek and Cow Creek	Fish and water
040601020906-01	Rivers/Streams in HUC 040601020906	Includes: Greenwood Creek and Muskegon River	Fish and water
040601020906-02	Rivers/Streams in HUC 040601020906	Includes: Sand Creek	Fish and water
040601020906-03	Rivers/Streams in HUC 040601020906	Includes: Minnie Creek	Fish and water
040601020906-04	Rivers/Streams in HUC 040601020906	Includes: Minnie Creek	Fish and water
040601021004-10	Rivers/Streams in HUC 040601021004	Includes: West Branch Ruddiman Creek and North Branch Ruddiman Creek	Fish and water
040700060605-02	Rivers/Streams in HUC 040700060605	Includes: Fall Creek and Thunder Bay River	Fish and water
040801020206-03	Rivers/Streams in HUC 040801020206	Includes: Kawkawlin River and Millpond Drain	Fish and water
040802010408-01	Rivers/Streams in HUC 040802010408	Includes: Tittabawassee River and Varity Creek	Fish and water
040802010408-02	Rivers/Streams in HUC 040802010408	Includes: Black Creek	Fish and water
040802010601-01	Rivers/Streams in HUC 040802010601	Includes: Carrol Creek Drain	Fish and water
040802010602-01	Rivers/Streams in HUC 040802010602	Includes: Grass Creek and Sturgeon Creek	Fish and water
040802010603-01	Rivers/Streams in HUC 040802010603	Includes: Unnamed Tributary to Newell Drain	Fish and water
040802010603-02	Rivers/Streams in HUC 040802010603	Includes: Branch Number Two, Jacobs Drain, Miller Drain, Newell Drain and Sturgeon Creek	Fish and water
040802010604-01	Rivers/Streams in HUC 040802010604	Includes: Tittabawassee River upstream from 460 feet downstream of Poseyville Road	Fish and water
040802010604-02	Rivers/Streams in HUC 040802010604	Includes: Averill Creek, Prairie Creek, and Tittabawassee River	Fish and water
040802010604-03	Rivers/Streams in HUC 040802010604	Includes: Tittabawassee River downstream from 460 feet downstream of Poseyville Road	Fish and water
040802010605-01	Rivers/Streams in HUC 040802010605	Includes: Bullock Creek, Duncan Drain, Kneeland Drain, and Unnamed Tributaries to Bullock Creek	Fish and water
040802010606-01	Rivers/Streams in HUC 040802010606	Includes: Tittabawassee River	Fish and water
040802010606-02	Rivers/Streams in HUC 040802010606	Includes: Tittabawassee River	Fish and water
040802010606-03	Rivers/Streams in HUC 040802010606	Includes: Lingle Drain, Sarle Drain, Shaffner Drain, Brown and Mills Drain	Fish and water

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040802010607-01	Rivers/Streams in HUC 040802010607	Includes: Tittabawassee River	Fish and water
040802010607-02	Rivers/Streams in HUC 040802010607	Includes: Tributaries to the Tittabawassee River	Fish and water
040802020207-02	Rivers/Streams in HUC 040802020207	Includes: Chippewa River	Fish and water
040802020207-03	Rivers/Streams in HUC 040802020207	Includes: Chippewa River	Fish and water
040802020207-04	Rivers/Streams in HUC 040802020207	Includes: Chippewa River	Fish and water
040802020207-05	Rivers/Streams in HUC 040802020207	Includes: Cedar Creek	Fish and water
040802020501-01	Rivers/Streams in HUC 040802020501	Includes: Chippewa River and Mission Creek	Fish and water
040802020502-01	Rivers/Streams in HUC 040802020502	Includes: Parcher Drain and Salt Creek	Fish and water
040802020503-01	Rivers/Streams in HUC 040802020503	Includes: Childs Creek and Salt Creek	Fish and water
040802020504-01	Rivers/Streams in HUC 040802020504	Includes: Onion Creek and Potter Creek	Fish and water
040802020504-02	Rivers/Streams in HUC 040802020504	Includes: Potter Creek	Fish and water
040802020505-01	Rivers/Streams in HUC 040802020505	Includes: Black Creek, Salt Creek and Thrasher Creek	Fish and water
040802020506-01	Rivers/Streams in HUC 040802020506	Includes: Little Salt Creek	Fish and water
040802020506-02	Rivers/Streams in HUC 040802020506	Includes: Little Salt Creek	Fish and water
040802020507-01	Rivers/Streams in HUC 040802020507	Includes: Little Salt Creek and Turkey Creek	Fish and water
040802020508-01	Rivers/Streams in HUC 040802020508	Includes: Chippewa River	Fish and water
040802020508-02	Rivers/Streams in HUC 040802020508	Includes: Chippewa River	Fish and water
040802020508-03	Rivers/Streams in HUC 040802020508	Includes: Chippewa River	Fish and water
040802020508-04	Rivers/Streams in HUC 040802020508	Includes: Chippewa River	Fish and water
040802030101-02	Rivers/Streams in HUC 040802030101	Includes: Marion And Genoa Drain	Fish and water
040802030102-01	Rivers/Streams in HUC 040802030102	Includes: Sprague Creek	Fish and water
040802030104-01	Rivers/Streams in HUC 040802030104	Includes: Bogue Creek	Fish and water
040802030111-01	Rivers/Streams in HUC 040802030111	Includes: Shiawassee River	Fish and water
040802030205-01	Rivers/Streams in HUC 040802030205	Includes: Maple River and Shiawassee River	Fish and water
040802030205-02	Rivers/Streams in HUC 040802030205	Includes: Scribner Drain and Unnamed Tributaries to Scribner Drain	Fish and water
040802030206-02	Rivers/Streams in HUC 040802030206	Includes: Shiawassee River	Fish and water
040802030207-01	Rivers/Streams in HUC 040802030207	Includes: Unnamed Tributary to Shiawassee River	Fish and water
040802030207-02	Rivers/Streams in HUC 040802030207	Includes: Shiawassee River	Fish and water
040802030208-04	Rivers/Streams in HUC 040802030208	Includes: Shiawassee River	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040802030301-01	Rivers/Streams in HUC 040802030301	Includes: Bad River and Brady Creek	Fish and water
040802030302-01	Rivers/Streams in HUC 040802030302	Includes: Limbocker Creek	Fish and water
040802030303-01	Rivers/Streams in HUC 040802030303	Includes: South Fork Bad River	Fish and water
040802030304-01	Rivers/Streams in HUC 040802030304	Includes: Griffus Creek and Lamb Creek	Fish and water
040802030309-01	Rivers/Streams in HUC 040802030309	Includes: Bad River and Shad Creek	Fish and water
040802030310-01	Rivers/Streams in HUC 040802030310	Includes: South Fork Bad River	Fish and water
040802030313-01	Rivers/Streams in HUC 040802030313	Includes: Bad River, Eagle Creek, Little Eagle Creek, Shiawassee River, Soap Run and South Fork Bad River	Fish and water
040802030410-03	Rivers/Streams in HUC 040802030410	Includes: Shiawassee River	Fish and water
040802030410-06	Rivers/Streams in HUC 040802030410	Includes: Shiawassee River	Fish and water
040802040303-07	Rivers/Streams in HUC 040802040303	Includes: Thread Creek	Fish and water
040802040402-01	Rivers/Streams in HUC 040802040402	Includes: Hasler Creek	Fish and water
040802040403-01	Rivers/Streams in HUC 040802040403	Includes: Flint River and unnamed tributaries	Fish and water
040802040403-03	Rivers/Streams in HUC 040802040403	Includes: Flint River and Henry Drain	Fish and water
040802040409-01	Rivers/Streams in HUC 040802040409	Includes: Flint River	Fish and water
040802040409-02	Rivers/Streams in HUC 040802040409	Includes: Flint River	Fish and water
040802040409-03	Rivers/Streams in HUC 040802040409	Includes: POWERS-CULLEN DRAIN	Fish and water
040802040409-04	Rivers/Streams in HUC 040802040409	Includes: Parker Scothan Drain	Fish and water
040802040409-09	Rivers/Streams in HUC 040802040409	Includes: Clark Drain, Flint River, Riegle Drain and Zufelt Drain	Fish and water
040802040410-01	Rivers/Streams in HUC 040802040410	Includes: Flint River	Fish and water
040802040410-02	Rivers/Streams in HUC 040802040410	Includes: Gilkey Creek	Fish and water
040802040501-01	Rivers/Streams in HUC 040802040501	Includes: Cole Creek	Fish and water
040802040501-02	Rivers/Streams in HUC 040802040501	Includes: Flint River	Fish and water
040802040501-03	Rivers/Streams in HUC 040802040501	Includes: Mud Creek	Fish and water
040802040501-05	Rivers/Streams in HUC 040802040501	Includes: Pirnie Creek	Fish and water
040802040502-01	Rivers/Streams in HUC 040802040502	Includes: Flint River	Fish and water
040802040502-02	Rivers/Streams in HUC 040802040502	Includes: Brent Creek and Freeman Drain	Fish and water
040802040503-01	Rivers/Streams in HUC 040802040503	Includes: Brent Run	Fish and water
040802040504-01	Rivers/Streams in HUC 040802040504	Includes: Armstrong Creek	Fish and water
040802040504-02	Rivers/Streams in HUC 040802040504	Includes: Flint River	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040802040505-01	Rivers/Streams in HUC 040802040505	Includes: Misteguay Creek and Crawford Creek	Fish and water
040802040506-01	Rivers/Streams in HUC 040802040506	Includes: Misteguay Creek and Rush Creek	Fish and water
040802040506-02	Rivers/Streams in HUC 040802040506	Includes: Rush Creek	Fish and water
040802040506-03	Rivers/Streams in HUC 040802040506	Includes: Onion Creek	Fish and water
040802040507-01	Rivers/Streams in HUC 040802040507	Includes: Misteguay Creek and Porter Creek	Fish and water
040802040508-01	Rivers/Streams in HUC 040802040508	Includes: Northwood Creek	Fish and water
040802040509-01	Rivers/Streams in HUC 040802040509	Includes: Misteguay Creek, Mitchell Creek and Northwood Creek	Fish and water
040802040510-01	Rivers/Streams in HUC 040802040510	Includes: Benjamin Run, Parker Creek and Pine Run	Fish and water
040802040511-01	Rivers/Streams in HUC 040802040511	Includes: Alexander Drain, Bogart Drain, Hutchinson And Young Drain, Silver Creek and Silver Creek Drain	Fish and water
040802040512-01	Rivers/Streams in HUC 040802040512	Includes: Bortle Drain, Misteguay Creek and Pattee Creek	Fish and water
040802040513-01	Rivers/Streams in HUC 040802040513	Includes: Atwell Drain, Flint River, Pitch Creek and Spring Brook Drain	Fish and water
040802040513-02	Rivers/Streams in HUC 040802040513	Includes: Flint River	Fish and water
040802050101-01	Rivers/Streams in HUC 040802050101	Includes: South Branch Cass River	Fish and water
040802050102-01	Rivers/Streams in HUC 040802050102	Includes: Carter Drain and Unnamed Tributaries to Carter Drain	Fish and water
040802050102-02	Rivers/Streams in HUC 040802050102	Includes: Duff Creek and South Branch Cass River	Fish and water
040802050103-01	Rivers/Streams in HUC 040802050103	Includes: South Branch Cass River	Fish and water
040802050104-01	Rivers/Streams in HUC 040802050104	Includes: Argyle Drain, Carson Drain, Hartel Drain, Middle Branch Cass River and Sanderson Drain	Fish and water
040802050105-01	Rivers/Streams in HUC 040802050105	Includes: Hawksworth Drain, Kramp Drain, McIntyre Drain, Middle Branch Cass River, Swan Drain and Wheeler Drain	Fish and water
040802050106-01	Rivers/Streams in HUC 040802050106	Includes: South Branch Cass River and Stony Creek	Fish and water
040802050106-02	Rivers/Streams in HUC 040802050106	Includes: Ryder Drain and Turtle Creek	Fish and water
040802050106-03	Rivers/Streams in HUC 040802050106	Includes: Beaver Creek, Kirby Drain, Middle Branch Cass River, South Branch Cass River, Tank Drain and Temple Drain	Fish and water
040802050107-01	Rivers/Streams in HUC 040802050107	Includes: Brown Drain, Osentoski Branch, Schiestel Drain and South Fork Cass River	Fish and water
040802050108-01	Rivers/Streams in HUC 040802050108	Includes: North Branch Cass River	Fish and water
040802050109-01	Rivers/Streams in HUC 040802050109	Includes: North Branch Cass River and Sanilac Huron Creek	Fish and water
040802050110-01	Rivers/Streams in HUC 040802050110	Includes: Greenman Creek and South Branch Cass River	Fish and water
040802050205-01	Rivers/Streams in HUC 040802050205	Includes: Cass River	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
040802050207-01	Rivers/Streams in HUC 040802050207	Includes: Cass River	Fish and water
040802050207-02	Rivers/Streams in HUC 040802050207	Includes: Butternut Creek, Cass River, and Tributaries to the Cass River	Fish and water
040802050208-01	Rivers/Streams in HUC 040802050208	Includes: Cass River	Fish and water
040802050304-01	Rivers/Streams in HUC 040802050304	Includes: Carpenter Branch, Dead Creek and Zehender Drain	Fish and water
040802050304-02	Rivers/Streams in HUC 040802050304	Includes: Dead Creek	Fish and water
040802050305-01	Rivers/Streams in HUC 040802050305	Includes: Cass River, not including tributaries.	Fish and water
040802050305-03	Rivers/Streams in HUC 040802050305	Includes: Cass River	Fish and water
040802050305-04	Rivers/Streams in HUC 040802050305	Includes: Unnamed trib to the Cass River, east of Frankenmuth	Fish and water
040802050305-05	Rivers/Streams in HUC 040802050305	Includes: Coles Creek and Unnamed Tributaries to the Cass River	Fish and water
040802050306-01	Rivers/Streams in HUC 040802050306	Includes: Cass River	Fish and water
040802050306-03	Rivers/Streams in HUC 040802050306	Includes: Cass River	Fish and water
040802060101-01	Rivers/Streams in HUC 040802060101	Includes: Cheboyganing Creek, Richville Drain, Rousch Drain, Sheboygan Drain, Tinglan Drain, Unnamed Tributaries to Cheboyganing Creek, Unnamed Tributaries to Richville Drain, Unnamed Tributaries to Rousch Drain, and Unnamed Tributaries to Sheboygan Drain	Fish and water
040802060102-01	Rivers/Streams in HUC 040802060102	Includes: Blumfield Creek, Cool Creek, Unnamed Tributaries to Blumfield Creek, and Unnamed Tributaries to Cool Creek	Fish and water
040802060103-02	Rivers/Streams in HUC 040802060103	Includes: Unnamed Tributaries to Weaver Drain and Weaver Drain	Fish and water
040802060202-01	Rivers/Streams in HUC 040802060202	Includes: Kochville Drain, Unnamed Tributaries to Kochville Drain, and Unnamed Tributaries to Saginaw River	Fish and water
040802060203-01	Rivers/Streams in HUC 040802060203	Includes: Armon Drain, Branch Number Three, Colmubia Drain, Dutch Creek, Kochville and Frankenlust Drain, Squaconning Creek, Unnamed Tributaries to Dutch Creek, Unnamed Tributaries to North Branch Kochville and Frankenlust Drain, and Unnamed Tributaries t	Fish and water
040900010101-01	Rivers/Streams in HUC 040900010101	Includes: Black River, Darlington Drain, Lloyd Drain, Unnamed Tributaries to Black River, Unnamed Tributaries to Darlington Drain, and Unnamed Tributaries to Lloyd Drain	Fish and water
040900010102-01	Rivers/Streams in HUC 040900010102	Includes: Black River, Grandy Drain, Pelton Drain, Thompson Drain, Unnamed Tributaries to Black River, and Unnamed Tributary to Grandy Drain	Fish and water
040900010104-01	Rivers/Streams in HUC 040900010104	Includes: Black River, Nicol Drain, Smith Drain, Unnamed	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Tributaries to Nicol Drain, Unnamed Tributaries to Smith Drain, and Unnamed Tributary to Wilkins Drain	
040900010111-01	Rivers/Streams in HUC 040900010111	Includes: Elk Creek, Recor Drain, Meyers Drain, Alexander Drain, Methven Drain, Watertown State Drain, Lynch Drain, Smalldon Drain, Parks Drain, Mullen Drain, Colbough Drain.	Fish and water
040900010112-01	Rivers/Streams in HUC 040900010112	Includes: Black River, Gordon Drain, McPherson Drain, Shrapnell Drain, Unnamed Tributaries to Black River, and Unnamed Tributaries to Shrapnell Drain	Fish and water
040900010112-02	Rivers/Streams in HUC 040900010112	Includes: CARSONVILLE DRAIN	Fish and water
040900010113-01	Rivers/Streams in HUC 040900010113	Includes: Arnot Creek, Black River, Freeman Drain, Kelly Creek, Kelly Drain, Papst Drain, Unnamed Tributaries to Black River, Unnamed Tributaries to Freeman Drain, Unnamed Tributaries to Kelly Creek, Unnamed Tributaries to Kelly Drain, Unnamed Tributaries	Fish and water
040900010114-01	Rivers/Streams in HUC 040900010114	Includes: Arnot Creek, Black River, Mills Creek, Unnamed Tributaries to Arnot Creek, Unnamed Tributaries to Black River, and Unnamed Tributaries to Mills Creek	Fish and water
040900010114-02	Rivers/Streams in HUC 040900010114	Includes: Black River and Unnamed Tributaries to Black River	Fish and water
040900010114-04	Rivers/Streams in HUC 040900010114	Includes: Black River	Fish and water
040900010211-01	Rivers/Streams in HUC 040900010211	Includes: Black River, Mason Drain, Plum Creek, Unnamed Tributaries to Black River, Unnamed Tributariest to Mason Drain, and Unnamed Tributaries to Plum Creek	Fish and water
040900010211-02	Rivers/Streams in HUC 040900010211	Includes: Plum Creek, Pohly Drain, Engles Drain, and Unnamed Tributaries to Plum Creek	Fish and water
040900010213-01	Rivers/Streams in HUC 040900010213	Includes: Black River, Glyshaw Drain, O Dette Drain, Unnamed Tributaries to Black River	Fish and water
040900010214-01	Rivers/Streams in HUC 040900010214	Includes: Black River, Brandymore Drain, Howe Drain, Price Drain, Stocks Creek, Unnamed Tributaries to Black River, Unnamed Tributaries to Brandymore Drain, Unnamed Tributaries to Howe Drain, and Unnamed Tributariest to Stocks Creek	Fish and water
040900010214-02	Rivers/Streams in HUC 040900010214	Includes: Black River	Fish and water
040900050402-01	Rivers/Streams in HUC 040900050402	Includes: GEDDES POND (HURON RIVER) AND ALLEN CREEK	Fish and water
041000020101-01	Rivers/Streams in HUC 041000020101	Includes: GOOSE CREEK	Fish and water
041000020102-02	Rivers/Streams in HUC 041000020102	Includes: Briggs Lake Creek, Kedron Drain, Little Stony Lake Outlet, Mud Lake Outlet, Plum Brook Drain, River Raisin, Stony Lake	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Outlet, Unnamed Tributary to Mercury Lake, Unnamed Tributary to Mud Lake, Unnamed Tributary to Pickerel Lake, Unnamed Tributa	
041000020103-01	Rivers/Streams in HUC 041000020103	Includes: Bessey Lake Outlet, River Raisin, Sweezy Lake Outlet, and Unnamed Tributaries to River Raisin	Fish and water
041000020103-02	Rivers/Streams in HUC 041000020103	Includes: River Raisin	Fish and water
041000020104-01	Rivers/Streams in HUC 041000020104	Includes: Fay Lake Outlet, River Raisin, Unnamed Tributary to Fay Lake, and Unnamed Tributary to River Raisin	Fish and water
041000020105-01	Rivers/Streams in HUC 041000020105	Includes: River Raisin	Fish and water
041000020105-02	Rivers/Streams in HUC 041000020105	Includes: River Raisin and Unnamed Tributaries to River Raisin	Fish and water
041000020106-01	Rivers/Streams in HUC 041000020106	Includes: Honey Lake Outlet, Iron Creek, Jordon Lake Outlet, Mud Lake Outlet, and Unnamed Tributary to Lower Lake	Fish and water
041000020107-01	Rivers/Streams in HUC 041000020107	Includes: Evans Creek, Lamkin Drain, Taylor Creek, and Unnamed Tributaries to Evans Creek	Fish and water
041000020108-01	Rivers/Streams in HUC 041000020108	Includes: River Raisin and Unnamed Tributaries to River Raisin	Fish and water
041000020108-02	Rivers/Streams in HUC 041000020108	Includes: Dillingham Creek, River Raisin, and Unnamed Tributaries to River Raisin	Fish and water
041000020201-01	Rivers/Streams in HUC 041000020201	Includes: Hazen Creek, Stoddard Drain, Unnamed Tributaries to Hazen Creek, and Unnamed Tributaries to Stoddard Drain	Fish and water
041000020202-01	Rivers/Streams in HUC 041000020202	Includes: Cadmus Drain, Harrison Drain, Nash Drain, South Branch River Raisin, Stony Creek, Unnamed Tributary to Harrison Drain, and Unnamed Tributaries to South Branch River Raisin	Fish and water
041000020203-01	Rivers/Streams in HUC 041000020203	Includes: Wolf Creek, Black Creek, Fisk Drain, and Unnamed Tribs	Fish and water
041000020204-01	Rivers/Streams in HUC 041000020204	Includes: Squaw Creek, Wolf Creek, Unnamed Tributaries to Erin Lake, and Unnamed Tributaries to Squaw Creek	Fish and water
041000020204-03	Rivers/Streams in HUC 041000020204	Includes: WOLF CREEK	Fish and water
041000020205-01	Rivers/Streams in HUC 041000020205	Includes: Porter Drain and South Branch River Raisin	Fish and water
041000020205-02	Rivers/Streams in HUC 041000020205	Includes: Savage Drain and South Branch River Raisin	Fish and water
041000020206-01	Rivers/Streams in HUC 041000020206	Includes: South Branch River Raisin	Fish and water
041000020206-02	Rivers/Streams in HUC 041000020206	Includes: EAST SIDE DRAIN	Fish and water
041000020302-01	Rivers/Streams in HUC 041000020302	Includes: Bear Creek	Fish and water
041000020302-02	Rivers/Streams in HUC 041000020302	Includes: Bear Creek	Fish and water
041000020302-03	Rivers/Streams in HUC 041000020302	Includes: Camp Drain, J B Drain, Hudson Lake from the outlet upstream to include Bear Creek, Hennings Drain, Tucker Drain, and	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		Unnamed Tribs	
041000020302-05	Rivers/Streams in HUC 041000020302	Includes: Baker and May Drain, Hoadley Drain, and Unnamed Tributaries to Baker and May Drain	Fish and water
041000020302-06	Rivers/Streams in HUC 041000020302	Includes: Rice Lake Drain	Fish and water
041000020303-01	Rivers/Streams in HUC 041000020303	Includes: Black Creek, Nile Ditch, Abbott Drain, Hall Drain, Nelson Drain, Knapp Drain, Raymond Drain, and Unnamed Tribs	Fish and water
041000020304-01	Rivers/Streams in HUC 041000020304	Includes: Bear Creek and Unnamed Tributaries to Bear Creek	Fish and water
041000020305-01	Rivers/Streams in HUC 041000020305	Includes: BLACK CREEK	Fish and water
041000020306-01	Rivers/Streams in HUC 041000020306	Includes: Big Meadow Drain, Grinnel Drain, Bixby Drain, and Unnamed Tribs	Fish and water
041000020306-02	Rivers/Streams in HUC 041000020306	Includes: Unnamed Tributary to Big Meadow Drain	Fish and water
041000020306-03	Rivers/Streams in HUC 041000020306	Includes: Big Meadow Drain	Fish and water
041000020307-01	Rivers/Streams in HUC 041000020307	Includes: River Raisin upstream to Blissfield.	Fish and water
041000020307-02	Rivers/Streams in HUC 041000020307	Includes: Bay Drain, River Raisin upstream of Blissfield, Unnamed Tributaries to River Raisin, Floodwood Creek, Unnamed Tributaries to Floodwood Creek, and Unnamed Tributaries to River Raisin	Fish and water
041000020308-01	Rivers/Streams in HUC 041000020308	Includes: River Raisin	Fish and water
041000020308-02	Rivers/Streams in HUC 041000020308	Includes: Camp Drain, Unnamed Tributary to Camp Drain, and Unnamed Tributaries to River Raisin	Fish and water
041000020309-01	Rivers/Streams in HUC 041000020309	Includes: Ash Drain, Fry Drain, Isley Drain, Little River Raisin, Miller Drain, Pope Drain, Swamp Raisin Creek, Unnamed Tributaries to Little River Raisin, Unnamed Tributaries to Swamp Raisin Creek, Westgate Drain, and Woodruff Brook	Fish and water
041000020310-01	Rivers/Streams in HUC 041000020310	Includes: River Raisin	Fish and water
041000020310-02	Rivers/Streams in HUC 041000020310	Includes: Dunlap Drain, Miller Drain, River Raisin, Roe Drain, Russell Drain, Stacy Drain, Unnamed Tributaries to Russell Drain, and Unnamed Tributary to Stacy Drain.	Fish and water
041000020401-01	Rivers/Streams in HUC 041000020401	Includes: Columbia Lake Outlet, Joslin Lake Outlet, Saline River, Unnamed Tributaries to Columbia Lake, and Unnamed Tributaries to Saline River	Fish and water
041000020402-01	Rivers/Streams in HUC 041000020402	Includes: Birkle Lake Outlet, Saline River, Unnamed Tributary to Birkle Lake, Unnamed Tributaries to Saline River, Unnamed Tributaries to Wood Outlet Drain, and Wood Outlet Drain	Fish and water
041000020403-01	Rivers/Streams in HUC 041000020403	Includes: Koch Warner Drain, Pittsfield Number Five Drain, Saline	Fish and water

AUID	Assessment Unit Name	Location Description	PCB Impairment
		River, and Unnamed Tributary to Saline River	
041000020404-01	Rivers/Streams in HUC 041000020404	Includes: MACON CREEK	Fish and water
041000020405-01	Rivers/Streams in HUC 041000020405	Includes: Coats Drain, Dibble Drain, Schreeder Brook, South Branch Macon Creek, Springbrook Drain, Sutton Drain, Unnamed Tributary to Schreeder Brook, Unnamed Tributaries to South Branch Macon Creek, and Unnamed Tributary to Sutton Drain	Fish and water
041000020406-01	Rivers/Streams in HUC 041000020406	Includes: Bear Swamp Creek, Center Creek, Cone Drain, Leet Weidner Drain, Nolan Engle Drain, Unnamed Tributary to Bear Swamp Creek, and Unnamed Tributaries to Center Creek	Fish and water
041000020407-01	Rivers/Streams in HUC 041000020407	Includes: MACON CREEK	Fish and water
041000020408-01	Rivers/Streams in HUC 041000020408	Includes: Macon Creek, Leppleman Drain, Middle Branch Macon Creek, Richardson Drain, and Unnamed Tribs	Fish and water
041000020408-02	Rivers/Streams in HUC 041000020408	Includes: North Branch Macon Creek	Fish and water
041000020409-01	Rivers/Streams in HUC 041000020409	Includes: Saline River	Fish and water
041000020409-02	Rivers/Streams in HUC 041000020409	Includes: Bear Creek, Beaver Meadow Drain, Saline River, Sherman Wilson Drain, Unnamed Tributaries to Bear Creek, and Unnamed Tributaries to Bear Creek	Fish and water
041000020409-03	Rivers/Streams in HUC 041000020409	Includes: Ella Lee Lake Outlet, Saline River, Unnamed Tributary to Ella Lee Lake, and Unnamed Tributary to Saline River	Fish and water
041000020410-01	Rivers/Streams in HUC 041000020410	Includes: Barnaby Drain, Brost Drain, Brown Drain, Burdeau Drain, Karm Drain, Mason Run, Middle Branch Willow Run, Moore Drain, North Branch Willow Run, River Raisin, Sietz Drain, Unnamed Tributary to River Raisin, and Willow Run	Fish and water
041000020410-02	Rivers/Streams in HUC 041000020410	Includes: River Raisin and Unnamed Tributary to River Raisin	Fish and water

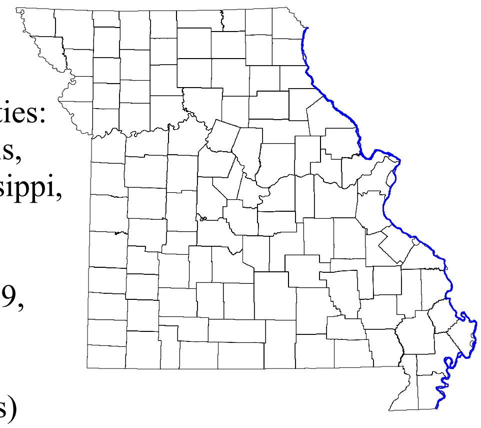
EXHIBIT C

Missouri Department of Natural Resources
Water Protection Program

Total Maximum Daily Loads (TMDLs) for Chlordane and Polychlorinated Biphenyls in the Mississippi River

Completed: October 5, 2006
Approved: November 3, 2006

Total Maximum Daily Loads (TMDLs)
For the Mississippi River
Pollutants: Chlordane and Polychlorinated Biphenyls (PCBs) in fish tissue



Name: Mississippi River

Location: Upper and Lower Mississippi River, across 16 counties: Clark, Lewis, Marion, Ralls, Pike, Lincoln, St. Charles, St. Louis, Jefferson, Ste. Genevieve, Perry, Cape Girardeau, Scott, Mississippi, New Madrid and Pemiscot

Hydrologic Unit Code (HUC): 07110001, 07110004, 07110009, 07140101, 07140105, 08010100

Water Body # (WBID): 00001 (165 miles), 03152 (124.5 miles) and 01707 (200.5 miles)

Missouri Stream Classification: The Mississippi River is classified in the Missouri Water Quality Standards (WQS) as a Class P[1] stream.

Beneficial Uses for Mississippi River[2]:
• Livestock and Wildlife Watering
• Protection of Warm Water Aquatic Life and Human Health – Fish Consumption
• Whole Body Contact Recreation, Category A (WBID 00001 only) and Category B
• Secondary Contact Recreation
• Irrigation
• Drinking Water Supply
• Industrial

Pollutant: Chlordane and PCBs in fish tissue

Size of Impaired Segment: 490 miles

Pollutant Source: Many point and nonpoint sources

TMDL Priority Ranking: High

[1] Class P streams maintain permanent flow even in drought periods
[2] For Beneficial uses see 10 CSR 20-7.0310 (C) and Table (H)

1. Introduction

1.1 Study Area Description:

The Mississippi River is 2,320 mile long starting at Lake Itasca in Minnesota and ending at the Gulf of Mexico. The river is divided into the Upper Mississippi Basin from its source south to the Ohio River and the Lower Mississippi Basin from the Ohio River to its mouth approximately 100 miles downstream from New Orleans, Louisiana. There are a series of 27 locks and dams on the Upper Mississippi River, which are designed to maintain a 9-foot channel for commercial barge traffic. Below St. Louis, the Mississippi River is relatively free-flowing, although it is constrained by numerous levees and directed by numerous wing dams.

The TMDL discussed in this report is for the portion of the Mississippi River that begins at the confluence of the Des Moines and Mississippi Rivers on the border of Iowa, Illinois and Missouri near Alexandria, Missouri at River Mile 359.1 on the Upper Mississippi River (Figure 1). It ends at the Missouri and Arkansas state line. Table A in the Appendix provides a detailed description of 19 sampling locations along the Mississippi River in Figure 1. Land use for this 490-mile river segment is shown in Figure 2. Within the impaired segments, four major tributaries enter the Mississippi River. These tributaries are the Des Moines, Illinois, Missouri and Ohio rivers, and their confluences are at Upper Mississippi River Miles 361, 218, 197 and Lower Mississippi River Mile 955.8, respectively. Table 1 summarizes the information on the impaired segments in the Mississippi River based on 2002 303(d) listing.

Table 1: Missouri 2002 303(d) List for Impaired Segments of the Mississippi River

WBID	Waterbody	Size	Unit	Pollutant	Downstream County	Upstream County	Priority
1	Mississippi River	165	Miles	Chlordane, PCBs	St. Charles	Clark	High
3152	Mississippi River	124.5	Miles	Chlordane, PCBs	Pemiscot	Mississippi	High
1707	Mississippi River	200.5	Miles	Chlordane, PCBs	Mississippi	St. Louis	High

1.2 Fish Advisories in Missouri:

The Missouri Department of Conservation (MDC) has monitored levels of toxic contaminants in fish from Missouri lakes and rivers since 1984. At that time, MDC discovered elevated levels of chlordane in fish in the Missouri, Mississippi and Meramec rivers. MDC, the U.S. Environmental Protection Agency (EPA) and the department all provide fish tissue sample results to the Missouri Department of Health and Senior Services (DHSS) for use in determining health risks to fish consumers. DHSS, in turn, issues fish consumption advisories. DHSS has issued advisories based on pesticide contaminants in fish since 1985. Past DHSS fish advisories instructed anglers to limit consumption of fatty fish (carp, catfish, buffalo, drum, suckers and paddlefish) to one meal per week. This advisory was rescinded in 2001. Trout also have a high level of fat, but are considered safe to eat from anywhere in the state. In 2002, sturgeon eggs were added to the only existing PCB advisory, which has been in place for sturgeon meat from the Missouri River since 1997.

Figure 1: Location Map for Impaired Segments in Mississippi River

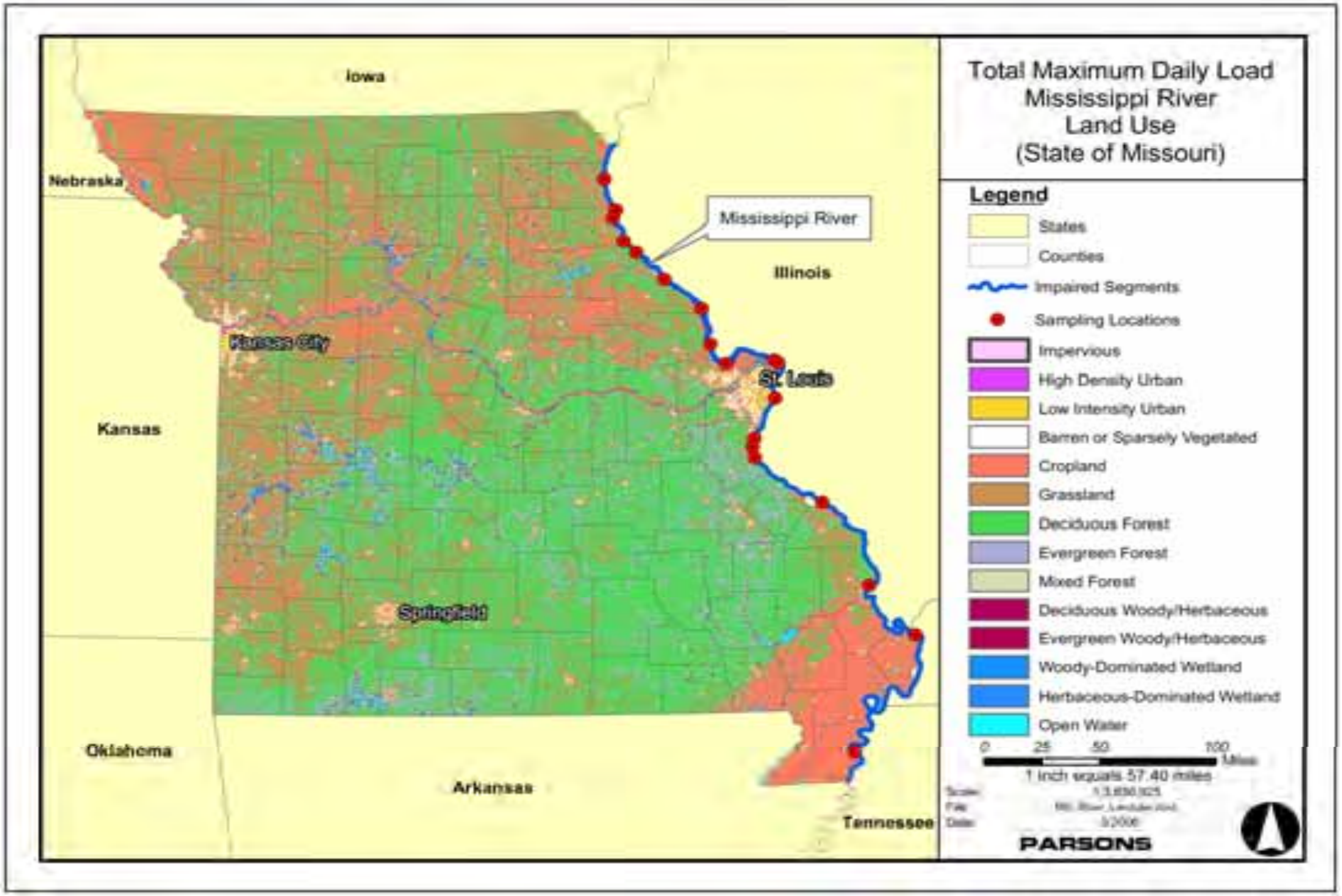


Figure 2: Land Use for Mississippi River Watershed within State of Missouri

DHSS issues its fish advisory every year around March or April. The advisory is made available to the public through press releases and may be accessed by calling DHSS at 1-866-628-9891. These advisories are also distributed to all Missouri county health departments and are posted on the Internet. The 2006 advisory may be found at www.dhss.mo.gov/NewsAndPublicNotices/06FishAdvisory.pdf.

2. Description of the Applicable Water Quality Standards

2.1 Beneficial or Designated Uses:
These uses are listed on page one. The use that is impaired is protection of warm water aquatic life and human health associated with fish consumption.

2.2 Anti-degradation Policy:
Missouri's WQS include EPA's "three-tiered" approach to anti-degradation and may be found at 10 CSR 20-7.031(2).

Tier 1 – Protects existing uses and provides the absolute floor of water quality for all waters of the United States. Existing instream water uses are those uses that were attained on or after Nov. 29, 1975, the date of EPA's first WQS regulation, or uses for which existing water quality is suitable unless prevented by physical problems such as substrate or flow.

Tier 2 – Protects the level of water quality necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water in waters that are currently of higher quality than required to support these uses. Before water quality in Tier 2 waters can be lowered, there must be an anti-degradation review consisting of: (1) a finding that it is necessary to accommodate important economical or social development in the area where the waters are located; (2) full satisfaction of all intergovernmental coordination and public participation provisions; and (3) assurance that the highest statutory and regulatory requirements for point sources and best management practices for nonpoint sources are achieved. Furthermore, water quality may not be lowered to less than the level necessary to fully protect the "fishable/swimmable" uses and other existing uses.

Tier 3 – Protects the quality of outstanding national resources, such as waters of national and state parks, wildlife refuges and water of exceptional recreational or ecological significance. There may be no new or increased discharges to these waters and no new or increased discharges to tributaries of these waters that would result in lower water quality (with the exception of some limited activities that result in temporary and short-term changes in water quality).

2.3 Specific Criteria:

2.3.1 Chlordane
The specific criteria for chlordane are found in Missouri's Water Quality Standards, 10 CSR 20-7.031, Table A, under Persistent, Bioaccumulative, Man-made Toxics. The limit for chlordane *in water* related to human health protection associated with fish consumption is 0.00048 micrograms per liter (µg/L or parts per billion). However, elevated chlordane levels in water are not the

problem. As chlordane tends to bioaccumulate in fish, this TMDL will be based on fish tissue chlordane levels. Fish tissue levels refer to the amount of chlordane in the fillet, or edible portion, of fish. The U.S. Food and Drug Administration (FDA) developed a fish tissue action level of 0.3 milligrams per kilogram (mg/kg or parts per million) for technical grade chlordane. Note: 1 kilogram equals approximately 2.2 pounds. However, the department and DHSS use the action level of 0.1 mg/kg sum-of-the-isomers of chlordane.[3] If the level of a toxic contaminant exceeds this action level or the unrestricted consumption level, a fish consumption limit advisory that provides a risk-based, safe consumption level for target populations is issued regarding the potential health risk associated with long-term consumption of contaminated fish.

2.3.2 PCBs

The specific criteria for PCBs are found in Missouri's WQS, 10 CSR 20-7.031, Table A, under Persistent, Bioaccumulative, Man-made Toxics. The limit for PCBs *in water* related to human health protection associated with fish consumption is 0.000045 µg/L. The FDA set a 2.0 mg/kg limit on PCBs in fish tissue for interstate shipment of fish for human consumption. DHSS currently uses this number to issue fish advisories related to PCBs and the department uses the same number to judge impairment of Missouri water bodies by PCBs. However, DHSS has a revised fish advisory methodology that follows EPA guidance, so the threshold value for PCBs will change. The new threshold value for unrestricted consumption is expected to be 0.04 mg/kg of total PCBs in fish tissue. Following adoption of these new guidelines by DHSS, the next state 303(d) listing methodology document will acknowledge them and may be revised accordingly.

3. Current Water Quality Condition and Desired Endpoint

3.1 Current Water Quality Condition:

Several agencies collected fish tissue samples at numerous monitoring sites along the Mississippi River from 1975 to 2004. The goal of the fish tissue monitoring and survey program was to analyze fish tissue samples for chlordane and PCBs in order to define water body segments impacted by contamination. Bottom feeding fish such as carp were sampled because of their feeding or dwelling preferences near the bottom of the water column where chlordane and PCBs remain in the sediments.

Even though they have been banned, both chlordane and PCBs degrade very slowly, making them particularly persistent in the environment, where they remain in the soil for long periods of time. Because these pollutants are not soluble they are not readily found in the water column and are instead found in lakebed or streambed sediments where they adsorb to soil particles. Bottom-feeding fish, such as carp, become exposed to chlordane and PCBs due to their feeding and dwelling preferences near streambeds or lakebeds where contaminated sediments persist. Fish uptake these pollutants in water through their gills and through the food chain by consumption of contaminated aquatic organisms. Once the pollutants are absorbed into the bloodstream, they

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[3] Data can be collected as technical chlordane or sum-of-the-isomers of chlordane, in which case the action level is 0.1 mg/kg. Sum-of-the-isomers of chlordane is usually comparable to FDA's action level of 0.3 mg/kg technical grade chlordane when the contamination is recent, because there is a lot of the technical chlordane still present. However, after a few years the comparison no longer works well. The department, MDC, EPA and DHSS quantify chlordane by summing the following four chlordane isomers: cis-chlordane, trans-chlordane, cis-nonachlor and trans-nonachlor.

accumulate primarily in fatty tissues where they have the ability to biomagnify, or increase in concentration, as the compound is transferred through the food chain. These fish include fatty fish, such as carp, catfish, buffalo, drum, suckers and paddlefish.

3.2 TMDL Endpoint:

The department uses threshold levels of 0.1 mg/kg of chlordane (sum of isomers) and 2.0 mg/kg of total PCBs in fish tissue to determine support of the designated use. As just stated, because DHSS has a revised fish advisory methodology that follows EPA guidance, the threshold value for PCBs will change. The new threshold value for unrestricted consumption will be 0.04 mg/kg of total PCBs in fish tissue. If the average levels of these compounds exceed these levels in fillets of the fish sampled, the water body is considered to be not supporting the fish consumption use. These will be used for the endpoints for these TMDLs and the achievement of these targets should lead to the removal of fish consumption advisories. Missouri's protocol for removing or down grading an advisory requires at least two years of data below these targets.

4. Source Inventory and Assessment

4.1 Chlordane:

Chlordane has been identified as a pollutant of concern because it is a bio-accumulative pesticide that is carcinogenic and can cause both acute and chronic toxic effects. Its polycyclic chlorinated organic structure produces deleterious biological effects similar to those of DDT, PCBs, and other related substances (MDE, 2000).

Chlordane is a manufactured chemical that was used as a pesticide in the U.S. from 1948 to 1988 (ATSDR, 1995). Since its introduction in the 1940s, chlordane had been used as a broad-spectrum pesticide for agricultural, home and commercial control of insects until it was withdrawn from the market in 1988. The original source of chlordane was runoff, particularly from urban areas where widespread termite eradication occurred around homes in the 1970s and 1980s. Chlordane was also used at nurseries, on golf courses and in agriculture. Chlordane was banned for agricultural use in 1975 and for all uses in 1988; therefore, no additional loading should occur. Some of its trade names include Oktachlor and Velsicol 1068 (ATSDR, 1995). At the height of production, chlordane was the second most widely used organochlorine insecticide in the U.S., with annual production of about 11 million kg/year. Production in the U.S. in 1974 amounted to 9.5 million kg (IPCS, 1988). Over 70,000 tons of chlordane has been manufactured since 1946 (U.S. EPA, 1998).

As previously mentioned, chlordane degrades very slowly, and thus is extremely persistent in the environment (with the ability to stay in the soil for over 20 years). It bio-accumulates in the tissue of bottom-feeding fish (such as carp) which become exposed to chlordane due to their feeding or dwelling preferences near chlordane-contaminated sediments. Eating fish contaminated by chlordane will not make a person immediately ill. However, over a long period of time, chlordane may damage the nervous system, digestive system and the liver (MDNR, 2001).

The department recognizes that there is still chlordane in products in storage sheds, barns and basements. It is possible that chlordane could still find its way into the environment through leaks, use of the product or improper disposal. However, it is estimated that the amount that might actually reach the river is negligible.[4] The reasons for this are: 1) since it has been banned since 1988, the number of people who still have a product containing chlordane is small, 2) chlordane would be only a small portion of the ingredients in the product, 3) The number of people who would use the product is smaller yet and 4) if applied according to directions, it should not cause a problem. Overall, there is no reason to expect that the levels of chlordane in the environment, and therefore chlordane levels in fish tissue, will do anything but decline in the future.

4.2 Polychlorinated Biphenyls (PCBs):

PCBs are a mixture of up to 200 different chlorinated compounds and are stable under conditions of high pressure and high temperature. PCBs are manmade compounds that have been used commercially since 1929. These chemicals were manufactured as combinations of chlorinated biphenyls that differed according to the percentage of chlorine in the mixture. PCBs had a wide variety of industrial applications due to their chemical stability and flame resistance. However, these characteristics also enabled them to remain highly persistent in the environment. PCBs were commonly used as plasticizers, heat-transfer fluids, solvent extenders, hydraulic fluids, flame retardants, sealers, ink carriers, organic diluents and dielectric fluids. They are found in transformers, capacitors, florescent lighting fixtures, televisions, computers, microscope oil, hydraulic oil, caulking compounds and elastic sealant made from 1966 to 1975. The manufacturing of PCBs stopped in the United States in 1977 due to concerns about the persistence of PCBs in the environment and evidence that they bioaccumulate, which can cause harmful health effects.

U.S. industry purchased approximately 1.25 billion pounds of PCBs by the time production stopped in 1977 (U.S. EPA, 1993). EPA estimates that 60 percent, or 750 million pounds, of PCBs produced are still in use in the U.S. in approximately 150,000 PCB transformers and 2.5 million mineral oil transformers (Graham, 1987). Another 36 percent (450 million pounds) of PCBs were either placed in landfills or dumps or were available to biota via air, water, soil and sediments. The remaining four percent (55 million pounds) were destroyed by incineration or were degraded in the environment (U.S. EPA, 1993). Monsanto Chemical Company in Sauget, Illinois, produced approximately 99 percent of commercial PCBs for U.S. industry and sold the compounds under the trade name Aroclor (ATSDR, 1995a). A four digit numbering code identifies the Aroclors. The first two digits denote the number of carbon atoms in the biphenyl group and the last two digits represent the approximate percentage of chlorine in the mixture. The most common PCBs manufactured include Aroclor 1242, Aroclor 1248, Aroclor 1254 and Aroclor 1260 (Cairns et. al., 1986).

The behavior of PCBs differs depending on the number of chlorine atoms present. Generally, these compounds are relatively insoluble and have the ability to absorb strongly into organic matter. As the chlorine content increases, the solubility of the compounds decrease and the mixture becomes more viscous. PCBs are highly lipophilic (fat loving) and bio-accumulate in fish tissue, which can result in very high concentrations that are unsafe for human consumption (U.S. EPA, 1980). Currently, the primary source of PCB ingestion is through the consumption of contaminated fish (USDHHS, 1995). Fish uptake of PCBs in water through their gills and through the consumption of contaminated aquatic organisms. As with Chlordane, PCBs are absorbed into the bloodstream, and accumulate primarily in fatty tissues. In these fatty tissues, they have the ability to biomagnify, or

[4] Personnel correspondence with Paul Andre, Missouri Department of Agriculture, Pesticide Program, 7/06.

increase in concentration, as the compound is transferred through the food chain. In humans and other mammals, PCBs accumulate in the gastrointestinal tract, adipose (fatty) tissue and skin.

Specifically in the Mississippi River Basin, PCBs are found in the greatest concentrations in the pools farthest upstream. The Upper Mississippi River is confined by control structures that form pools, which trap sediments and their absorbed contaminants. Twenty-nine locks and dams control the depth and flow of the river between Minneapolis and St. Louis. The fineness of the sediments is an important attribute in the retention of contaminants, the finer the sediment the greater total surface area there is for contaminants to be absorbed onto it. The most concentrated accumulation of the finest sediments in the pools of the Upper Mississippi River is in Lake Pepin bordering Minnesota and Wisconsin. Lower concentrations in the pools farther down river suggest the primary sources of PCBs in the Upper Mississippi River were localized in and near the Minneapolis-St. Paul metro area; and Lake Pepin has trapped and retained the majority of the PCBs, thereby slowing their transport further downstream (Meade and Leenheer, 1995).

PCB concentrations in the middle and lower reaches of the Mississippi River are less related to specific sources. One reason for this is the sources of PCBs have been more diverse and widely scattered. In the years following the banning of PCBs, the repeated deposition and re-suspension of contaminated sediments since, has resulted in a homogenization of PCB concentrations throughout the length of the river, and a subsequent blurring of significant distribution changes which would have indicated specific sources (Rostad et al., 1995).

As already stated U.S. production of PCBs ended in 1977 because of the evidence that they accumulate in the environment, which can cause harmful health effects. Although production of PCBs was banned, note that the ban was on the manufacture, processing, and distribution in commerce of PCBs. The ban did not extend to existing products containing PCBs, such as transformers. Poorly maintained hazardous waste sites that contain PCBs, industrial and municipal incinerators burning organic waste, illegal or improper dumping of PCB wastes (such as transformer fluids and some capacitors) and leaks from electrical transformers continue to release PCBs into the environment. However, since PCBs are no longer produced, a downward trend in the environment is inevitable.

5. Determination of TMDL and Allocation[5]

The following equation was used to calculate the TMDL.

TMDL = WLA + LA + MOS (Eq. 1)

where:

TMDL: Total Maximum Daily Load
WLA: Waste Load Allocation (for point sources)
LA: Load Allocation (for non-point sources)
MOS: Margin of Safety (to account for uncertainties)

5.1 TMDL/Loading Capacity:

TMDL or loading capacity is defined as the maximum pollutant load that a water body can assimilate and still attain WQS. EPA banned the use of chlordane in 1988 While the department

[5] Calculations and graphs by Parsons Corporation, a Pasadena-based engineering and construction firm

recognizes that there is still chlordane in existence that is unaccounted for, with the potential to enter the river system, the amount that might actually reach the river is believed to be negligible (see section 4.1). Again, there is no reason to expect that the levels of chlordane in the environment and in fish tissue will do anything but decline in the future. Therefore, the TMDL for chlordane in the 490 mile impaired segment along the Mississippi River is set as zero pounds/day.

Similarly, EPA banned the use of PCBs in 1977. Again, the department acknowledges that there is the potential for a certain amount of PCBs to leak into the environment (see Source Inventory-PCBs above). However, judging from the available data, that amount is deemed to be small and declining. Therefore, the TMDL for PCBs in the 490 mile impaired segment along the Mississippi River is set as zero pounds/day.

5.2 Waste Load Allocation:
As stated earlier, these two compounds are mainly a sediment issue and amounts in the water column are virtually non-detectable. There are no Missouri facilities which discharge either directly to the Mississippi River or to a tributary where the Mississippi River is the first classified water body, that have that potential for discharging detectable amounts of PCBs or chlordane. Since chlordane and PCBs were banned in 1988 and 1977, respectively, there should be negligible discharge of chlordane and PCBs into streams from wastewater treatment plants and other point sources. Therefore, the WLA is set as zero pounds/day in this TMDL.

5.3 Load Allocation:
Since chlordane and PCBs were banned, there will be only minor and/or infrequent application of chlordane anywhere that might be discharged under runoff conditions and enter the river. As time passes, this, too, will decline. Therefore, the LA is set as zero pounds/day in this TMDL.

5.4 Margin of Safety:
In order to ensure there is no threat of chlordane and PCB levels impairing fish consumption, fish advisories will remain in effect until all samples taken from fish have met the desired endpoint for two years. The department will coordinate with DHSS in guarding against threats to human health associated with fish consumption from these two contaminants.

5.5 Seasonal Variation:
There is no seasonal variation associated with this TMDL.

6. Implementation

Since chlordane and PCBs have been banned, there is no specific remediation plan for this impairment. In regard to existing stores, stashes and unused inventory of these products, Missouri continues to collect them as they are turned in for proper disposal through various hazardous waste and hazardous household waste disposal initiatives. A major source of PCBs is transformers. Transformer fluid is tested and properly disposed of as the transformer ends its useful life. Otherwise, fish tissue concentrations are declining as chlordane and PCBs are purged or degraded in water body sediments over time. Figures 3 and 4 show the average annual chlordane and PCB concentrations and their corresponding moving average trends.

Figure 3: Average Annual Chlordane Concentration (as Sum-of-the-Isomers) and Three-Year Moving Average in Mississippi River over Time

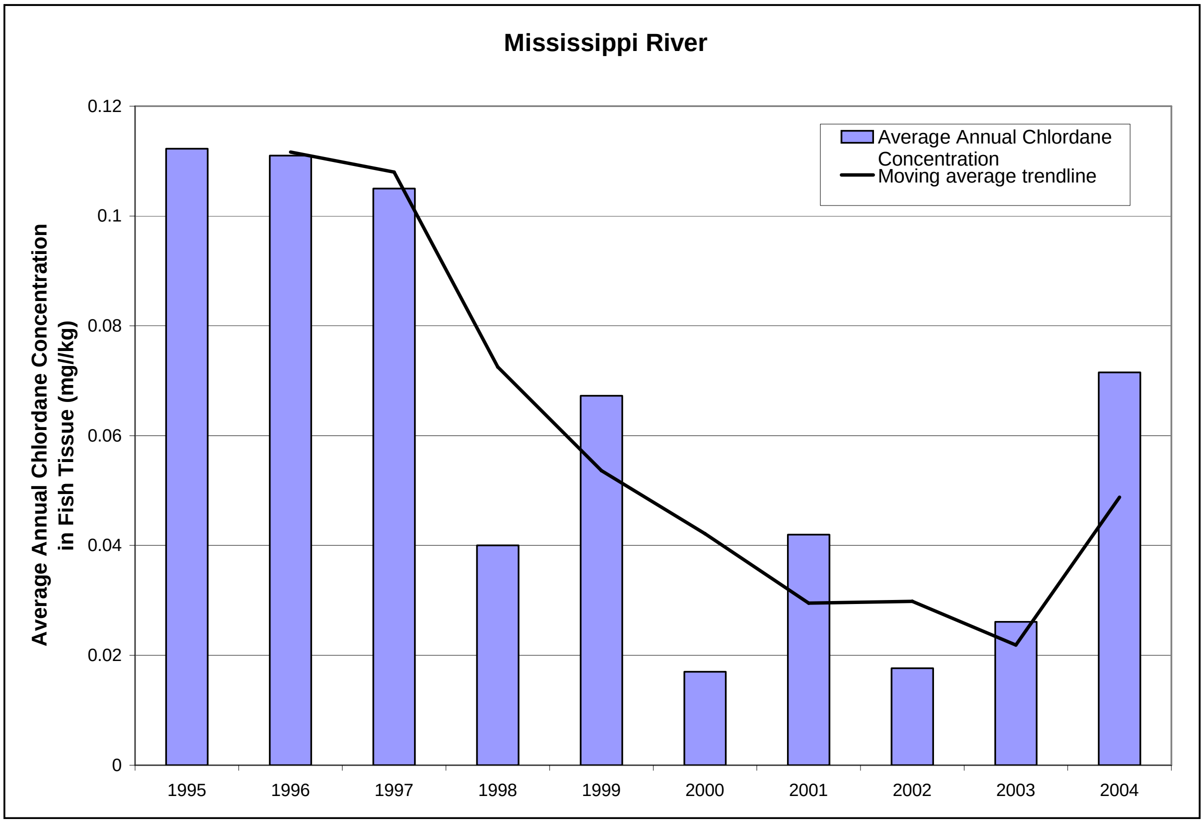
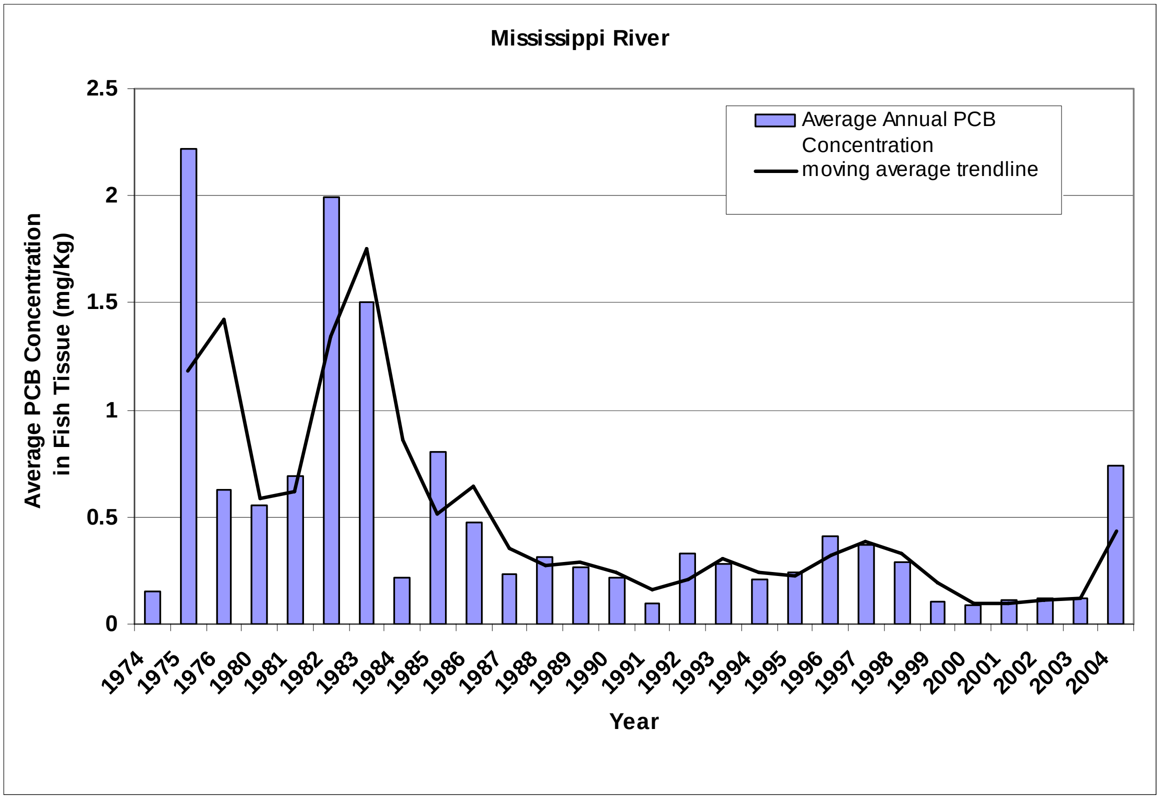


Figure 4: Average Annual PCB Concentration and Three-Year Moving Average in Mississippi River over Time



The department recognizes that data collected to date do not always reflect a downward trend of PCBs or chlordane on a year-to-year basis, however, that this is most likely due to collection inconsistencies. Some years of data contain tissue samples of many different fish species, but some years contain only one or two species of fish. Fatty fish, such as carp, tend to absorb more PCBs than a less fatty fish such as catfish. Likewise, feeding habits, rainfall and age and size of the fish can effect the amount of sediment (thus PCBs and chlordane) assimilated by fish or the bio-accumulative effect. The most recent data predominately sampled catfish and sturgeon, however in 2004, only sturgeon was sampled. This would tend to show increasing levels of PCBs and chlordane in later years and obscure the overall downward trend. When only fillets are considered, from the year 1999 to the present, concentrations of both compounds are consistently below the stated action levels.

As mentioned, these pollutants degrade slowly and are extremely persistent in the environment. However, since they are no longer produced, a downward trend is inevitable and this TMDL recommends development of a consistent protocol for measurement of the pollutants in fish tissue and continued sampling.

This is a phased TMDL, which means that if future data indicates fish tissue chlordane and PCB levels are not continuing to decline, this TMDL will be re-evaluated. This TMDL will be incorporated into Missouri's Water Quality Management Plan.

7. Public Participation

This TMDL was on public notice from June 9 to July 9, 2006. Due to comments received during the first notice period, which resulted in substantial changes to the TMDL document, a second public notice period was needed. This period was from Aug. 30 to Sept. 29, 2006. Groups who received the public notice announcement included the Missouri Clean Water Commission, the Water Quality Coordinating Committee, the water quality departments in neighboring states where the Mississippi River is a shared border (Illinois, Kentucky and Tennessee), 24 Stream Team volunteers in the watershed, and the 32 legislators representing all the counties bordering this river. Also, the department posted the notice, the Mississippi River Information Sheet and this document on its Web site, making them available to anyone with access to the Web. The department has placed a copy of the notice, the comments received and its responses in the Mississippi River file.

8. References

Agency for Toxic Substances and Disease Registry (ATSDR) (1995). ToxFAQs for Chlordane, http://www.atsdr.cdc.gov/tfacts31.html

Agency for Toxic Substances and Disease Registry (1995a). Toxicological Profile for Polychlorinated Biphenyls, http://www.atsdr.cdc.gov/toxprofiles/tp17.html

Cairns, T. et al. (1986). Analytical Chemistry of PCBs, PCBs and the Environment Volume I., Waid, J. S. (Ed.), CRC Press, Boca Raton, p.2-45

Graham, F. J. (1987). Eliminating PCBs, *American City and County* 102: 134-137

International Programmer on Chemical Safety (IPCS) (1988). Health and Safety Guide No. 13 – Chlordane, http://www.inchem.org/documents/hsg/hsg/hsg013.htm

Iowa Department of Natural Resources (DNR) (2001). Chlordane TMDL for Cedar Lake (Linn County, Iowa), http://www.iowadnr.com/water/tmdlwqa/tmdl/pdf/final/fcedar.pdf

Maryland Department of Environment (MDE) (2000). Total Maximum Daily Load (TMDL) Documentation for Chlordane in Baltimore Harbor, http://www.mde.state.md.us/assets/document/tmdl/baltharbor/bhchlor_tmdl_main_fin.pdf

Meade, R. H., and Leenheer, J. A. (1995). Contaminants in the Mississippi River – Executive Summary, U. S. Geological Survey Circular 1133, http://pubs.usgs.gov/circ/circ1133/exec-summary.html

Missouri Department of Natural Resources (MDNR) (2001). Chlordane TMDL for Creve Coeur Lake, http://www.epa.gov/Region7/water/pdf/CreveCoeurFinalTMDL.pdf

Missouri Department of Natural Resources (MDNR) (2001a). Chlordane TMDL for St. Louis Lake, http://www.dnr.mo.gov/env/wpp/tmdl/lake_stlouis_final_tmdl.pdf

Missouri Department of Natural Resources (MDNR) (2002). State 303(d) List and 305(b) Report, http://www.dnr.mo.gov/wpscd/wpcp/waterquality/303d/

Missouri Department of Natural Resources (MDNR) (2005). TMDL Information Sheet – Mississippi River (Chlordane and PCBs), http://dnr.mo.gov/env/wpp/tmdl/info/miss-r-chlor-pcb-info.pdf

Kansas Department of Health and Environment (KDHE) (2000). Kansas-Lower Republican Basin Total Maximum Daily Load (Chlordane for Lower Kansas River), http://www.kdheks.gov/tmdl/klr/LowKSRvCHLORD.pdf

Ohio River Valley Water Sanitation Commission (ORSANCO) (2002). Ohio River Total Maximum Daily Load for PCBs (Ohio River Miles 40.0 to 317.1), http://www.orsanco.org/watqual/aquatic/documents/PCBTMDL.pdf

Parsons Corporation, a Pasadena-based engineering and construction firm

Rostad, C. E., Bishop, L. M., Ellis, G. S., Leiker, T. J., Monsterleet, S. G., and Pereira, W. E. (1995). Contaminants in the Mississippi River - Polychlorinated Biphenyls and other Synthetic Organic Contaminants Associated with Sediments and Fish in the Mississippi River, U.S. Geological Survey Circular 1133, http://pubs.usgs.gov/circ/circ1133/polychlorinated.html

USEPA (1980). Ambient Water Quality Criteria for Polychlorinated Biphenyls. EPA Report 440-580068

USEPA (1991). Technical Support Document For Water Quality-based Toxics Control, EPA/505/2-90-001, http://www.epa.gov/npdes/pubs/owm0264.pdf

USEPA (1993). Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume I: Fish Sampling and Analysis. http://www.epa.gov/ost/fish/guidance.html

USEPA (1998). Great Lakes Pesticide Report, http://www.epa.gov/glnpo/bnsdocs/98summ/pest1.pdf

USEPA (1999). Draft Guidance for Water Quality-based Decisions: The TMDL Process (Second Edition), EPA Report 841-D-99-001

USEPA (2000). Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume I: Fish Sampling and Analysis. EPA-823-B-00-007. November 2000. http://www.epa.gov/ost/fish/guidance.html

USEPA (2004). Current National Recommended Water Quality Criteria, http://www.epa.gov/waterscience/criteria/wqcriteria.html and http://www.oregon.gov/DHS/ph/envtox/pcbs.shtml (PCBs in Fish)

Appendix

Table A: Sampling Locations along Mississippi River

Table B: Fish Tissue Data

Table A: Sampling Locations along Mississippi River

Number	Location	Station Name	River Mile	Latitude	Longitude	Data Source
1	Upper Mississippi River	Above Canton, Missouri	RM 343.2	40.1441	-91.511	IL EPA
2	Upper Mississippi River	Quincy, Illinois	RM 327	39.931	-91.4209	IL EPA USEPA MDC
3	Upper Mississippi River	0.5-miles below Quincy, Illinois	RM 326.5	39.8786	-91.4484	IL EPA
4	Upper Mississippi River	Hannibal, Missouri	RM 309	39.7231	-91.3636	EPA/MDNR MDC USEPA
5	Upper Mississippi River	Saverton, Missouri	RM 302	39.6459	-91.2631	MDC
6	Upper Mississippi River	Louisiana, Missouri	RM 282.8	39.4527	-91.043	MDC USEPA
7	Upper Mississippi River	Cannon NWR, Illinois	RM 260	39.2532	-90.7489	MDC
8	Upper Mississippi River	Winfield, Missouri	RM 241.5	39.005	-90.688	IL EPA USEPA MDC USPHS
9	Upper Mississippi River	Golden Eagle, Illinois	RM 228.4	38.8689	-90.5666	IL EPA
10	Upper Mississippi River	Alton, Illinois	RM 203.1	38.885	-90.1808014	EPA/MDNR MDC USEPA
11	Upper Mississippi River	Maple Island, Illinois (Near Alton)	RM 200.4	38.8652	-90.1474	IL EPA
12	Upper Mississippi River	St. Louis, Missouri	RM 180	38.629	-90.181	EPA/MDNR MDC
13	Upper Mississippi River	Kimmswick, Missouri	RM 159	38.3579	-90.3576	MDC IL EPA USEPA EPA/MDNR USPHS
14	Upper Mississippi River	2.5-miles below Herculaneum, Missouri	RM 149	38.2962	-90.3739	EPA/MDNR
15	Upper Mississippi River	Crystal City, Missouri	RM 148.7	38.2237	-90.3574	MDC EPA/MDNR
16	Upper Mississippi River	Chester, Illinois	RM 110	37.904	-89.838	EPA/MDNR IL EPA MDC USEPA

Number	Location	Station Name	River Mile	Latitude	Longitude	Data Source
						USFWS
17	Upper Mississippi River	Cape Girardeau, Missouri	RM 52	37.3295	-89.4937	EPA/MDNR USGS USEPA MDC
18	Lower Mississippi River	Cairo, Illinois	RM 955.8	36.9783	-89.1476	IL EPA MDC
19	Lower Mississippi River	Caruthersville, Missouri	RM 846	36.1995	-89.6513	MDC USEPA EPA/MDNR TN

Table B: Mississippi River Fish Tissue Data for Sum of the Isomers (SOI) Chlordane and PCBs from 1975 to 2004

Note: For use in calculations, the original data were adjusted as follows: Where the data were recorded as "less than" values, half that value is used. Where data were recorded as "Trace amount", zero (0) is used. The SOI Chlor and PCB columns below reflect these adjustments. The units for both are milligrams per kilogram (mg/kg).

Org	Site	WBID	Site Name	Species	County	Date	Type	# in samples	SOI Chlor	PCB
ILLEPA			MISS R. FT.MADISON	CH CAT		1974	F	5		0
ILLEPA			MISS R. FT.MADISON	CARP		1974	F	2		0
ILLEPA			MISS R. FT.MADISON	SAUGER		1974	F	2		0
ILLEPA			MISS R. FT.MADISON	CRA		1974	F	4		0
ILLEPA			MISS R. FT.MADISON	CARP		1974	F	1		0.37
ILLEPA			MISS R. FT.MADISON	CH CAT		1974	F	1		0.73
ILLEPA			MISS R. FT.MADISON	B BUF		1974	F	1		0.1
ILLEPA			MISS R. FT.MADISON	W BASS		1974	F	4		0
ILLEPA			MISS R. FT.MADISON	CH CAT		1974	F	1		0.16
ILLEPA			MISS R. FT.MADISON	CARP		1974	F	1		0.3
ILLEPA		1	MISS R. QUINCY-KEO	CRA		1974	F	2		0
ILLEPA		1	MISS R. QUINCY-KEO	CARP		1974	F	2		0
ILLEPA		1	MISS R. QUINCY-KEO	CRA		1974	F	4		0
ILLEPA		1	MISS R. QUINCY-KEO	CH CAT		1974	F	1		0.67
ILLEPA		1	MISS R. QUINCY-KEO	CARP		1974	F	2		0
ILLEPA		1	MISS R. QUINCY-KEO	CARP		1974	F	2		0.26
ILLEPA		1	MISS R. QUINCY-KEO	CH CAT		1974	F	2		0.31
ILLEPA		1	MISS R. QUINCY-KEO	CH CAT		1974	F	2		0
ILLEPA		1	MISS R. QUINCY-KEO	PADDLE		1974	F	2		0
WISDNR			MISS R.	CARP		1975				3
WISDNR			MISS R.	CARP		1975	F			0.4
IACC			MISS R. COMANCHE	N PIKE		1975		1		0.1
WISDNR			MISS R. LAKE PEPIN	CARP		1975	F			2.9
WISDNR			MISS R. LAKE PEPIN	CARP		1975	F			0.9
WISDNR			MISS R. LAKE PEPIN	CARP		1975	F			12

WISDNR			MISS R. LAKE PEPIN	CARP		1975	F			4.2
WISDNR			MISS R. LAKE PEPIN	CARP		1975	F			0.9
WISDNR			MISS R. LAKE PEPIN	CARP		1975	F			1.6
WISDNR			MISS R. LAKE PEPIN	CARP		1975	F			1.4
WISDNR			MISS R. LAKE PEPIN	CARP		1975	F			3.1
WISDNR			MISS R. LAKE PEPIN	CARP		1975				3.6
IACC			MISS R. LANSING	N PIKE		1975	F	1		0.22
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			1.1
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			1.3
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			1.4
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			0.3
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			1.8
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			0.8
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			1.3
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			1.9
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			0.2
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			2.2
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			3.5
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			0.5
WISDNR			MISS R. LYNXVILLE	CARP		1975	F			1.5
WISDNR			MISS R. MAIDEN RK	CARP		1975				0.9
WISDNR			MISS R. MAIDEN RK	CARP		1975				9.6
WISDNR			MISS R. MAIDEN RK	CARP		1975				0.7
WISDNR			MISS R. MAIDEN RK	CARP		1975				0.6
WISDNR			MISS R. MAIDEN RK	CARP		1975				0.7
WISDNR			MISS R. MAIDEN RK	CARP		1975				8.0
WISDNR			MISS R. MAIDEN RK	CARP		1975				0.7
WISDNR			MISS R. MAIDEN RK	CARP		1975				2.3
WISDNR			MISS R. MAIDEN RK	CARP		1975				1.8
WISDNR			MISS R. MAIDEN RK	CARP		1975				2.0
WISDNR			MISS R. MAIDEN RK	CARP		1975				1.3
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.3
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.5
WISDNR			MISS R. PRESCOTT	WALL		1975	F			1.1
WISDNR			MISS R. PRESCOTT	WALL		1975	F			9.8
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.9
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.7
WISDNR			MISS R. PRESCOTT	WALL		1975	F			1.6
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.3
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.6
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.6
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.2
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.7
WISDNR			MISS R. PRESCOTT	CARP		1975				2.5
WISDNR			MISS R. PRESCOTT	WALL		1975	F			6.5
WISDNR			MISS R. PRESCOTT	WALL		1975	F			0.7
WISDNR			MISS R. WABASHA	CARP		1975	F			3.6
WISDNR			MISS R. WABASHA	CARP		1975	F			0.5
WISDNR			MISS R. WABASHA	CARP		1975	F			7.8

WISDNR			MISS R. WABASHA	CARP		1975	F			2.4
WISDNR			MISS R. WABASHA	CARP		1975	F			1.2
WISDNR			MISS R. WABASHA	CARP		1975	F			0.9
WISDNR			MISS R. WABASHA	CARP		1975	F			1.6
WISDNR			MISS R. WABASHA	CARP		1975	F			7.3
USEPA			MISS R. COMANCHE	STRIPE		1976		1		0.194
USEPA			MISS R. COMANCHE	DRUM		1976		1		0.306
USEPA			MISS R. COMANCHE	BH CAT		1976		1		0
USEPA			MISS R. COMANCHE	SM BUF		1976		4		0.593
USEPA			MISS R. COMANCHE	GAR		1976		4		0.653
USEPA			MISS R. COMANCHE	CARP		1976		4		0
USEPA			MISS R. COMANCHE	SHAD		1976		4		0.469
USEPA			MISS R. DAVENPORT	STRIPE		1976		1		0.509
USEPA			MISS R. DAVENPORT	CARP		1976		4		0.588
USEPA			MISS R. DAVENPORT	SM BUF		1976		3		0.382
USEPA			MISS R. DAVENPORT	BM BUF		1976				0.267
USEPA			MISS R. DAVENPORT	CARPSU		1976		1		0.61
USEPA			MISS R. DAVENPORT	WALL		1976		1		0.219
USEPA			MISS R. DAVENPORT	CRA		1976		4		0.071
USEPA			MISS R. DAVENPORT	SHAD		1976		4		0.822
USEPA			MISS R. DAVENPORT	CH CAT		1976				0.088
USEPA			MISS R. LANSING	WALL		1976		1		0.194
USEPA			MISS R. LANSING	W BASS		1976		1		0.513
USEPA			MISS R. LANSING	RED		1976		3		0.317
USEPA			MISS R. LANSING	ROCK		1976		2		0.4
USEPA			MISS R. LANSING	BH CAT		1976		1		0.155
USEPA			MISS R. LANSING	W CRA		1976		1		0.302
USEPA			MISS R. LANSING	ROCK		1976		1		0.06
USEPA			MISS R. LANSING	BGILL		1976		2		0.32
USEPA			MISS R. LANSING	G EYE		1976		1		0.46
USEPA			MISS R. LANSING	SHAD		1976		4		0.252
USEPA			MISS R. LANSING	DRUM		1976		2		0
USEPA			MISS R. LANSING	FH CAT		1976		1		0.188
USEPA			MISS R. LANSING	L BASS		1976		2		0.09
USEPA			MISS R. LANSING	SUCKER		1976		4		0.188
USEPA	1707/53.0	1707	Mississippi R. @ Cape Girardeau, MO.	L GAR		1976		6		1.026
USEPA	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	BASS		1976		2		0.27
USEPA	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	SHAD		1976				0
USEPA	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	SM BUF		1976		1		0.211
USEPA	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1976		3		2.225
USEPA	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CH CAT		1976		1		0.86
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CAT		1976		10		1.3
USEPA	3152/15.5	3152	Mississippi R. @Caruthersville	SUN		1976		1		0

USEPA	3152/15.5	3152	Mississippi R. @Caruthersville	SM BUF		1976		1		2.045
USEPA	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1976		1		0.102
USEPA	3152/15.5	3152	Mississippi R. @Caruthersville	A GAR		1976		3		3.39
USEPA	3152/15.5	3152	Mississippi R. @Caruthersville	PADDLE		1976		1		0.42
USEPA	3152/15.5	3152	Mississippi R. @Caruthersville	SHAD		1976		4		0.345
USEPA	3152/15.5	3152	Mississippi R. @Caruthersville	B CRA		1976		1		0.28
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	W BASS	JEFFERSON	1976		1		0.6
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	A GAR	JEFFERSON	1976				3.692
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	M EYE	JEFFERSON	1976		2		0.729
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	BUF	JEFFERSON	1976		4		0.627
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1976		4		1.45
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	L GAR	JEFFERSON	1976		3		2.95
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	G SHAD	JEFFERSON	1976		4		0.093
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	SM BUF	JEFFERSON	1976		2		1.196
MDC	1/113.8	1	Mississippi R. @ Hannibal	CAT	MARION	1976		10		0.96
MDC	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1976		5		0
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	CAT	PERRY	1976		8		1.64
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1976		5		0
MDC	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1976		5		0
USGS			MISS R. DUBUQUE	B CRA		1980		1		0.37
USGS			MISS R. DUBUQUE	CARP		1980		1		0.85
USGS			MISS R. DUBUQUE	CARP		1980		1		0.309
USGS	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1980	W	1		1.63
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1980	W	5		0
USGS	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	W BASS		1980	W	1		1.04
USGS	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1980	W	1		1.31
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1980	W	5		0
EPA/MDNR	1707/110	1707	Mississippi R.@Chester,Ill.	CARP	PERRY	1980	W	5		0
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1980	W	5		0
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1981	W	2		0.87
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1981	W	5		0

EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1981	W	4		1.9
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1981	W	5		0
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	B BUF		1982	W	5		1.94
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1982	W	5		0.16
EPA/MDNR	1707/180.0	1707	Mississippi R. at St. Louis	B BUF	ST LOUIS	1982	W	5		3.89
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1983	W	3		7.9
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1983	W	5		0.43
ILLEPA	1707/1.0	1707	Mississippi R. @ Cairo	CARP	MISSISSIPPI	1983		5		0
ILLEPA	1707/1.0	1707	Mississippi R. @ Cairo	W BASS	MISSISSIPPI	1983		5		0
ILLEPA	1707/1.0	1707	Mississippi R. @ Cairo	B CRA	MISSISSIPPI	1983		1		0
EPA/MDNR	1707/180.0	1707	Mississippi R. at St. Louis	CARP	ST LOUIS	1983	W	5		0.69
ILLEPA		1	MISS R. WINFIELD	CARP		1984		5		0.05
ILLEPA		1	MISS R. WINFIELD	CARP		1984		5		0.05
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1984	W	5		0
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CH CAT	JEFFERSON	1984		1		0
EPA/MDNR	1707/158.5	1707	Mississippi R. @ Kimmswick	SM BUF	JEFFERSON	1984	W	6		2.4
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1984	W	5		0.48
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1984	F	1		0
ILLEPA	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1984		5		0.04
ILLEPA	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1984		5		0.38
ILLEPA	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1984		5		0.02
ILLEPA	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1984		5		0.16
ILLEPA	1707/110	1707	Mississippi R.@Chester,Ill.	CARP	PERRY	1984		5		0.05
ILLEPA	1707/110	1707	Mississippi R.@Chester,Ill.	B BUF	PERRY	1984		5		0.05
ILLEPA	1707/110	1707	Mississippi R.@Chester,Ill.	CH CAT	PERRY	1984		1		0.05
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1984	W	5		1.001
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1984	W	5		0.21
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1984	W	5		0.32
MDC	1707/180.0	1707	Mississippi R. at St. Louis	CARP	ST LOUIS	1984	F	1		0
MDC	1707/180.0	1707	Mississippi R. at St. Louis	CARP	ST LOUIS	1984	F	1		0
MDC	1707/180.0	1707	Mississippi R. at St. Louis	CARP	ST LOUIS	1984	F	1		0
MDC	1707/180.0	1707	Mississippi R. at St. Louis	CARP	ST LOUIS	1984	F	1		0

MDC	1707/180.0	1707	Mississippi R. at St. Louis	CARP	ST LOUIS	1984	F	1		0
MDC	1707/180.0	1707	Mississippi R. at St. Louis	CARP	ST LOUIS	1984	F	5		0
MDC	1707/180.0	1707	Mississippi R. at St. Louis	FH CAT	ST LOUIS	1984	F	5		0
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1985	W	5		1.31
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1985	F	5		0
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1985	W	5		0.41
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1985	W	5		0.067
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1985	W	5		0
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1985	W	5		0
EPA/MDNR	1707/110	1707	Mississippi R.@Chester,Ill.	CARP	PERRY	1985	W	5		0.52
EPA/MDNR	1707/110	1707	Mississippi R.@Chester,Ill.	CARP	PERRY	1985	W	5		0.3
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1985	W	5		0.073
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1985	W	5		0.75
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1985	W	6		0
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.218
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.412
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.78
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		3.9
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.276
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		1.1
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.509
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.408
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		3.3
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		1.85
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.721
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		1.05
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.839
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.693
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		1.25
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.768

MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.544
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		1.68
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.494
MDC	1707/180.0	1707	Mississippi R. at St. Louis	SHSTUR	ST LOUIS	1985		1		0.721
EPA/MDNR			MISS R. DAVENPORT	CH CAT		1986	W	5		0.32
EPA/MDNR			MISS R. GUTTENBURG	CH CAT		1986	W	5		0.039
USPHS		1	MISS R. WINFIELD	BUF		1986	W			0
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1986	W	5		1.405
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1986	W	5		0.775
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CH CAT		1986	F	5		0
USPHS	1707/158.5	1707	Mississippi R. @ Kimmswick	PADDLE	JEFFERSON	1986	F	4		0
USPHS	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1986	F			0.25
USPHS	1707/158.5	1707	Mississippi R. @ Kimmswick	BL CAT	JEFFERSON	1986	F	1		0
USPHS	1707/158.5	1707	Mississippi R. @ Kimmswick	BUF	JEFFERSON	1986	F			0.28
MDC	1/113.8	1	Mississippi R. @ Hannibal	SHSTUR	MARION	1986	F			0.338
MDC	1/113.8	1	Mississippi R. @ Hannibal	FH CAT	MARION	1986	F			0.498
MDC	1/113.8	1	Mississippi R. @ Hannibal	CH CAT	MARION	1986	F			0.252
MDC	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1986	F			0.107
MDC	1/113.8	1	Mississippi R. @ Hannibal	DRUM	MARION	1986	F			0.172
MDC	1/113.8	1	Mississippi R. @ Hannibal	SHSTUR	MARION	1986	F			0.268
MDC	1/113.8	1	Mississippi R. @ Hannibal	CARPSU	MARION	1986	F			0.147
MDC	1/113.8	1	Mississippi R. @ Hannibal	SHSTUR	MARION	1986	E			0.367
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	CARP	PERRY	1986	F	5		0
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1986	W	5		3.045
MDC	1/7.6	1	Mississippi R. @ Alton	CH CAT	ST CHARLES	1986	F			0.211
EPA/MDNR	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1986	W	5		2.855
MDC	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1986	F			0.134
MDC	1707/180.0	1707	Mississippi R. at St. Louis	CARP	ST LOUIS	1986	F	5		0
MDC		1	MISS R. WINFIELD	CH CAT		1987	F	5		0.242
MDC		1	MISS R. WINFIELD	CARP		1987	F	5		0.073
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	FH CAT		1987	E	1		0.3

MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	BL CAT		1987	F	1		0.342
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1987	W	5		0.695
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CRA		1987	F	5		0.045
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1987	F	5		0.248
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	FH CAT		1987	F	1		0.194
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	FH CAT		1987	F	1		0.133
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARPSU		1987	F	2		0.096
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1987	W	5		0.69
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	FH CAT		1987	F	2		0.2
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	FH CAT		1987	F	2		0.06
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	BUF		1987	F	1		0.056
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	DRUM		1987	F	5		0.08
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	FH CAT		1987	F	1		0.192
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1987	F	5		0.127
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	DRUM		1987	F	1		0.102
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CH CAT		1987	F	5		0.137
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	W BASS		1987	F	2		0.322
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	BL CAT		1987	F	1		0.148
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	FH CAT		1987	F	2		0.136
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	FH CAT	JEFFERSON	1987	F	1		0.17
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	FH CAT	JEFFERSON	1987	F	1		0.447
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	FH CAT	JEFFERSON	1987	F	1		0.118
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CH CAT	JEFFERSON	1987	F	2		0.238
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1987	F	5		0.273
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	L BASS	JEFFERSON	1987	F	1		0.133
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	W BASS	JEFFERSON	1987	F	1		0.215
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CH CAT	JEFFERSON	1987	F	1		0.205
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1987	W	5		0.21
MDC	1/113.8	1	Mississippi R. @ Hannibal	L STUR	MARION	1987	F	1		0.885
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1987	W	5		0.226

MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1987	F	5		0.059
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1987	F	3		0.077
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1987	F	5		0.122
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1987	F	5		0.055
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1987	F	3		0.079
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1987	F	5		0.057
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1987	F	1		0.025
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1987	F	5		0.116
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1987	F	2		0.025
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1987	F	4		0.092
MDC	1707/1.0	1707	Mississippi R. @ Cairo	W BASS	MISSISSIPPI	1987	F	5		0.193
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CH CAT	MISSISSIPPI	1987	W	5		0.305
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CH CAT	MISSISSIPPI	1987	F	5		0.3
MDC	1707/1.0	1707	Mississippi R. @ Cairo	BUF	MISSISSIPPI	1987	F	5		0.308
MDC	1707/1.0	1707	Mississippi R. @ Cairo	SM BUF	MISSISSIPPI	1987	F	5		0.383
MDC	1707/1.0	1707	Mississippi R. @ Cairo	SM BUF	MISSISSIPPI	1987	F	5		0.692
MDC	1707/1.0	1707	Mississippi R. @ Cairo	SAUGER	MISSISSIPPI	1987	W	5		0.76
MDC	1707/1.0	1707	Mississippi R. @ Cairo	SAUGER	MISSISSIPPI	1987	F	5		0.161
MDC	1707/1.0	1707	Mississippi R. @ Cairo	W BASS	MISSISSIPPI	1987	W	5		0.785
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CH CAT	MISSISSIPPI	1987	W	5		0.692
MDC	1707/1.0	1707	Mississippi R. @ Cairo	SAUGER	MISSISSIPPI	1987	F	5		0.192
MDC	1707/1.0	1707	Mississippi R. @ Cairo	SAUGER	MISSISSIPPI	1987	F	5		0.963
MDC	1707/1.0	1707	Mississippi R. @ Cairo	SM BUF	MISSISSIPPI	1987	F	5		0.434
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CH CAT	MISSISSIPPI	1987	W	5		0.65
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CH CAT	MISSISSIPPI	1987	F	5		0.467
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CH CAT	MISSISSIPPI	1987	F	5		0.496
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	BUF	PERRY	1987	W	4		0.206
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	CARP	PERRY	1987	W	4		0.502
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	CH CAT	PERRY	1987	W	3		0.768
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	CARP	PERRY	1987	W	4		0.385
MDC	1/87.7	1	Mississippi R. @ Louisiana	SAUGER	PIKE	1987	F	4		0.052
MDC	1/87.7	1	Mississippi R. @ Louisiana	CH CAT	PIKE	1987	F	5		0.164
MDC	1/87.7	1	Mississippi R. @ Louisiana	FH CAT	PIKE	1987	F	1		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	PADDLE	PIKE	1987	F	1		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARPSU	PIKE	1987	F	3		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARPSU	PIKE	1987	F	1		0.025

MDC	1/87.7	1	Mississippi R. @ Louisiana	SHSTUR	PIKE	1987	E			0.676
MDC	1/87.7	1	Mississippi R. @ Louisiana	W BASS	PIKE	1987	F	5		0.066
MDC	1/87.7	1	Mississippi R. @ Louisiana	CH CAT	PIKE	1987	F	5		0.178
MDC	1/87.7	1	Mississippi R. @ Louisiana	L BASS	PIKE	1987	F	5		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	BGILL	PIKE	1987	F	5		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	BUF	PIKE	1987	F	6		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	DRUM	PIKE	1987	F	5		0.079
MDC	1/87.7	1	Mississippi R. @ Louisiana	SHSTUR	PIKE	1987	F	5		0.054
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1987	F	5		0.116
MDC	1/87.7	1	Mississippi R. @ Louisiana	CRA	PIKE	1987	F	5		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1987	F	5		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	FH CAT	PIKE	1987	F	2		0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	CH CAT	PIKE	1987	F	5		0.238
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1987	F	5		0.083
MDC	1/87.7	1	Mississippi R. @ Louisiana	BUF	PIKE	1987	F	1		0.025
MDC	1/7.6	1	Mississippi R. @ Alton	CH CAT	ST CHARLES	1987	F	5		0.025
MDC	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1987	F	5		0.025
USEPA		1	MISS R. WINFIELD	CARP		1988	F	5		0.134
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1988	W	5		0.82
USEPA	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1988	W	5		0.62
USEPA	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1988	W	5		0.73
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1988	W	4		0.12
USEPA	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1988	W	5		0.075
USEPA	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1988	W	4		0.183
USEPA	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1988	W	5		0.165
USEPA	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1988	W	5		0.109
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1988	W	4		0.27
USEPA	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1988	W	5		0.215
USEPA	1707/110	1707	Mississippi R.@Chester,Ill.	CARP	PERRY	1988	W	5		0.45
USEPA	1/87.7	1	Mississippi R. @ Louisiana	L BASS	PIKE	1988	F	5		0.009

USEPA	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1988	W	5		0.216
USEPA	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1988	W	5		0.68
USEPA	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1988	W	5		0.206
MDC		1	MISS R. QUINCY-KEO	CARP		1989	F	5		0.096
MDC		1	MISS R. QUINCY-KEO	CH CAT		1989	F	5		0.216
MDC		1	MISS R. WINFIELD	CARP		1989	F	5		0.061
MDC		1	MISS R. WINFIELD	CH CAT		1989	F	5		0.101
MDC		1	MISS R. WINFIELD	PADDLE		1989	F	5		0.025
MDC		1	MISS R. WINFIELD	CH CAT		1989	F	5		0.116
MDC		1	MISS R. WINFIELD	CARP		1989	F	5		0.09
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1989	W	5		0.94
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CAT		1989	F	5		0.174
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1989	F	5		0.398
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1989	F	5		0.273
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	FH CAT		1989	F	1		0.124
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CAT		1989	F	3		0.114
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1989	W	5		1.25
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	BL CAT		1989	F	1		0.263
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1989	F	1		0.238
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1989	F	4		1.43
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CH CAT		1989	F	5		0.284
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1989	F	4		0.088
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1989	W	3		0.141
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1989	F	5		0.133
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1989	F	5		0.085
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CH CAT	MISSISSIPPI	1989	F	5		0.11
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CARP	MISSISSIPPI	1989	F	2		0.094
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CARP	MISSISSIPPI	1989	F	1		0.08
MDC	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1989	F	5		0.088
MDC	1/7.6	1	Mississippi R. @ Alton	CH CAT	ST CHARLES	1989	F	5		0.133
MDC		1	MISS R. QUINCY-KEO	CH CAT		1990	F	5		0.251
MDC		1	MISS R. QUINCY-KEO	CARP		1990	F	5		0.088
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CH CAT		1990	F	5		0.098
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1990	F	3		0.087

MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1990	F	3		0.478
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1990	W	3		0.79
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1990	W	3		1.19
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1990	F	5		0.247
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CH CAT		1990	F	5		0.135
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1990	F	5		0.154
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR		1990	F	2		0.185
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR		1990	F	4		0.372
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	PADDLE		1990	F	5		0.025
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CH CAT		1990	F	5		0.294
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1990	F	5		0.295
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	FH CAT	JEFFERSON	1990	F	5		0.057
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	W BASS	JEFFERSON	1990	F	5		0.09
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1990	W	5		0.367
MDC	1/113.8	1	Mississippi R. @ Hannibal	CH CAT	MARION	1990	F	5		0.105
MDC	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1990	F	5		0.097
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CARP	MISSISSIPPI	1990	F	5		0.356
MDC	1707/1.0	1707	Mississippi R. @ Cairo	FH CAT	MISSISSIPPI	1990	F	5		0.07
MDC	1707/1.0	1707	Mississippi R. @ Cairo	CH CAT	MISSISSIPPI	1990	F	5		0.193
MDC	1/64.0	1	Mississippi R. @ Cannon NWR	CARP	PIKE	1990	F	5		0.07
MDC	1/64.0	1	Mississippi R. @ Cannon NWR	CH CAT	PIKE	1990	F	5		0.126
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1990	F	5		0.068
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1990	F	5		0.074
MDC	1/87.7	1	Mississippi R. @ Louisiana	CH CAT	PIKE	1990	F	5		0.125
MDC	1/87.7	1	Mississippi R. @ Louisiana	CH CAT	PIKE	1990	F	5		0.138
MDC	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1990	F	5		0.058
MDC	1/7.6	1	Mississippi R. @ Alton	PADDLE	ST CHARLES	1990	F	5		0.053
MDC	1/7.6	1	Mississippi R. @ Alton	CH CAT	ST CHARLES	1990	F	5		0.194
MDC		1	MISS R. QUINCY-KEO	CARP		1991	F			
MDC		1	MISS R. QUINCY-KEO	CH CAT		1991	F			
MDC		1	MISS R. WINFIELD	CH CAT		1991	F			
MDC		1	MISS R. WINFIELD	CARP		1991	F			

MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1991	F			
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1991	F			
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CH CAT		1991	F			
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CH CAT		1991	F			
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CH CAT		1991	F			
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1991	F			
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARPSU		1991	F			
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CH CAT		1991	F			
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1991	F			0.09
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	W BASS	JEFFERSON	1991	F			0.025
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CH CAT	JEFFERSON	1991	F			0.179
MDC	1/113.8	1	Mississippi R. @ Hannibal	CH CAT	MARION	1991	F			
MDC	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1991	F			
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CH CAT	MARION	1991	F			
MDC	1/140.7	1	Mississippi R. @ Quincy, IL	CARP	MARION	1991	F			
MDC	1/87.7	1	Mississippi R. @ Louisiana	CH CAT	PIKE	1991	F			
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1991	F			
MDC	1/7.6	1	Mississippi R. @ Alton	CH CAT	ST CHARLES	1991	F			
MDC	1/7.6	1	Mississippi R. @ Alton	CARP	ST CHARLES	1991	F			
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1992	F			
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1992	F			
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1992	F			
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1992	F			
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1992	F			
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1992	F			0.326
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1992	F			
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1992	F			
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1992	F			
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1992	X			
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1993	W	3		0.81

EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1993	W	3		0.57
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1993	F	17		0.362
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1993	F	8		0.05
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1993	F	17		0.121
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1993	F	18		0.373
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1993	F	18		0.11
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1993	F	9		0.123
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1993	F	5		0.1
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1993	F	5		0.183
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1994	F	3		0.69
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1994	F	3		0.53
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1994	F	15		0.025
EPA/MDNR	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1994	W	5		0.159
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1994	W	15		0.025
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1994	W	15		0.025
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1994	F	15		0.076
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1994	F	15		0.197
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1994	F	10		0.23
EPA/MDNR	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1994	W	4		0.3
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1994	W	3		0.137
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1994	W	45		0.097
TN			MISS R. AB MEMPHIS	L BASS		1995	F	3		0.2
TN			MISS R. AB MEMPHIS	CARP		1995	F	3		0.02
TN			MISS R. AB MEMPHIS	CARP		1995	F	1		0.17
TN			MISS R. AB MEMPHIS	BL CAT		1995	F	3		0.27
TN			MISS R. BL MEMPHIS	BL CAT		1995	F	1		1.43
TN			MISS R. BL MEMPHIS	BL CAT		1995	F	3		0.31
TN			MISS R. BL MEMPHIS	CARP		1995	F	1		0.21
TN			MISS R. BL MEMPHIS	CARP		1995	F	3		0.01
TN			MISS R. BL MEMPHIS	CARP		1995	F	1		0.18
TN		3152	MISS R. BLYTHVILLE	BL CAT		1995	F	3		0.08
TN		3152	MISS R. BLYTHVILLE	BL CAT		1995	F	3		0.56
TN		3152	MISS R. BLYTHVILLE	CARP		1995	F	1		0.08
TN		3152	MISS R. BLYTHVILLE	CARP		1995	F	1		0.01
TN		3152	MISS R. BLYTHVILLE	BL CAT		1995	F	1		0.15
TN		3152	MISS R. BLYTHVILLE	SM BUF		1995	F	1		0.1

TN		3152	MISS R. BLYTHVILLE	SM BUF		1995	F	3		0.14
TN		3152	MISS R. BLYTHVILLE	BASS		1995	F			0.17
TN		3152	MISS R. BLYTHVILLE	SM BUF		1995	F	3		0.08
TN	3152/15.5	3152	Mississippi R. @Caruthersville	BASS		1995	F			0.01
TN	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1995	F	3		0.01
TN	3152/15.5	3152	Mississippi R. @Caruthersville	CH CAT		1995	F	3		0.17
MDC	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	1995	F	45	0.034	0.109
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	BL CAT	NEW MADRID	1995	F	1	0.379	1.45
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP	PEMISCOTT	1995	F	48	0.001	0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1995	W	45	0.035	0.077
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP		1996	W	8		0.159
EPA/MDNR	3152/15.5	3152	Mississippi R. @Caruthersville	CARP		1996	W	3		0.079
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	1996	F	9	0.054	0.148
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	1996	F	9	0.062	0.157
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	1996	F	9	0.059	0.363
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	1996	F	9	0.049	0.133
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	SM BUF	CAPE GIRARDEAU	1996	F	25	0.01	0.025
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	1996	F	9	0.061	0.149
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CH CAT	CAPE GIRARDEAU	1996	F	25	0.051	0.107
EPA/MDNR	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1996	W	5		0.171
MDC	1707/149	1707	Mississippi R. @Crystal City	SHSTUR	JEFFERSON	1996	F	25	0.072	0.313
MDC	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	1996	F	30	0.062	0.11
MDC	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	1996	F	15	0.062	0.15
MDC	1707/149	1707	Mississippi R. @Crystal City	SM BUF	JEFFERSON	1996	F	25	0.059	0.05
MDC		1	MISS R. QUINCY-KEO	SHSTUR	LEWIS	1996	F	5	0.046	0.161
MDC		1	MISS R. QUINCY-KEO	CARP	LEWIS	1996	F	15	0.04	0.025
MDC		1	MISS R. QUINCY-KEO	CH CAT	LEWIS	1996	F	10	0.123	0.351
MDC		1	MISS R. QUINCY-KEO	CARP	LEWIS	1996	F	15	0.039	0.025
MDC		1	MISS R. QUINCY-KEO	BUF	LEWIS	1996	F	25	0.02	0.07
MDC		1	MISS R. QUINCY-KEO	CARP	LEWIS	1996	F	15	0.025	0.025
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1996	W	5		0.203
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	BM BUF	PEMISCOT	1996	F	10	0.018	0.074
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR	PEMISCOT	1996	E		0.119	0.757

MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR	PEMISCOT	1996	F	15	0.109	0.457
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CH CAT	PEMISCOT	1996	F	26	0.005	0.025
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP	PEMISCOT	1996	F	13	0.035	0.169
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP	PEMISCOT	1996	F	6	0.042	0.165
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP	PEMISCOT	1996	F	5	0.028	0.074
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP	PEMISCOT	1996	F	6	0.06	0.273
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP	PEMISCOT	1996	F	15	0.031	0.109
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SM BUF	PEMISCOT	1996	F	5	0.012	0.066
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	B BUF	PEMISCOT	1996	F	10	0.041	0.147
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR	PEMISCOT	1996	F	10	0.113	0.548
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1996	E	10	0.124	0.432
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1996	E		0.997	4.52
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1996	E	13	0.116	0.531
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1996	E		0.81	5.81
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1996	E		0.495	1.39
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1996	E	4	0.128	0.495
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1996	E		0.387	0.017
MDC	1/87.7	1	Mississippi R. @ Louisiana	CH CAT	PIKE	1996	F	15	0.112	0.148
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1996	F	15	0.044	0.07
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1996	F	15	0.026	0.091
MDC	1/87.7	1	Mississippi R. @ Louisiana	SHSTUR	PIKE	1996	F	13	0.029	0.083
MDC	1/87.7	1	Mississippi R. @ Louisiana	SHSTUR	PIKE	1996	F	12	0.054	0.142
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1996	F	15	0.025	0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	BUF	PIKE	1996	F	10	0.022	0.025
MDC	1/87.7	1	Mississippi R. @ Louisiana	BUF	PIKE	1996	F	15	0.008	0.025
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.025	0.22
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.026	0.2
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.03	0.21
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.025	0.094
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.025	0.23

FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.028	0.49
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.06	0.28
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.025	0.14
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.025	0.16
FWS-Coffey			MISS R. DAVENPORT	SHSTUR		1997	W	1	0.031	0.31
ILLEPA	1/ILL	1	Mississippi R. @ Frentress Lake	CH CAT		1997	F	3		0.43
ILLEPA	1/ILL	1	Mississippi R. @ Frentress Lake	CARP		1997	F	5		0.28
ILLEPA	1/ILL	1	Mississippi R. @ Frentress Lake	CH CAT		1997	F	5		0.25
ILLEPA	1/ILL	1	Mississippi R. @ Frentress Lake	CARP		1997	F	5		0.3
ILLEPA	1/ILL	1	Mississippi R. @ L. Bogus Island	W CRA		1997	F	3		0.05
ILLEPA	1/ILL	1	Mississippi R. @ L. Bogus Island	CH CAT		1997	F	5		0.23
ILLEPA	1/ILL	1	Mississippi R. @ L. Bogus Island	CARP		1997	F	5		0.14
ILLEPA	1/ILL	1	Mississippi R. @ L. Bogus Island	CH CAT		1997	F	5		0.25
ILLEPA	1/ILL	1	Mississippi R. @ L. Bogus Island	CARP		1997	F	5		0.19
ILLEPA	1/ILL	1	Mississippi R. @ L. Bogus Island	L BASS		1997	F	3		0.05
ILLEPA	1/ILL	1	Mississippi R. @ Marais D'Osier Slough	CARP		1997	F	5		0.3
ILLEPA	1/ILL	1	Mississippi R. @ Marais D'Osier Slough	CARP		1997	F	5		0.2
ILLEPA	1/ILL	1	Mississippi R. @ Marais D'Osier Slough	L BASS		1997	F	3		0.05
ILLEPA	1/ILL	1	Mississippi R. @ Sylvan Slough	CARP		1997	F	5		0.26
ILLEPA	1/ILL	1	Mississippi R. @ Sylvan Slough	CARP		1997	F	5		0.45
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1997	F	22	0.073	0.251
MDC	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	1997	F	25	0.043	0.207
ILLEPA	1/127.2	1	Mississippi R. 5 mi. bl. Quincy, IL	CARP	MARION	1997	F	5		0.16
ILLEPA	1/127.2	1	Mississippi R. 5 mi. bl. Quincy, IL	CARP	MARION	1997	F	5		0.17
ILLEPA	1/127.2	1	Mississippi R. 5 mi. bl. Quincy, IL	CH CAT	MARION	1997	F	3		0.69
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.193	0.9
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.155	0.5
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.152	0.61
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.121	0.75
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	E		0.271	1.03

USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.112	1.2
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.098	0.31
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.301	1
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.156	0.45
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.441	1.5
MDC	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	15	0.118	0.483
USFWS	1707/110	1707	Mississippi R.@Chester,Ill.	SHSTUR	PERRY	1997	W	1	0.19	0.86
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1997	F	25	0.021	0.056
MDC	1/87.7	1	Mississippi R. @ Louisiana	SHSTUR	PIKE	1997	F	15	0.015	0.051
MDC	1/87.7	1	Mississippi R. @ Louisiana	CH CAT	PIKE	1997	F	15	0.075	0.39
ILLEPA	1/4.9	1	Mississippi R. @ Maple Island	CARP	ST CHARLES	1997	F	4		0.24
ILLEPA	1/4.9	1	Mississippi R. @ Maple Island	CH CAT	ST CHARLES	1997	F	5		0.42
ILLEPA	1/4.9	1	Mississippi R. @ Maple Island	L BASS	ST CHARLES	1997	F	5		0.05
ILLEPA	1/4.9	1	Mississippi R. @ Maple Island	SHSTUR	ST CHARLES	1997	F	5		0.24
ILLEPA	1/4.9	1	Mississippi R. @ Maple Island	SHSTUR	ST CHARLES	1997	F	5		0.19
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	1998	W	5		0.345
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	FH CAT	CAPE GIRARDEAU	1998	W	15	0.023	0.025
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	1998	W	25	0.047	0.025
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	1998	W	5		0.335
MDC	1707/149	1707	Mississippi R. @Crystal City	CH CAT	JEFFERSON	1998	W	15	0.015	0.102
MDC	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	1998	W	25	0.048	0.103
EPA/MDNR	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	1998	W	5		0.823
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	1998	W	5		0.255
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	CARP	PEMISCOT	1998	W	25	0.05	0.318
EPA/MDNR	3152/15.5	3152	Mississippi R. @Caruthersville	MIXED	PEMISCOT	1998	W	7		0.415
ILLEPA	1/32.4	1	Mississippi R. @ Golden Eagle, IL	STUR	ST CHARLES	1998	F	5		0.29
ILLEPA	1/32.4	1	Mississippi R. @ Golden Eagle, IL	STUR	ST CHARLES	1998	F	5		0.29
ILLEPA	1/32.4	1	Mississippi R. @ Golden Eagle, IL	STUR	ST CHARLES	1998	F	3		0.52
ILLEPA	1/32.4	1	Mississippi R. @ Golden Eagle, IL	STUR	ST CHARLES	1998	F	5		0.17
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	1999	F	25	0.084	0.14

MDC	1707/149	1707	Mississippi R. @Crystal City	STUR	JEFFERSON	1999	F		0.125	0.198
MDC	1707/149	1707	Mississippi R. @Crystal City	STUR	JEFFERSON	1999	F	15	0.035	0.14
MDC	1/87.7	1	Mississippi R. @ Louisiana	CARP	PIKE	1999	F	25	0.025	0.025
ILLEPA	1/32.4	1	Mississippi R. @ Golden Eagle, IL	PADDLE	ST CHARLES	1999	F	5		0.05
ILLEPA	1/32.4	1	Mississippi R. @ Golden Eagle, IL	PADDLE	ST CHARLES	1999	F	4		0.05
MDC	1707/149	1707	Mississippi R. @Crystal City	FH CAT	JEFFERSON	2000	F	17	0.017	0.089
MDC	1707/158.5	1707	Mississippi R. @ Kimmswick	CARP	JEFFERSON	2001	F	25	0.04	0.1
MDC	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	2001	F	25	0.044	0.119
ILLEPA	1/ILL	1	Mississippi R. @ RM 403	CARP		2002	F	1		0.27
ILLEPA	1/ILL	1	Mississippi R. @ RM 403	CARP		2002	F	4		0.22
ILLEPA	1/ILL	1	Mississippi R. @ RM 403	BGILL		2002	F	5		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 403	CH CAT		2002	F	2		0.14
ILLEPA	1/ILL	1	Mississippi R. @ RM 403	L BASS		2002	F	4		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 403	CARP		2002	F	5		0.22
ILLEPA	1/ILL	1	Mississippi R. @ RM 437	CARP		2002	F	5		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 437	BGILL		2002	F	4		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 437	CARP		2002	F	5		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 437	L BASS		2002	F	4		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 437	W BASS		2002	F	3		0.11
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	CARP		2002	F	4		0.13
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	CARP		2002	F	4		0.11
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	L BASS		2002	F	5		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	CH CAT		2002	F	4		0.16
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	CH CAT		2002	F	4		0.15
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	BGILL		2002	F	3		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 525	L BASS		2002	F	5		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 525	BGILL		2002	F	5		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 525	CARP		2002	F	4		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 525	W BASS		2002	F	1		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 525	CARP		2002	F	3		0.05
EPA/MDNR	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	CARP	CAPE GIRARDEAU	2002	W	5		0.34
EPA/MDNR	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	2002	F	5	0.029	0.47
EPA/MDNR	1707/149	1707	Mississippi R. @Crystal City	W BASS	JEFFERSON	2002	F	5	0.008	0.056
EPA/MDNR	1707/153.5	1707	Mississippi R. 2.5 mi.ab. Herculaneum	CARP	JEFFERSON	2002	F	5	0.044	0.201
EPA/MDNR	1707/153.5	1707	Mississippi R. 2.5 mi.ab. Herculaneum	W BASS	JEFFERSON	2002	F	5	0.004	0.051
ILLEPA	1/145.6	1	Mississippi R. ab. Canton	CARP	LEWIS	2002	F	5		0.11
ILLEPA	1/145.6	1	Mississippi R. ab. Canton	CARP	LEWIS	2002	F	5		0.05
EPA/MDNR	1/113.8	1	Mississippi R. @ Hannibal	CARP	MARION	2002	W	5		0.125
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	FH CAT	PEMISCOT	2002	F	15	0.0079	0.07

MDC	3152/15.5	3152	Mississippi R. @Caruthersville	BL CAT	PEMISCOT	2002	F	15	0.013	0.061
EPA/MDNR	3152/15.5	3152	Mississippi R. @Caruthersville	CARP	PEMISCOT	2002	W	5		0.31
ILLEPA	1/ILL	1	Mississippi R. @ RM 403	CARP		2003	F	3		0.11
ILLEPA	1/ILL	1	Mississippi R. @ RM 437	W BASS		2003	F	5		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 437	CH CAT		2003	F	5		0.12
ILLEPA	1/ILL	1	Mississippi R. @ RM 437	CARP		2003	F	3		0.19
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	CARP		2003	F	4		0.11
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	CARP		2003	F	4		0.12
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	CH CAT		2003	F	3		0.11
ILLEPA	1/ILL	1	Mississippi R. @ RM 480	L BASS		2003	F	3		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 525	CARP		2003	F	3		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 525	CARP		2003	F	3		0.05
ILLEPA	1/ILL	1	Mississippi R. @ RM 525	L BASS		2003	F	3		0.05
EPA/MDNR	1707/149	1707	Mississippi R. @Crystal City	CARP	JEFFERSON	2003	F	5	0.039	0.278
EPA/MDNR	1707/149	1707	Mississippi R. @Crystal City	SAUGER	JEFFERSON	2003	F	3	0.0084	0.1
EPA/MDNR	1707/153.5	1707	Mississippi R. 2.5 mi.ab. Herculaneum	CARP	JEFFERSON	2003	F	5	0.037	0.278
EPA/MDNR	1707/153.5	1707	Mississippi R. 2.5 mi.ab. Herculaneum	CH CAT	JEFFERSON	2003	F	3	0.02	0.132
ILLEPA	1/145.6	1	Mississippi R. ab. Canton	CARP	LEWIS	2003	F	3		0.18
ILLEPA	1/145.6	1	Mississippi R. ab. Canton	CH CAT	LEWIS	2003	F	4		0.13
ILLEPA	1/145.6	1	Mississippi R. ab. Canton	CARP	LEWIS	2003	F	4		0.13
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	SHSTUR	CAPE GIRARDEAU	2004	E	1	0.294	3.42
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	SHSTUR	CAPE GIRARDEAU	2004	F	5	0.0486	0.771
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	SHSTUR	CAPE GIRARDEAU	2004	F	5	0.0482	0.513
MDC	1707/53.0	1707	Mississippi R. @ Cape Girardeau,MO.	SHSTUR	CAPE GIRARDEAU	2004	F	5	0.0453	0.485
EPA/MDNR	1707/149	1707	Mississippi R. @Crystal City	W BASS	JEFFERSON	2004	F	5	0.0454	0.29
MDC	1707/149	1707	Mississippi R. @Crystal City	SHSTUR	JEFFERSON	2004	F	5	0.0384	0.472
MDC	1707/149	1707	Mississippi R. @Crystal City	SHSTUR	JEFFERSON	2004	F	5	0.0508	0.79
EPA/MDNR	1707/149	1707	Mississippi R. @Crystal City	C CARP	JEFFERSON	2004	F	5	0.0752	0.66
MDC	1707/149	1707	Mississippi R. @Crystal City	SHSTUR	JEFFERSON	2004	F	5	0.0368	0.397
EPA/MDNR	1707/153.5	1707	Mississippi R. 2.5 mi.ab. Herculaneum	W BASS	JEFFERSON	2004	F	5	0.0158	0.16
EPA/MDNR	1707/153.5	1707	Mississippi R. 2.5 mi.ab. Herculaneum	C CARP	JEFFERSON	2004	F	5	0.0343	0.31
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR	PEMISCOT	2004	F	5	0.0382	0.366
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR	PEMISCOT	2004	E	1	0.269	2.47
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR	PEMISCOT	2004	F	5	0.033	0.305
MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR	PEMISCOT	2004	F	5	0.0733	0.666

MDC	3152/15.5	3152	Mississippi R. @Caruthersville	SHSTUR	PEMISCOT	2004	E	1	0.224	1.85
MDC	1/106.2	1	Mississippi R. @ Saverton	SHSTUR	RALLS	2004	E	1	0.0981	1.02
MDC	1/106.2	1	Mississippi R. @ Saverton	SHSTUR	RALLS	2004	F	5	0.0173	0.179
MDC	1/106.2	1	Mississippi R. @ Saverton	SHSTUR	RALLS	2004	E	1	0.0306	0.398
MDC	1/106.2	1	Mississippi R. @ Saverton	SHSTUR	RALLS	2004	F	5	0.0218	0.221
MDC	1/106.2	1	Mississippi R. @ Saverton	SHSTUR	RALLS	2004	F	5	0.014	0.189
MDC	1/106.2	1	Mississippi R. @ Saverton	SHSTUR	RALLS	2004	E	1	0.0616	
MDC	1/106.2	1	Mississippi R. @ Saverton	SHSTUR	RALLS	2004	E	1	0.0314	0.343

Note: Site = WBID/number of miles from mouth; u = urban; r = rural; # in sample = the number of fish in each "sample".

Type = what form of the fish is evaluated:

W = the whole fish

F = the fillet of the fish only

E = the fish eggs only

EXHIBIT D

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Decision Rationale
Total Maximum Daily Loads
For Polychlorinated Biphenyls (PCBs)
Tidal Potomac & Anacostia River Watershed
in the District of Columbia, Maryland and Virginia

Approved

____

Jon M. Capacasa, Director
Water Protection Division

Date: October 31, 2007

Decision Rationale
Total Maximum Daily Loads
For Polychlorinated Biphenyls (PCBs)
Tidal Potomac & Anacostia River Watershed
in the District of Columbia, Maryland and Virginia

Executive Summary

I. Introduction

The Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed for those water bodies that will not attain water quality standards after application of technology-based and other required controls. A TMDL sets the quantity of a pollutant that may be introduced into a waterbody without causing a violation of the applicable water quality standards. EPA's regulations define a TMDL as the sum of the waste load allocations (WLAs) assigned to point sources, the load allocations (LAs) assigned to nonpoint sources and natural background, and a margin of safety. The TMDL is commonly expressed as:

$$TMDL = WLAs + LAs + MOS$$

Where: WLA = waste load allocation
LA = load allocation
MOS = margin of safety

II. Summary

This document sets forth the United States Environmental Protection Agency's (EPA) rationale for approving the TMDLs for polychlorinated biphenyls (PCBs) in the tidal Potomac and Anacostia Rivers and their tidal tributaries. The TMDLs were submitted to EPA by the Interstate Commission on the Potomac River Basin (ICPRB) on behalf of the District of Columbia Department of the Environment, the Maryland Department of the Environment and the Virginia Department of Environmental Quality. A total of twenty eight (28) impaired water body segments in the tidal waters in Maryland, the District of Columbia and Virginia are addressed by this TMDL. The objectives of the PCB TMDLs are 1) to ensure that the fish consumption use is protected in each of the impaired water bodies and 2) to ensure that the Virginia, Maryland and District of Columbia's numerical water quality criteria for PCBs for the protection of public health are achieved in their respective portions of the watershed. The endpoint of the TMDL (the one that requires the most stringent reduction in PCB loads from the significant sources) is the fish tissue concentration of PCBs that does not exceed each State's concentration threshold for issuing a fish consumption advisory. The spatial domain considered for the calculation of the TMDLs is the entire tidal Potomac and Anacostia Rivers and their tidal tributaries, which includes the waters of Maryland, the District of Columbia and Virginia. The TMDL addresses human health concerns relative to the consumption of PCB contaminated fish from the tidal waters that are the subject of this study.

The allocations established in this TMDL were developed to attain and maintain the water quality standards related to PCBs for the tidal Potomac and Anacostia Rivers and their tidal tributaries in Maryland, the District of Columbia and Virginia. Due to 1) the District of Columbia Court of Appeals decision in Friends of the Earth, Inc (FOE) v. EPA that TMDLs must include daily loads, and 2) the fact that for human health criteria for carcinogens, such as PCBs, the risk is directly proportional to the lifetime average concentration exposure (dose), the allocations in this TMDL are expressed as both annual average loads and daily loads.

The following tables summarize the TMDLs for the for 28 listed impaired water body segments in the tidal waters of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia. Table A shows the annual TMDL compared to the baseline (2005) loads for the 28 water quality limited (impaired) segments. Tables B and C show the waste load allocation, load allocation, and margin of safety (MOS) components of the TMDL for the 28 water quality limited segments. Table D shows the waste load allocations for the individual wastewater treatment plants that are affected by the TMDL.

The TMDLs are distributed among: 1) waste load allocations (WLAs) to National Pollutant Discharge Elimination System (NPDES) municipal and industrial point source (PS) discharges, NPDES municipal separate storm sewers (MS4s) and other regulated stormwater (SW), and combined sewer overflows (CSOs) in the District of Columbia (53 overflows) and the City of Alexandria (4 overflows), and 2) load allocations (LAs) to non point sources, tributaries, atmospheric deposition and contaminated sites.

The TMDL includes both an explicit 5% margin of safety as well as an implicit margin of safety to account for any uncertainty in the calculation. The implicit margin of safety results from the conservative assumptions used in estimating loads, and in the process of determining the PCB TMDL.

EPA notes that, for each of the allocation tables, the columns and rows, when added, will not necessarily equal the totals shown on each table. This is due to the fact that each allocation has been rounded to 3 significant digits. As an example, eliminating rounding for the WLAs, LAs and MOS for the Upper Potomac (Table B), the TMDL (right-most column) would be 332.135 and not the 333.0 as shown on Table B. To display numbers with more significant digits than three is to imply a level of accuracy that is not present in the analytical method.

During the review process EPA commented on a minor inconsistency within the document with regards to MOS (Table 4 and 9 of the Final Draft) and requested that the Steering Committee clarify whether an explicit MOS was applied to wastewater treatment plants (WWTPs). The Steering Committee clarified that an explicit MOS was not applied to the WWTPs because there is a qualitative difference in the load estimation methods applied to this specific source category as compared to all other sources. Language in the text and values shown in Table 4 in the final document have been updated to clarify that the explicit MOS was not applied to the WWTP WLA category. EPA concurs with this approach.

Table A Annual Baseline and TMDL PCB loads to each impaired segment

Water Quality Limited Segment	Impairment ref. #[a]	Jurisdiction	Baseline (g/year)	TMDL (g/year)	Reduction
Upper Potomac	1	DC	16700	333	98.0%
Middle Potomac	2	DC	3610	53.7	98.5%
Lower Potomac	3	DC	1880	80.9	95.7%
Upper Anacostia	4	DC	4990	3.74	99.9%
Lower Anacostia	5	DC	2700	4.95	99.8%
Accotink Creek	6	VA	618	49.5	92.0%
Aquia Creek	7	VA	54.3	44.5	18.0%
Belmont Bay	8	VA	41.5	4.84	88.3%
Chopawamsic Creek	9	VA	7.56	5.32	29.6%
Coan River	10	VA	15	6.98	53.5%
Dogue Creek	11	VA	89.2	30.6	65.7%
Fourmile Run	12	VA	193	12.6	93.4%
Gunston Cove	13	VA	43.7	5.62	87.1%
Hooff Run & Hunting Creek	14	VA	480	89.7	81.3%
Little Hunting Creek	15	VA	46.8	15.5	66.9%
Monroe Creek	16	VA	9.35	1.66	82.2%
Neabsco Creek	17	VA	17.4	8.76	49.7%
Occoquan River	18	VA	442	71.1	83.9%
Pohick Creek	19	VA	57.8	22.4	61.2%
Potomac Creek	20	VA	24.1	11.5	52.3%
Potomac River, Fairview Beach	21	VA	11.9	1.50	87.4%
Powells Creek	22	VA	6.57	0.7	89.3%
Quantico Creek	23	VA	22	15.3	30.5%
Upper Machodoc Creek	24	VA	13.9	9.12	34.4%
Tidal Anacostia	25	MD	1970	16.2	99.2%
Potomac River Lower	26	MD	1250	138	89.0%
Potomac River Middle	27	MD	454	56.2	87.6%
Potomac River Upper	28	MD	618	61.7	90.0%
Not Listed waterbodies		ALL	777	350	55.0%
Total all tidal waters[b]		ALL	37143	1510	95.9%

[a] Locations of Water Quality Limited Segments (Impaired Water Bodies) are shown on Figure 1, by reference number.

[b] Not included in this table are changes in the Downstream Boundary with the Chesapeake Bay. There is a net export of PCBs from the Potomac with the Baseline Scenario while there is a net import of PCBs, although at lower concentration with the TMDL scenario (See TMDL Report,Section V(5.2))

Table B Annual TMDL load allocations for each PCB impairment.

All values are expressed to 3 significant digits only. Units are total PCBs in g/year. Does not include PCB flux at Downstream Boundary (see TMDL Report, Section V(5.2)).

			WLA				LA						
Ref #	Impaired Water body	Juris.	WWTP	Reg. Stormwtr	CSO	Total WLA	Trib.	nonpoint source	Atmos. Dep.	Contam. Sites	Total LA	MOS	TMDL
1	Upper Potomac	DC	0	1.46	0.604	2.07	312	0.141	1.33	0	314	16.6	333.0
2	Middle Potomac	DC	0	7.42	3.58	11.0	34.5	0.843	4.61	0.00063	40.0	2.68	53.7
3	Lower Potomac	DC	30.3	5.41	33.2	68.9	0	0.923	8.59	0	9.51	2.53	80.9
4	Upper Anacostia	DC	0	1.76	0.0562	1.81	0	0.262	1.47	0.0014	1.74	0.187	3.74
5	Lower Anacostia	DC	0	0.612	2.18	2.79	0	0.173	2.52	0	1.91	0.247	4.95
6	Accotink Creek	VA	0	0.0992	0	0.0992	46.1	0.084	0.711	0	46.9	2.47	49.5
7	Aquia Creek	VA	1.06	5.28	0	6.34	21	14.2	0.757	0	36.0	2.17	44.5
8	Belmont Bay	VA	0	0.409	0	0.409	0	1.56	2.63	0	4.19	0.242	4.84
9	Chopawamsic Creek	VA	0	1.35	0	1.35	0	3.54	0.16	0	3.70	0.266	5.32
10	Coan River	VA	0	0	0	0	0	6.06	0.573	0	6.63	0.349	6.98
11	Dogue Creek	VA	0	20.2	0	20.2	0	7.28	1.56	0	8.84	1.53	30.6
12	Fourmile Run	VA	3.54	7.50	0	11.0	0	0.218	0.905	0	1.12	0.454	12.6
13	Gunston Cove	VA	0	0.517	0	0.517	0	0.437	2.73	1.65	4.82	0.281	5.62
14	Hooff Run & Hunting Creek	VA	4.77	13.6	18.5	36.8	45.8	0.452	1.56	0.722	48.6	4.25	89.7
15	Little Hunting Creek	VA	0	10.1	0	10.1	0	3.65	0.925	0	4.58	0.774	15.5
16	Monroe Creek	VA	0.177	0	0	0.177	0	1.06	0.352	0	1.41	0.0742	1.66
17	Neabsco Creek	VA	2.94	3.69	0	6.63	0	1.13	0.716	0	1.84	0.291	8.76
18	Occoquan River	VA	0	2.86	0	2.86	51.3	4.2	8.08	1.18	64.7	3.56	71.1
19	Pohick Creek	VA	5.96	7.58	0	13.5	0	6.35	1.74	0	8.08	0.824	22.4
20	Potomac Creek	VA	0	0.556	0	0.556	0	9.47	0.898	0	10.4	0.577	11.5
21	Potomac River, Fairview Beach	VA	0	0.0183	0	0.0183	0	0.668	0.745	0	1.41	0.0752	1.50
22	Powells Creek	VA	0	0.0675	0	0.0675	0	0.177	0.42	0	0.597	0.035	0.70
23	Quantico Creek	VA	0	0.742	0	0.742	11.4	1.94	0.481	0	13.8	0.765	15.3
24	Upper Machodoc Creek	VA	0.0883	0	0	0.0883	0	8.24	0.34	0	8.58	0.452	9.12
25	Tidal Anacostia	MD	0	1.13	0	1.13	13.8	0.0404	0.41	0.00124	14.3	0.812	16.2
26	Potomac River Lower	MD	0.064	1.99	0	2.06	0	44.1	79.5	5.12	129	6.89	138.0
27	Potomac River Middle	MD	7.55	3.04	0	10.6	0	13.4	28.8	1.05	43.2	2.43	56.2
28	Potomac River Upper	MD	0	16.4	0	16.4	0	10.6	31.2	0.467	42.2	3.09	61.7
29	Not Listed water bodies	ALL	11.8	18.2	0	30.0	162	119	21.4	0.0979	303	16.9	350.0
	Total all tidal waters	ALL	68.2	132	58.1	258	699	260	206	10.3	1180	71.8	1510

Table B(continued) Annual TMDL load allocation for Not Listed water bodies.

All values are expressed to 3 significant digits only. Units are total PCBs in g/year. Does not include PCB flux at Downstream Boundary (see TMDL Report, Section V(5.2)).

		WLA				LA						
Water body	Juris.	WWTP	Reg. Stormwtr	CSO	Total WLA	Trib.	nonpoint source	Atmos. Dep.	Contam. Sites	Total LA	MOS	TMDL
St Marys River	MD	0	0	0	0	9.01	12.7	3.6	0	25.3	1.33	26.6
Yeocomico River	VA	0	0	0	0	0	7.78	1.6	0	9.37	0.493	9.9
Lower Machodoc	VA	0	0	0	0	0	1.85	0.704	0	2.55	0.134	2.7
Breton Bay	MD	0.245	0	0	0.245	8.87	7.31	1.3	0	17.5	0.921	18.7
Nomini Bay	VA	0	0	0	0	0	7.52	0.884	0	8.4	0.442	8.8
St. Clements Bay	MD	0	0	0	0	7.05	7.49	1.05	0	15.6	0.821	16.4
Wicomico River	MD	0	0.996	0	0.996	66.7	24.3	3.92	0	94.9	5.05	101.0
Mattox Creek	VA	0	0	0	0	0	3.93	0.233	0	4.16	0.219	4.4
Port Tobacco River	MD	0.538	4.09	0	4.63	0	11.1	0.711	0	11.9	0.842	17.4
Nanjemoy Creek	MD	0	1.38	0	1.38	6.08	14.3	1.1	0	21.4	1.2	24.0
Mattawoman Creek	MD	0.179	2.87	0	3.05	36.7	8.55	2.48	0.0979	47.8	2.67	53.5
Piscataway Creek	MD	10.8	7.7	0	18.5	27.9	6.81	2.39	0	37.1	2.36	58.0
Oxon Run	MD / DC	0	1.09	0	1.09	0	0.232	0.803	0	1.04	0.112	2.2
Hull Creek	VA	0	0	0	0	0	3.03	0.405	0	3.43	0.181	3.6
Rosier Creek	VA	0	0	0	0	0	1.87	0.24	0	2.11	0.111	2.2
Wash. Ship Channel	DC	0	0.0824	0	0.0824	0	0.0934	0.779	0	0.873	0.0503	1.0
Total Not Listed water bodies		11.8	18.2	0	30	162	119	22.2	0.0979	303	16.9	350.0

Table C Maximum Daily TMDL load allocations for each PCB impairment.

All values are expressed to 3 significant digits only. Units are mg/day total PCBs. Does not include PCB flux at Downstream Boundary (see TMDL Report, Section V(5.2)).

			WLA				LA						
Ref #	Impaired Waterbody	Juris.	WWTP	Reg. Stormwtr	CSO	Total WLA	Trib.	nonpoint source	Atmos. Dep.	Contam. Sites	Total LA	MOS	TMDL
1	Upper Potomac	DC	0	197	2.37	199	34200	19.2	3.63	0	34300	1820	36300
2	Middle Potomac	DC	0	1130	1190	2310	4210	126	12.6	0.00173	4350	351	7010
3	Lower Potomac	DC	3090	924	7250	11300	0	153	23.5	0	176	439	11900
4	Upper Anacostia	DC	0	300	26.1	326	0	51.1	4.04	0.00384	55.2	20	401
5	Lower Anacostia	DC	0	125	795	920	0	35.4	4.77	0	40.1	50.5	1010
6	Accotink Creek	VA	0	12.9	0	12.9	5780	11	1.95	0	5790	305	6110
7	Aquia Creek	VA	3.82	642	0	645	3010	1730	2.07	0	4750	284	5680
8	Belmont Bay	VA	0	58.4	0	58.4	0	223	7.22	0	230	15.2	304
9	Chopawamsic Creek	VA	0	143	0	143	0	376	0.439	0	376	27.3	546
10	Coan River	VA	0	0	0	0	0	1050	1.57	0	1050	55.3	1110
11	Dogue Creek	VA	0	2590	0	2590	0	934	4.28	0	938	186	3710
12	Fourmile Run	VA	12.7	1130	0	1140	0	32.8	2.48	0	35.3	61.3	1240
13	Gunston Cove	VA	0	67.3	0	67.3	0	57	7.47	4.53	69	7.18	143
14	Hooff Run & Hunting Creek	VA	17.1	2980	1110	4110	6590	99.4	4.26	1.98	6690	567	11400
15	Little Hunting Creek	VA	0	1300	0	1300	0	469	2.53	0	471	93.2	1860
16	Monroe Creek	VA	0.636	0	0	0.636	0	156	0.964	0	157	8.26	166
17	Neabsco Creek	VA	10.6	510	0	520	0	155	1.96	0	157	35.1	712
18	Occoquan River	VA	0	393	0	393	3180	574	22.1	3.23	3780	220	4390
19	Pohick Creek	VA	21.4	988	0	1010	0	828	4.75	0	832	95.8	1940
20	Potomac Creek	VA	0	93.5	0	93.5	0	1590	2.46	0	1600	89.1	1780
21	Potomac R. Fairview Beach	VA	0	2.76	0	2.76	0	100	2.04	0	102	5.51	110
22	Powells Creek	VA	0	10.3	0	10.3	0	27	1.15	0	28.1	2.02	40.4
23	Quantico Creek	VA	0	113	0	113	1460	297	1.32	0	1750	98.1	1960
24	Upper Machodoc Creek	VA	0.317	0	0	0.317	0	1150	0.931	0	1150	60.5	1210
25	Tidal Anacostia	MD	0	161	0	161	1580	5.78	1.12	0.00338	1590	92.2	1840
26	Potomac River Lower	MD	0.23	254	0	255	0	6420	218	14	6650	363	7270
27	Potomac River Middle	MD	27.1	401	0	428	0	1730	78.9	2.86	1810	116	2350
28	Potomac River Upper	MD	0	2140	0	2140	0	1350	85.4	1.28	1430	188	3760
	Not Listed water bodies	ALL	42.2	2310	0	2360	16500	16800	60.8	0.268	33400	1880	37600
	Total all tidal waters	ALL	3220	19000	10400	32600	76600	36600	564	28.2	114000	7540	154000

Table D Waste Load Allocations for the Wastewater Treatment Plants

Facility	NPDES	Tidal Receiving Waterbody (Ref #)	Flow (MGD)	Baseline [tPCB] (ng/l)	Baseline tPCB Load (g/year)	Design Flow (MGD)	TMDL [tPCB] (ng/l)	TMDL tPCB Load (g/year)	Reduction
Blue Plains	DC0021199	[a] DC Lower Potomac (3)	321.20	1.58	701	370.00	0.059	30.2	95.7%
Indian Head	MD0020052	MD Mattawoman Creek	0.30	0.163	0.068	0.5	0.26	0.18	-164.7%
La Plata	MD0020524	MD Port Tobacco Creek	1.17	0.163	0.264	1.5	0.26	0.539	-104.2%
NSWC-Indian Head	MD0020885	[a] MD Potomac Middle (27)	0.45	3.98	2.47	0.5	0.26	0.18	92.7%
Piscataway	MD0021539	MD Piscataway Creek	21.39	0.0554	1.64	30	0.26	10.8	-558.5%
Mattawoman	MD0021865	[a] MD Potomac Middle (27)	9.49	0.0533	0.699	20	0.26	7.18	-927.2%
Leonardtown	MD0024767	MD Breton Bay	0.43	0.376	0.224	0.68	0.26	0.244	-8.9%
NSWC-Dahlgren	VA0021067	[a] MD Potomac Lower (26)	0.28	0.0565	0.0221	0.72	0.064	0.064	-189.6%
Dale City #8	VA0024678	[a] VA Neabsco Creek (17)	2.96	0.0217	0.0887	4.6	0.064	0.407	-358.9%
Dale City #1	VA0024724	[a] VA Neabsco Creek (17)	3.05	0.0446	0.1879	4.6	0.064	0.407	-116.6%
H.L. Mooney	VA0025101	[a] VA Neabsco Creek (17)	12.25	0.107	1.8108	24	0.064	2.12	-17.1%
Arlington	VA0025143	[a] VA Four Mile Run (12)	26.38	0.462	16.8	40	0.064	3.54	78.9%
Alexandria	VA0025160	[a] VA Hooff/Hunting Creek (14)	37.37	0.323	16.7	54	0.064	4.77	71.4%
Noman M. Cole Jr.	VA0025364	[a] VA Gunston Cove (13)	42.11	0.291	16.9	67	0.064	5.92	65.0%
Colonial Beach	VA0026409	VA Mattox Creek	0.83	2.57	2.95	2	0.064	0.177	94.0%
Dahlgren Sanitary Dist.	VA0026514	[a] VA Up Machodoc Creek (24)	0.24	0.359	0.118	1	0.064	0.088	25.4%
Quantico-Mainside	VA0028363	[a] MD Potomac Middle (27)	1.20	0.0674	0.112	2.2	0.064	0.195	-74.1%
Aquia	VA0060968	[a] VA Aquia Creek (7)	4.86	0.0312	0.21	12	0.064	1.06	-404.8%
TOTAL all WWTPs					762.3			68.2	91.1%
These WWTPS are located within tributaries and are not part of the WLA for the TMDL. These calculations are provided for reference only.									
Beltsville USDA East	MD0020842	[a] MD Tidal Anacostia (25)	0.2	0.163	0.045	0.62	0.26	0.223	-395.6%
Beltsville USDA West	MD0020851	[a] MD Tidal Anacostia (25)	0.09	0.163	0.02	0.2	0.26	0.072	-260.0%
UOSA	VA0024988	[a] VA Occoquan River (18)	28.94	0.00217	0.0868	64	0.064	5.66	-6420.7%
The following WWTP was not included in this TMDL study because its current design flow is below the 0.1 MGD minimum that MDE used to determine which facilities to include in the loading model. There are plans, however, to expand this WWTP 0.6 MGD in the future. When that expansion is complete, then the facility will get a WLA of 0.216 g/year, based on the default PCB concentration for MD WWTPs of 0.26 ng/l and design flow of 0.6 MGD.									
Swan Point	MD0057525	[a] MD Potomac Lower (26)	0.067			0.6	0.26	0.216	

[a] The tidal receiving waterbody is currently listed on the Sec.303(d) list as impaired and the number in brackets corresponds to the water body reference number in tables A, B and C.

III. Background

The District of Columbia has listed as impaired due to PCBs, in five defined segments, all of the tidal Anacostia and Potomac Rivers within District borders. These impaired water body segments are designated for Class D (protection of human health related to the consumption of fish and shellfish) beneficial use, which is not supported due to elevated levels of PCBs in fish tissue. These impaired water body segments were initially listed on DC's 303(d) lists in 1996 and 1998 (DC DOH 2006). A PCB TMDL was established for the tidal Anacostia River by the District of Columbia in 2003. The TMDLs developed in the September 28, 2007 TMDL submittal will replace the 2003 tidal Anacostia River PCB TMDL.

The Commonwealth of Virginia has listed in the 2006 305(b)/303(d) Integrated Report 19 tidal embayments of the Potomac River as impaired due to PCBs. These impaired water body segments are designated for the beneficial uses of primary contact recreation, fish consumption, shellfish consumption (from Upper Machodoc Creek to the Potomac mouth), and the aquatic life use (VA DEQ 2006a). The fish consumption use is not supported due to elevated levels of PCBs in fish tissue (VA DEQ 2006b).

The State of Maryland has listed the Potomac River Lower Tidal (basin number 02140101), Potomac River Middle Tidal (basin number 02140102), and Potomac River Upper Tidal (basin number 02140201) and as impaired due to elevated levels of PCBs in fish tissue in 2002. The waters of the tidal Anacostia River watershed were placed on the State's Tidal Potomac PCB TMDL 303(d) List as impaired by toxics (PCBs in fish tissue) in 2006. These waters are designated Use II: Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting (COMAR 2007a, b).

In 2000, a consent decree was entered into by the EPA and the U.S. District Court (Kingman Park Civic Association, et al. v. U.S. Environmental Protection Agency, et al, No. 1:98CV00758 (D.D.C.)) that requires the District of Columbia to complete a PCB TMDL for among others, the Potomac River, by September 30, 2007. Maryland and Virginia were required to complete their PCB TMDLs by a later date. Following discussions in 2004 between the District of Columbia, the State of Maryland, the Commonwealth of Virginia, the Interstate Commission on the Potomac River Basin and the EPA, it was agreed that the most logical approach would be to complete a watershed-based PCB TMDL for the entire tidal Potomac River and tidal Anacostia River watershed. The result was a coordinated effort between those parties to develop a PCB TMDL that addresses all of the tidal Potomac River and tidal Anacostia River PCB impairments by the District's September 30, 2007 Court deadline. A tidal watershed-based TMDL was desirable because the impaired water bodies in the three jurisdictions are in such close proximity to each other that flows and loads cross state lines in each direction. Furthermore, a single, joint TMDL would be more cost effective, and the jurisdictions would avoid confusing the public with three independent TMDLs completed on different dates using potentially different models and assumptions, and possibly reaching different conclusions, particularly with respect to PCB loads crossing state lines. It was also expected that cooperation in developing the joint TMDLs would assist in the implementation of the final TMDLs.

The agreement to coordinate the tidal Potomac PCB TMDL led to the creation of a PCB TMDL Steering Committee representing the District of Columbia Department of the Environment (DDOE), the Maryland Department of the Environment (MDE), the Virginia Department of

Environmental Quality (VADEQ), the U.S. Environmental Protection Agency (US EPA), the Interstate Commission on the Potomac River Basin (ICPRB), and the Metropolitan Washington Council of Governments (MWCOG). LimnoTech, through Battelle, Inc., under contract to the EPA, was brought on board as an expert consultant to the Steering Committee to develop the Potomac PCB model and to run the model to evaluate various TMDL scenarios. The Steering Committee is the body through which the jurisdictions resolved issues, reviewed data and model results, and guided the TMDL to completion. The ICPRB was charged with coordinating the activities of the Steering Committee, managing monitoring contracts, collecting and analyzing data, and writing the TMDL document. The ICPRB, on behalf of DC, Maryland and Virginia submitted the TMDLs to EPA.

The Potomac River estuary extends for 117 miles (188 km) from its mouth at Pt. Lookout on the Maryland side and Smith Point on the Virginia side, to its head-of-tide located approximately 0.4 miles (0.64 km) upstream of Chain Bridge in the District of Columbia. In this document, "Potomac River at Chain Bridge," or simply "Chain Bridge," is used to indicate the Potomac River estuary head-of-tide. The surface area of all tidal waters, including Potomac River embayments and the tidal Anacostia River, is about 434 mi2 (1,125 km2). The land area of the lower Potomac River basin, where small rivers, streams, and runoff drain into tidal waters, is 2,537 mi2 (6,572 km2), or approximately 1/6 of the entire basin area (Lippson et al. 1979).
The lower Potomac River basin straddles the fall-line separating the Piedmont and Coastal Plain provinces of the North American East Coast. There are roughly two dozen soil groups represented in the lower basin, with each group comprised of two to three specific soil types. Generally, the nature of the soil is dependent on the underlying geologic material from which it is derived, the processes which have reworked the soil, and the soil's environment. The soils in the Piedmont Province are derived from crystalline rocks, and are on mostly hilly terrain with a dense dendritic stream network. The sediments of the Coastal Plain Province are formed from previous sea level sands, are on flat terrain, and have been reworked by the meandering streams from the west. The nature of the soils also varies roughly from east to west approaching the ocean as the depth to water generally decreases. (Braun et al. 2001, USDA 1994a,b).
The population of the entire Potomac basin is 5.8 million (US EPA 2006), with approximately 4.4 million living in metropolitan Washington, D.C., an area that straddles the lower and upper portions of the basin. Land cover in the lower basin is 30% developed, 15% agricultural, and 55% forested (CBP 2002), however the distribution of these land covers is not even. Figure 2 shows that urban development and population are concentrated around the upper end of the estuary. Developed land in the individual watersheds of the lower basin ranges from greater than 95% to less than 10%.

The sources of PCBs contributing loads to the tidal Potomac River and tidal Anacostia River watershed are numerous and include wastewater treatment plants (WWTPs), combined sewer overflows, municipal separate stormwater systems (MS4), non point source runoff, contaminated sites, atmospheric deposition to the water surface, tributaries to the tidal waters, the upstream boundary (Potomac River at Chain Bridge) and the downstream boundary with the Chesapeake Bay under certain reduced external PCB loading conditions. Of the more than 60 permitted municipal and industrial wastewater treatment plants (WWTPs) in the study area, the 22 WWTPs with the largest flows account for approximately 95% of the total WWTP flow.

Two areas, approximately 1/3 of the District of Columbia and a smaller area in Alexandria, VA, are served by a combined storm and sanitary sewer system. During high precipitation events, when storm water exceeds wastewater treatment plant capacity, the excess flow is diverted to nearby systems (the Anacostia and Potomac rivers, Rock Creek, and Four Mile Run). There are 53 combined sewer overflow (CSOs) outfalls in the District of Columbia and four CSOs in Alexandria.

Twenty one contaminated sites within the study area were identified as possible sources of PCBs by the three state environmental agencies. Of these, 13 sites are located in direct drainage watersheds and eight sites are located within tributary watersheds.

There are over 30 municipal and county level MS4 permits covering the District of Columbia, Maryland and Virginia that are considered to be sources of PCBs that will be impacted by this TMDL.

IV. The PCB TMDL Model for the Potomac River Estuary

As described by LimnoTech (2007), the overall conceptual approach followed for modeling of PCBs in the tidal Potomac River and tidal Anacostia River watershed was an integrated modeling framework that includes hydrodynamics, salinity, sorbent dynamics and PCB transport and fate. The underlying premise is that the transport and fate of toxic chemicals, especially hydrophobic organic chemicals (HOCs) like PCBs, are strongly influenced by sorption to organic carbon and interactions between the water column and sediments. In this framework, separate balances are conducted in series for water, salinity, sorbents (as organic carbon) and PCBs.

Hydrodynamics was implemented for the tidal Potomac and Anacostia rivers using a 1D branched version of DYNHYD5 (Ambrose et al. 1993a) coupled to a modified version of WASP5/TOXI5 (Ambrose et al. 1993b). This implementation closely followed the successful model implementation used for transport and fate of penta-PCBs in the Delaware River Estuary. Results from the Delaware modeling effort were judged acceptable by an expert panel of independent scientists and modeling practitioners, and the model was used to develop a Stage 1 TMDL for PCBs that was established by EPA Regions 2 and 3. Complete results for the Delaware hydrodynamic and salinity models are presented in Delaware River Basin Commission (DRBC) (2003a). Complete results for the organic carbon sorbents and PCB models are presented in DRBC (2003b, 2003c) and summarized in Bierman et al. (2004a, 2004b, 2005).

The water quality model is two dimensional in the horizontal direction and includes 257 discrete spatial segments that encompass the tidal Potomac and Anacostia rivers, their tidal tributaries, and numerous embayments. The model spatial grid includes separate representation of the main channel (Maryland waters), the DC portion of the main channel, and various embayments, tributaries and coves in both Virginia (VA) and Maryland (MD) waters. This detailed spatial representation was required because there are different water quality standards for PCBs in each of these three jurisdictions.

Hydrodynamic and salinity calibrations were conducted for 1996-1997 and 2002-2005. Sorbent and PCB calibrations were conducted for 2002-2005. Sensitivity analyses, diagnostic simulations, mass balance components analysis and an assessment of model calibration results have been performed. The PCB TMDL Steering Committee judged that the model was scientifically credible and acceptable for use in developing the PCB TMDL. EPA also finds that the model is scientifically credible and appropriate for use in developing the PCB TMDL.

V. Discussions of Regulatory Requirements

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA policy and guidance. Based on this review, EPA determined that the following seven regulatory requirements have been met:

1. The TMDLs are designed to implement the applicable water quality standards,

2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations,

3. The TMDLs consider the impacts of background pollutant contributions,

4. The TMDLs consider critical environmental conditions,

5. The TMDLs consider seasonal environmental variations,

6. The TMDLs include a margin of safety,

7. The TMDLs have been subject to public participation.

In addition, EPA considered whether there was reasonable assurance that the Load Allocations for the nonpoint sources in the TMDLs would be met.

VI. Implementation

Neither the Clean Water Act nor the EPA implementing regulations, guidance or policy requires a TMDL to include an implementation plan. EPA therefore does not approve or disapprove implementation plans as part of the TMDL process. EPA offers the following summary of the submitted implementation strategy to acknowledge the important task ahead and for informational purposes.

Several activities are taking place or are planned that will begin the tidal Potomac River and tidal Anacostia River watershed PCB TMDL implementation process. These activities were described in the TMDL report and are summarized here. Further, the District of Columbia, Maryland, Virginia and the ICPRB understand the importance of coordinating the implementation activities for the watershed and intend to work together in that regard.

The states have recognized that progress toward achieving the PCB loading capacity allocations described in the TMDL report will clearly require significant reductions from atmospheric, nonpoint, and point sources of PCBs to the estuary, with an emphasis on those sources with the greatest relative impact on use impairments. The states have further agreed that pursuing an adaptive implementation approach is an appropriate course to follow in implementing the Potomac PCB TMDL, due to the uncertainty associated with the TMDL loading capacity and specific allocation scheme. As described in Wong (2006), adaptive implementation is an iterative implementation process that makes progress toward achieving water quality goals while using new data and information to reduce uncertainty and adjust implementation activities. The focus of this approach is oriented towards increasingly efficient management and restoration and is not generally anticipated to lead to a re-opening of the TMDL, but the TMDL and allocation scenarios can be changed if warranted by new data and information.

Therefore, the states intend to pursue implementation strategies that focus on additional data collection concurrently with activities to reduce PCB loadings. New data and information will be used to steer control strategies aimed to mitigate PCB loadings into the estuary and to better understand and characterize PCB loadings from key sources such as the Chain Bridge boundary, significant tributary contributions, atmospheric deposition as well as point sources.

It should also be noted that the Commonwealth of Virginia has the requirement, specified in the Code of Virginia, Section 62.1-44.19.7. Virginia's 1997 Water Quality Monitoring, Information and Restoration Act, that an implementation plan be developed for each TMDL. The Act requires that the implementation plan include the date of expected achievement of water quality objectives, measurable goals, corrective actions necessary and the associated costs, benefits and environmental impacts of addressing the impairments as well as a description of potential funding sources.

A. Implementation of Waste Load Allocations

Following the approval of the TMDL for the tidal Anacostia and Potomac River estuary, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued or modified after the TMDL approval date must be consistent with the WLAs (CFR 2007b).

The states intend to use non-numeric WQBELs in NPDES permits when they are reissued as being consistent with the WLA provisions of the TMDL. This approach will also include additional data collection from selected NPDES permitted facilities to better characterize PCB discharges. Where warranted, non-numeric, BMPs will be implemented. These BMPs are intended to focus on PCB source tracking and elimination at the source, rather than end-of-pipe controls.

The states have agreed that non-storm water permits that are issued, reissued, or modified after the TMDL approval date should incorporate specific provisions for additional data collection. Permits for non-storm water discharges identified as possible significant PCB sources should include the following provisions when reissued or renewed:

- If not already available, congener specific data should be collected using the most current version of EPA Method 1668 (currently, Method 1668, Revision A), or other equivalent methods capable of providing low-detection level, congener specific results, or other methods appropriate under the circumstances which are approved in advance by the permitting authority.
- The frequency of testing, quality control requirements, and specific test conditions such as flow conditions shall be prescribed in the permit.
- Conditions or criteria warranting implementation of BMPs to locate sources of PCBs should be included in the permit.

Regulated stormwater permits and permits for CSO systems also may incorporate BMP based controls as described above. More details of state specific provisions are described in Section VII, "TMDL Implementation and Reasonable Assurance", of the TMDL Report.

B. Implementation of Load Allocations(LAs)

The states will use existing programs and authorities to implement the LA provisions of the TMDL. Nonpoint sources will initially be addressed through the implementation of the existing TMDLs for sediments and nutrients throughout the Potomac watershed. Since PCB concentrations in the water column are linked to TSS concentrations, a reduction in the sediment loads entering the tidal Anacostia and Potomac watersheds are expected to result in lower PCBs concentrations. Also, implementation of BMPs intended to reduce nutrient runoff will contribute to PCBs runoff reductions. Specifically, state efforts relative to the Chesapeake Bay nutrient and sediment tributary strategies will be the initial focus of the PCB non-point source load reduction effort. Reductions in sediment from construction sites and development areas will also be of benefit for reducing PCBs. This will be supplemented by additional monitoring and assessment activities to identify PCB hot spots that may require additional remedial activities.

State specific details of the implementation of the LA provisions of the TMDL are described in Section VII, "TMDL Implementation and Reasonable Assurance", of the TMDL Report.

C. Priorities for data collection

The PCB TMDL Steering Committee, in the TMDL Report, also recommended that the states, along with the ICPRB and the EPA Region III, work together to achieve the following objectives in order to effectively pursue the adaptive implementation approach for the Potomac estuary:

- develop and implement a monitoring strategy to fill key data gaps;
- craft and implement PCB load reduction strategies; and
- develop and implement programs to monitor and report progress toward achieving both PCB load reduction and water quality goals.

Priorities for data collection to better refine PCB loading estimates to the estuary from PCB sources not governed under the NPDES permitting program, and those sources that are outside of the study area (i.e., LA) include, in priority order:

1. Chain Bridge
2. Atmospheric deposition and exchange
3. Other tributaries and direct drainage
4. Downstream boundary with the Chesapeake Bay

The uncertainty associated with the Baseline PCB loadings from these sources warrants additional data collection to enhance the current understanding of PCB loadings and to help characterize the potential source(s) of the PCBs.

Decision Rationale
Total Maximum Daily Loads
For Polychlorinated Biphenyls (PCBs)
Tidal Potomac & Anacostia River Watershed
in the District of Columbia, Maryland and Virginia

I. Introduction

The Clean Water Act (CWA) requires that Total Maximum Daily Loads (TMDLs) be developed for those water bodies that will not attain water quality standards after application of technology-based and other required controls. A TMDL sets the quantity of a pollutant that may be introduced into a water body without causing a violation of the applicable water quality standard. EPA's regulations define a TMDL as the sum of the waste load allocations (WLAs) assigned to point sources, the load allocations (LAs) assigned to nonpoint sources and natural background, and a margin of safety.

A TMDL is a written plan and analysis established to ensure that a water body will attain and maintain water quality standards. A TMDL is a scientifically-based strategy which considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a margin of safety. TMDLs may be revised in order to address new water quality data, better understanding of natural processes, refined modeling assumptions or analysis and/or reallocation.

This document sets forth the United States Environmental Protection Agency's (EPA) rationale for approving the TMDLs for polychlorinated biphenyls (PCBs) in the tidal Potomac River and tidal Anacostia River and their tidal tributaries in the District of Columbia (DC or the District), Maryland, and Virginia. These TMDLs were established by DC, Maryland and Virginia to address impairment of water quality as identified in the District of Columbia's 1998 Section 303(d) list of impaired waters, Virginia's 2006 Section 303(d) list of impaired waters and Maryland's 2006 Section 303(d) list of impaired waters.

The Interstate Commission on the Potomac River Basin (ICPRB) on behalf of the District of Columbia Department of the Environment and the Maryland Department of the Environment submitted the PCB TMDL report and supporting documentation to EPA for final review by letter dated September 27, 2007. The ICPRB transmittal also included individual TMDL transmittal letters from the District of Columbia Department of the Environment (dated September 24, 2007) and the Maryland Department of the Environment (dated September 28, 2007). It was noted in the transmittal letter that the Virginia Department of Environmental Quality (VADEQ) also participated in the development of the TMDL and have requested that the Virginia Water Control Board at its next meeting on October 25, 2007 approve the submittal of this TMDL to EPA. The Virginia Water Control Board, did in fact, approve the submittal of the TMDL to EPA and the VADEQ officially transmitted (by fax) their concurrence with the Virginia portion of the TMDL to EPA by letter dated October 25, 2007.

The report (TMDL Report) entitled *Total Maximum Daily Loads of Polychlorinated Biphenyls (PCBs) for Tidal Portions of the Potomac & Anacostia Rivers in the District of Columbia, Maryland and Virginia*, dated September, 2007 was received by EPA Region 3 on September 28, 2007. Minor edits to the TMDL Report were provided to EPA on October 23, 2007 and October 29, 2007. The TMDL Report includes five technical appendices (A through E), and uses as its technical basis the report entitled *PCB TMDL Model for the Potomac River Estuary*, prepared by LimnoTech, dated September 28, 2007.

The TMDL report as submitted by the ICPRB on behalf of the District of Columbia Department of the Environment, the Maryland Department of the Environment and the Virginia Department of Environmental Quality establishes TMDLs for PCBs that: 1) ensure that the fish consumption use is protected in each of the impaired water bodies and 2) ensure that the Virginia, Maryland and District of Columbia's numerical water quality criteria for PCBs for the protection of public health are achieved in their respective portions of the watershed.

Based on this review, EPA determined that the following seven regulatory requirements have been met:

1. The TMDLs are designed to implement the applicable water quality standards,

2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations,

3. The TMDLs consider the impacts of background pollutant contributions,

4. The TMDLs consider critical environmental conditions,

5. The TMDLs consider seasonal environmental variations,

6. The TMDLs include a margin of safety,

7. The TMDLs have been subject to public participation.

In addition, EPA considered whether there was reasonable assurance that the Load Allocations for the nonpoint sources in the TMDLs would be met.

II. Impairments Identified by the District, Maryland and Virginia

The District of Columbia has listed as impaired, in five defined segments, all of the tidal Anacostia and Potomac Rivers within District borders. These impaired water body segments are designated for Class D (protection of human health related to the consumption of fish and shellfish) beneficial use, which is not supported due to elevated levels of PCBs in fish tissue. These impaired water body segments were initially listed on DC's 303(d) lists in 1996 and 1998 (DC DOH 2006). A PCB TMDL was established for the tidal Anacostia River by the District of Columbia in 2003. The TMDLs developed in the September 28, 2007 TMDL submittal will replace the 2003 tidal Anacostia River PCB TMDL.

The Commonwealth of Virginia has listed in the 2006 305(b)/303(d) Integrated Report 19 tidal embayments of the Potomac River as impaired due to PCBs. These impaired water body segments are designated for the beneficial uses of primary contact recreation, fish consumption, shellfish consumption (from Upper Machodoc Creek to the Potomac mouth), and the aquatic life use (VA DEQ 2006a). The fish consumption use is not supported due to elevated levels of PCBs in fish tissue (VA DEQ 2006b).

The State of Maryland has listed the Potomac River Lower Tidal (basin number 02140101), Potomac River Middle Tidal (basin number 02140102), and Potomac River Upper Tidal (basin number 02140201) and as impaired due to elevated levels of PCBs in fish tissue in 2002. The waters of the tidal Anacostia River watershed were placed on the State's Tidal Potomac PCB TMDL 303(d) List as impaired by toxics (PCBs in fish tissue) in 2006. These waters are designated Use II: Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting (COMAR 2007a, b).

Table 1 lists the PCB impaired water bodies in the study area, which are the focus of the TMDL. Figure 1 is a map showing these PCB impaired water bodies. The numbers shown on Figure 1 correspond to the impaired water body numbers in Table 1.

EPA agrees that the impairments identified by the District, Maryland and Virginia on their respective section 303(d) lists of impaired waters are related to the fish consumption use. EPA finds that these TMDLs designed to restore and maintain the fish consumption uses in the respective state waters are in accordance with the Clean Water Act's Section 303(d) requirements to resolve the listed impairment and achieve the applicable water quality standards. EPA also agrees that the TMDLs, once implemented, will profoundly improve the levels of PCBs in fish of the tidal Potomac and Anacostia Rivers and their tidal tributaries. The TMDL is designed to improve the fish tissue levels of PCBs so that the fish consumption advisories for the impaired water bodies can be eliminated (i.e. so that humans can safely consume fish from the tidal Potomac and Anacostia Rivers and their tidal tributaries). EPA agrees with the recommendation of the PCB TMDL Steering Committee that the states, along with the ICPRB and the EPA Region III, continue to work together to achieve the following objectives in order to effectively pursue the adaptive implementation approach for the Potomac estuary:

- develop and implement a monitoring strategy to fill key data gaps;
- craft and implement PCB load reduction strategies; and
- develop and implement programs to monitor and report progress toward achieving both PCB load reduction and water quality goals.

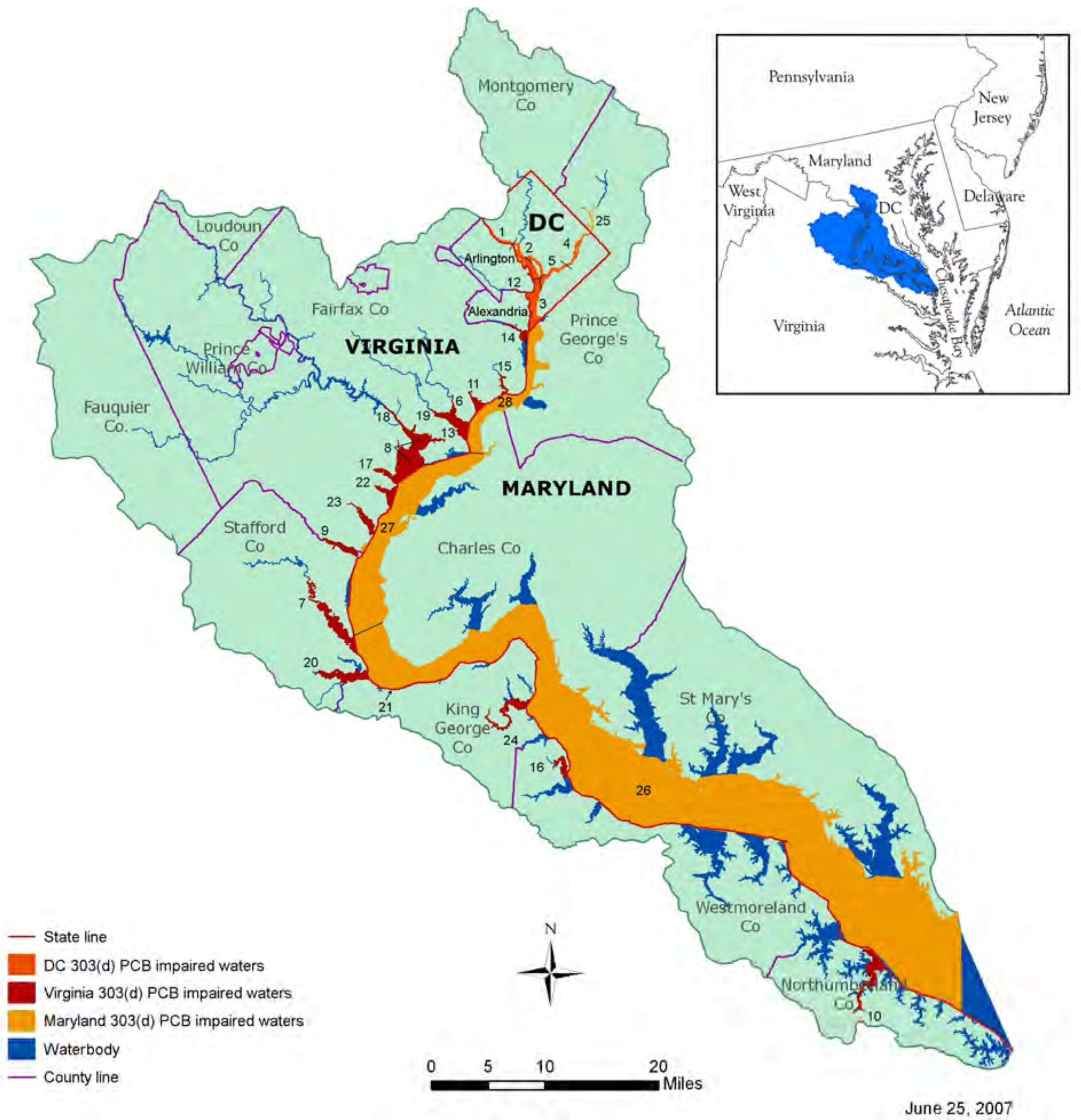
TMDLs are established at a level necessary to attain and maintain existing applicable water quality standards. Water quality standards consist of (1) designated uses, (2) both narrative and numerical criteria and (3) an antidegradation policy. The objective of the PCB TMDL established in the TMDL Report is to ensure that the "fish consumption" use is protected in each of the impaired water bodies. This is done by identifying maximum allowable loads of PCBs that would a) meet the numerical PCB water quality criteria in each state's Water Quality Standards and b) lead to fish tissue PCB concentrations that do not exceed state fish consumption advisory thresholds.

Table 1. PCB Impaired Waterbodies in the tidal Potomac and Anacostia Rivers

	Impaired Waterbody	Jurisdiction	Description
1	Upper Potomac	DC	Potomac River, Chain Bridge to Key Bridge
2	Middle Potomac	DC	Potomac River, Key Bridge to Hains Point
3	Lower Potomac	DC	Potomac River, Hains Point to Wilson Bridge (DC/MD border)
4	Upper Anacostia	DC	Anacostia River, DC/MD border to Pennsylvania Ave. bridge
5	Lower Anacostia	DC	Anacostia River, Pennsyl. Ave. bridge to Potomac River
6	Accotink Bay	VA	In each Virginia embayment, the impairment generally includes all tidal waters within the embayment, from head-of-tide to the Potomac river mainstem. The Potomac River, Fairview Beach, impairment is an area on the mainstem off the beach. See the Virginia 2006 Integrated Assessment report for specific descriptions of the geographic extent of each impairment.
7	Aquia Creek	VA	
8	Belmont Bay/ Occoquan Bay	VA	
9	Chopawamsic Creek	VA	
10	Coan River	VA	
11	Dogue Creek	VA	
12	Fourmile Run	VA	
13	Gunston Cove	VA	
14	Hooff Run & Hunting Creek	VA	
15	Little Hunting Creek	VA	
16	Monroe Creek	VA	
17	Neabsco Creek	VA	
18	Occoquan River	VA	
19	Pohick Creek/Pohick Bay	VA	
20	Potomac Creek	VA	
21	Potomac River, Fairview Beach	VA	
22	Powells Creek	VA	
23	Quantico Creek	VA	
24	Upper Machodoc Creek	VA	
25	* Tidal Anacostia	MD	Tidal Anacostia River, from head-of-tide on NE and NW Branches of the Anacostia to the DC/MD border
26	* Potomac River Lower	MD	Mouth of the Potomac to Smith Point, Charles County
27	*Potomac River Middle	MD	Smith Point to Pomonkey Point, Charles County
28	* Potomac River Upper	MD	Pomonkey Point, to DC/MD line at Wilson Bridge

*Maryland impaired waterbodies are listed by 8 digit watershed Hydrologic Unit Code (HUC). The HUC codes for these impairments are 02140101 (Potomac River Lower), 02140102 (Potomac River Middle), 02140201 (Potomac River Upper), and 02140205 (Anacostia River). For the Potomac River watersheds, only the tidal waters are listed as impaired by PCBs. For the Anacostia River watershed, tidal and nontidal impairments are listed separately. This TMDL study does not address the non-tidal PCB impairment in the Anacostia watershed. By default the Maryland-side Potomac embayments that are within each listed 8-digit watershed are part of the impairment listing. Some of the larger Maryland embayments are parts of different 8-digit watersheds and are not listed as impaired by PCBs. These include: St. Mary's River, Breton Bay, St. Clements Bay, Wicomico River, Port Tobacco River, Nanjemoy Creek, Mattawoman Creek, and Piscataway Creek.

Figure 1. PCB Impaired Waterbodies in the tidal Potomac River Basin



Note: Numbers on map correspond to the impaired waterbody numbers in Table 1.

All three jurisdictions have numerical water quality criteria for total PCBs and, in addition, have established fish tissue concentration thresholds that, when exceeded, may result in fish consumption advisories and 303(d) listings. Fish consumption advisories are health warnings issued to inform the public about the risks of consuming fish contaminated with toxics. These are shown in Table 2 below.

Table 2 State Water Quality Criteria & Fish Tissue Thresholds

	Fish Tissue Impairment Threshold(ppb)	PCB Water Quality Criteria (ng/l)
District of Columbia	20	0.064
Maryland	88	0.64
Virginia	54[1]	1.70

[1] The Virginia Department of Health uses 50 ppb as the fish tissue threshold for establishing consumption advisories

As discussed below, the criteria used as the endpoints for the PCB TMDLs are the fish tissue concentration thresholds that, when exceeded, may result in fish consumption advisories and 303(d) listings. It should be noted that the PCB TMDL Model does not provide a projection of fish tissue PCB concentration, but rather provides a projection of both water column and sediment PCB concentration in response to specified external loads, river flow and ambient water quality conditions. Model results are related to fish tissue concentration through the use of bioaccumulation factors (BAFs). The use of BAFs along with detailed guidance on their use is recommended by EPA in *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA, October 2000).*

BAF is defined as the ratio (in L/kg-tissue) of the concentration of a substance in tissue to its concentration in the ambient water, in situations where both the organism and its food are exposed. The BAF is calculated as:

$$BAF = Ct / Cw$$

where:

Ct = Concentration of the chemical in the specified wet tissue
Cw = Concentration of chemical in water

An alternative approach is the use of a biota-sediment accumulation factor (BSAF) which is conceptually similar to a BAF, except that a BSAF references the biota concentration to the sediment concentration. Both water column accumulation factors (BAFs) and sediment accumulation factors (BSAFs) were developed from field data for fish tissue (2000-2005), water column (2002-2006) and surface sediment PCB concentration (2000-2005) collected from the tidal Potomac River and its tidal tributaries. BAFs and BSAFs were calculated for 24 fish species from the tidal Potomac River watershed. The single target fish species was selected by each state that had the highest BAF and BSAF (excluding striped bass which, because they are migratory, are not representative of PCB conditions solely in the Potomac). Virginia selected gizzard shad, as their target species. Although gizzard shad is not typically consumed by most people, it is specifically mentioned in their impairment listing and was therefore selected. Although gizzard shad have the highest water BAF, there are no samples collected in MD or DC. Therefore those two jurisdictions selected channel catfish. Channel catfish also have the highest SBAF so all three jurisdictions selected that species for calculating the sediment PCB target. The use of this target species approach ensures that if the target species PCB tissue levels meet fish consumption criteria, all other species will have lower PCB levels and also meet consumption criteria.

With the target species BAF and BSAF along with each State's fish tissue impairment thresholds, a *target PCB water column* and *target sediment concentration* can be calculated. The *target water column* and *target sediment concentration* of PCBs is the concentration that produces the fish tissue impairment threshold concentration above which a fish consumption advisory may be issued. Therefore achieving the *target PCB water column* and *target sediment concentration* will result in achievement of the fish consumption use. The results of those calculations are shown below in Table 3.

Table 3 Water Column and Sediment Target Concentrations Compared to State Water Quality Criteria

	Fish Tissue PCB Impairment Threshold (ppb)	PCB Water Quality Criteria (ng/l)	BAF-based Target PCB Water Concentration (ng/l)	BSAF-based Target PCB Sediment Concentration (ng/g dry wt.)
DC	20	0.064	0.059	2.8
Maryland	88	0.64	0.26	12.0
Virginia	54	1.70	0.064	7.6

It is immediately clear that based on the BAF calculation, the State numerical water quality criteria for PCBs is not fully protective of the fish consumption use, particularly for Maryland and Virginia. The District's water quality criteria and *BAF-based target water concentration* differ by only 0.005 ng/l and therefore can be considered approximately the same value. Additional evidence of this for the three states is provided in Figures 7a, b and c and the accompanying discussion on pages 12-15 of the TMDL Report.

The development of the District of Columbia and Maryland's current water quality criteria for PCBs is based on EPA's *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (EPA, October 2000). Virginia's criterion is based on EPA's previous human health methodology document published in 1980. One of the significant revisions in the 2000 methodology is the use of BAFs in the calculation of a criterion, which takes into consideration the uptake and retention of a chemical by an aquatic organism from all surrounding media, rather than a bioconcentration factor (BCF) which refers to the uptake and retention from water only. Absent national BAFs or the preferred site-specific BAF, EPA allows the continued use of the BCFs or field-measured BAFs previously developed using the 1980 methodology. All of the current criteria represented in Table 3 were developed using the EPA recommended BCF for PCBs.

EPA's 2000 methodology provides defaults for all parameters of the equations for calculating human health criteria, but allows for state flexibility depending state-specific considerations or site-specific conditions. Other factors contributing to the differences between the states' current water quality criteria and the BAF-based target water concentration could be based on each state's choice of cancer risk level, fish consumption rate, drinking water consumption rate, exposure duration, and preparation and cooking loss factors used in the criteria calculation.

The use of the PCB TMDL Model along with the *target water column* and *target sediment concentration* of PCBs has shown that achievement of the *target water column concentration* of PCBs also ensures achievement of the *target sediment concentration* of PCBs. Therefore the *target water column concentration* of PCBs, which ensures the appropriate fish tissue PCB levels for consumption are achieved, is the endpoint used for the PCB TMDL.

Because the states have identified PCB impaired water uses (i.e. fish consumption) that cannot be adequately protected or maintained by using the respective state PCB numeric criteria, EPA finds it appropriate that the District, Maryland and Virginia have used their respective fish tissue threshold criteria as the endpoint to use in determining the PCB TMDLs. This endpoint is appropriately related to water column PCB concentration through the use of BAFs and the establishment of the BAF-based *target PCB water column concentration*. Achievement of this endpoint will result in achievement of the fish consumption use as well as state numerical water quality criteria for PCBs. It should be noted, however, that there is a lot of variability (approximately an order of magnitude between the 5%ile and 95%ile of the calculated BAF, by species) in the calculated BAFs for the indicator species used (gizzard shad and channel catfish) to establish the BAF-based *target PCB water column concentration*. EPA therefore recommends that as part of the states' adaptive implementation approach, additional data should be collected and analyzed to refine and/or confirm the indicator species BAFs, as well as to confirm the most appropriate species to use.

III. Allocation Summary

TMDLs are established at a level necessary to attain and maintain existing applicable water quality standards. Water quality standards consist of (1) designated uses, (2) both narrative and numerical criteria and (3) an antidegradation policy. For the tidal Potomac and Anacostia Rivers and their tidal tributaries, the TMDL must be designed to address the use impairment due to PCBs in fish tissue (fish consumption use) as well as achieve the applicable numeric criteria. As discussed in the previous section, the use of BAFs and the establishment of the BAF-based *target PCB water column concentration* will result in achievement of the fish consumption use as well as state numerical water quality criteria for PCBs.

The process used to arrive at the TMDL and its' WLA, LA and MOS components is described on pages 16-38 of the TMDL Report. A brief summary follows. A deliberate process was followed that began with a set of diagnostic model runs that provided a general sense of the overall level of load reductions required to achieve the targets in each impairment and a general sense of the contributions, both magnitude and geographic extent, of each source category to PCB levels. The next step was a series of model runs that adjusted loads from each source category (except WWTPs, see section V 5.1 of the TMDL Report) up or down in order to get as close as possible to the target concentrations in each model segment, without exceeding them. For each model run, selected source loads are reduced, the POTPCB model is run to quasi-equilibrium, and PCB concentrations are compared to water column and sediment targets. The loads specified for each model run were an iterative adjustment informed by the results of previous model runs. This process continued until a set of loads is arrived at that provides quasi-equilibrium PCB concentrations at or below water column and sediment targets in all model segments. For the categories of WWTPs, CSOs and stormwater, the following category specific details apply.

For the WWTPs, the states agreed to apply a consistent approach to all WWTPs for determining waste load allocations when it became clear that significant PCB reductions would be needed for all loading source categories to achieve the BAF-based *target PCB water column concentration*. The waste load allocations were determined by facility design flow multiplied by the applicable jurisdiction BAF-based *target PCB water column concentration*.

Pursuant to EPA Requirements, "Stormwater discharges (called MS4s) that are regulated under Phase I or Phase II of the National Pollutant Discharge Elimination System (NPDES) stormwater program are point sources that must be included in the WLA portion of a TMDL" (US EPA 2002). EPA recognizes that available data and information are usually not detailed enough to determine WLAs for NPDES regulated stormwater discharges on an outfall-specific basis (US EPA 2002). Therefore, in the tidal Potomac watershed, loads from the regulated NPDES stormwater outfalls were expressed as a single stormwater WLA for each impaired water body. The stormwater WLAs are calculated for the direct drainage areas located in the District of Columbia as well as Maryland and Virginia Counties covered by a NPDES stormwater permit. A list of the MS4 permits in the study area are included in Table 10 (pg 29-30) of the TMDL Report.

The DC CSO system and the Alexandria CSO system each were assigned one load reduction (the two systems received different load reductions). The CSO system flows for DC assumes that the DC Long Term Control Plan (LTCP) has been implemented. These flows were obtained from a DC CSO model simulation of 2005 hydrology with the LTCP and represent a reduction in the total CSO flow compared to existing conditions. Flows representing the Alexandria CSO system were the same for the TMDL and Baseline Scenarios because that city's Long Term Control Plan has already been implemented and no changes to the system are planned that would impact flows. For the DC CSO load with the LTCP, model runs indicated that further CSO load reductions would be required to achieve the in stream targets. For the Alexandria CSOs, it was determined that no further reductions would be needed for the TMDL. The WLA to the CSOs is shown in Tables III. B, and III.C.

Tables III. B, III. C and III. D show the annual TMDL allocations, the maximum daily TMDL load allocations and the waste load allocations for the wastewater treatment plants respectively.

Table III. B Annual TMDL load allocations for each PCB impairment.

All values are expressed to 3 significant digits only. Units are total PCBs in g/year. Does not include PCB flux at Downstream Boundary (see TMDL Report, Section V(5.2)).

Ref #	Impaired Waterbody	Juris.	WLA				LA					MOS	TMDL
			WWTP	Reg. Stormwtr	CSO	Total WLA	Trib.	nonpoint source	Atmos. Dep.	Contam. Sites	Total LA		
1	Upper Potomac	DC	0	1.46	0.604	2.07	312	0.141	1.33	0	314	16.6	333.0
2	Middle Potomac	DC	0	7.42	3.58	11.0	34.5	0.843	4.61	0.00063	40.0	2.68	53.7
3	Lower Potomac	DC	30.3	5.41	33.2	68.9	0	0.923	8.59	0	9.51	2.53	80.9
4	Upper Anacostia	DC	0	1.76	0.0562	1.81	0	0.262	1.47	0.0014	1.74	0.187	3.74
5	Lower Anacostia	DC	0	0.612	2.18	2.79	0	0.173	2.52	0	1.91	0.247	4.95
6	Accotink Creek	VA	0	0.0992	0	0.0992	46.1	0.084	0.711	0	46.9	2.47	49.5
7	Aquia Creek	VA	1.06	5.28	0	6.34	21	14.2	0.757	0	36.0	2.17	44.5
8	Belmont Bay	VA	0	0.409	0	0.409	0	1.56	2.63	0	4.19	0.242	4.84
9	Chopawamsic Creek	VA	0	1.35	0	1.35	0	3.54	0.16	0	3.70	0.266	5.32
10	Coan River	VA	0	0	0	0	0	6.06	0.573	0	6.63	0.349	6.98
11	Dogue Creek	VA	0	20.2	0	20.2	0	7.28	1.56	0	8.84	1.53	30.6
12	Fourmile Run	VA	3.54	7.50	0	11.0	0	0.218	0.905	0	1.12	0.454	12.6
13	Gunston Cove	VA	0	0.517	0	0.517	0	0.437	2.73	1.65	4.82	0.281	5.62
14	Hooff Run & Hunting Creek	VA	4.77	13.6	18.5	36.8	45.8	0.452	1.56	0.722	48.6	4.25	89.7
15	Little Hunting Creek	VA	0	10.1	0	10.1	0	3.65	0.925	0	4.58	0.774	15.5
16	Monroe Creek	VA	0.177	0	0	0.177	0	1.06	0.352	0	1.41	0.0742	1.66
17	Neabsco Creek	VA	2.94	3.69	0	6.63	0	1.13	0.716	0	1.84	0.291	8.76
18	Occoquan River	VA	0	2.86	0	2.86	51.3	4.2	8.08	1.18	64.7	3.56	71.1
19	Pohick Creek	VA	5.96	7.58	0	13.5	0	6.35	1.74	0	8.08	0.824	22.4
20	Potomac Creek	VA	0	0.556	0	0.556	0	9.47	0.898	0	10.4	0.577	11.5
21	Potomac River, Fairview Beach	VA	0	0.0183	0	0.0183	0	0.668	0.745	0	1.41	0.0752	1.50
22	Powells Creek	VA	0	0.0675	0	0.0675	0	0.177	0.42	0	0.597	0.035	0.70
23	Quantico Creek	VA	0	0.742	0	0.742	11.4	1.94	0.481	0	13.8	0.765	15.3
24	Upper Machodoc Creek	VA	0.0883	0	0	0.0883	0	8.24	0.34	0	8.58	0.452	9.12
25	Tidal Anacostia	MD	0	1.13	0	1.13	13.8	0.0404	0.41	0.00124	14.3	0.812	16.2
26	Potomac River Lower	MD	0.064	1.99	0	2.06	0	44.1	79.5	5.12	129	6.89	138.0
27	Potomac River Middle	MD	7.55	3.04	0	10.6	0	13.4	28.8	1.05	43.2	2.43	56.2
28	Potomac River Upper	MD	0	16.4	0	16.4	0	10.6	31.2	0.467	42.2	3.09	61.7
29	Not Listed water bodies	ALL	11.8	18.2	0	30.0	162	119	21.4	0.0979	303	16.9	350.0
	Total all tidal waters	ALL	68.2	132	58.1	258	699	260	206	10.3	1180	71.8	1510

Table III. B (continued) Annual TMDL load allocation for Not Listed waterbodies.

All values are expressed to 3 significant digits only. Units are total PCBs in g/year. Does not include PCB flux at Downstream Boundary (see TMDL Report, Section V(5.2)).

		WLA				LA						
Waterbody	Juris.	WWTP	Reg. Stormwtr	CSO	Total WLA	Trib.	nonpoint source	Atmos. Dep.	Contam. Sites	Total LA	MOS	TMDL
St Marys River	MD	0	0	0	0	9.01	12.7	3.6	0	25.3	1.33	26.6
Yeocomico River	VA	0	0	0	0	0	7.78	1.6	0	9.37	0.493	9.9
Lower Machodoc	VA	0	0	0	0	0	1.85	0.704	0	2.55	0.134	2.7
Breton Bay	MD	0.245	0	0	0.245	8.87	7.31	1.3	0	17.5	0.921	18.7
Nomini Bay	VA	0	0	0	0	0	7.52	0.884	0	8.4	0.442	8.8
St. Clements Bay	MD	0	0	0	0	7.05	7.49	1.05	0	15.6	0.821	16.4
Wicomico River	MD	0	0.996	0	0.996	66.7	24.3	3.92	0	94.9	5.05	101.0
Mattox Creek	VA	0	0	0	0	0	3.93	0.233	0	4.16	0.219	4.4
Port Tobacco River	MD	0.538	4.09	0	4.63	0	11.1	0.711	0	11.9	0.842	17.4
Nanjemoy Creek	MD	0	1.38	0	1.38	6.08	14.3	1.1	0	21.4	1.2	24.0
Mattawoman Creek	MD	0.179	2.87	0	3.05	36.7	8.55	2.48	0.0979	47.8	2.67	53.5
Piscataway Creek	MD	10.8	7.7	0	18.5	27.9	6.81	2.39	0	37.1	2.36	58.0
Oxon Run	MD / DC	0	1.09	0	1.09	0	0.232	0.803	0	1.04	0.112	2.2
Hull Creek	VA	0	0	0	0	0	3.03	0.405	0	3.43	0.181	3.6
Rosier Creek	VA	0	0	0	0	0	1.87	0.24	0	2.11	0.111	2.2
Wash. Ship Channel	DC	0	0.0824	0	0.0824	0	0.0934	0.779	0	0.873	0.0503	1.0
Total Not Listed water bodies		11.8	18.2	0	30	162	119	22.2	0.0979	303	16.9	350.0

Table III. C Maximum Daily TMDL load allocations for each PCB impairment.

All values are expressed to 3 significant digits only. Units are mg/day total PCBs. Does not include PCB flux at Downstream Boundary (see TMDL Report, Section V(5.2)).

			WLA				LA						
Ref #	Impaired Waterbody	Juris.	WWTP	Reg. Stormwtr	CSO	Total WLA	Trib.	nonpoint source	Atmos. Dep.	Contam. Sites	Total LA	MOS	TMDL
1	Upper Potomac	DC	0	197	2.37	199	34200	19.2	3.63	0	34300	1820	36300
2	Middle Potomac	DC	0	1130	1190	2310	4210	126	12.6	0.00173	4350	351	7010
3	Lower Potomac	DC	3090	924	7250	11300	0	153	23.5	0	176	439	11900
4	Upper Anacostia	DC	0	300	26.1	326	0	51.1	4.04	0.00384	55.2	20	401
5	Lower Anacostia	DC	0	125	795	920	0	35.4	4.77	0	40.1	50.5	1010
6	Accotink Creek	VA	0	12.9	0	12.9	5780	11	1.95	0	5790	305	6110
7	Aquia Creek	VA	3.82	642	0	645	3010	1730	2.07	0	4750	284	5680
8	Belmont Bay	VA	0	58.4	0	58.4	0	223	7.22	0	230	15.2	304
9	Chopawamsic Creek	VA	0	143	0	143	0	376	0.439	0	376	27.3	546
10	Coan River	VA	0	0	0	0	0	1050	1.57	0	1050	55.3	1110
11	Dogue Creek	VA	0	2590	0	2590	0	934	4.28	0	938	186	3710
12	Fourmile Run	VA	12.7	1130	0	1140	0	32.8	2.48	0	35.3	61.3	1240
13	Gunston Cove	VA	0	67.3	0	67.3	0	57	7.47	4.53	69	7.18	143
14	Hooff Run & Hunting Creek	VA	17.1	2980	1110	4110	6590	99.4	4.26	1.98	6690	567	11400
15	Little Hunting Creek	VA	0	1300	0	1300	0	469	2.53	0	471	93.2	1860
16	Monroe Creek	VA	0.636	0	0	0.636	0	156	0.964	0	157	8.26	166
17	Neabsco Creek	VA	10.6	510	0	520	0	155	1.96	0	157	35.1	712
18	Occoquan River	VA	0	393	0	393	3180	574	22.1	3.23	3780	220	4390
19	Pohick Creek	VA	21.4	988	0	1010	0	828	4.75	0	832	95.8	1940
20	Potomac Creek	VA	0	93.5	0	93.5	0	1590	2.46	0	1600	89.1	1780
21	Potomac R. Fairview Beach	VA	0	2.76	0	2.76	0	100	2.04	0	102	5.51	110
22	Powells Creek	VA	0	10.3	0	10.3	0	27	1.15	0	28.1	2.02	40.4
23	Quantico Creek	VA	0	113	0	113	1460	297	1.32	0	1750	98.1	1960
24	Upper Machodoc Creek	VA	0.317	0	0	0.317	0	1150	0.931	0	1150	60.5	1210
25	Tidal Anacostia	MD	0	161	0	161	1580	5.78	1.12	0.00338	1590	92.2	1840
26	Potomac River Lower	MD	0.23	254	0	255	0	6420	218	14	6650	363	7270
27	Potomac River Middle	MD	27.1	401	0	428	0	1730	78.9	2.86	1810	116	2350
28	Potomac River Upper	MD	0	2140	0	2140	0	1350	85.4	1.28	1430	188	3760
	Not Listed water bodies	ALL	42.2	2310	0	2360	16500	16800	60.8	0.268	33400	1880	37600
	Total all tidal waters	ALL	3220	19000	10400	32600	76600	36600	564	28.2	114000	7540	154000

Table III. D Wasteload Allocations for the Wastewater Treatment Plants

Facility	NPDES	Tidal Receiving Waterbody (Ref #)	Baseline Flow (MGD)	Baseline [tPCB] (ng/l)	Baseline tPCB Load (g/year)	TMDL Design Flow (MGD)	TMDL [tPCB] (ng/l)	TMDL tPCB Load (g/year)	Reduction
Blue Plains	DC0021199	[a] DC Lower Potomac (3)	321.20	1.58	701	370.00	0.059	30.2	95.7%
Indian Head	MD0020052	MD Mattawoman Creek	0.30	0.163	0.068	0.5	0.26	0.18	-164.7%
La Plata	MD0020524	MD Port Tobacco Creek	1.17	0.163	0.264	1.5	0.26	0.539	-104.2%
NSWC-Indian Head	MD0020885	[a] MD Potomac Middle (27)	0.45	3.98	2.47	0.5	0.26	0.18	92.7%
Piscataway	MD0021539	MD Piscataway Creek	21.39	0.0554	1.64	30	0.26	10.8	-558.5%
Mattawoman	MD0021865	[a] MD Potomac Middle (27)	9.49	0.0533	0.699	20	0.26	7.18	-927.2%
Leonardtown	MD0024767	MD Breton Bay	0.43	0.376	0.224	0.68	0.26	0.244	-8.9%
NSWC-Dahlgren	VA0021067	[a] MD Potomac Lower (26)	0.28	0.0565	0.0221	0.72	0.064	0.064	-189.6%
Dale City #8	VA0024678	[a] VA Neabsco Creek (17)	2.96	0.0217	0.0887	4.6	0.064	0.407	-358.9%
Dale City #1	VA0024724	[a] VA Neabsco Creek (17)	3.05	0.0446	0.1879	4.6	0.064	0.407	-116.6%
H.L. Mooney	VA0025101	[a] VA Neabsco Creek (17)	12.25	0.107	1.8108	24	0.064	2.12	-17.1%
Arlington	VA0025143	[a] VA Four Mile Run (12)	26.38	0.462	16.8	40	0.064	3.54	78.9%
Alexandria	VA0025160	[a] VA Hooff/Hunting Creek (14)	37.37	0.323	16.7	54	0.064	4.77	71.4%
Noman M. Cole Jr.	VA0025364	[a] VA Gunston Cove (13)	42.11	0.291	16.9	67	0.064	5.92	65.0%
Colonial Beach	VA0026409	VA Mattox Creek	0.83	2.57	2.95	2	0.064	0.177	94.0%
Dahlgren Sanitary Dist.	VA0026514	[a] VA Up Machodoc Creek (24)	0.24	0.359	0.118	1	0.064	0.088	25.4%
Quantico-Mainside	VA0028363	[a] MD Potomac Middle (27)	1.20	0.0674	0.112	2.2	0.064	0.195	-74.1%
Aquia	VA0060968	[a] VA Aquia Creek (7)	4.86	0.0312	0.21	12	0.064	1.06	-404.8%
TOTAL all WWTPs					762.3			68.2	91.1%
These WWTPS are located within tributaries and are not part of the WLA for the TMDL. These calculations are provided for reference only.									
Beltsville USDA East	MD0020842	[a] MD Tidal Anacostia (25)	0.2	0.163	0.045	0.62	0.26	0.223	-395.6%
Beltsville USDA West	MD0020851	[a] MD Tidal Anacostia (25)	0.09	0.163	0.02	0.2	0.26	0.072	-260.0%
UOSA	VA0024988	[a] VA Occoquan River (18)	28.94	0.00217	0.0868	64	0.064	5.66	-6420.7%
The following WWTP was not included in this TMDL study because its current design flow is below the 0.1 MGD minimum that MDE used to determine which facilities to include in the loading model. There are plans, however, to expand this WWTP 0.6 MGD in the future. When that expansion is complete, then the facility will get a WLA of 0.216 g/year, based on the default PCB concentration for MD WWTPs of 0.26 ng/l and design flow of 0.6 MGD.									
Swan Point	MD0057525	[a] MD Potomac Lower (26)	0.067			0.6	0.26	0.216	

[a] The tidal receiving waterbody is currently listed on the Sec.303(d) list as impaired and the number in brackets corresponds to the water body reference number in tables 1,III B and III C.

IV. Technical Approach

a. Coupled Hydrodynamic/PCB Model

As described by LimnoTech (2007), the overall conceptual approach followed for modeling of PCBs in the tidal Potomac River and tidal Anacostia River watershed was an integrated modeling framework that includes hydrodynamics, salinity, sorbent dynamics and PCB transport and fate. The underlying premise is that the transport and fate of toxic chemicals, especially hydrophobic organic chemicals (HOCs) like PCBs, are strongly influenced by sorption to organic carbon and interactions between the water column and sediments. In this framework, separate balances are conducted in series for water, salinity, sorbents (as organic carbon) and PCBs.

Hydrodynamics was implemented for the tidal Potomac and Anacostia rivers using a 1D branched version of DYNHYD5 (Ambrose et al. 1993a) coupled to a modified version of WASP5/TOXI5 (Ambrose et al. 1993b). This implementation closely followed the successful model implementation used for transport and fate of penta-PCBs in the Delaware River Estuary. Results from the Delaware modeling effort were judged acceptable by an expert panel of independent scientists and modeling practitioners, and the model was used to develop a Stage 1 TMDL for PCBs that was established by EPA Regions 2 and 3. Complete results for the Delaware hydrodynamic and salinity models are presented in Delaware River Basin Commission (DRBC) (2003a). Complete results for the organic carbon sorbents and PCB models are presented in DRBC (2003b, 2003c) and summarized in Bierman et al. (2004a, 2004b, 2005).

The water quality model is two dimensional in the horizontal direction and includes 257 discrete spatial segments that encompass the tidal Potomac and Anacostia rivers, their tidal tributaries, and numerous embayments. The model spatial grid includes separate representation of the main channel (Maryland waters), the DC portion of the main channel, and various embayments, tributaries and coves in both Virginia (VA) and Maryland (MD) waters. This detailed spatial representation was required to represent the 28 impaired waterbody segments as well as the different water quality standards for PCBs in each of the three jurisdictions.

Hydrodynamic and salinity calibrations were conducted for 1996-1997 and 2002-2005. Sorbent and PCB calibrations were conducted for 2002-2005. Selection of these calibration periods was based primarily on availability of data for model inputs and for comparisons of computed results with observations. PCBs are represented in the model as the group of PCB homologs 3-10, or $PCB3^{+}$. The goal is to select a surrogate for total PCB concentrations that represent all sources, ambient conditions and impacted resources. After a comprehensive, detailed review of the PCB data and considering the goals of the TMDL development project, LimnoTech concluded that PCB3+ is the most reasonable choice, given the site-specific conditions in the Potomac and Anacostia. It should also be noted that PCB3+ (also called Tri+ PCB) had previously been successfully used as the surrogate variable for total PCBs in the transport and fate model for the Upper Hudson River Reassessment (EPA, 2000). The results from that model were approved by an Expert Panel of independent scientists and accepted by EPA Region 2. The PCB Model Report (LimnoTech, 2007) provides a detailed discussion of the rationale for selection of $PCB3^{+}$ and its use to model PCBs.

Sensitivity analyses, diagnostic simulations, mass balance components analysis and an assessment of model calibration results have been performed.

The assessment of model calibration results was a weight-of-evidence approach that relied on a suite of quantitative metrics and best professional judgment. No single metric provides sufficient information by itself to completely evaluate model calibration results. The metrics used included cumulative frequency distributions, bivariate plots with lines of 1:1 correspondence, regression statistics, time series plots at fixed locations, spatial profiles at fixed points in time, comparisons of seasonal median values, and comparisons of computed first-order PCB loss rates with those from available historical data for PCB body burdens in benthic feeding fish.

Given the model assumptions and the available data for model inputs and ambient water quality conditions, LimnoTech concluded that the results from the calibrated model are a reasonable representation of seasonal magnitudes and spatial distributions for water surface elevation, salinity, organic carbon sorbents, and PCBs in the tidal Potomac and Anacostia Rivers. The PCB TMDL Steering Committee judged that the model was scientifically credible and acceptable for use in developing the PCB TMDL. EPA agrees with this analysis and finds it adequate, reliable, accurate and when used to develop the TMDL, ultimately protective of the fish consumption use.

The TMDL design conditions correspond to quasi-steady state, dynamic equilibrium among external PCB mass loads, and concentrations in the water column and sediments. Under these conditions there is no net flux of PCB across the air-water interface, and both the surface and deep sediment layers are net sinks for PCB, not sources. Diagnostic simulations conducted with the calibrated model indicated that approximately 50 years or more is required to reach the TMDL design conditions of quasi-steady state, dynamic equilibrium.

b. Sources of PCBs to the Tidal Potomac and Anacostia River Watershed

A brief summary of the external load calculations follows. A full description can be found in the TMDL Report, Appendix A.

For modeling purposes, external loads of PCBs to the Potomac River estuary system are grouped into six categories: the non-tidal Potomac River at Chain Bridge, lower basin tributaries, direct drainage, wastewater treatment plants (WWTPs), combined sewer overflows (CSOs), atmospheric deposition to the water surface, and contaminated sites. The Potomac PCB model requires daily input values for flows and carbon and PCBs loads from each of these source categories (LTI 2007).

The WWTP loading category was determined by first identifying all known point sources within the study area that either have or have the potential to discharge PCB loads. This universe of point source discharges was further screened to eliminate the municipal WWTPs with a flow of 0.1 mgd or less, which were judged to contribute "de minimus" PCB loads. The resulting list of WWTPs that are the subject of this TMDL analysis is shown in Table 9 and represent the best available information regarding WWTP point source PCB loads.

Output from the Chesapeake Bay Watershed Model (WM5) was used to estimate daily flows and the associated loads from 17 lower basin tributaries and from direct drainage areas.

Loadings at Little Falls on the Potomac River (referred to as "Chain Bridge") were based on the actual observed US Geologic Survey(USGS) flows and the use of a regression model (Loadest Program, Runkel et al, 2004) to estimate daily carbon and PCB loads. These are the flows and loads from the non-tidal Potomac River, above the study area.

c. Daily Load Determination

Fish tissue concentrations are reflective of exposure to PCBs over extended time periods, ranging from season to annual in length, and human health impacts typically result from PCB exposure of many years duration. Consequently, the TMDL target condition in the POTPCB model for Maryland and Virginia waters was set at the annual median water column concentration at or below the jurisdictional water quality target. District of Columbia regulations require that the highest 30-day average water column concentration not exceed the water quality target. Thus, the 30-day average water column concentration became the TMDL target condition in model segments located in the District. To reflect the loading conditions that result in these annual median or high 30-day average concentrations, the TMDL allocations are expressed as annual loads. In order to comply with current EPA guidance the TMDL is also expressed as a daily load in two ways: a) the average daily loading condition, calculated as the annual load divided by 365; and b) peak one day loads in the TMDL evaluation year. The peak one day loads for tributaries (including the non-tidal Potomac River), direct drainage areas, CSOs, and the Blue Plains WWTP are the annual maximum daily loads in the daily load time series for the TMDL year. For atmospheric deposition and contaminated sites, which are input to the model in equal amounts each day, the peak one day loads were the annual load divided by 365. For WWTPs other than Blue Plains, the peak one day load was calculated as 1.31 times the average daily load. This multiplier was based on a statistical procedure that relates the maximum daily concentration to the long term average. In this case the 1.31 multiplier assumes 2 samples/month are collected. The procedure is explained in the EPA document entitled Technical Support Document (TSD) for Water Quality-based Toxics Control (US EPA 1991). EPA finds this approach credible.

V. Discussions of Regulatory Requirements

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA policy and guidance. EPA's rationale for approval is set forth according to the regulatory requirements listed below. The TMDL is the sum of the individual waste load allocations (WLAs) for point sources and the load allocations (LAs) for nonpoint sources and natural background and must include a margin of safety (MOS). The TMDL is commonly expressed as:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

Where:
WLA = waste load allocation
LA = load allocation
MOS = margin of safety

1. The TMDLs are designed to implement the applicable water quality standards.

Based on the discussion in Sections II and III of this document, EPA finds that this TMDL is consistent with and achieves the District's, Maryland's and Virginia's water quality standards for the fish consumption use as well as the numerical criteria for PCBs .

EPA finds that the allocations were properly developed to attain and maintain existing applicable water quality standards

2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.

As documented in Tables B, C and D of this decision document and in the TMDL Report, the TMDLs include the total allowable load and the individual waste load allocations and load allocations.

EPA finds the proposed TMDLs meet the requirement to include total loads as well as wasteload allocations and load allocations.

3. The TMDLs consider the impacts of background pollutant contributions.
All loads of PCBs outside of the modeling domain were considered as background loads to the model. These loads were identified in the allocation tables as allocations to upstream.

EPA finds the proposed TMDLs appropriately considered impacts of background pollutant contributions.

4. The TMDLs consider critical environmental conditions.

The critical conditions used for development of the PCB TMDL were the actual 2005 observed flows and environmental conditions. This hydrology approximates the harmonic mean flow calculated from the long term period of record, as discussed in Section IV of this document. The use of the harmonic mean flow as the design condition is recommended by EPA when considering human health criteria for carcinogens, such as PCBs (EPA 1991). Selection of 2005 as the design year is described in Appendix C of the TMDL Report.

EPA finds the proposed TMDLs meet the requirement to consider the critical environmental conditions.

5. The TMDLs consider seasonal environmental variations.

Seasonality is captured through the use of 2005 as the hydrologic design year, and the use of daily surface flows and loads of total suspended solids and particulate carbon from 2005 as baseline conditions for development of the TMDL. In addition, the cumulative frequency distribution of the daily flows for 2005 closely resembles the cumulative frequency distribution for the long term period of record. These design year conditions were cycled through the PCB Model with the external PCB loading scenarios being evaluated until dynamic equilibrium conditions are achieved. Selection of 2005 as the hydrologic design year is described in Appendix C of the TMDL Report.

EPA finds the proposed TMDLs meet the requirement to consider seasonal environmental variations.

6. The TMDLs include a margin of safety.

The CWA and EPA's TMDL regulations require TMDLs to include a margin of safety (MOS) to take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. EPA guidance suggests two approaches to satisfy the MOS requirement. First, it can be met implicitly by using conservative model assumptions to develop the TMDL and its allocations. Alternately, it can be met explicitly by allocating a portion of the allowable load to the MOS. The *TMDL for PCBs for tidal Portions of the Potomac & Anacostia Rivers in the District of Columbia, Maryland and Virginia* includes both an explicit MOS of 5% as well as an implicit MOS as documented on page 18 of the TMDL Report.

EPA finds the proposed TMDLs meet the requirement to include a margin of safety.

7. The TMDLs have been subject to public participation.

The draft TMDL for 28 Polychlorinated Biphenyl (PCB) impairments in the tidal Potomac and Anacostia Rivers was made available for public review on July 17, 2007 by the District of Columbia Department of the Environment (DDOE), Maryland Department of the Environment (MDE), and Virginia Department of Environmental Quality (VADEQ). Announcements were placed in the Virginia electronic Town Hall (public register), the District of Columbia public register, and local newspapers in Maryland, and distributed via e-mail to "TMDL interest groups" by each jurisdiction. The documents were placed in local libraries in Maryland and the District of Columbia and posted on the ICPRB website http://www.potomacriver.org/water_quality/pcbtmdl.htm. Notices and links to the ICPRB webpage were placed on VADEQ and MDE websites. The draft TMDL also was distributed on CD-ROMs at public meetings, one in each jurisdiction plus one for the Technical Advisory Committee, held July 17-19, 2007. An Addendum to the draft TMDL was released on August 8, and the comment period extended to August 23, 2007. A total of 95 written comments were received from 17 agencies or organizations. Detailed responses to those comments were prepared by the Steering Committee and are contained in the *Response to Comment Document for the Tidal Potomac PCB TMDL* (September, 2007), submitted to EPA with the TMDL Report. The Steering Committee carefully considered the comments in preparing the final tidal Potomac PCB TMDL report

EPA finds the proposed TMDL meets the requirement to provide adequate opportunity for public participation.

VI. There is reasonable assurance that the proposed LAs can be met.

The TMDL report provides an adequate discussion of practicable implementation measures and strategies for achieving the TMDLs' nonpoint source allocations. The TMDL report notes that the nonpoint source reductions can be achieved by application of best management practices (BMPs). The states will use existing programs and authorities to comply with the LA provisions of the TMDL. Nonpoint sources will initially be addressed through the implementation of the existing TMDLs for sediments and nutrients throughout the Potomac watershed. Since PCB concentrations in the water column are linked to TSS concentrations, a reduction in the sediment loads entering the tidal Anacostia and Potomac watersheds are expected to result in lower PCBs concentrations. Also, implementation of BMPs intended to reduce nutrient runoff will contribute to PCBs runoff reductions. Specifically, state efforts relative to the Chesapeake Bay nutrient and sediment tributary strategies will be the initial focus of the PCB non-point source load reduction effort. Reductions in sediment from construction sites and development areas will also be of benefit for reducing PCBs. This will be supplemented by additional monitoring and assessment activities to identify PCB hot spots that may require additional remedial activities.

State specific details of the implementation of the LA provisions of the TMDL are described in Section VII, "TMDL Implementation and Reasonable Assurance", of the TMDL Report and are briefly summarized in the following.

A District of Columbia

The District of Columbia has several programs in place to control the effects of storm water runoff and promote nonpoint source pollution prevention and control. For the Anacostia watershed, the District is addressing toxics and legacy contaminant issues through the Anacostia Watershed Restoration Committee, whose goal is to coordinate efforts to improve water quality in the Anacostia Watershed. Significant resources have been spent over the last several years in identifying and characterizing toxic pollutants, including PCBs in the Anacostia and Potomac rivers. A number of steps have been taken to deal with the problem, including sediment capping pilot projects in the Anacostia River.

In addition to its responsibilities under the MS4 NPDES permit to implement a stormwater management plan (SWMP) to control the discharge of pollutants from separate storm sewer outfalls, DC is also implementing a nonpoint source management plan through its Nonpoint Source Management and Chesapeake Bay Implementation programs. The District has several well-established programs to draw upon, including the Erosion and Sedimentation Control Amendment Act of 1994 and DC Law 5-188 (Storm Water Management Regulations – 1988) of The District of Columbia Water Pollution Control Act of 1984, and the Federal Nonpoint Source Management Program (Section 319 of the Clean Water Act).

The District, under authority of various laws, implements a number of action plans that involve reviewing and approving construction plans for stormwater runoff control measures, erosion and sediment control measures, and landscaping; conducting routine and programmed inspections at construction sites; providing technical assistance to developers and DC residents; and conducting investigations of citizen complaints related to drainage and erosion and sediment control. In conjunction with regulatory activities, voluntary programs are implemented through the Nonpoint Source Management and Chesapeake Bay Implementation programs. It is expected that through implementation of sediment and nutrient control measures sediment-laden pollutants, including PCBs, will also be removed.

B Maryland

Nonpoint sources will initially be addressed through the implementation of the existing TMDLs for sediments and nutrients throughout the Potomac watershed. Since PCBs concentrations in the water column are linked to TSS concentrations, a reduction in the sediment loads entering the tidal Anacostia and Potomac watersheds are expected to result in lower PCBs concentrations. Also, implementation of BMPs intended to reduce nutrient runoff will contribute to PCBs runoff reductions. The following Maryland Department of the Environment (MDE) and Prince George's County watershed restoration activities will be used.

MDE

1. Stormwater Management: In the 2000 Maryland Stormwater Design Manual, MDE requires 80% sediment reduction for new development. For existing development, MDE's NPDES stormwater permits require watershed assessments and restoration based on impervious surface area. Currently, Prince George's County is required to restore 10% of its impervious areas.
2. Sediment and Erosion Control Program: Some local governments have shown the ability to enforce the provisions of their ordinances relating to soil erosion and sediment control. In other cases, the State has retained enforcement responsibilities. MDE conducts periodic reviews of local programs to ensure that implementation is acceptable and it has the authority to suspend delegation and take over any program that does not meet State standards.
3. In 2000, the Maryland DNR initiated the Watershed Restoration Action Strategy (WRAS) Program as one of several new approaches to implementing water quality and habitat restoration and protection. The WRAS Program encouraged local governments to focus on priority watersheds for restoration and protection. Since the program's inception, local governments have received grants and technical assistance from DNR for 25 WRAS projects in which local people identify watershed priorities for restoration, protection, and implementation. MDE has directed the WRAS Program since January 2005. The WRAS project area in Prince George's County, Maryland totals about 86 square miles. In the WRAS, the County has identified and prioritized local restoration and protection needs associated with water quality and habitat (MDE 2005).

Prince Georges County

1. Conducts regular stream assessment monitoring and MS4 monitoring for constituents including TSS.
2. Implements programs of street-sweeping, storm drain-inlet cleaning, and storm pipe cleaning in urban areas.
3. Conducting the Anacostia LID demonstration project, in partnership with the Anacostia Watershed Toxics Alliance, with $1 million in funding from a Congressional appropriation

C Virginia

The Commonwealth of Virginia has the requirement, specified in the Code of Virginia, Section 62.1-44.19.7. Virginia's 1997 Water Quality Monitoring, Information and Restoration Act, that an implementation plan be developed for each TMDL. The Act requires that the implementation plan include the date of expected achievement of water quality objectives, measurable goals, corrective actions necessary and the associated costs, benefits and environmental impacts of addressing the impairments as well as a description of potential funding sources. The implementation plan, when developed will provide the specific details of how the LA component of the TMDL will be implemented. In general, the following existing programs or activities will form the basis of LA implementation.

1. In 2006, the General Assembly passed legislation requiring the Secretary of Natural Resources to develop a plan for the cleanup of the Chesapeake Bay and Virginia's waters (HB 1150). This plan was completed in 2007 (Commonwealth of Virginia 2007). The plan addresses both point and non-point sources of pollution and includes measurable and attainable objectives for water cleanup, attainable strategies, a specified timeline, funding sources, and mitigation strategies. Additionally, challenges to meeting the clean up plan goals (i.e. lack of program funding, staffing needs, monitoring needs) are identified.

2. The Chesapeake Bay Nutrient and Sediment Tributary Strategy, published in January 2005, outlines goals for reducing nutrients and sediment inputs to the Chesapeake Bay (Commonwealth of Virginia 2005). As PCBs cling to the organic carbon on sediments, efforts to meet tributary strategy sediment goals will also be beneficial to reducing PCBs, and vise-versa.

3. Reductions in sediment from construction sites and development areas will also be of benefit for reducing PCBs. The Virginia Erosion and Sediment Control and Virginia Stormwater Management Programs – administered by the Department of Conservation and Recreation and delegated to local jurisdictions – provides the framework for implementing sediment reduction BMPs throughout localities.

EPA anticipates that the funding will continue to be provided under Section 319 of the CWA for nonpoint source control.

VII. Implementation

Neither the Clean Water Act nor the EPA implementing regulations, guidance or policy requires a TMDL to include an implementation plan. These activities were described in the TMDL report and are summarized here. However, several activities are taking place or are planned that will begin the tidal Potomac River and tidal Anacostia River watershed PCB TMDL implementation process. Further, the District of Columbia, Maryland, Virginia and the ICPRB understand the importance of coordinating the implementation activities for the watershed and intend to work together in that regard.

The states have recognized that progress toward achieving the PCB loading capacity allocations described in the TMDL report will clearly require significant reductions from atmospheric, nonpoint, and point sources of PCBs to the estuary, with an emphasis on those sources with the greatest relative impact on use impairments. The states have further agreed that pursuing an adaptive implementation approach is an appropriate course to follow in implementing the Potomac PCB TMDL, due to the uncertainty associated with the TMDL loading capacity and specific allocation scheme. As described in Wong (2006), adaptive implementation is an iterative implementation process that makes progress toward achieving water quality goals while using new data and information to reduce uncertainty and adjust implementation activities. The focus of this approach is oriented towards increasingly efficient management and restoration and is not generally anticipated to lead to a re-opening of the TMDL, but the TMDL and allocation scenarios can be changed if warranted by new data and information.

Therefore, the states intend to pursue implementation strategies that include additional data collection concurrently with activities to reduce PCB loadings. New data and information will be used to steer control strategies aimed to mitigate PCB loadings into the estuary and to better understand and characterize PCB loadings from key sources such as the Chain Bridge boundary, significant tributary contributions, atmospheric deposition as well as point sources.

It should also be noted that the Commonwealth of Virginia has the requirement, specified in the Code of Virginia, Section 62.1-44.19.7. Virginia's 1997 Water Quality Monitoring, Information and Restoration Act, that an implementation plan be developed for each TMDL. The Act requires that the implementation plan include the date of expected achievement of water quality objectives, measurable goals, corrective actions necessary and the associated costs, benefits and environmental impacts of addressing the impairments as well as a description of potential funding sources .

A Implementation of Waste Load Allocations

Following the approval of the TMDL for the tidal Anacostia and Potomac River estuary, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued or modified after the TMDL approval date must be consistent with the WLAs (CFR 2007b).

The states intend to use non-numeric WQBELs in certain NPDES permits reissued hereafter consistent with the WLA provisions of the TMDL. This approach will include additional data collection from selected NPDES permitted facilities to better characterize PCB discharges. Where warranted, non-numeric, BMPs will be implemented. These BMPs are intended to focus on PCB source tracking and elimination at the source, rather than end-of-pipe controls.

The states have agreed that non-storm water permits that are issued, reissued, or modified after the TMDL approval date should incorporate specific provisions for additional data collection. Permits for non-storm water discharges identified as possible significant PCB sources should include the following provisions when reissued or renewed:

- If not already available, congener specific data should be collected using the most current version of EPA Method 1668 (currently, Method 1668, Revision A), or other equivalent methods capable of providing low-detection level, congener specific results, or other methods appropriate under the circumstances which are approved in advance by the permitting authority.
- The frequency of testing, quality control requirements, and specific test conditions such as flow conditions shall be prescribed in the permit.
- Conditions or criteria warranting implementation of BMPs to locate sources of PCBs should be included in the permit.

Regulated stormwater permits and permits for CSO systems also may incorporate BMP based controls as described above and additional state specific provisions as described in Section VII, "TMDL Implementation and Reasonable Assurance", of the TMDL Report.

B Implementation of Load Allocations(LAs)

The states will use existing programs and authorities to comply with the LA provisions of the TMDL. Nonpoint sources will initially be addressed through the implementation of the existing TMDLs for sediments and nutrients throughout the Potomac watershed. Since PCB concentrations in the water column are linked to TSS concentrations, a reduction in the sediment loads entering the tidal Anacostia and Potomac watersheds are expected to result in lower PCBs concentrations. Also, implementation of BMPs intended to reduce nutrient runoff will contribute to PCBs runoff reductions. Specifically, state efforts relative to the Chesapeake Bay nutrient and sediment tributary strategies will be the initial focus of the PCB non-point source load reduction effort. Reductions in sediment from construction sites and development areas will also be of benefit for reducing PCBs. This will be supplemented by additional monitoring and assessment activities to identify PCB hot spots that may require additional remedial activities.

State specific details of the implementation of the LA provisions of the TMDL are described in Section VII, "TMDL Implementation and Reasonable Assurance", of the TMDL Report.

C Priorities for data collection

The PCB TMDL Steering Committee, in the TMDL Report, also recommended that the states, along with the ICPRB and the EPA Region III, work together to achieve the following objectives in order to effectively pursue the adaptive implementation approach for the Potomac estuary:

- develop and implement a monitoring strategy to fill key data gaps;
- craft and implement PCB load reduction strategies; and
- develop and implement programs to monitor and report progress toward achieving both PCB load reduction and water quality goals.

Priorities for data collection to better refine PCB loading estimates to the estuary from PCB sources not governed under the NPDES permitting program, and those sources that are outside of the study area (i.e., LA) include, in priority order:

1. Chain Bridge
2. Atmospheric deposition and exchange
3. Other tributaries and direct drainage
4. Downstream boundary with the Chesapeake Bay

The uncertainty associated with the Baseline PCB loadings from these sources warrants additional data collection to enhance the current understanding of PCB loadings and to help characterize the potential source(s) of the PCBs.

EXHIBIT E

TOTAL MAXIMUM DAILY LOADS (TMDLs)

For Dioxins and Polychlorinated Biphenyls (PCBs) in Chattanooga Creek

Lower Tennessee River Watershed (HUC 06020001) Hamilton County, Tennessee

FINAL

Prepared by:

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ATSDR	Agency for Toxic Substances and Disease Registry
ADB	Assessment Database
BCF	Bioconcentration Factor
BMP	Best Management Practices
CAS	Chemical Abstract Service
CDD	Chlorinated Dibenzo-p-Dioxin
CDF	Chlorinated Dibenzofuran
CFR	Code of Federal Regulations
CFS	Cubic Feet Per Second
HHC	Human Health Criteria
HUC	Hydrologic Unit Code
LA	Load Allocation
MOS	Margin of Safety
MRLC	Multi-Resolution Land Characteristic
MS4	Municipal Separate Storm Sewer System
NHD	National Hydrography Dataset
NPL	National Priorities List
NPS	Non-point Source
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyl
PPB	Parts per Billion (1×10^{-9})
PPM	Parts per Million (1×10^{-6})
PPQ	Parts per Quadrillion (1×10^{-15})
PPT	Parts per Trillion (1×10^{-12})
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RM	River Mile
TDEC	Tennessee Department of Environment & Conservation
TDSWM	Tennessee Division of Solid Waste Management
TEF	Toxic Equivalent Factor
TMDL	Total Maximum Daily Load
USEPA	United States Environmental Protection Agency
USFDA	United States Food and Drug Administration
USGS	United States Geological Survey
WLA	Waste Load Allocation
WWTF	Wastewater Treatment Facility

SUMMARY SHEET

LOWER TENNESSEE RIVER WATERSHED (HUC 06020001)

Total Maximum Daily Loads for Dioxins and Polychlorinated Biphenyls (PCBs) As Identified on the State of Tennessee's *2008 303(d) List*

Impaired Waterbody Information:

State: Tennessee
Counties: Hamilton
Watershed: Lower Tennessee River Watershed (HUC 06020001)
Constituents of Concern: Dioxins and Polychlorinated Biphenyls (PCBs)

Impaired Waterbody Addressed in This Document:

Waterbody ID	Impaired Waterbody	Miles
TN060200011244_1000	Chattanooga Creek	8.4

Designated Uses:

The designated use classifications for segments of the Chattanooga Creek addressed in these TMDLs include fish and aquatic life, industrial water supply, irrigation, livestock watering & wildlife, and recreation.

Target Criteria:

Fish tissue concentrations, calculated from the formulas used for fish advisories, will be used as the target criteria.

Pollutant	Target Criteria (mg/kg)
Dioxins	5.0E-06
PCBs	0.0200

General TMDL Analysis Methodology:

- Composite fish tissue samples were collected and analyzed for the constituents of concern.
- The TMDLs are expressed in lbs/day as a function of flow. To assist with implementation, the TMDLs are also expressed as a maximum water column concentration (in μg/L) and as a maximum fish tissue concentration (in mg/kg), which are equivalent to the target criteria.
- Waste Load Allocations (WLAs) are derived for point source dischargers of dioxins and PCBs.
- Load Allocations are established for non-point sources using a mass-balance approach.

Critical Conditions:

The methodology takes into account that the pollutants are contained in the sediment. The methodology addresses all seasons.

Margin of Safety:

5% (Explicit)

Summary of TMDLs, WLAs, and LAs

Waterbody ID	Pollutant	WLAs	LAs[1]	MOS[1]	TMDLs		
					Maximum Load[1]	Maximum Water Column Concentration[2]	Maximum Fish Tissue Concentration[2]
		(lbs/day)	(lbs/day)[3]	(lbs/day)[3]	(lbs/day)[3]	(μg/L)	(mg/kg)
TN060200011244_1000	Dioxins	0	Q * 5.12E-09	Q * 2.70E-10	Q * 5.39E-09	1.0E-06	5.0E-06
	PCBs	0	Q * 3.28E-06	Q * 1.73E-07	Q * 3.45E-06	0.00064	0.0200

1 The LA, MOS, and the Maximum Load TMDL are expressed as a function of flow (Q), where Q represents the annual average flow of Chattanooga Creek at the pour point of the segment.

2 The TMDL is also expressed in terms of maximum allowable water column concentration and maximum fish tissue concentration because TDEC recognizes that these values provide information that potentially will be more useful regarding TMDL implementation efforts than the values that are expressed in terms of an allowable load.

3 Lbs/day calculated as an annual average.

TOTAL MAXIMUM DAILY LOADS (TMDLs) FOR DIOXINS AND PCBs IN CHATTANOOGA CREEK LOWER TENNESSEE RIVER WATERSHED (HUC 06020001)

1.0 INTRODUCTION

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology-based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Impaired waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those waterbodies that are not attaining water quality standards. State water quality standards consist of designated use(s) for individual waterbodies, appropriate numeric and narrative water quality criteria protective of the designated uses, and an antidegradation statement. The TMDL process establishes the maximum allowable loadings of pollutants for a waterbody that will allow the waterbody to maintain water quality standards. The TMDL may then be used to develop controls for reducing pollution from both point and non-point sources in order to restore and maintain the quality of water resources (USEPA, 1991).

2.0 WATERSHED DESCRIPTION

This document presents details of TMDL development for waterbodies in the Lower Tennessee River Watershed, identified on the Final 2008 303(d) List as not supporting designated uses due to dioxins and PCBs. Portions of the Lower Tennessee River Watershed lie in Tennessee, Alabama, and Georgia. This document addresses only impaired waterbodies in Tennessee.

The Lower Tennessee River Watershed (HUC 06020001) is located in Eastern Tennessee as shown in Figure 1. The Lower Tennessee River Watershed lies within two Level III ecoregions (Ridge and Valley, Southwestern Appalachians) and contains eight Level IV ecoregions as shown in Figure 2 (USEPA, 1997):

- The **Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f)** form a heterogeneous region composed predominantly of limestone and cherty dolomite. Landforms are mostly low rolling ridges and valleys, and the solids vary in their productivity. Landcover includes intensive agriculture, urban and industrial, or areas of thick forest. White oak forests, bottomland oak forests, and sycamore-ash-elm riparian forests are the common forest types, and grassland barrens intermixed with cedar-pine glades also occur here.

- The **Southern Shale Valleys (67g)** consist of lowlands, rolling valleys, slopes and hilly areas that are dominated by shale materials. The northern areas are associated with Ordovician-age calcareous shale, and the well-drained soils are often slightly acid to neutral. In the south, the shale valleys are associated with Cambrian-age shales that contain some narrow bands of limestone, but the soils tend to be strongly acid. Small farms and rural residences subdivide the land. The steeper slopes are used for pasture or have reverted to brush and forested land, while small fields of hay, corn, tobacco, and garden crops are grown on the footslopes and bottomland.

- The **Southern Sandstone Ridges (67h)** encompasses the major sandstone ridges with areas of shale and siltstone. The steep, forested ridges have narrow crests with soils that are typically stony, sandy, and of low fertility. The chemistry of streams flowing down the ridges can vary greatly depending on the geological material. The higher elevation ridges are in the north, including Wallen Ridge, Powell Mountain, Clinch Mountain and Bays Mountains. White Oak Mountain in the south has some sandstone on the west side, with abundant shale and limestone. Grindstone Mountain, capped by the Grizzard Group sandstone, is the only remnant of Pennsylvanian-age strata in the ridge and valley of Tennessee.

- The **Southern Dissected Ridges and Knobs (67i)** contain more crenulated, broken, or hummocky ridges, compared to smoother, more sharply pointed sandstone ridges. Although shale is common, there is a mixture and interbedding of geologic materials. The ridges on the east side of Tennessee's Ridge and Valley tend to be associated with the Ordovician-age Sevier shale, Athens shale, and Holston and Lenoir limestones. These can include calcareous shale, limestone, siltstone, sandstone, and conglomerate. In the central and western part of the ecoregion, the shale ridges are associated with the Cambrian-age Rome Formation: shale and siltstone with beds of sandstone. Chestnut oak forests and pine forests are typical for the higher elevations of the ridges, with areas of white oak, mixed mesophytic forest, and tulip on the lower slopes, knobs, and draws.

- The **Cumberland Plateau (68a)** tablelands and open low mountains are about 1000 feet higher than the Eastern Highland Rim (71g) to the west, and receive slightly more precipitation with cooler annual temperatures than the surrounding lower-elevation ecoregions. The plateau surface is less dissected with lower relief compared to the Cumberland Mountains (69d) or the Plateau Escarpment (68c). Elevations are generally 1200-2000 feet, with the Crab Orchard Mountains reaching over 3000 feet. Pennsylvanian-age conglomerate, sandstone, siltstone, and shale is cover by well-drained, acid soils of low fertility. Bituminous coal that has been extensively surface and underground mined underlies the region. Acidification of first and second order streams is common. Stream siltation and mine spoil bedload deposits continue as long-term problems in these headwater systems. Pockets of severe acid mine drainage persist.

- The **Sequatchie Valley (68b)** is structurally associated with an anticline, where erosion of broken rock to the south of the Crab Orchard Mountains scooped out the linear valley. The open, rolling, valley floor, 600-1000 feet in elevation, is generally 1000 feet below the top of the Cumberland Plateau. A low, central, cherty ridge separates the west and east valleys of Mississippian to Ordovician-age limestones, dolomites, and shales. Similar to parts of the Ridge and Valley (67f), this is an agriculturally productive region, with areas of pasture, hay, soybeans, small grain, corn, and tobacco.

- The **Plateau Escarpment (68c)** is characterized by steep, forested slopes with high velocity, high gradient streams. Local relief is often 1000 feet or more. The geologic strata include Mississippian-age limestone, sandstone, shale, and siltstone, and Pennsylvanian-age shale, siltstone, sandstone, and conglomerate. Streams have cut down into the limestone, but the gorge talus slopes are composed of colluvium with huge angular, slabby blocks of sandstone. Vegetation community types in the ravine and gorges include mixed oak and chestnut oak on the upper slopes, mesic forests on the middle and lower slopes (beech-tulip popular, sugar maple-basswood-ash-buckeye), with hemlock along rocky streamsides and river birch along floodplain terraces.

- The **Southern Table Plateaus (68d)** include Sand Mountain and Lookout Mountain in northwest Georgia. While it has some similarities to the Cumberland Plateau (68a) in Tennessee with its Pennsylvanian-age sandstone caprock, shale layers, and coal-bearing strata, this ecoregion is lower in elevation, has a slightly warmer climate, and has more agriculture. Although the Georgia portion is mostly forested, primarily with mixed oak and oak-hickory communities, elevations decrease to the southwest in Alabama and there is more cropland and pasture. The plateau surface is less dissected with lower relief compared to the Plateau Escarpment (68c), and it is slightly cooler with more precipitation than in the nearby lower elevations of 67f.

Figure 1 Location of the Lower Tennessee River Watershed

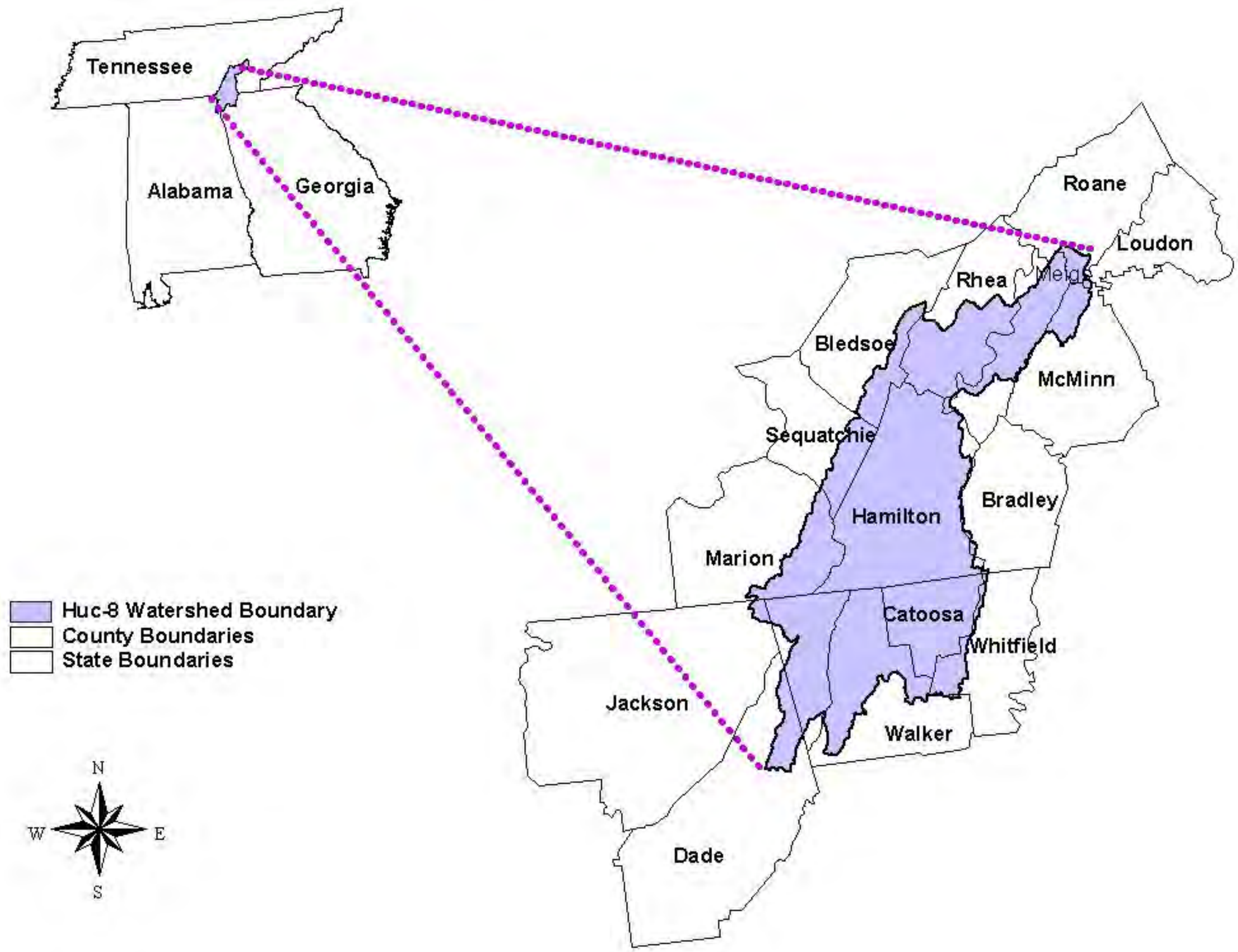
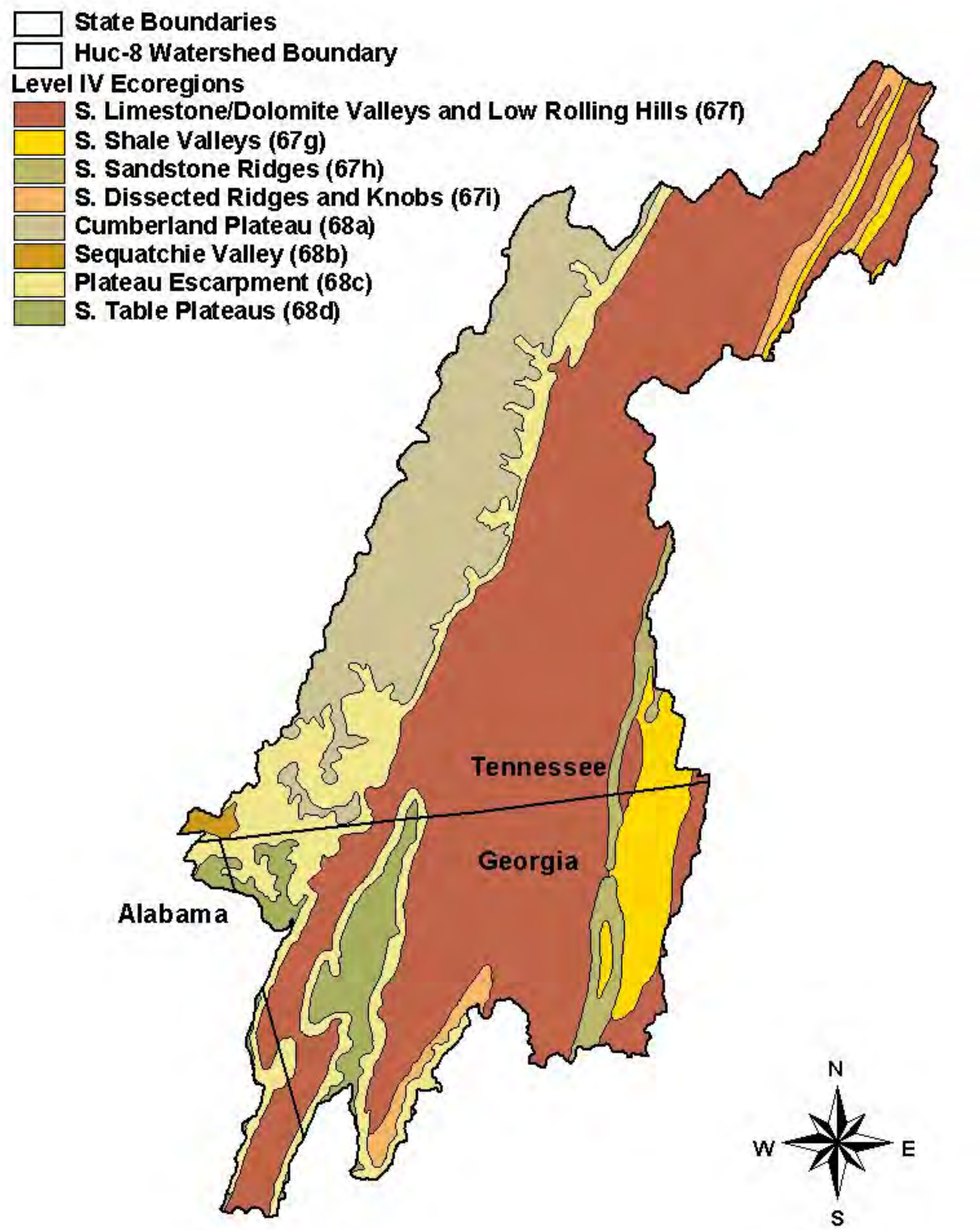


Figure 2 Level IV Ecoregions in the Lower Tennessee River Watershed



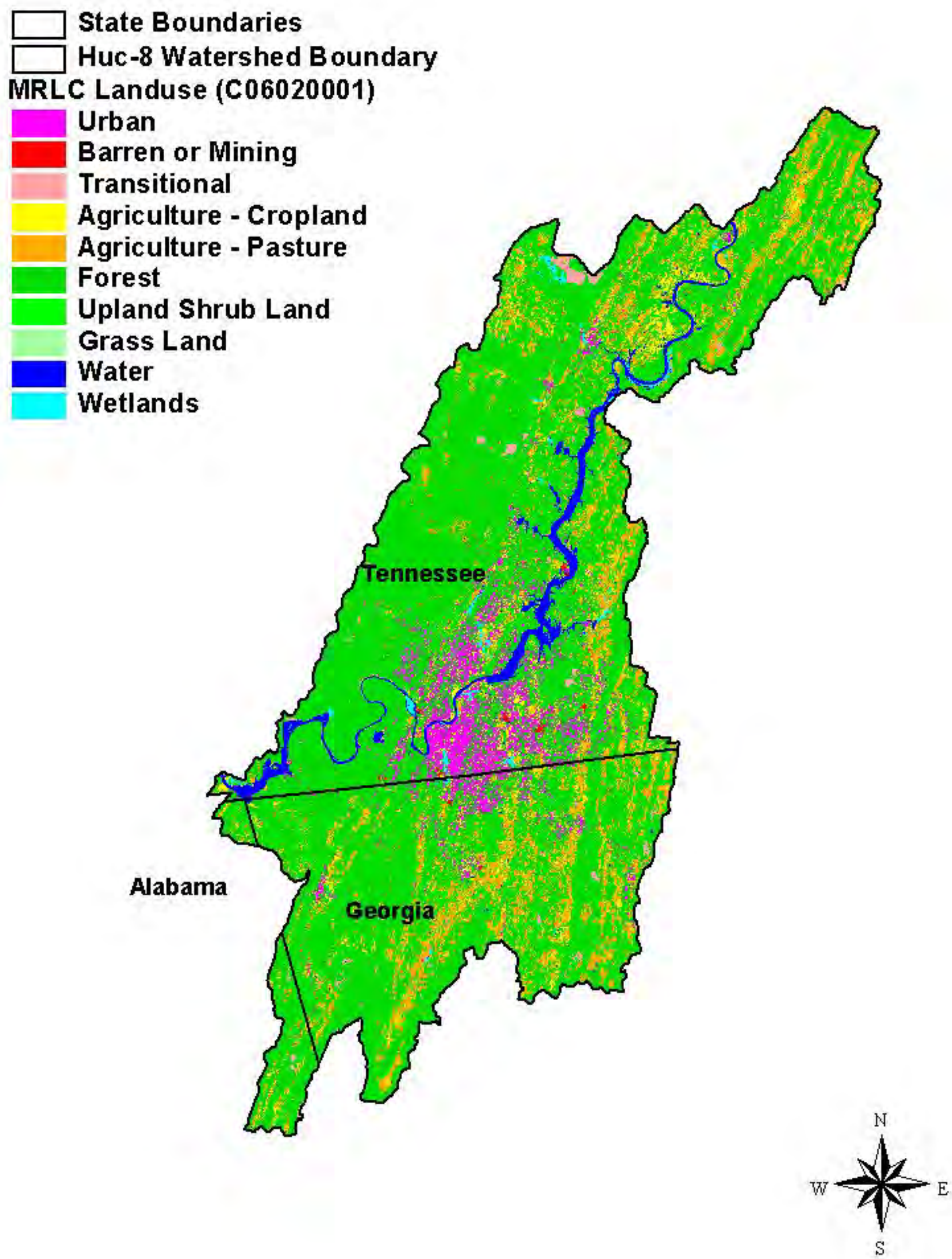
The Tennessee portion of the Lower Tennessee River Watershed drains approximately 1,214 square miles (TDEC, 2006). The entire watershed, including Tennessee, Alabama, and Georgia, drains approximately 1,870 square miles. Watershed land use distribution is based on the 1992 Multi-Resolution Land Characteristic (MRLC) satellite imagery databases. Land use for the Lower Tennessee River Watershed is summarized in Table 1 and in Figure 3.

Table 1 Land Use Distribution – Lower Tennessee River Watershed

Land Use	Area		% of watershed
	acres	mi^2	
Bare Rock/Sand/Clay	41	0.064	0.00
Deciduous Forest	475,555	742.82	39.73
Emergent Herbaceous Wetlands	1,329	2.08	0.11
Evergreen Forest	151,404	236.49	12.65
High Intensity Commercial/Industrial/Transportation	15,710	24.54	1.31
High Intensity Residential	6,407	10.01	0.54
Low Intensity Residential	37,949	59.28	3.17
Mixed Forest	254,057	396.84	21.23
Open Water	34,967	54.62	2.92
Other Grasses (Urban/recreational; e.g. parks, lawns)	12,242	19.12	1.02
Pasture/Hay	147,402	230.24	12.31
Quarries/Strip Mines/Gravel Pits	1,321	2.06	0.11
Row Crops	41,952	65.53	3.50
Transitional	11,326	17.70	0.95
Woody Wetlands	5,303	8.28	0.44
Total	**1,196,966**	**1,869.67**	**100.00**

Note: A spreadsheet was used for this calculation and values are approximate due to rounding.

Figure 3 Land Use in the Lower Tennessee River Watershed



3.0 PROBLEM DEFINITION

The State of Tennessee's 2008 303(d) List (TDEC, 2008a) identified segment TN060200011244_1000 of Chattanooga Creek in the Lower Tennessee River Watershed as not fully supporting designated use classifications due, in part, to elevated levels of dioxins and polychlorinated biphenyls (PCBs) in fish tissue samples. An excerpt from the 2008 303(d) List is presented in Table 2. The impaired segment is shown in Figure 4. Note that there is a fishing advisory for Chattanooga Creek from the mouth to the Georgia state line (7.7 miles) (TDEC, 2008).

The designated use classifications for the Chattanooga Creek include fish and aquatic life, industrial water supply, irrigation, livestock watering and wildlife, and recreation.

Table 2 Final 2008 303(d) List for Stream Impairment Due to Dioxins and PCBs

Waterbody ID	Impacted Waterbody	River Miles Impaired	Cause (Pollutant)	Pollutant Source
TN060200011244_1000 Chattanooga Creek from Nickajack Reservoir to Hooker Road.	Chattanooga Creek	8.4	PCBs Dioxins Low dissolves oxygen Escherichia coli Other Anthropogenic Habitat Alterations Oil and Grease	Combined Sewer Overflows Discharges from MS4 area Municipal High Density Area Spills Contaminated Sediment

Note: There is a fishing advisory for Chattanooga Creek from the mouth to the Georgia state line (7.7 miles).

Figure 4 Waterbody Impaired with Dioxins and PCBs (as documented on the Final *2008 303(d) List*)

3.1 Dioxins

Dioxins are a group of synthetic organic chemicals that contain 210 structurally related (congeners) chlorinated dibenzo-p-dioxins (CDD's) and chlorinated dibenzofurans (CDFs) (USEPA, 1999). Some polychlorinated biphenyls (PCBs) are also regarded as "dioxin-like" in nature. Each congener possesses different physical and chemical properties. As a result, there is a range of toxicity among these structurally related organics. 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) is the most toxic of any dioxins. Toxic Equivalent Factors (TEFs) were derived to express the toxicity of other dioxins "as a fraction of the toxicity attributed to 2,3,7,8-TCDD" (ATSDR, 1998).

Dioxins are largely created as unintentional by-products of incomplete combustion and various chemical processes, like chlorine bleaching in pulp and paper mills, and as contaminants during the production of some chlorinated organic chemicals such as chlorinated phenols (USEPA, 1999). These chlorinated hydrocarbons are persistent environmental contaminants, with environmental half-lives ranging from years to several decades. According to *An Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the United States for the Years 1987, 1995, and 2000*, "dioxin-like compounds enter surface water from atmospheric deposition, stormwater runoff erosion, and discharges of anthropogenic wastes" (USEPA, 2006).

Humans are predominately exposed to dioxins through dietary intake. Dioxins have been demonstrated to bioaccumulate in the aquatic food chain; therefore, contaminated fish and shellfish are a primary route of exposure. The exposure to any dioxins is associated with a number of adverse effects. EPA has classified dioxins as Group B2 (probable carcinogen). Furthermore, experiments "have shown toxic effects to the liver, gastrointestinal system, blood, skin, endocrine system, immune system, nervous system, and reproductive system" (USEPA, 1999).

3.2 Polychlorinated Biphenyls (PCBs)

There are approximately 209 congeners of polychlorinated biphenyls. These 209 synthetic organic compounds vary not only in their physical and chemical properties, but also in their toxicity (USEPA, 1999a). PCBs were sold as a mixture that was based upon the percentage of chlorination. Aroclor 1248, 1254, and 1260 indicate the relative percentages 48, 54, and 60 percent respectively of chlorination contained in each of these mixtures.

PCBs were manufactured in the United States from the 1920's until 1979 when they were banned by the U.S. Environmental Protection Agency. Prior to this ban, PCBs were commonly used as coolants and lubricants in transformers, capacitors and other electrical equipment. The manufacturing ban on PCBs did not require all PCB-containing materials to be removed from use. Therefore, some PCBs may still be utilized commercially. So, although the production of PCBs has ceased, these chemicals are widely distributed throughout the environment (USEPA, 1999a). Some other products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors and old microscope and hydraulic oils (ATSDR, 2001).

As stated in *Fact Sheet: Polychlorinated Biphenyls Update: Impact on Fish Advisories* (USEPA, 1999a):

> Currently, the major source of PCBs is environmental reservoirs from past releases. PCBs have been detected in soil, surface water, air, sediment, plants, and animal tissue in all regions of the earth. PCBs are highly persistent in the environment with reported half-lives in soil and sediment ranging from months to years.

Once in the sediment, PCBs can enter the aquatic food chain. PCBs are fat-soluble chemicals with the potential to concentrate in fish tissue. As a result, humans may be exposed to PCBs through the consumption of contaminated foods, primarily contaminated fish. Studies have demonstrated adverse health effects resulting from PCB exposure. PCBs are classified by EPA as Group B2 (probable carcinogen). PCBs have also been shown to be toxic to the immune system, the reproductive system, the nervous system, and the endocrine system (USEPA, 1999a).

4.0 TARGET IDENTIFICATION

In order for a TMDL to be established, a numeric "target" protective of the uses of the water body segments must be identified to serve as the basis for the TMDL. Fish tissue target criteria will be used in this TMDL because, in the State of Tennessee, assessment of waterbody segments for impairment due to dioxins and PCBs is based on fish tissue concentration. A detailed discussion of the calculations involved in the development of fish tissue target criteria, and the relationship of fish tissue concentrations to published numerical water column criteria, is included in Appendix A. For the purpose of this TMDL, target criteria expressed as the fish tissue concentrations are summarized in Table 3. These values are based on the water quality criteria for the recreation designated use classification.

Table 3 Fish Tissue Target Criteria

Pollutant	Target Criteria (mg/kg)
Dioxins	5.0E-06
PCBs	0.0200

5.0 WATER QUALITY ASSESSMENT AND DEVIATION FROM TARGET

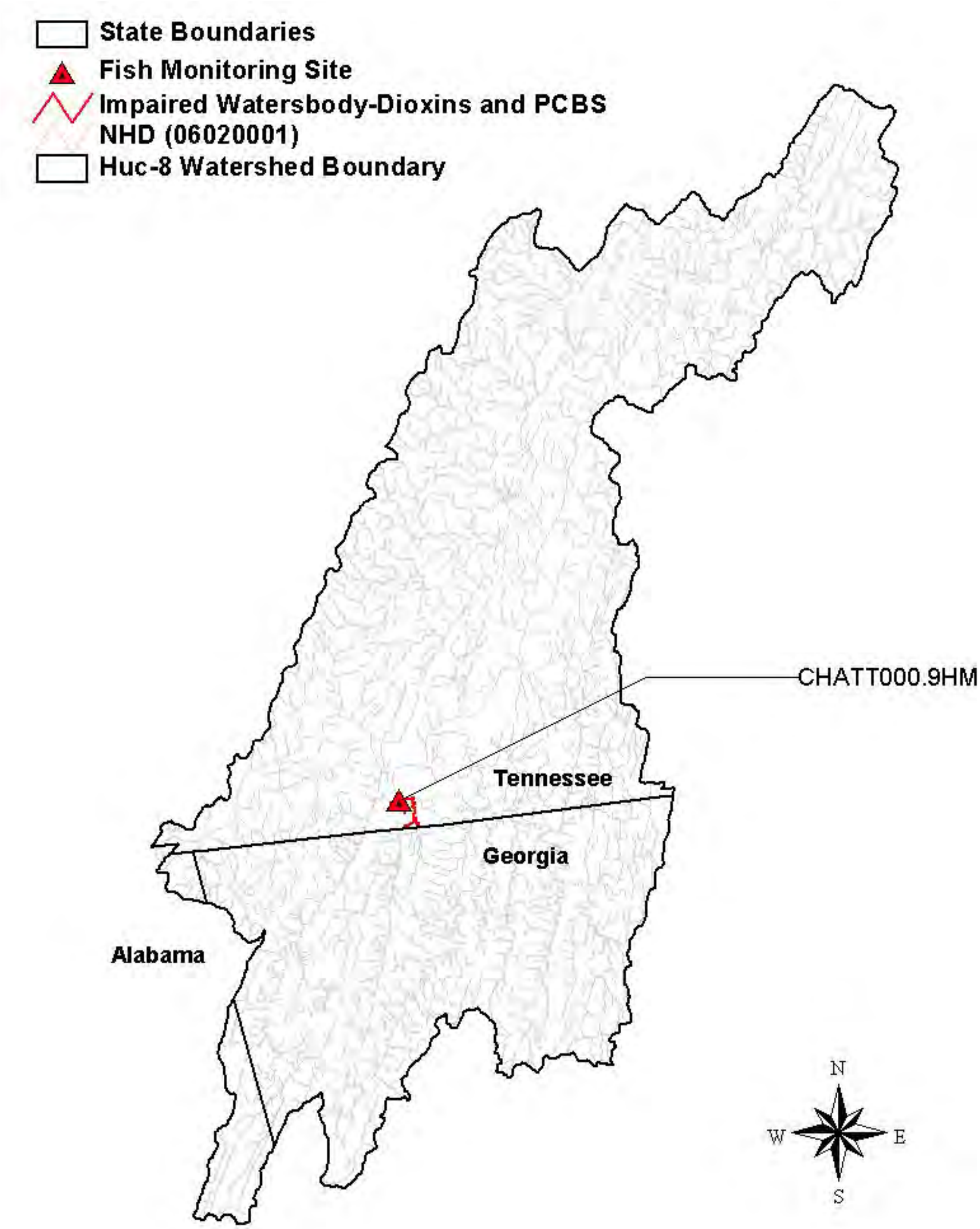
Fish tissue samples were collected and analyzed as defined in *The Results of Fish Tissue Monitoring in Tennessee 1992-1997* (TDEC). Fish tissue data were available from one station (CHATT000.9HM). Examination of the data shows exceedances of fish tissue target criteria established in Section 4.0. Table 4 presents a summary of the fish tissue monitoring results for these stations compared to the fish tissue target criteria.

The location of the monitoring site is shown in Figure 5. Fish tissue monitoring data for this site are tabulated in Appendix B.

Table 4 Fish Tissue Monitoring Data

Monitoring Station	Waterbody ID	Date Range	Pollutant	Data Points	Target (mg/kg)	Max. (mg/kg)	No. > target
CHATT000.9HM	TN060200011244_1000	1995-1997	Dioxins	9	5.0E-06	6.94E-06	3
		1990-1998	PCBs	28	0.0200	3.29	25

Figure 5 Fish Tissue Monitoring Site



6.0 SOURCE ASSESSMENT

An important part of the TMDL analysis is the identification of individual sources, source categories, or source subcategories of pollutants in the watershed and the amount of pollutant loading contributed by each of these sources. According to the Clean Water Act, sources are broadly classified as either point or non-point sources. Under 40 CFR §122.2, a point source is defined as a discernable, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. The National Pollutant Discharge Elimination System (NPDES) program regulates point source discharges. Regulated point sources include: 1) municipal and industrial wastewater treatment facilities (WWTFs); 2) storm water discharges associated with industrial activity (which includes construction activities); and 3) certain discharges from Municipal Separate Storm Sewer Systems (MS4s). For the purposes of these TMDLs, all sources of pollutant loading not regulated by NPDES are considered non-point sources.

6.1 Point Sources

There are numerous permitted dischargers in the Lower Tennessee River Watershed. However, there are currently no permitted point source dischargers with existing allocations for dioxins or PCBs in the Lower Tennessee River Watershed.

6.2 Non-point Sources

Assessments have determined that contaminated sediment is the source of dioxin and PCB impairments in Chattanooga Creek. There is one National Priorities List (NPL) site located in the Lower Tennessee River Watershed.

The Tennessee Products Superfund site (TND071516959) consists of the former Tennessee Products coal carbonization facility and its associated coal-tar dumping areas in Chattanooga Creek and its floodplain. The former coke plant is located at 4800 Central Avenue, south of Hamill/Hooker Road in Chattanooga, Tennessee. The coke plant operated from 1918 until 1987. Uncontrolled dumping of coal-tar wastes has contaminated the facility, groundwater underlying the facility, and surface water/sediment of Chattanooga Creek downstream of the facility. Coal-tar wastes are present along an approximate 2.5 mile reach of the Creek extending from just upstream of the Hamill Road Bridge to the downstream confluence with one of its tributaries, Dobbs Branch.

Environmental investigations have been conducted on Chattanooga Creek by EPA, the Tennessee Department of Environment and Conservation (TDEC), and others since 1973. Due to elevated levels of contamination in the sediments and surface waters, TDEC issued a health advisory for the Creek in 1983, and a fish consumption advisory in 1992. In August 1993, the Agency for Toxic Substances and Disease Registry (ATSDR) issued a Public Health Advisory for the Tennessee Products site based on the chemical and physical hazards presented by the coal-tar deposits. ATSDR recommended that nearby residents avoid contact with the coal-tar deposits and that the site be considered for inclusion on the National Priorities List (NPL). The site was listed on the NPL in September 1995.

In 1993, EPA fenced a section of the Creek to prevent public access. In 1994, EPA initiated a fund-lead Remedial Investigation//Feasibility Study (RI/FS) of the Chattanooga Creek study area. By November 1998, EPA completed a non-time critical removal action that focused on the upper reach of Chattanooga Creek. This action removed coal-tar deposits and contaminated sediments along a one-mile section of Chattanooga Creek between Hamill Road and 1,200 feet north of the 38th Street bridge. Approximately 25,300 cubic yards of coal-tar and contaminated sediment were removed from the creek. In addition, 1,150 cubic yards of pesticide contaminated sediment was removed from the creek and disposed at a local municipal landfill.

EPA finalized the Record of Decision (ROD) in September 2002, and issued an Explanation of Significant Differences in August 2004. The selected remedial action includes excavation of visually impacted sediments from the middle reach of Chattanooga Creek and a spoil pile along the Northeast Tributary utilizing standard construction methods, consolidation and disposal of sediments and stabilization of disturbed creek banks. In May 2005, EPA entered into a Remedial Design/Remedial Action Consent Decree with the Chattanooga Creek Cleanup Committee . This Consent Decree recovered past response costs incurred by EPA and secured a commitment to perform the final phase of cleanup that involves approximately 1.9 miles of Chattanooga Creek from north of the 38th Street Bridge to the confluence with Dobbs Branch. Cleanup work required by the May 2005 Consent Decree was initiated in September 2005 and was finished in September 2007 (USEPA, 2008).

These TMDLs will consider contaminated sediment as the primary source of dioxins and PCBs in Chattanooga Creek. According to the U.S. Environmental Protection Agency, these pollutants have a very low solubility in water and low volatility and they are contained in sediments that serve as reservoirs from which these pollutants may be released over a long period of time (USEPA, 1999, 1999a, 2006).

7.0 DEVELOPMENT OF TOTAL MAXIMUM DAILY LOADS

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards based on the relationship between pollution sources and in-stream water quality conditions. A TMDL can be expressed as the sum of all point source loads (Waste Load Allocations), non-point source loads (Load Allocations) and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\text{TMDL} = \Sigma\ \text{WLAs} + \Sigma\ \text{LAs} + \text{MOS}$$

The objective of a TMDL is to allocate loads among all of the known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. 40 CFR §130.2 (i) states that TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measure.

7.1 Critical Conditions and Seasonal Variation

Critical conditions were incorporated into the TMDL analysis by using the entire period of record (1990-1998) for the fish tissue monitoring data. Fish tissue data were collected during a variety of seasons. Dioxin and PCB concentrations are not expected to fluctuate very much due to the fact that these pollutants are contained mainly in the sediment.

7.2 Determination of TMDLs

In this document, the TMDLs are daily loads expressed as a function of the annual average flow (daily loading function). The daily load is calculated by multiplying the water quality criterion by the annual average flow (represented by Q) and the required unit conversion factor.

Example: Water quality criterion for PCBs = 0.00064 μg/L
Conversion Factor = 5.39×10^{-3} (lbs-L-sec/(μg-ft^3-day))
Daily Load = Q * 3.45×10^{-6} lbs/day

The TMDLs were developed based on fish tissue target criteria which are the equivalent of the water quality criteria (See Appendix A for a more detailed explanation). For implementation purposes, the TMDLs are also expressed as maximum water column concentrations and maximum fish tissue concentrations

7.3 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in TMDL analysis: a) implicitly incorporate the MOS using conservative model assumptions to develop allocations; or b) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. In these TMDLs, a 5% explicit MOS was incorporated to account for uncertainties.

7.4 Determination of WLAs & LAs

There are currently no permitted point source dischargers with existing allocations for dioxins or PCBs. Waste load allocations of zero are being provided. The load allocation requires the contribution from non-point sources to be less than or equal to the TMDL target value. In the absence of point sources:

$$LA = TMDL - MOS$$

TMDLs, WLAs, and LAs are summarized in Table 5.

Table 5 TMDLs, WLAs, and LAs for the Lower Tennessee River Watershed

Waterbody ID	Pollutant	WLAs	LAs[1]	MOS[1]	TMDLs		
					Maximum Load[1]	Maximum Water Column Concentration[2]	Maximum Fish Tissue Concentration[2]
		(lbs/day)	(lbs/day)[3]	(lbs/day)[3]	(lbs/day)[3]	(µg/L)	(mg/kg)
TN060200011244_1000	Dioxins	0	Q * 5.12E-09	Q * 2.70E-10	Q * 5.39E-09	1.0E-06	5.0E-06
	PCBs	0	Q * 3.28E-06	Q * 1.73E-07	Q * 3.45E-06	0.00064	0.0200

1 The LA, MOS, and the Maximum Load TMDL are expressed as a function of flow (Q), where Q represents the annual average flow of the Chattanooga Creek at the pour point of the segment.
2 The TMDL is also expressed in terms of maximum allowable water column concentration and maximum fish tissue concentration because TDEC recognizes that these values provide information that potentially will be more useful regarding TMDL implementation efforts than the values that are expressed in terms of an allowable load.
3 Lbs/day calculated as an annual average.

8.0 IMPLEMENTATION PLAN

8.1 Point Sources

There are currently no NPDES permitted facilities in the Lower Tennessee River Watershed with an existing allocation to discharge dioxins or PCBs to the Chattanooga Creek.

8.2 Non-point Sources

The Tennessee Department of Environment & Conservation (TDEC) has no direct regulatory authority over most non-point source discharges. Voluntary, incentive-based mechanisms will be used to implement non-point source management measures in order to assure that measurable reductions in pollutant loadings can be achieved for the impaired waterbody.

One segment of the Chattanooga Creek was listed as impaired on the *2008 303(d) List* because it was not fully supporting designated use classifications due, in part, to elevated levels of dioxins and PCBs. Contaminated sediment was identified as the likely source for dioxin and PCB contamination in Chattanooga Creek.

There are generally two options to prevent dioxins and PCBs contained in the sediment from being released to the waterbody: 1) avoid disturbing the sediment or 2) remediate contaminated sites. TDEC recommends using option one whenever possible. On the other hand, if the sediment must be disturbed, remediation efforts will be necessary to control the load of dioxins and PCBs so that the water quality criteria are not exceeded. Strategies to identify sites with elevated levels of dioxins and PCBs may be helpful for implementing controls to prevent the contaminants from being released into Chattanooga Creek. As less of the contaminants become biologically available the concentrations of dioxins, and PCBs measured in fish tissue samples should theoretically decline. Most importantly, continued fish tissue monitoring is advised to ensure that contamination decreases as time passes. This will help determine if additional loading is occurring.

8.3 Evaluation of TMDL Implementation Effectiveness

The effectiveness of these TMDLs will be assessed as data becomes available or when necessary. Watershed monitoring and assessment activities will provide information by which the effectiveness of dioxin and PCB load allocations can be evaluated. Continued fish tissue sampling will be necessary to monitor the efficacy of the proposed TMDLs. These results will be reevaluated during subsequent water quality assessment cycles as required by the Clean Water Act.

9.0 PUBLIC PARTICIPATION

In accordance with 40 CFR §130.7, the proposed TMDLs for dioxins and PCBs in the Chattanooga Creek was placed on Public Notice for a 35-day period and comments were solicited. Steps taken in this regard included:

1) Notice of the proposed TMDLs was posted on the Tennessee Department of Environment and Conservation website. The notice invited public and stakeholder comments and provided a link to a downloadable version of the TMDL document.

2) Notice of the availability of the proposed TMDLs (similar to the website announcement) was be included in one of the NPDES permit Public Notice mailings, which was sent to interested persons or groups who have requested this information.

3) A letter was sent to identified water quality partners in the Lower Tennessee River Watershed advising them of the proposed dioxins and PCB TMDLs and their availability on the TDEC website. The letter also stated that a written copy of the Draft TMDL document would be provided upon request. A letter was sent to the following partners:

   Natural Resources Conservation Service
   Tennessee Department of Agriculture
   Tennessee Water Sentinels
   United States Fish and Wildlife Service
   United States Geological Survey
   Nature Conservancy
   Southeast Tennessee RC&D Council

4) A draft copy of the proposed TMDLs was sent to the following MS4s:

TNS068063	City of Chattanooga
TNS075566	Hamilton County
TNS077585	Tennessee Department of Transportation

No comments were received during the public notice period.

10.0 FURTHER INFORMATION

Further information concerning Tennessee's TMDL program can be found on the Internet at the Tennessee Department of Environment and Conservation website:

http://www.state.tn.us/environment/wpc/tmdl/

Technical questions regarding these TMDLs should be directed to the following members of the Division of Water Pollution Control staff:

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11.0 REFERENCES

ATSDR. 1998. *Toxicological Profile for Chlorinated Dibenzo-p-dioxins (CDDs).* U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. December 1998.

ATSDR. 2001. *Toxicological Frequently asked Questions-Polychlorinated Biphenyls.* U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. February 2001.

TDEC. *The Results of Fish Tissue Monitoring in Tennessee 1992-1997.* Tennessee, Department of Environment and Conservation, Division of Water Pollution Control.

TDEC. 2002. *Dioxin Levels in Pigeon River Fish 1996-2002.* Tennessee Department of Environment and Conservation, Division of Water Pollution Control. October 2002.

TDEC. 2006. *2006 305(b) Report: The Status of Water Quality in Tennessee*, Tennessee Department of Environment and Conservation, Division of Water Pollution Control. April 2006.

TDEC. 2007. *State of Tennessee Water Quality Standards, Chapter 1200-4-3 General Water Quality Criteria, October 2007.* Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Approved March 2008.

TDEC. 2008. *Bacteriological and Fishing Advisories in Tennessee.* Tennessee Department of Environment and Conservation, Division of Water Pollution Control. May 2008.

TDEC. 2008a. *Final Version, Year 2008 303(d) List.* Tennessee Department of Environment and Conservation, Division of Water Pollution Control, July 2008. This document is available from the TDEC website at: http://state.tn.us/environment/wpc/publications/2008_303d.pdf.

USEPA. 1991. *Guidance for Water Quality-based Decisions: The TMDL Process.* U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-440/4-91-001. April 1991.

USEPA. 1997. *Ecoregions of Tennessee*. U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Corvallis, Oregon. EPA/600/R-97/022.

USEPA. 1999. *Fact Sheet: Polychlorinated Dibenzo-p-dioxins and Related Compounds Update: Impact on Fish Advisories*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-823-F-99-015. September 1999.

USEPA. 1999a. *Fact Sheet: Polychlorinated Biphenyls (PCBs) Update: Impact on Fish Advisories*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-823-F-99-019. September 1999.

USEPA. 2002. *National Recommended Water Quality Criteria: 2002; Human Health Criteria Calculation Matrix*. EPA-822-R-02-012. November 2002.

USEPA. 2006. *An Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the United States for the Year 1987, 1995, and 2000.* U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA/600/P-03/002F. November 2006.

USEPA. 2007. Federal Register/Vol. 72/Thursday, May 10, 2007/Rules and Regulations. May 2007.

USEPA. 2008. *Tennessee NPL/NPL Caliber Cleanup Site Summaries* , January 15th, 2008. http://www.epa.gov/region4/waste/npl/npltn/tennprtn.htm

APPENDIX A

Development of Target Criteria For PCBs and Dioxins

In the State of Tennessee, assessment of waterbody segments for impairment due to dioxins and PCBs is based on fish tissue concentrations. Public fishing advisories are also based upon fish tissue concentrations. Therefore, for the purpose of this TMDL, development of target criteria will be based on fish tissue concentration.

PCB Methodology

The formula for calculating the fish tissue concentration requiring a fish advisory is established by *State of Tennessee Water Quality Standards, Chapter 1200-4-3, General Water Quality Criteria, October 2007* (TDEC, 2007). Section 1200-4-3-.03 (4) (l) is summarized below:

$$R = q * E \qquad \text{(Equation A-1)}$$

where:

R = Plausible-upper-limit risk of cancer associated with a chemical in a fish species; in Tennessee, a risk level of 10^{-5} is used when considering a fish advisory
q = Carcinogenic Potency Factor for the specific chemical (kg-day/mg)
E = Exposure dose of the specific chemical (mg/kg-day) from the fish species

E is calculated based on the following formula:

$$E = C * I * X / W \qquad \text{(Equation A-2)}$$

where:

C = Concentration of the chemical (mg/kg) in the edible portion of the fish species
I = Ingestion rate (g/day) of the fish species; 17.5 g/day will be used (USEPA, 2002)
X = Relative absorption coefficient; assumed to be 1.0
W = Average human mass (kg); 70 kg will be used (USEPA, 2002)

Combining equations A-1 and A-2 and solving for fish tissue concentration (C) results in the following equation:

$$C = (R * CF1 * W) / (q * I * X) \qquad \text{(Equation A-3)}$$

where:

CF1 = Conversion Factor (1000 g/kg)

Once the fish tissue target concentration has been determined using Equation A-3, the corresponding water column concentration can be determined using the following equation:

$$C_{water} = [C_{fish} * CF2] / BCF \qquad \text{(Equation A-4)}$$

where:

CF2 = Conversion Factor (1000 μg /mg)
BCF = Bioconcentration Factor (L/kg)

Using Equations A-3 and A-4 and published values for q and BCF (USEPA, 2002), the target fish tissue concentrations were calculated for the waterbody (TN06020001001244_1000).

Table A-1 Target Fish Tissue Concentrations

Pollutant	q (kg-day/mg)	C_{fish} (mg/kg)	BCF (L/kg)	C_{water} (µg/L)
PCB	2.0	0.0200	31,200	0.00064

The fish tissue concentrations given in Table A-1 were calculated using the methodology developed on the previous page. These fish tissue concentrations are more stringent than the fish tissue concentrations calculated from the water column criteria established for the fish and aquatic life use classification. Therefore, the fish tissue concentrations in Table A-1 will be used as the target criteria for this TMDL.

<u>Dioxin Methodology</u>

For dioxin, a different methodology is used to determine water quality criterion and the fish advisory level. The fish tissue concentration requiring a fish advisory is based on the water quality criterion as established by *State of Tennessee Water Quality Standards, Chapter 1200-4-3, General Water Quality Criteria, October 2007* (TDEC, 2007). The water quality criterion is based on a combination of EPA and USFDA assumptions and was approved by EPA in 1999. (For a more complete explanation, see *Dioxin Levels in Pigeon River Fish: 1996-2002* [TDEC, 2002]). The water criterion of 1 ppq is multiplied by the bioconcentration factor for dioxin and the appropriate conversion factor:

$$C_{fish} = [C_{water} * BCF] / CF2 \qquad \text{(Equation A-5)}$$

where:

CF2 = Conversion Factor (1000 µg/mg)
BCF = Bioconcentration Factor (5,000 L/kg)

The resulting fish tissue concentration is:

$$C_{fish} = [(1x10^{-6}\ \mu g/L) * (5000\ L/kg)] / (1000\ \mu g/mg) = 5x10^{-6}\ mg/kg$$

where:

$1\ ppq = 1x10^{-6}\ \mu g/L$

Therefore, the fish tissue concentration calculated from Equation A-5 ($5x10^{-6}$ mg/kg) will be used as the target criterion for this TMDL.

APPENDIX B

Fish Tissue Monitoring Data
For Dioxins and PCBs

There was one site that provided fish tissue data for Chattanooga Creek. The location of this monitoring station is shown in Figure 5. Fish tissue data recorded at this site are tabulated in Tables B-1 and B-2.

In Table B-1, total dioxins were calculated as the sum of the concentrations of all polychlorinated dibenzo-p-dioxins (CDD) and and polychlorinated dibenzofuran (CDF) isomers after multiplication by the appropriate Toxic Equivalent Factor (TEF):

$$C_{dioxins} = \Sigma [C_i \times TEF_i]$$

where:

$C_{dioxins}$ = Total dioxins measured in fish tissue samples (ppt)
C_i = Concentration of isomer *i* in fish tissue samples (ppt)
TEF_i = Toxic Equivalent Factor specific for isomer *I*

The TEF approach compares the relative potential toxicity of each dioxin like compound in the mixture to the toxicity of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), the most toxic member of the group. The TEF for 2,3,7,8-TCDD is defined as unity; and the TEFs for all other polychlorinated dibenzo-p-dioxins (CDDs), polychlorodibenzofurans (CDFs), and certain coplanar polychlorinated biphenyls (PCBs) are defined with values that are less than one which reflects their lower toxic potency relative to 2,3,7,8 TCDD (USEPA, 2006).

The TEFs used in this TMDL were recommended by the EPA (USEPA, 2007).

In Table B-2, PCB data presented is for the sum of Aroclor 1248, 1254, and 1260.

Table B-1 Fish Tissue Monitoring Data for Dioxins

Monitoring Site ID	Date	Fish Species	Total Dioxins ppt	Total Dioxins mg/kg
CHATT000.9HM	1995	Channel Catfish	5.14	5.14E-06
	1995	Channel Catfish	5.83	5.84E-06
	1997	Largemouth Bass	0.91	9.14E-07
	1997	Channel Catfish	6.94	6.94E-06
	1997	Spotted Sucker	0.24	2.43E-07
	1997	Largemouth Bass	0.027	2.69E-08
	1997	Channel Catfish	2.40	2.40E-06
	1997	Channel Catfish	3.48	3.48E-06
	1997	Spotted Sucker	1.20	1.20E-06

Table B-2 Fish Tissue Monitoring Data for PCBs

Monitoring Site ID	Date	Fish Species	Total PCBs mg/kg
CHATT000.9HM	1990	Channel Catfish	1.43
	1990	Largemouth Bass	0.122
	1990	Carp	1.14
	1991	Channel Catfish	3.16
	1991	Channel Catfish	3.29
	1991	Channel Catfish	2.93
	1991	Channel Catfish	1.64
	1991	Channel Catfish	2.58
	1991	Channel Catfish	0.851
	1991	Largemouth Bass	0.264
	1991	Largemouth Bass	0.758
	1991	Largemouth Bass	0.222
	1991	Largemouth Bass	0.035
	1991	Spotted Sucker	ND
	1995	Channel Catfish	0.482
	1995	Channel Catfish	0.671
	1995	Spotted Sucker	ND
	1995	Largemouth Bass	ND
	1997	Largemouth Bass	0.087
	1997	Channel Catfish	0.434
	1997	Spotted Sucker	0.056
	1997	Largemouth Bass	0.029
	1997	Channel Catfish	0.336
	1997	Channel Catfish	0.157
	1997	Spotted Sucker	0.075
	1998	Channel Catfish	0.770
	1998	Largemouth Bass	0.399
	1998	Spotted Sucker	0.200

APPENDIX C

Public Notice Announcement

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER POLLUTION CONTROL

PUBLIC NOTICE OF AVAILABILITY OF PROPOSED TOTAL MAXIMUM DAILY LOAD (TMDLS) FOR DIOXINS & POLYCHLORINATED BIPHENYLS FOR CHATTANOOGA CREEK IN THE LOWER TENNESSEE RIVER WATERSHED (HUC 06020001), TENNESSEE

Announcement is hereby given of the availability of Tennessee's proposed Total Maximum Daily Loads (TMDLs) for dioxins and polychlorinated biphenyls (PCBs) for the Chattanooga Creek Watershed, located in eastern Tennessee. Section 303(d) of the Clean Water Act requires states to develop TMDLs for waters on their impaired waters list. TMDLs must determine the allowable pollutant load that the water can assimilate, allocate that load among the various point and nonpoint sources, include a margin of safety, and address seasonality.

Chattanooga Creek was identified on Tennessee's Final 2008 303(d) list as not supporting designated use classifications due to elevated levels of dioxins and polychlorinated biphenyls (PCBs) in fish tissue samples. Contaminated sediments are the source of pollutant causes associated with these impairments. Using a mass-balance approach, the TMDLs utilize Tennessee's general water quality criteria, fish tissue sampling data collected from the mouth of Chattanooga Creek, fish advisory calculations, Bioconcentration Factors defined by the U.S. Environmental Protection Agency, and an appropriate Margin of Safety (MOS) to establish dioxin and PCB loading levels which will result in lower fish tissue concentrations and the attainment of water quality standards.

The proposed dioxins and PCB TMDLs may be downloaded from the Department of Environment and Conservation website:

http://www.state.tn.us/environment/wpc/tmdl/

Technical questions regarding this TMDL should be directed to the following members of the Division of Water Pollution Control staff:

Vicki S. Steed, P.E., Watershed Management Section
Telephone: 615-532-0707

Sherry H. Wang, Ph.D., Watershed Management Section
Telephone: 615-532-0656

Persons wishing to comment on the proposed TMDL are invited to submit their comments in writing no later than June 22, 2009 to:

Division of Water Pollution Control
Watershed Management Section
7th Floor, L & C Annex
401 Church Street
Nashville, TN 37243-1534

All comments received prior to that date will be considered when revising the TMDL for final submittal to the U.S. Environmental Protection Agency.

The TMDL and supporting information are on file at the Division of Water Pollution Control, 6th Floor, L & C Annex, 401 Church Street, Nashville, Tennessee. They may be inspected during normal office hours. Copies of the information on file are available on request.

EXHIBIT F

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGIONS II AND III

TOTAL MAXIMUM DAILY LOAD FOR POLYCHLORINATED BIPHENYLS (PCBs) FOR ZONE 6 OF THE DELAWARE RIVER

Signed 12/11/2006

Walter E. Mugdan Date
Director
Division of Environmental Planning
and Protection
EPA Region II

Signed 12/14/2006

Jon M. Capacasa Date
Director
Water Protection Division
EPA Region III

Prepared by the
DELAWARE RIVER BASIN COMMISSION
WEST TRENTON, NJ

December 2006

TOTAL MAXIMUM DAILY LOAD FOR POLYCHLORINATED BIPHENYLS (PCBs) FOR ZONE 6 OF THE DELAWARE RIVER

Delaware River Basin Commission
DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

DELAWARE RIVER BASIN COMMISSION
WEST TRENTON, NEW JERSEY

December 2006

Authority

This TMDL is established by the U.S. Environmental Protection Agency under the authority of Section 303(d) of the Clean Water Act, 33 U.S.C. § 1251 *et seq.,* and in accordance with EPA's implementing regulations, 40 C.F.R., § 130.

Acknowledgments

This report was prepared by the Delaware River Basin Commission staff: Carol R. Collier, Executive Director. Dr. Namsoo Suk and Dr. Thomas J. Fikslin were the principal authors of the report. Gregory Cavallo and John Yagecic of the Modeling & Monitoring Branch also contributed to this report. Dr. Suk is a Water Resources Engineer/Modeler in the Modeling & Monitoring Branch. Dr. Fikslin is the Head of the Commission's Modeling & Monitoring Branch.

Richard W. Greene is gratefully acknowledged for his efforts in summarizing fish tissue data for PCBs, and for providing Figures 2 through 4 of the report. Technical recommendations for developing Stage 1 TMDLs were provided by the Commission's Toxic Advisory Committee and its TMDL Policies and Procedures Subcommittee.

Special acknowledgment is made to the following organizations for their support in development of the report and the studies leading up to it:

Delaware Department of Natural Resources & Environmental Control
New Jersey Department of Environmental Protection
Pennsylvania Department of Environmental Protection
U.S. Environmental Protection Agency, Region II
U.S. Environmental Protection Agency, Region III
Rutgers University
Limno-Tech, Inc.

Suggested Citation

Suk, N.S. and T.J. Fikslin. 2006. Total Maximum Daily Load for Polychlorinated Biphenyls (PCBs) for Zone 6 of the Delaware River. Delaware River Basin Commission. West Trenton, NJ. December 2006.

EXECUTIVE SUMMARY

On behalf of the states of Delaware and New Jersey, and in cooperation with the Delaware River Basin Commission (DRBC), the United States Environmental Protection Agency Regions II and III (EPA) has developed a total maximum daily load (TMDL) for polychlorinated biphenyls (PCBs) from the head of the Delaware Bay at Liston Point to the mouth of the Bay at Cape Henlopen to Cape May. This area is also referred to as Delaware River Basin Commission Water Quality Management Zone 6. EPA establishes this TMDL in order to achieve and maintain the applicable water quality criteria for PCBs designed to protect human health from the carcinogenic effects of eating the contaminated fish now found in the Delaware Estuary and Bay. In accordance with Section 303(d) of the Clean Water Act (CWA) and its implementing regulations, this TMDL provides allocations to point sources (WLAs) discharging PCBs as well as allocations to nonpoint sources (LAs) of PCBs, and an explicit margin of safety to account for uncertainties. This TMDL meets all of the current federal regulatory requirements of a TMDL established under the Clean Water Act.

This TMDL report and its appendices set forth the basis for the TMDL and allocations, and discuss follow up strategies that will be necessary to achieve these substantial reductions of PCBs. EPA will continue to work with the Commission and the States as they develop enhanced Stage 2 PCB TMDLs for the entire Delaware Estuary (also referred to as Delaware River Basin Commission Water Quality Management Zones 2 through 6) based on information to be collected and analyzed over the next several years. While EPA acknowledges that implementation of these TMDLs will be difficult and may take decades to fully achieve, the establishment of these TMDLs sets forth a framework and specific goals to protect human health and restore the Delaware River from the effects of PCB pollution.

Listing under Section 303(d) of the Clean Water Act

The Delaware Department of Natural Resources & Environmental Control (DNREC) first listed Zones 5 and 6 of the Delaware River as impaired for toxics on the state's 1996 Section 303(d) List. In 1998, DNREC again listed Zone 5 of the Delaware River, but specifically listed PCBs as a pollutant contributing to the impairment. In Attachment B to a Memorandum of Agreement (MOA) between the Delaware Department of Natural Resources & Environmental Control and the U.S. Environmental Protection Agency, Region III dated July 25, 1997, DNREC agreed to complete the TMDL for Zone 6 by December 31, 2006 provided that funding and certain other conditions were met. In a Consent Decree between the American Littoral Society, the Sierra Club, and the U.S. Environmental Protection Agency dated July 31, 1997, the U.S. EPA agreed to establish all TMDLs by December 15 of the year following the state's deadline provided that all TMDLs be established by December 15, 2006. In June 2005, New Jersey listed all of Delaware Bay and the tidal portions of tributaries to Delaware Bay (i.e., Zone 6) as impaired by PCBs on their 2004 Integrated List of Waterbodies.

Basis for TMDL

TMDLs must be based upon the water quality criteria and the designated uses for the water body that was listed under Section 303(d). In the Delaware River Basin, applicable water quality criteria and uses have been adopted in regulation by the states bordering the river as well as the Delaware River Basin Commission. The DRBC does not have specific numerical criteria for toxic pollutants including PCBs for Zone 6. Delaware adopted a numerical water quality criterion of 64 pg/l for Total PCBs in 2004. New Jersey currently has a state-wide numerical water quality criterion of 170 pg/l for Total PCBs that was adopted in January 2002. In September 2005, the NJDEP proposed a state-wide numerical water quality criterion of 64 pg/l for Total PCBs. The TMDL presented in this report is based upon a water quality criterion of 64 pg/l for Total PCBs. The TMDL must, however, also ensure that the water quality of adjacent water bodies is met. Numerical water quality criteria to protect designated uses for toxic pollutants including Total PCBs for Zones 2 through 5 of the Delaware River were adopted by the DRBC in October 1996. These criteria do, however, differ from the criterion adopted by Delaware and New Jersey. Human health criteria in Zones 4 and 5 are based solely upon exposure to PCBs through ingestion of fish taken from these estuary zones. The water quality regulations of both Delaware and New Jersey specify that criteria formally adopted by the DRBC are the applicable criteria for that portion of the Delaware River. DRBC criteria for Zones 4 and 5 are more stringent, and must be considered in developing the TMDL.

In January 2006, the Commission's Executive Director requested the concurrence of the U.S. Environmental Protection Agency Regions II and III that the existing human health water quality criteria namely: 64 pg/l in Zone 6, 7.9 pg/l in lower Zone 5 and 44.8 pg/l in upper Zone 5 and all of Zone 4 should be the basis for the Zone 6 TMDL. In a letter received on February 21, 2006, both U.S. EPA regional offices concurred with this approach.

TMDL Approach

The complexity of a TMDL for a class of compounds such as PCBs, the limited time imposed by the MOA and Consent Decree, the limited data available, and the benefits of refining it through time with more data led to a decision to develop the TMDL for PCBs in two stages consistent with EPA TMDL guidance. A staged approach provides for adaptive implementation through execution of load reduction strategies while additional monitoring and modeling efforts proceed in order to refine the wasteload and load allocations. The approach recognizes that additional monitoring data and modeling results will be available following issuance of this Stage 1 TMDL to enable a more refined analysis to form the basis of the Stage 2 TMDL. This staged approach to establishing TMDLs will be utilized for the Zone 6 TMDL as it was for the Stage 1 TMDLs for Zones 2 - 5.

In essence, the Zone 6 TMDL is an extension of the Stage 1 TMDLs developed for Zones 2 - 5. Due to the tidal nature of this portion of the Delaware River, the influence of Zone 6 on the upriver zones had to be considered in the development of the Zones 2 - 5 TMDLs. Similarly in this TMDL, Zones 2 - 5 have a significant influence on the PCB concentrations in Zone 6 and must be considered. The Zone 6 TMDL also needed to be staged due to the lack of any PCB data on point sources as well as tributaries to Delaware Bay, the need to collect additional ambient data in Delaware Bay, and the need for modifications to the penta-PCB water quality model to better describe the processes occurring in the estuarine turbidity maximum (ETM). Other planned enhancements include specification of sediment PCB concentrations based upon additional sediment data and assignment of segment-specific gaseous air concentrations.

Wasteload allocations for individual discharges to Zone 6 were developed using a simplified methodology, which still met all of the current regulatory requirements for establishing a TMDL. A number of key guiding principles were utilized in developing the TMDL and allocations. These principles were based on available scientific data, model simulation results, and policy decisions. The guiding principles are as follows:

1. The Stage 1 TMDL for Zone 6 (Delaware Bay) is built upon TMDLs developed for Zones 2 to 5 in 2003.

2. Pentachlorobiphenyls, the penta-PCB homolog group, are used as a surrogate for Total PCBs. The same ratio used in development of the Zones 2 to 5 TMDLs in 2003, 1:4 for penta to total PCBs, is used in this TMDL.

3. Preliminary model simulations revealed that there are two potential critical locations that control the loading of PCBs to Zone 6. One location is at River Mile 68.75, the location of Delaware Memorial Bridge, where the applicable water quality criteria changes from 44.8 to 7.9 pg/L . The other location is at the boundary of Zone 5 and 6 (River Mile 48.2) where the applicable water quality criteria changes from 7.9 to 64 pg/L in an upstream to downstream direction. Allowable loadings of PCBs to Zone 6 or from the downstream boundary will be determined while focusing on violations at those two locations

4. All WLAs and LAs in Zone 6 are allowed to discharge at the applicable water quality criterion of 64 picograms per liter of total PCBs. Since this Stage 1 TMDL for the Delaware Bay is limited to the mainstem of the Estuary not the individual tributaries, the influence from the WLAs and LAs are relatively minor compared to the influence from the upstream or the downstream boundaries (the Ocean) of Zone 6. .

5. As a policy decision, 5 percent of the TMDL is explicitly reserved for a margin of safety. This is consistent with the margin of safety used in the Zones 2 - 5 TMDLs.

TMDL Procedure

The TMDL for Total PCBs for Zone 6 of the Delaware Estuary is established using a seven step procedure. A brief description of each of the seven steps follows:

1 Using the revised model code and revised input conditions, re-confirm that the TMDLs developed in 2003 are still valid. The governing criterion occurs at two locations, River Mile 68.75 and River Mile 48.2, is 1.975 picograms per liter (pg/L). This value is 25% of 7.9 pg/L, the water quality criterion for Total PCBs at these locations.

2. Determine the usable assimilative capacity for Stage 1 Zone 6 PCB TMDL at the two

critical locations by assigning zero penta-PCBs at the ocean boundary, and for all point and non-point sources to Zone 6. The difference between the simulation results and applicable water quality target is the total assimilative capacity available for Zone 6.

3. Allowable loadings from all point and non-point sources having inflows into Zone 6 are then calculated by multiplying their inflow by the applicable water quality target of 16 pg/L for penta-PCBs. These loadings are distributed in the model proportional to the model segment sizes in Zone 6. The only missing load will then be the influx from the ocean boundary.

4. Determine the allowable ocean boundary by trial and error simulations using the penta-PCB model, the re-confirmed TMDLs for Zones 2 to 5 developed in 2003 plus the Zone 6 loads calculated from the previous step. Compare the results with the applicable water quality target at the two critical locations.

5. Once the allowable ocean boundary is found, calculate and assign equilibrium gaseous atmospheric concentrations in the model. Run the model and go back to Step 4 until the difference between the water quality target and the simulated water column penta PCBs is less than 0.02 pg/L.

6. Convert the ocean boundary concentration to a load and add it to the gross load allocation portion.

7. Reserve 5 percent of the wasteload allocation (WLA) and load allocation (LA) portions for a margin of safety.

Stage 1 TMDL for Zone 6

The Stage 1 TMDL for Total PCBs for Water Quality Management Zone 6 (the Delaware Bay) and its components are listed in the following table:

	TMDL	WLAs	LAs	MOS
Total PCBs	1876.45 mg/day	13.12 mg/day	1769.51 mg/day	93.82 mg/day
Percent of TMDL	-	0.7%	94.3%	5.0%

The wasteload allocation portion of the TMDL represents those source categories that are regulated under the NPDES program (industrial discharges, municipal wastewater treatment plant discharges, combined sewer overflows or CSOs, and municipal separate storm sewer systems or MS4s). Eight (8) industrial and municipal wastewater discharges are assigned wasteload allocations in this TMDL. No CSOs were identified by state permitting authorities. 20 municipal separate storm sewer systems or MS4s were included in the allocation for this point source category. The load allocation portion of the TMDL represents categories including contaminated sites, non-NPDES regulated stormwater discharges, tributaries, air deposition and most importantly input from the Ocean.

Note that the load allocation portion of the TMDL is the largest portion of the TMDL due to the relatively large influence of the ocean on pollutant concentrations in the Bay. Despite this large influence, the allocated loading from the ocean is equivalent to 14.5 picograms per liter (ppq)of Total PCBs rather than the applicable ocean water quality criterion of 64 pg/l. This is primarily attributable to the need to meet the water quality criteria at the two critical locations in Zone 5. With the use of a uniform criterion for the entire estuary for the Stage 2 TMDLs for Zones 2 - 6, this issue should be resolved.

A Stage 2 TMDL, individual WLAs and LAs for Zone 6 will be developed concurrently with those for Zones 2 - 5. They are targeted for development by December 31, 2008. Once the Stage 2 TMDLs are finalized, EPA expects the WLAs developed in Stage 2 to replace the Stage 1 WLAs. EPA expects the Stage 2 WLAs and LAs to be based on all of the monitoring data obtained through the development of the Stage 2 TMDLs, and the additional modeling that will be performed following the establishment of the Stage 1 TMDL. Stage 2 TMDLs will also be based on the summation of those PCB homolog groups accumulated by resident fish and aquatic biota, without the use of extrapolation. It is anticipated that the Stage 2 WLAs will be based upon a more sophisticated allocation methodology than the Stage 1 WLAs, and will likely reflect application of the procedures set forth in the DRBC Water Quality Regulations.

Following establishment of the TMDL for Zone 6, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued or modified after the approval date must be consistent with the WLAs. The NPDES permitting authorities (i.e., U.S. EPA, Delaware DNREC and New Jersey DEP) believe that these WQBELs will include non-numeric controls in the form of a best management practices (BMP) approach as the most appropriate way to identify and control discharges of PCBs consistent with the Stage 1 WLAs. Federal regulations (40 CFR Part 122.44(k)(4)) allow the use of non-numeric, BMP-based WQBELs in permits. Appropriate NPDES permitting actions resulting from individual WLAs include 1) the use of Method 1668A for any monitoring of the wastewater influent and effluent at a facility, 2) development of a PCB minimization plan, and 3) implementation of appropriate, cost-effective PCB minimization measures identified through the plan. This approach is identical to the approach used in establishing the TMDLs in Zones 2 - 5.

The identification of point source dischargers that are potentially significant sources of total PCBs is a dynamic process that depends on several factors including the availability and extent of PCB congener data for each discharge, the detection limit of the method used to analyze for PCB congeners, the flows used for each discharge, the procedure used to calculate the loadings, the location of the discharge in the estuary, and the proximity and loading of other sources of PCBs. EPA specifically requests comment on the list of significant point source dischargers contained in Appendix 1 during the public comment period.

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1. INTRODUCTION

1.1 Regulatory Background

Total Maximum Daily Loads or TMDLs are one of the approaches defined in the Clean Water Act (CWA) for addressing water pollution. The first approach of the CWA that was implemented by the U.S. EPA was the technology-based approach to controlling pollutants (Section 301). This approach was implemented in the mid-1970s through the issuance of permits authorized under Section 402 of the Act. The approach specified minimum levels of treatment for sanitary sewage and for various categories of industries. The other water quality-based approach was implemented in the 1980s. This approach includes water quality-based permitting and planning to ensure that standards of water quality established by States are achieved and maintained.

Section 303(d) of the Act establishes TMDLs as one of the tools to address those situations where the technology-based controls are not sufficient to meet applicable water quality standards for a water body (U.S. EPA, 1991). They are defined as the maximum amount of a pollutant that can be assimilated by a water body without causing the applicable water quality criteria to be exceeded. The basis of a TMDL is thus the water quality criteria to protect the designated uses of the waterbody. The designated uses for which criteria may be established include the protection of aquatic life, human health through ingestion of drinking water or resident fish, or wildlife. Under Section 303(d), States are required to identify, establish a priority ranking, and to develop TMDLs for those waters that do not achieve or are not expected to achieve water quality criteria approved by the U.S. EPA. Federal regulations implementing Section 303(d) of the Clean Water Act provide that a TMDL must be expressed as the sum of the individual wasteload allocations for point sources (WLA) plus the load allocation for non-point sources (LA) plus a margin of safety (MOS). This definition may be expressed as the equation:

$$TMDL = WLA + LA + MOS$$

This TMDL meets all of the current federal regulatory requirements of a TMDL established under the Clean Water Act.

1.2 Study Area

Water Quality Management Zone 6 of the Delaware River (Figure 1) has been designated by the Delaware River Basin Commission as that section of the mainstem of the Delaware River including the tidal portions of the tributaries thereto, between the head of Delaware Bay at Liston Point (River Mile 48.2) and the mouth of Delaware Bay between Cape Henlopen and Cape May (River Mile 0.0). Zone 6 is bordered by the States of Delaware and New Jersey.

In 1989, the Delaware River Basin Commission created the Estuary Toxics Management Program to address the impact of toxic pollutants in the tidal Delaware River. By 1993, Commission staff identified several classes of pollutants and specific chemicals that were likely to exceed water quality criteria currently being developed under the program for Zones 2 through 5 of the Delaware River (Figure 1). These included polychlorinated biphenyls (PCBs), volatile organics, metals, chlorinated pesticides, chronic toxicity and acute toxicity. While this program did not specifically address Zone 6, oyster tissue data collected under NOAA's Status and Trends Program indicated that a number of these pollutants, including PCBs, were being transported into Zone 6 from upstream sources (NOAA, 1989).

Beginning in the late 1980's, concern regarding the possible contamination of fish populations that were rebounding as dissolved oxygen levels improved resulted in a number of investigations of contaminant levels in resident and anadromous fish species. The studies subsequently identified PCBs and several chlorinated organics at elevated levels in the tissues of resident fish species in Delaware Bay (Greene and Miller, 1994; Hauge, 1993; U.S. F&WS, 1991). These studies and subsequent data collected by DRBC and the states resulted in fish consumption advisories being issued by both Delaware and New Jersey beginning in 1994. These advisories were principally based upon PCB contamination; and to a lesser degree, chlorinated pesticides such as DDT and its metabolites DDE and DDD, and chlordane.

ESTUARY ZONES

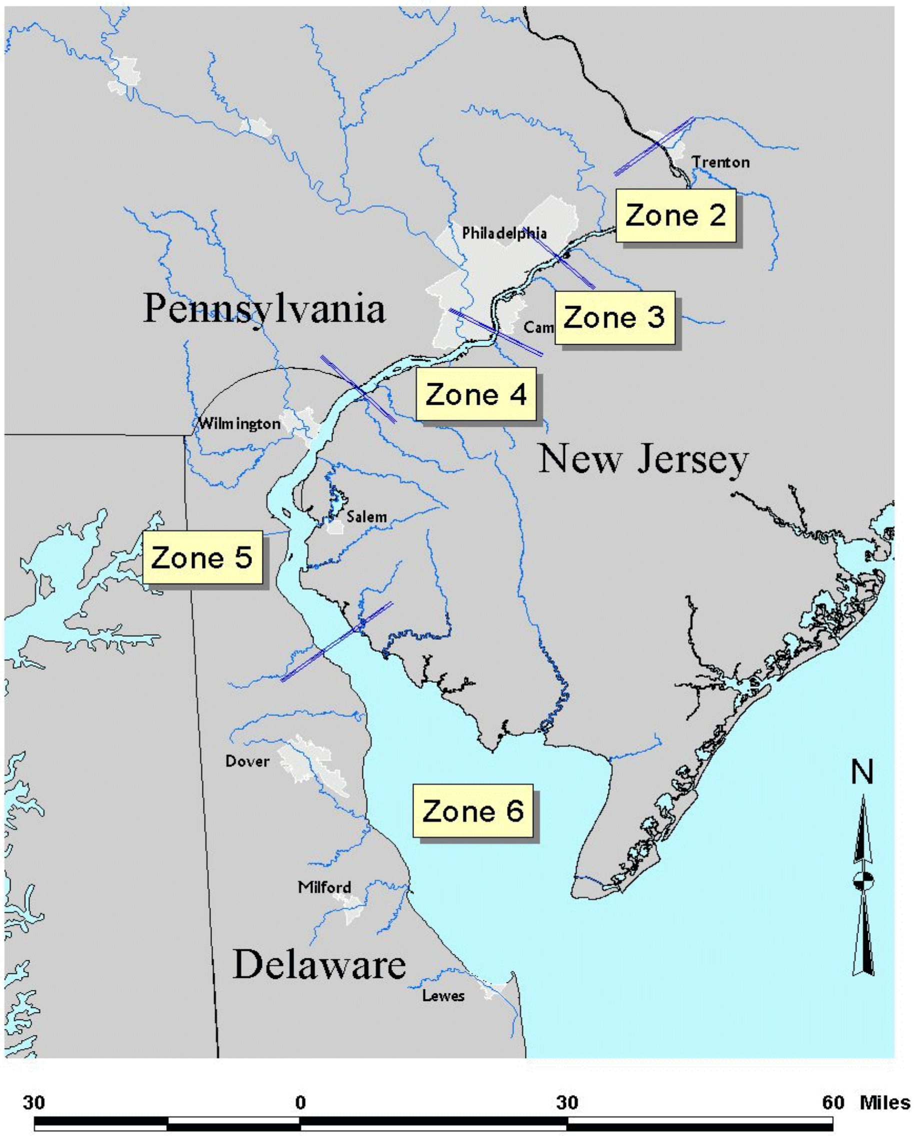
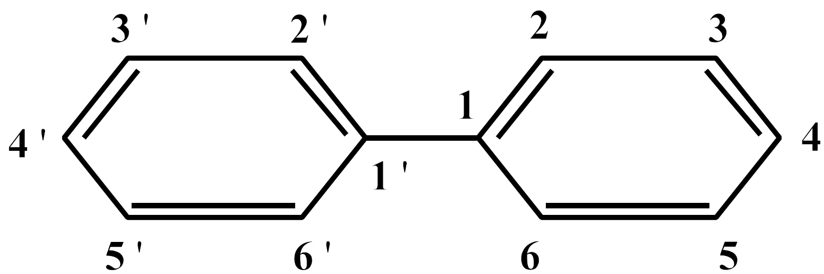


Figure1: Water Quality Management Zones of the Delaware River.

1.3 Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are a class of man-made compounds that were manufactured and used extensively in electrical equipment such as transformers and capacitors, paints, printing inks, pesticides, hydraulic fluids and lubricants. Individual PCB compounds called congeners can have up to 10 chlorine atoms on a basic structure consisting of two connected rings of six carbon atoms each. There are 209 possible patterns where chlorine atoms can be substituted on this ring structure resulting in 209 possible PCB compounds. PCB compounds can be grouped by the number of chlorine atoms attached to the carbon rings. These groups are called homologs. For example, one homolog group, the pentachlorobiphenyls or penta-PCBs, consists of all of the congeners that contain five chlorine atoms.



Although their manufacture and use were generally banned by federal regulations in the late 1970s, existing uses in electrical equipment and certain exceptions to the ban were allowed. In addition, PCBs may also be created as a by-product in certain manufacturing processes such as dye and pigment production. PCBs are hydrophobic, sorbing to organic particles such as soils and sediments and concentrating in the tissues of aquatic biota either directly or indirectly through the food chain.

1.4 Applicable Water Quality Criteria and Numerical Target for TMDLs

In the Delaware River Basin, applicable water quality criteria have been adopted in regulation by the states bordering the river as well as the Delaware River Basin Commission. The DRBC does not have specific numerical criteria for toxic pollutants including PCBs for Zone 6. Delaware adopted a numerical water quality criterion of 64 pg/l for Total PCBs in 2004. New Jersey currently has a state-wide numerical water quality criterion of 170 pg/l for Total PCBs that was adopted in January 2002. In September 2005, the NJDEP proposed a state-wide numerical water quality criterion of 64 pg/l for Total PCBs. The basis for the value of 64 pg/l is the use of a revised cancer slope factor of 2.0 mg/kg-day and a fish consumption rate of 17.5 grams per day. This consumption rate is the U.S. EPA recommended default consumption rate (U.S. EPA, 2000), and is also consistent with site-specific consumption data collected by the State of Delaware (DNREC, 1994). Therefore, a value of 64 pg/l was selected as the applicable water quality criterion for Zone 6 of the Delaware River including both the tidal and non-tidal portions of tributaries draining to the zone.

The TMDL must, however, also ensure that the water quality of adjacent water bodies is met. On October 23, 1996, the Commission adopted numerical water quality criteria for toxic pollutants including Total PCBs for Zones 2 through 5 of the Delaware River. These criteria do, however, differ from the criterion adopted by Delaware and New Jersey. In Zone 4 (from River Mile 95.0 to River Mile78.8) and Zone 5 (from River Mile 68.75 to River Mile78.8), use of the water for public water supply is not a designated use, and human health criteria are based solely upon exposure to PCBs through ingestion of fish taken from these estuary zones. Current DRBC criterion in Zone 4 and upper Zone 5 is 44.8 pg/l based upon a consumption rate of

6.5 grams per day. This rate was the U.S. EPA recommended default national value for freshwater fish consumption at the time that the DRBC criteria were adopted. In lower Zone 5, a consumption rate of 37 grams per day was used. This rate was consistent with the rate utilized by the State of Delaware following an evaluation of information available at that time on consumption rates. The current DRBC criterion in lower Zone 5 (below River Mile 68.75) is 7.9 pg/l based upon this consumption rate. The water quality regulations of both Delaware and New Jersey specify that criteria formally adopted by the DRBC are the applicable criteria for that portion of the Delaware River. DRBC criteria for Zones 4 and 5 are more stringent, and must be considered in developing the TMDL.

The TMDL is therefore based upon the most stringent water quality criteria for protecting human health from the carcinogenic effect of PCBs through ingestion of fish taken from these estuary zones. Table 1contains the applicable Delaware, New Jersey and DRBC water quality criteria for this TMDL:

Table 1: Applicable Water Quality Criteria for PCBs for Zones 4 to 6 of the Delaware Estuary

Delaware River Management Zone	**Water Quality Criteria for Total PCBs for the Protection of Human Health from Carcinogenic Effects**		
	Delaware	**New Jersey**	**DRBC**
Zone 4		170 pg/l[1]	44.8 pg/l
Zone 5	64 pg/l	170 pg/l[1]	44.8 pg/l (above RM 68.75) 7.9 pg/l (below RM 68.75)
Zone 6	64 pg/l	170 pg/l[1]	NA

1 - NJDEP proposed a criterion of 64 pg/l in September 2005.

As part of the effort to establish Stage 2 TMDLs for Total PCBs for Zones 2 - 6 and to update adopted water quality standards based upon new information, the Commission's Toxic Advisory Committee developed revised human health criteria for carcinogens for Total PCBs using an updated cancer potency factor (i.e., slope factor), site-specific consumption data for Zones 2 through 6, and a site-specific bioaccumulation factor (BAF) in accordance with revised guidance on developing human health water quality criteria issued by the U.S. EPA in October 2000 (U.S. EPA, 2000). In July 2005, the Toxics Advisory Committee recommended that the Commission proceed with the process of public notice and comment on the adoption of a revised criterion for Total PCBs for Zones 2 - 6. On December 7, 2005, the Commission passed a resolution authorizing public participation of the revised human health criterion for carcinogens of 16 picograms per liter for Zones 2 through 6. Since the basis for the TMDL could be affected by adoption of either new wildlife criteria by the NJDEP or the revised criterion by the DRBC, and the TMDL must be based on the water quality criteria in force when the TMDL is approved, the Commission further directed that the Commission's Executive Director to request the concurrence of the U.S. Environmental Protection Agency Regions II and III that the existing human health water quality criteria namely: 64 pg/l in Zone 6, 7.9 pg/l in lower Zone 5 and 44.8 pg/l in upper Zone 5 and all of Zone 4 should be the basis for the Zone 6 TMDL. In a letter received on February 21, 2006, both U.S. EPA regional offices concurred with this approach.

1.5 Listing under Section 303(d)

Until recently, the attainment of water quality standards for total PCBs could not be measured directly in samples of ambient water so States relied on measurements of contaminants in fish fillet samples collected from the estuary. This is possible since the amount in fish tissue is related to the water concentration by a factor known as the bioaccumulation factor or BAF. This factor accounts for the uptake and concentration of a contaminant in the tissue either directly from the water or through the target species' food chain. Current and historical concentrations of total PCBs in filet samples collected from striped bass, white perch and weakfish collected in Zones 2 through 6 are shown in Figures 2 through 4. While tissue concentrations have declined since the banning in the late 1970s, current levels in these species are approximately 50 to 200 parts per billion (ppb), one to two orders of magnitude above the level expected to occur when estuary waters are at the water quality standards for total PCBs.

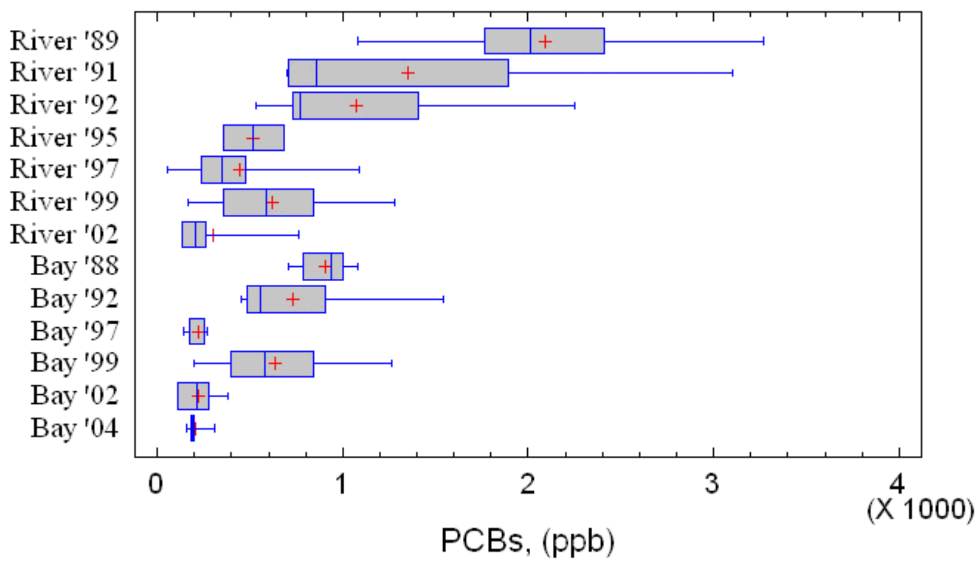


Figure 2: PCB concentrations in fillet samples of striped bass from Zones 5 and 6 of the Delaware Estuary from 1988 to 2004. Units are in parts per billion (ppb) or micrograms per kilogram wet weight of fillet. The range of values (minimum to maximum) is indicated by the full extent of the whiskers which extent from the ends of the boxes. The box encloses the 25th and 75th percentile. The line indicates the median and the red plus sign indicates the mean. Graphs provided by Richard Greene, Delaware DNREC.

After conducting sampling in Zone 5 and 6, Delaware issued an advisory in 1994 recommending limited consumption (no more than five 8-ounce meals per year) of striped bass, channel catfish and white catfish caught between the Chesapeake and Delaware Canal (C&D Canal) and the mouth of Delaware Bay. In 1999, Delaware increased the restrictions to one 8-ounce meal per year and added white perch and eel. By early 2006, bluefish greater than 14 inches had been added to the existing list of species, and consumption of weakfish of all sizes and bluefish less than 14 inches were limited to no more than five 8-ounce meals per month.

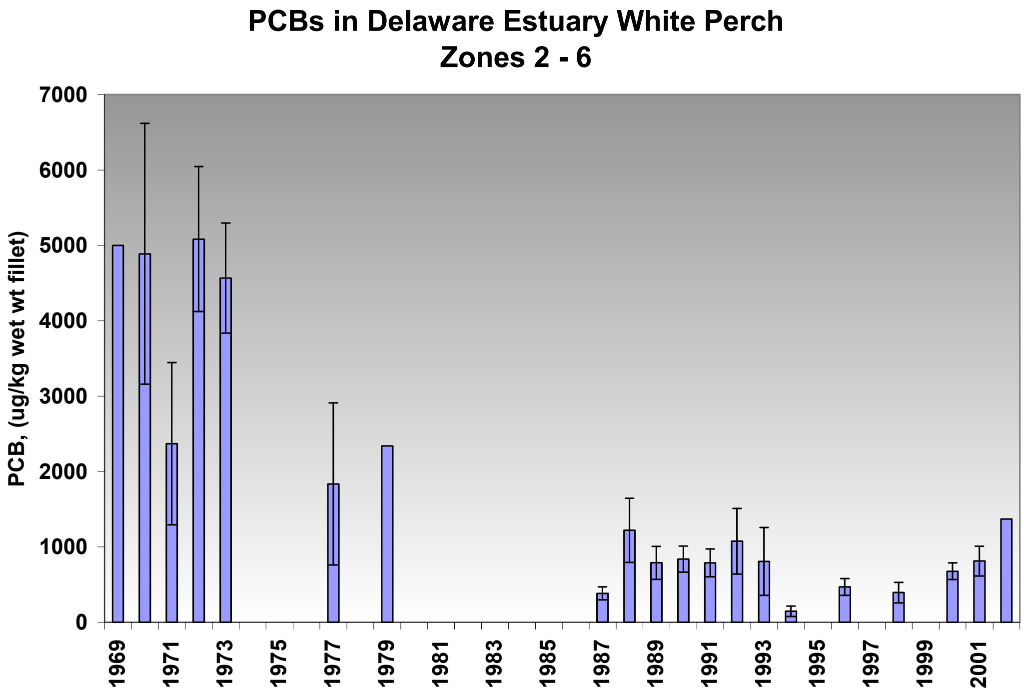


Figure 3: PCB concentrations in fillet samples of white perch from Zones 2 through 6 of the Delaware Estuary from 1969 to 2002. Units are in parts per billion (ppb)or micrograms per kilogram wet weight of fillet. Bars indicate the mean value. Lines represent the standard error of the mean. Graphs provided by Richard Greene, Delaware DNREC.

In March 1995, New Jersey issued updated state-wide and water body-specific advisories due to PCB contamination that included Zone 6. These advisories included advisories issued by Pennsylvania and Delaware covering the Delaware River from Yardley, PA to the mouth of Delaware Bay including the above-cited Delaware advisory. Starting in March 2004, New Jersey and Delaware have issued joint advisories for both Zones 5 and 6 that currently reflect the consumption advice described above.

The Delaware Department of Natural Resources & Environmental Control (DNREC) first listed Zones 5 and 6 of the Delaware River as impaired for toxics on the state's 1996 Section 303(d) List. The Section 303(d) List identifies those waters of a state that are failing to attain the applicable water quality criteria and/or designated use, and for which a TMDL will be needed. In 1998, DNREC again listed Zone 5 of the Delaware River, but specifically listed PCBs as a pollutant contributing to the impairment. In Attachment B to a Memorandum of Agreement between the Delaware Department of Natural Resources & Environmental Control and the U.S. Environmental Protection Agency, Region III dated July 25, 1997, DNREC agreed to complete the TMDL for Zone 6 by December 31, 2006 provided that funding and certain other conditions were met. The MOA also provided that EPA Region III establish the TMDL if DNREC was unable to complete the TMDL by the date set forth in Attachment B. In a Consent Decree between the American Littoral Society, the Sierra Club, and the U.S. Environmental Protection Agency dated July 31, 1997, the U.S. EPA agreed to establish all TMDLs by December 15 of the year following the state's deadline provided that all TMDLs be established by December 15, 2006.

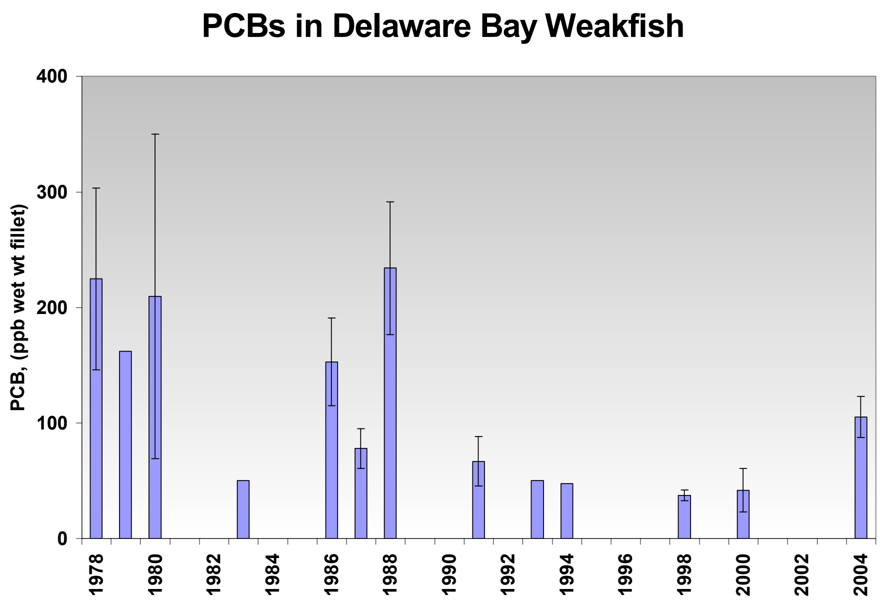


Figure 4: PCB concentrations in fillet samples of weakfish from Zone 6 of the Delaware Estuary from 1978 to 2004. Units are in parts per billion (ppb)or micrograms per kilogram wet weigh of fillet. Graphs provided by Richard Greene, Delaware DNREC.

The New Jersey Department of Environmental Protection included Zones 2 through 5 of the Delaware River for PCBs in a report entitled "1998 Identification and Setting of Priorities for Section 303(d) Water Quality Limited Waters in New Jersey", September 15, 1998, but did not include Zone 6 of the Delaware River in this report. In June 2005, New Jersey listed all of Delaware Bay and the tidal portions of tributaries to Delaware Bay (i.e., Zone 6) as impaired by PCBs on their 2004 Integrated List of Waterbodies.

1.6 Pollutant Sources, Loadings and Ambient Data

The basis for the inclusion of Zone 6 on the Section 303(d) lists of the estuary states was the levels of PCBs observed in fish tissue collected from the estuary. This was necessary since the common analytical method used for ambient water and wastewater up to the mid-1990's had detection limits for total PCBs in the 500 nanogram per liter range. Since the water quality criterion is 1000 times lower than this value, the failure to detect PCBs using this method did not ensure that the criterion was being attained. Development and validation of a new analytical methodology using high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) proceeded from the mid-1990s, culminating in the issuance of Method 1668A by the U.S. Environmental Protection Agency in December 1999 (U.S. EPA, 1999). This method permits the identification and quantitation of all 209 PCB congeners in water, sediment, soil and tissue samples.

Beginning in September 2001, the Commission initiated surveys of the ambient waters of Zones 2 - 6 of the estuary in support of the development of Stage 1 TMDLs for PCBs for Zones 2 - 5 of the estuary. Five of these ambient surveys included sample collection at five locations within the shipping channel of Delaware Bay while three other surveys included sample collection at two of the five locations. Figure 5 presents the results of the surveys conducted in 2002 and 2003. Observed Total PCB concentrations were generally less than 3000 pg/l (parts per quadrillion) during this period with the lowest concentrations occurring near the mouth of Delaware Bay. Concentrations above 3000 pg/l were all observed during a single survey in

November 2003 during high flow conditions (~25,000 cfs at Trenton).

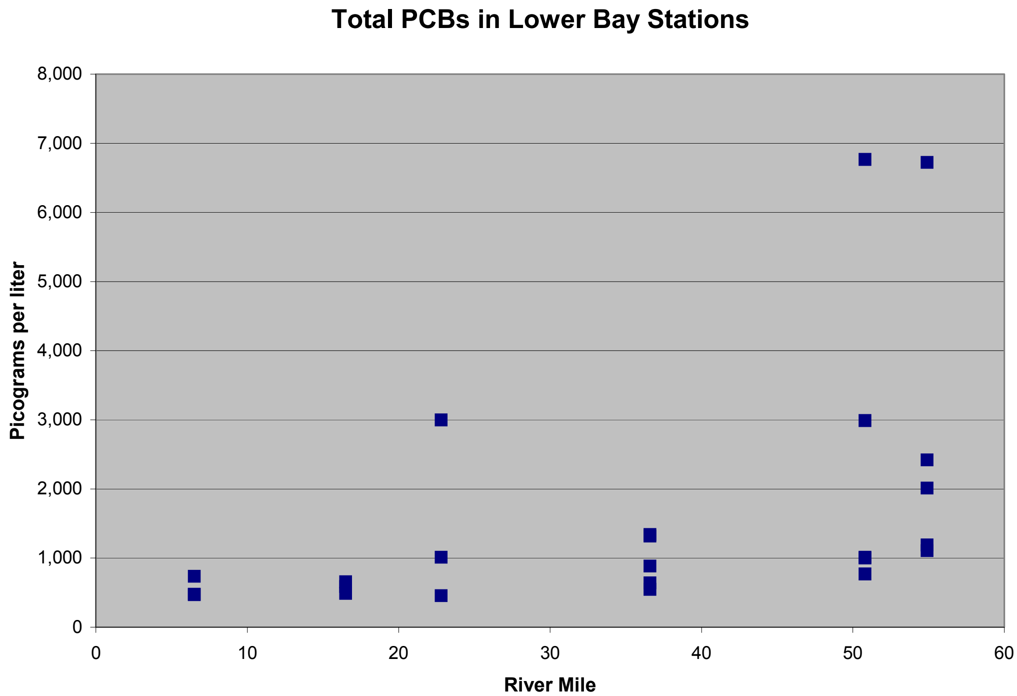


Figure 5: Concentrations of 124 PCB congeners at 5 locations in Zone 6 of the Delaware Estuary during varying flow conditions.

Loadings of PCBs to Zones 2 - 5 the estuary from point sources were first investigated by the Delaware River Basin Commission in 1996 and 1997 (DRBC, 1998). In the spring of 2000, the Commission required 94 NPDES permittees to conduct monitoring of their continuous and stormwater discharges for 81 PCB congeners utilizing analytical methods that could achieve picogram per liter detection limits. The Stage 1 TMDLs established in 2003 indicated that the point source loading category was the third largest source category for PCBs. As part of the Implementation of these TMDLs, the Commission required 96 NPDES permittees to conduct additional monitoring of their continuous and stormwater discharges for all 209 PCB congeners in the fall of 2004 and winter of 2005.

Eight NPDES permittees in Delaware and New Jersey have been identified as possible sources of PCBs to Zone 6. No effluent data is available for these discharges, but the Commission has required the permittees to monitor their continuous and stormwater discharges for 209 PCB congeners. This data will be available along with the additional data from the 96 dischargers to Zones 2 - 5 during the development of the Stage 2 TMDLs for Zones 2 - 6.

1.7 Other Required Elements for Establishing TMDLs

1.7.1 Seasonal variation

TMDL regulations at Section 130.32(b)(9) require the consideration of seasonal variation in environmental factors that affect the relationship between pollutant loadings and water quality impacts. Although seasonal variation is usually not as important for TMDLs based upon human health criteria for carcinogens since the duration for this type of criteria is a 70 year exposure, the Stage 1 TMDL for Zone 6 for Total PCBs do include seasonal variation in several ways. Due to the interaction of PCBs with the sediments of the estuary, long-term model simulations were necessary to both confirm the model parameters established during the short-term calibration, and evaluate the time required for the sediments to reach pseudo steady-state with the overlying water column as loadings of PCBs were reduced.

Model simulations utilize inputs from the period February 1, 2002 until January 31, 2003. This one year period is considered to be representative of long-term hydrological conditions (Section 3.2.3.1, DRBC 2003c). This one year period is also utilized for long-term, decadal scale model simulations by repeating or cycling the same conditions. Use of this one year cycling period, allowed consideration of seasonal variation in model input parameters such as tributary flows, tidal forcing functions, air and water temperature, wind velocity and loadings of penta-PCBs.

1.7.2 Monitoring Plan

The Delaware River Basin Commission has conducted eight surveys of the ambient waters of Zone 6 between August 2002 and June 2006 to provide data for calibrating the water quality model for penta-PCBs. Samples collected during these surveys were analyzed using a more sensitive HRGC/HRMS method (Method 1668A) and larger sample volumes to obtain data at picogram per liter levels. The Commission plans to conduct additional surveys in the Estuary with particular emphasis on Delaware Bay (Zone 6) as part of the effort to calibrate water quality models for the other PCB homologs, and to establish and refine the TMDLs and associated WLAs and LAs for Stage 2 TMDLs for all zones. Contingent on available funding, the Commission plans to continue the ambient water surveys on a yearly basis to track the progress in achieving the load reductions and applicable water quality standards for PCBs.

Twice in the last six years, the Commission has required ~94 NPDES permittees to conduct monitoring of their continuous and stormwater discharges for PCB congeners utilizing analytical methods that could achieve picogram per liter detection limits. The results of this monitoring indicated that loadings to the estuary zones from point sources were significant and of such magnitude to cause the water quality standards to be exceeded. The results showed that significant differences occurred between discharges with 90% of the loadings attributable to 11 discharges. These results have been used to determine the need for and the frequency of additional monitoring in NPDES permits as they have been reissued. These monitoring requirements will provide data in future years to assess the progress in achieving the TMDLs.

Eight NPDES permittees discharging to the tidal portions of tributaries to Zone 6 have been identified as potential sources of PCBs. No direct point source discharges to Zone 6 have been identified. In the summer of 2006, the Commission required these permittees to conduct similar monitoring for 209 PCB congeners. Data from this monitoring requirement will be used to refine the wasteload allocations during the development of the Stage 2 TMDL for Zone 6, and to establish the need for and the frequency of additional monitoring in the NPDES permits for these facilities as their permits are reissued.

The Commission is also continuing to work cooperatively with Rutgers University to continue air monitoring at Lums Pond near the western end of the C&D Canal and at an urban site in Camden, NJ. Contingent on available funding, this program is anticipated to continue for the long-term. Monitoring data at these sites and at a long-term site at Rutgers University will provide data to assess the long-term trends in regional background concentrations of PCBs (Lums Pond) and in regional concentrations in the estuary airshed.

1.7.3 Implementation Plan

Current EPA regulations do not require an implementation plan to be included with TMDLs. EPA NPDES regulations do require that effluent limitations must be consistent with approved WLAs [40 CFR Part 122.44(8)(1)(vii)(B)]. EPA regulations allow the use of non-numeric effluent limits in certain circumstances [40 CFR Part 122.44(K)]. In addition to EPA regulations, the Commission and its signatory parties currently have in place an implementation procedure for utilizing wasteload allocations and other effluent requirements formally issued by the Commission's Executive Director. This procedure has been in use for over 25 years with wasteload allocations for carbonaceous oxygen demand and other pollutants that were developed for discharges to the estuary. Section 4.30.7B.2.c.6). of the Commission regulations requires that WLAs developed by the Commission shall be referred to the appropriate state agency for use, as appropriate, in developing effluent limitations, schedules of compliance and other effluent requirements in NPDES permits. As part of the implementation strategy for this TMDL, the NPDES permitting authorities believe that it is appropriate for 8 NPDES point source discharges to Zone 6 to receive non-numeric WQBELs consistent with the WLAs. It is expected that the non-numeric WQBELs resulting from the Stage 1 WLAs will result in additional monitoring using Method 1668A consistent with state and federal NPDES regulations, and may result in a requirement to submit and implement a pollutant minimization plan (PMP). The New Jersey Department of Environmental Protection has proposed regulations requiring PMPs for discharges to waters impaired by PCBs. In addition, the Commission adopted regulations in May 2005 allowing point and non-point discharges to be required to submit and implement a PMP for PCBs or other designated toxic pollutants. These permit requirements are intended to expedite the reduction in PCB loadings to the Delaware River and Bay while Stage 2 TMDLs and WLAs are being completed.

1.7.4 Reasonable Assurance that the TMDL will be Achieved

Data available to assess whether the TMDL will be achieved include ambient water quality data collected by the Commission during routine surveys of Zones 2 through 6 of the Delaware River. Effluent quality data and PMPs required by the Commission or through NPDES permits issued by state permitting authorities will provide the basis for assessments regarding consistency with the WLAs developed or issued in Stage 1 and Stage 2. Commission regulations also require that the WLAs be reviewed and, if required, revised every five years, or as directed by the Commission. This will ensure that additional discharges of the pollutant or increased non-point source loadings in the future will be considered.

Achieving the reductions in the load allocations for tributaries to Zones 2 through 6 will require the listing of the tributary on future Section 303(d) lists submitted by the estuary states for those tributaries that are not currently listed for impairment by PCBs, and completion and implementation of TMDLs for PCBs for those tributaries that are already listed as impaired by PCBs. Achieving the load reductions required for contaminated sites will require close coordination with the federal CERCLA programs and state programs overseeing the assessment and cleanup of these sites. Actions by federal and state authorities to reduce air emissions from point and non-point air sources will also be necessary before achievement of the applicable water quality criteria is achieved.

The Commission also has broad powers under Article 5 of the Delaware River Basin Compact (Public Law 87-328) to control future pollution and abate existing pollution in the waters of the basin including Section 2.3.5B of the Commission's Rules of Practice and Procedure (DRBC, 2002).

2. TWO STAGE APPROACH TO ESTABLISHING AND ALLOCATING THE TMDL FOR PCBs

2.1 Background

Developing TMDLs for a complex pollutant in a complex estuarine ecosystem with numerous point and non-point sources is an enormous task requiring substantial levels of effort, funding and time. As discussed above, the deadlines contained in the Section 303(d) lists prepared by the States and approved by the U.S. EPA, Memoranda of Understanding, and Consent Decrees discussed above imposed limited time for developing the TMDLs for Zones 2 through 6. A coordinated effort to develop the TMDLs (with emphasis on the initial deadline for Zones 2 - 5) was initiated in 2000 when Carol R. Collier, Executive Director of the Delaware River Basin Commission in a letter dated May 25, 2000 requested that U.S. EPA Regions II and III endorse the Commission as the lead agency in developing the TMDLs for PCBs in the Delaware Estuary. In a letter dated August 7, 2000, Region II endorsed the Commission's role as the lead agency to develop the TMDLs. An August 11, 2000 letter from Region III also acknowledge the important role of the Commission while identifying the legal constraints on the date for establishing the TMDLs for Zones 2 - 5. On July 26, 2000, the Commission passed Resolution 2000-13 stating that the Commission would continue its ongoing program to control the discharge of toxic substances, including PCBs, to the Delaware Estuary, and would work cooperatively with the signatory parties to the Delaware River Basin Compact and their agencies and affected parties in this effort.

2.2 Staged Approach

As noted in Section 1 of this document, this TMDL meets all of the federal regulatory requirements of a TMDL. However, the states and DRBC are working on a Stage 2 TMDL that would be submitted to EPA for review and approval consideration. The states and DRBC are undertaking this effort because of the complexity of a TMDL for a class of compounds such as PCBs, the limited time and data available, and the benefits of refining it through time with more data led to a decision to develop the TMDLs for PCBs in two stages consistent with EPA TMDL guidance concerning phased TMDL development and staged implementation. A staged approach provides for adaptive implementation through execution of load reduction strategies while additional monitoring and modeling efforts proceed in order to refine the wasteload and load allocations. The approach recognizes that additional monitoring data and modeling results will be available following issuance of the Stage 1 TMDLs to enable a more refined analysis to form the basis of the Stage 2 TMDLs. This staged approach to establishing TMDLs would be utilized for the Zone 6 TMDL as it was for the Stage 1 TMDLs for Zones 2 - 5.

In essence, the Zone 6 TMDL is an extension of the Stage 1 TMDLs developed for Zones 2 - 5. Due to the tidal nature of this portion of the Delaware River, the influence of Zone 6 on the upriver zones had to be considered in the development of the Zones 2 - 5 TMDLs. Similarly in this TMDL, Zones 2 - 5 have a significant influence on the PCB concentrations in Zone 6 and must be considered. The States and DRBC are committed to development of a Stage 2 TMDL due to the lack of any PCB data on point sources, the need to incorporate the results of on going data collection surveys in tributaries to Delaware Bay, the need to collect additional ambient data in Delaware Bay and nearshore coastal waters, and the need to make modifications to the penta-PCB water quality model to better describe the processes occurring in the estuarine turbidity maximum (ETM). Other planned enhancement include specification of sediment PCB concentrations based upon additional sediment data and assignment of segment-specific gaseous air concentrations.

Like the Zones 2 - 5 TMDLs, the Stage 2 TMDL for Zone 6 will be based upon an improved water quality model. While Total PCBs are extrapolated from penta-PCBs in Stage 1, the Stage 2 TMDL will be based upon the sum of the PCB homologs that occur in the tissue of resident fish and biota. Data collected to date indicate that this will be the sum of the tetra, penta, hexa and hepta homologs that constitute 90% of the PCB tissue burden in resident fish.

Wasteload allocations for individual discharges to Zone 6 were developed using a simplified methodology, which still met all of the current regulatory requirements for establishing a TMDL. Consistent with the recommendations of an expert panel of scientists experienced with PCB modeling, this TMDL was extrapolated from penta homolog data using the observed ratio in the ambient waters of the Delaware Estuary of the penta homolog to total PCBs (see Section 3.2.3 and 3.2.4).

A Stage 2 TMDL, individual WLAs and LAs for Zone 6 is being developed by the DRBC concurrently with those for Zones 2 - 5. Once the Stage 2 TMDLs are completed, EPA expects WLAs developed in Stage 2 to replace Stage 1 WLAs. EPA expects the Stage 2 WLAs and LAs to be based on all of the monitoring data obtained through the development of the Stage 2 TMDLs, and the additional modeling that will be performed following the establishment of the Stage 1 TMDL. Stage 2 TMDLs will also be based on the summation of those PCB homolog groups accumulated by resident fish and aquatic biota, without the use of extrapolation. It is anticipated that the Stage 2 WLAs will be based upon a more sophisticated allocation methodology than the Stage 1 WLAs, and will likely reflect application of the procedures set forth in the DRBC Water Quality Regulations.

Following establishment of the TMDL for Zone 6, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued or modified after the approval date must be consistent with the WLAs. The NPDES permitting authorities (i.e., U.S. EPA, Delaware DNREC and New Jersey DEP) believe that these WQBELs will include non-numeric controls in the form of a best management practices (BMP) approach as the most appropriate way to identify and control discharges of PCBs consistent with the Stage 1 WLAs. Federal regulations (40 CFR Part 122.44(k)(4)) allow the use of non-numeric, BMP-based WQBELs in permits. Appropriate NPDES permitting actions resulting from individual WLAs include 1) the use of Method 1668A for any monitoring of the wastewater influent and effluent at a facility, 2) development of a PCB minimization plan, and 3) implementation of appropriate, cost-effective PCB minimization measures identified through the plan. This approach is identical to the approach used in establishing the TMDLs in Zones 2 - 5.

The identification of point source dischargers that are potentially significant sources of total PCBs is a dynamic process that depends on several factors including the availability and extent of PCB congener data for each discharge, the detection limit of the method used to analyze for PCB congeners, the flows used for each discharge, the procedure used to calculate the loadings, the location of the discharge in the estuary, and the proximity and loading of other sources of PCBs. EPA specifically requests comment on the list of significant point source dischargers during the public comment period (see Appendix 1).

An important component of the staged approach is the assessment and evaluation of options to control non-point sources of PCBs. These sources include contaminated sites (sites covered under CERCLA or RCRA), non-NPDES regulated stormwater discharges, tributaries to the estuary, air deposition, and contaminated sediments.

3. STAGE 1 APPROACH TO ESTABLISHING THE TMDL

3.1 Background

A TMDL for total PCBs is an estimate of the loading of the sum of all the PCB homologs that can enter the estuary and still meet the current water quality criteria. TMDLs are, by nature, abstract. They are the *projected*, not the current, loadings from all sources that should result in the achievement of water quality standards at all points in the estuary.

In order to meet standards at all points in the estuary, some parts of the estuary will have to be less than the standard for that portion of the estuary. This is particularly true for this TMDL for Delaware Bay as it was for the Stage 1 TMDLs for Zones 2 - 5 that were established in 2003. Similar to those TMDLs, the water quality standards vary between the zones, and the controlling standard in lower Zone 5 (7.9 pg/l) below the Delaware Memorial Bridges is approximately 8 times lower than the controlling standard of 64 pg/l in Zone 6 (see Section 1.4).

Even though the task is to develop a Zone 6 TMDL, it is necessary to consider all upstream zones. Any loadings or exchanges of PCBs within or through interfaces of the entire Delaware Estuary has to be included in this Zone 6 TMDL development because Zone 6 is the most downstream of the water quality management zones and is heavily influenced by the ocean through tidal exchanges.

As emphasized in the TMDL document for Zones 2 - 5 (DRBC, 2003c), theoretically, there will be no net exchange between air and water column when the water column reaches the water quality criterion. This can be implemented in the water quality model by assigning the atmospheric gaseous PCBs at a concentration that will be in equilibrium with the truly dissolved PCBs in water column under the continuous input of total maximum daily loadings. This is very important concept to bear in mind throughout any TMDL development case. It is important to distinguish TMDL conditions from the existing conditions. Even though it may take decades to reach ambient concentrations that are equal to the water quality criterion, the TMDL numeric number has to be calculated under this equilibrium condition. At present time, atmospheric gaseous PCBs alone may be sufficient to cause the impairment of the Delaware Estuary, however, TMDLs have to be calculated assuming no effect from atmosphere.

The same principle applies to the sediments of the estuary. PCBs are exchanged between the water column and the underlying sediments through resuspension/settling of particles and diffusion of pore water. When the water quality criterion is achieved, the sediments will also be in equilibrium with the overlying water column. In order to shorten the computation time for model simulations, PCB concentrations can be assigned that will be in equilibrium with the overlying water column under the input of continuous TMDL loadings. These PCB concentrations in the sediment layer can also be far lower than the existing conditions.

While simplistic approaches can be used to estimate TMDLs, significant effort has been devoted to developing and calibrating a hydrodynamic and water quality model for the Delaware Estuary to be used in establishing PCB TMDLs for this water body (DRBC, 2003a; DRBC, 2003b; DRBC, 2006). There are several reasons why a more sophisticated approach is appropriate. These reasons include:

1. The Delaware River and Bay are significantly influenced by tidal forces producing a 6 foot tidal range at Trenton, NJ and tidal excursions of up to 12 miles. The model incorporates this tidal movement in the hydrodynamic model (DRBC, 2003a).
2. PCBs are hydrophobic, sorb to dissolved, colloidal and particulate carbon, and are transported with carbon molecules and particulates associated with carbon. The model incorporates these characteristics, partitions PCBs to each of these phases, and simulates the concentrations of the 3 phases in the estuary (DRBC, 2003b).
3. PCBs are a class of chemicals; each having different physical-chemical properties such as volatilization rate and partitioning rate. The model can incorporate these properties for each of the ten homolog groups (DRBC, 2003b).
4. There are many sources of PCBs that enter the estuary at different locations in different amounts and at different times. The model can simulate the spatial and temporal nature of these sources (DRBC,

2006).

5. A model can simulate the additional assimilative capacity provided by the burial of PCBs into the deeper layers of the estuary sediments, and the exchange of PCBs in the gas phase in the estuary airshed with the dissolved phase of PCBs in the ambient waters of the estuary (DRBC, 2003b).

A modified version of the U.S. EPA's TOXI5/DYNHYD5 numerical models which were used in the Zone 2 to 5 TMDL development in the year of 2003 were also used in the development of this TMDL. The Delaware Estuary PCB Model has been updated and detailed revisions are described in DRBC (2006). One key update in this newer version of the model, compared to the version used in 2003, is correction of minor errors in wind velocity calculation which affects to the gaseous PCB exchanges between water column and atmosphere. The impact on Stage 1 TMDLs developed for Zones 2 to 5 by use of this revised version of the model is evaluated and discussed in Section 3.3.2. The physical model domain remains the same as that used for the Stage 1 TMDLs for Zones 2 - 5. The hydrodynamic and water quality models incorporate all influxes and effluxes within and through interfaces of the entire Estuary and calculate instream concentrations.

3.2 Conceptual Approach

3.2.1 Guiding Principles

TMDLs require that each source of PCBs meet the water quality criterion by itself and in conjunction with all other sources. A number of key guiding principles were developed based on available scientific data, model simulation results, and policy decisions for the development of the Zone 6 TMDL. The guiding principles are as follows:

1. Stage 1 TMDL for Zone 6 (Delaware Bay) is built upon TMDLs developed for Zones 2 to 5 in 2003. The revised version of Delaware Estuary PCB model is used in this TMDL development. Total Maximum Daily Loads developed for Zones 2 to 5 will not be changed either by the use of the revised version of the model or by this Stage-1 Zone 6 TMDL development. In addition, the assigned equilibrium PCB concentrations for the atmosphere will be remain the same as that used for Zones 2 to 5.

2. Pentachlorobiphenyls, the penta-PCB homolog group, are used as a surrogate for Total PCBs. The same ratio used in development of the Zones 2 to 5 TMDLs in 2003, 1:4 for penta to total PCBs, is used in this TMDL. A comparison of penta to total PCB concentrations in ambient water samples for the entire estuary are depicted in Figure 6. Simulating a single homolog group rather than total PCBs allows the model to simulate kinetic transfers accurately. Therefore, all the model simulations and applicable water quality target (i.e., criteria) for the development of the TMDL for the Delaware Bay is based on penta-PCBs. The TMDL for total PCBs is calculated by multiplying the penta-PCB TMDL and their components by four to obtain the Total PCB TMDL.

3. Preliminary model simulations revealed that there are two potential critical locations that control the loading of PCBs to Zone 6. These locations occur at transitions between different water quality criteria as described in Section 1.4. One location is at River Mile 68.75, the location of Delaware Memorial Bridge, where the applicable water quality criteria changes from 44.8 to 7.9 pg/L as the water quality changes from freshwater to marine conditions. Another potential location is at the boundary of Zone 5 and 6 (River Mile 48.2) where the applicable water quality criteria changes from 7.9 to 64 pg/L in an upstream to downstream direction. If any exceedance occurs during model simulations, it will occur either of these two locations as shown in example scenario results shown in Figure 7. Therefore, allowable loadings to Zone 6 or from the downstream boundary will be determined while focusing on violations at those two locations.

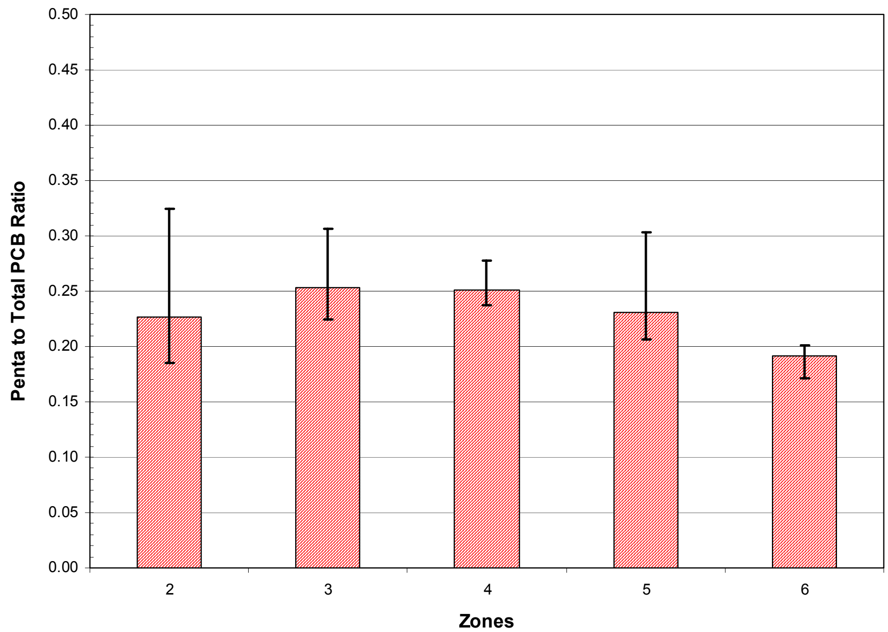


Figure 6: Ratio of Penta-PCBs to Total PCBs in ambient water samples collected from 15 sites in Zone 2-5 and 6 sites in Zone 6 between September 2001 and November 2003. Error bars indicate the minimum and maximum ratios observed at any sampling site during all surveys.

4. All WLAs and LAs in Zone 6 are allowed to discharge at the applicable water quality criterion of 64 picograms per liter of total PCBs. Based on the hydrodynamic model outputs, the averaged tidal cycle inflow during flooding tide near the mouth of the Bay is about 110,000 cubic meters per second. The annual median advective net inflow from the Zone 5 to Zone 6 is about 450 cubic meters per second. While, the annual median inflow from point and non-point sources into the Zone 6 is about 17.84 cubic meters per second. Since this Stage 1 TMDL for the Delaware Bay is limited to the mainstem of the Estuary not the individual tributaries, the influence from the WLAs and LAs are relatively minor compared to the influence from the upstream or the downstream boundaries of Zone 6. Note that because of tidal forcing, the Delaware Bay is heavily influenced by the water quality of the Ocean.

5. As a policy decision, 5 percent of the TMDL is explicitly reserved for a margin of safety. This is consistent with the margin of safety used in the Zones 2 - 5 TMDLs.

3.2.2 Modeling Approach

3.2.2.1 Justification for the Use of One-dimensional Model for Delaware Bay

In many cases, two or three dimensional numerical models are applied for an estuarine system with a large bay like the Delaware Bay. A one-dimensional model is used, however, to develop Stage 1 TMDL for Zone 6. The reasons for this include the following:

1. Limited data, and resources and extended computational time prohibit a use of multi-dimensional model in this TMDL development. Since this TMDL is based upon a human health criterion for protection from carcinogenic effects, long-term simulations are necessary due to the 70 year

exposure time for this type of criterion.

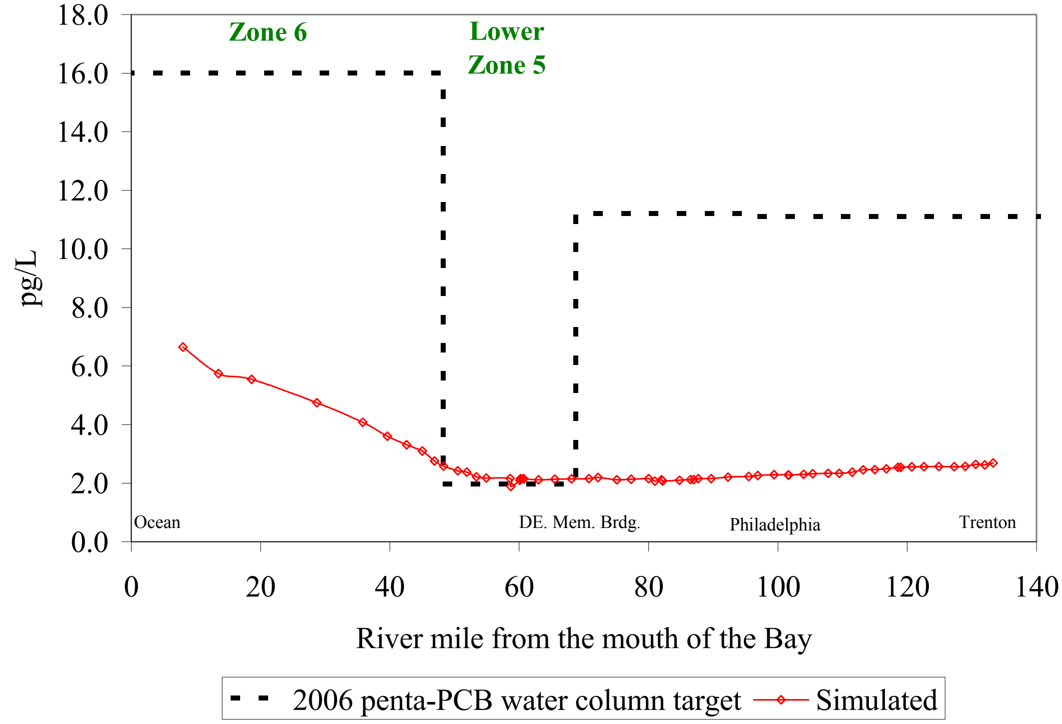


Figure 7: Exemplary simulation showing two potential critical locations at River mile 48 and 68 because of sharp transition of the applicable water quality criteria in Zone 6 TMDL Development.

2. The purpose of modeling work is not to track any sudden spike or changes in water column or any localized (lateral or vertical) variations. Rather, the TMDL is developed under the long-term, steady state loading conditions, even though the hydrologic conditions are cycled from a single year to consider any seasonal impacts. It is important that the model projects the average conditions after reaching to the equilibrium condition.

3. Because the model is run under steady state conditions for the TMDL calculation, the proximity of a downstream boundary to the area of interest is not an issue. In addition, lack of information regarding the sediment dynamics and flow patterns in the nearshore areas of the Bay and in the nearby coastal areas would amplify the model uncertainty if the downstream boundary is extended to the outside of the Bay.

4. Lastly, the existing one dimensional model has proven its capability of reproducing conservative substance profiles throughout the estuary (DRBC, 2003a) and was successfully used to develop Stage-1 TMDLs for Zones 2 to 5 in 2003 (DRBC, 2003c).

3.2.2.2 Hydrodynamic Model

A representative one year hydrologic condition is used for this Zone 6 TMDL development. This same condition was used in the development of the Zones 2 to 5 TMDLs in 2003. The hydrological conditions and the logic in selecting this condition is described in the Stage 1 Zones 2 - 5 TMDLs document in Section 3.2.4.1 (DRBC, 2003d). The description of the hydrodynamic model and calibration results are documented in DRBC (2003a). The representative hydrologic condition is then input into the hydrodynamic model and the output of this hydrodynamic model is fed to the water quality model. Decadal or centennial PCB model simulations are conducted by using this one year hydrologic condition year after year to develop the PCB TMDL.

Using the gaged daily flow data and drainage area, flow rate per unit area is calculated for the gaged tributaries. This information are then utilized to obtain flow rates for the nearby ungaged tributaries and direct runoff into Zone 6 of the Delaware Estuary. Median daily inflow value for the sum of point and non-point source inflows from Zone 6 during the cycling year is calculated at 17.84 m^3/sec.

3.2.3 TMDL Approach

Although the water quality standards are expressed as Total PCBs and the TMDL must be expressed as Total PCBs, the current water quality model only addresses penta-PCBs. As discussed in Section 2.2, the TMDL for Total PCBs is extrapolated from the TMDL for penta-PCBs using the observed ratio in the Delaware River/Estuary of the penta homolog to Total PCBs. Therefore, a water quality target for penta-PCBs must be established for use in the TMDL procedures. This target is determined by assuming that the ratio of penta-PCBs to Total PCBs is approximately 0.25. Figure 6 presents the ratio of penta-PCBs to Total PCBs in ambient water samples collected in Zones 2 through 6. While difference between zones are evident, 0.25 is a reasonable value for the ratio, and makes the Stage 1 Zone 6 TMDL consistent with the Stage 1 TMDLs for Zones 2 - 5.

The TMDL for Total PCBs for Zone 6 of the Delaware Estuary is established using a seven step procedure. A flow chart of these steps is presented in Figure 8. The TMDL is calculated over a one year period (annual median) to be consistent with both the model simulations and the 70 year exposure used for human health criteria.

The wasteload allocation portion of the TMDL represents those source categories that are regulated under the NPDES program (industrial discharges, municipal wastewater treatment plant discharges, combined sewer overflows or CSOs, and municipal separate storm sewer systems or MS4s). Eight (8) industrial and municipal wastewater discharges are assigned wasteload allocations in this TMDL. No CSOs were identified by state permitting authorities. Twenty (20) municipal separate storm sewer systems or MS4s were included in the allocation for this point source category. The load allocation portion of the TMDL represents categories including contaminated sites, non-NPDES regulated stormwater discharges, tributaries, air deposition and most importantly input from the Ocean.

In accordance with the TMDL regulations, a portion of TMDL must be allocated to a margin of safety. The margin of safety (MOS) is intended to account for any lack of knowledge concerning the relationships between pollutant loadings and receiving water quality. Commission regulations also require that a portion of the TMDL be set aside as a margin of safety, with the proportion reflecting the degree of uncertainty in the data and resulting water quality-based controls. The MOS can be incorporated into the TMDL either implicitly in the design conditions under which the TMDL is calculated or explicitly by assigning a fixed proportion of the TMDL. Since the conditions under which the TMDL is determined like tributary flows are related to the long-term conditions and not to design conditions associated with human health water quality standard for carcinogens (such as the harmonic mean flow of tributaries), expression of the MOS as an explicit percentage of each zone TMDL was considered the more appropriate approach. An explicit percentage of 5% was then utilized in the apportionment of the Zone 6 TMDL, which is in accordance with MOS used in Zones 2 to 5 TMDLs in 2003.

3.3 Procedure for Establishing The TMDL

3.3.1 Summary

The TMDL for total PCBs for Zone 6 of the Delaware Estuary is established using a multi-step procedure that incorporated the guiding principles discussed in Section 3.2.1. As discussed in Section 1.4, the existing human health water quality criterion for PCBs adopted by the State of Delaware of 64 pg/l, and the existing DRBC criteria are used as the basis for the Stage 1 TMDL. The lower DRBC criterion of 7.9 pg/L from the Delaware Memorial Bridge to the head of the Bay result in two critical locations. The resultant PCB loadings are thus limited to meet the criterion in this section of the estuary.

The DRBC Water Quality Management Zone 6 is located at the downstream end of the Delaware River. Inflows from upstream, tributaries, direct runoff, point sources, and exchanges with Atlantic Ocean through the mouth of the Bay are all contributors to the water quality of Delaware Bay. Because of this geophysical location, entire tidal Delaware River and Atlantic Ocean (or conditions at the mouth of the bay), has to be considered in the development of TMDL for Delaware Bay. In addition, because of the lower water quality criterion in lower Zone 5 which form critical locations, it is crucial to evaluate the conditions upstream of Zone 6.

Stage-1 PCB TMDLs for the entire tidal Delaware River, or Zones 2 to 5, were established in 2003. In the 2003 TMDLs, zero loadings were assigned for both point and non-point sources with exception of the ocean boundary condition which was set at one-fourth of the applicable water quality criterion of 7.9 pg/L (1.975 pg/L of penta-PCBs). The applicable water quality criterion has changed to 64 pg/L of Total PCBs; a water quality target of 16 pg/L of penta-PCBs for this Zone 6 TMDL development. While maintaining the Zones 2 to 5 TMDLs developed in 2003, the Zone 6 TMDL is calculated by multiplying inflows and water quality target for point and non-point sources. The ocean boundary condition, which has a substantial influence on water quality in Zone 6, was determined by trial and error methods through model simulations so as not to cause exceedances of the applicable water quality targets throughout the estuary. The gas phase concentrations for the lower Bay that would be in equilibrium with the penta-PCB water concentrations are then updated in the water quality model. The model is then run to confirm that the water quality targets are still being met.

The Zone 6 TMDL is calculated in a seven step procedure. A brief description of seven steps is as follows:

1. Using the revised model code and revised input conditions, re-confirm that the TMDLs developed in 2003 are still valid. The governing value occurs at two locations, River Mile 68.75 and River Mile 48.2, is 1.975 pg/L. This value is 25% of 7.9 pg/L, the applicable water quality criterion for Total PCBs at these locations.
2. Determine the usable assimilative capacity for Stage 1 Zone 6 PCB TMDL at the two critical locations by assigning zero penta-PCBs at the ocean boundary. The difference between the simulation results and the governing value is the total assimilative capacity available for Zone 6.
3. Allowable loadings from all point and non-point sources having inflows into Zone 6 are then calculated by multiplying their inflow by 16 pg/L for penta-PCB. These loadings are distributed in the model proportional to the model segment sizes in Zone 6. The only missing load will then be the influx from the ocean boundary.
4. Determine allowable ocean boundary by trial and error simulations using the penta-PCB model,

re-confirmed TMDLs for Zones 2 to 5 developed in 2003, and the Zone 6 load calculated from the previous step. Compare the results with the applicable water quality target at the two critical locations.

5. Once the allowable ocean boundary is found, calculate and assign equilibrium gaseous atmospheric concentrations in the model. Run the model and go back to Step 4 until the difference between the water quality target of 16pg/Land the simulated water column penta PCBs is less than 0.02 pg/L.
6. Convert the ocean boundary concentration to a load and add it to the gross load allocation portion.
7. In steps 1 through 6, the load of penta-PCBs that is required to meet applicable water quality target for penta-PCBs was determined. In step 7, five (5) percent of wasteload allocation (WLA) and load allocation (LA) are allocated to margin of safety (MOS).

Stage 1 PCB TMDL Development Procedure for Delaware Bay (Zone 6)

<u>Step 1:</u> Use the revised model codes and revised input conditions to re-confirm that the TMDLs developed in 2003 are still valid. Governing value for both locations (at River Mile 68.75 and RM 48.2) is 1.975 pg/L (25% of 7.9 pg/L, water quality criterion for Total PCBs)

↓

<u>Step 2:</u> Determine usable assimilative capacity for Stage 1 Zone 6 PCB TMDL at the critical locations, RM 48 and/or 68 by assigning zero penta-PCBs at the ocean boundary from the input conditions of the previous Step. The difference between the simulation result and applicable water quality criteria is the total assimilative capacity for Zone 6.

↓

<u>Step 3:</u> Calculate allowable loadings from all point and non-point sources having inflows into Zone 6: Inflow times applicable water quality target of 16 pg/L for penta-PCB (Zone 6). These loadings are distributed in the model proportional to the model segment sizes in Zone 6. The only missing load will be the influx from the ocean boundary.

↓

<u>Step 4:</u> Determine the allowable ocean boundary by trial and error simulations using the penta-PCB model, the re-confirmed TMDLs for Zones 2 to 5 developed in 2003 plus Zone 6 loads calculated from the previous step. Compared the results with the applicable water quality target at critical locations.

↓

<u>Step 5:</u> Calculate and assign equilibrium gaseous PCB concentrations in the model under the TMDL conditions developed in Steps 3 and 4. If the usable assimilative capacity is larger than 0.02 pg/L at the critical locations, go back to Step 4.

↓

<u>Step 6:</u> Convert the ocean boundary concentration to a load and add it to the gross load allocation portion to finalize individual WLAs and the gross LAs.

↓

Step 7: Allocate 5% of Margin of Safety by removing 5% of Ocean Boundary and 5% of WLA/LA loading.

Figure 8: Seven Step Procedure for Establishing TMDL for Zone 6.

3.3.2 Step 1: Confirmation of the 2003 TMDLs for Zones 2 - 5 using the revised model code

A concern was raised after revisions to the model code and input file parameters to correctly simulate the volatilization that these revisions may have affected the Zone 2 - 5 TMDLs. Because the Zone 6 TMDL is built upon the TMDLs for Zones 2 to 5, it was necessary to confirm the validity of 2003 TMDL results using the revised model code as a first step.

The 100 year simulations with the revised DELPCB model were conducted with the input conditions for the TMDLs developed in 2003 for Zones 2 to 5. Long-term, or 100 year in this case, simulations are required to assure that the model reaches steady state. The simulated results using the new code are compared with the simulation results generated with the model code in 2003 as shown in TMDL report (DRBC, 2003c). Figure 9 and 10 are the same comparison plots with different y-axes to visually compare the two simulation results. Simulation results were summarized to generate spatial plots with annual median values in the 99th and 100th years of the simulation. Slight differences are apparent between the simulation results in Figure 10. The relative differences between two models are from -3.2 to 2.7 percent. Simulation results from the revised code tend to show slightly lower water column PCBs concentrations compared to concentrations from the 2003 modeling results in the lower Zone 5 and Zone 6. This implies that Zone 6 will get additional assimilative capacity because of the use of the improved version of the model. It is also important to note that no exceedances are observed in both simulation results confirming that the TMDLs established for the Delaware Estuary Zones 2 to 5 are valid under the revised model coded and input conditions. All the simulation results presented in the rest of the report are generated by the revised model code.

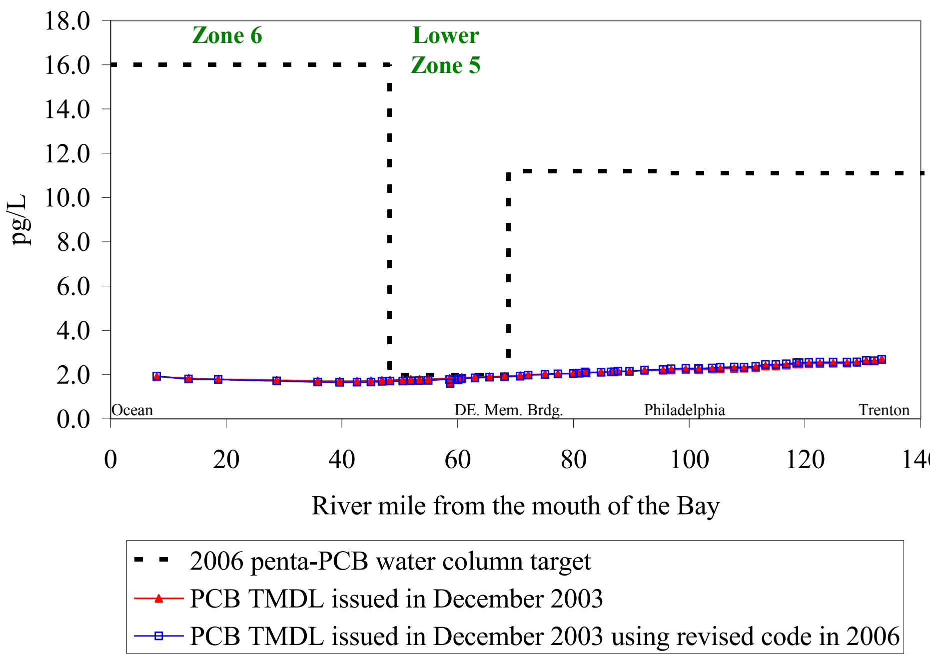


Figure 9: Comparison and validation of Zones 2 to 5 TMDLs established in 2003 using the revised DELPCB model code and input conditions (full Y-axis scale). Blue and red solid lines show median water column Penta-PCBs concentrations from the 99th and 100th year of the simulation using the old and revised code.

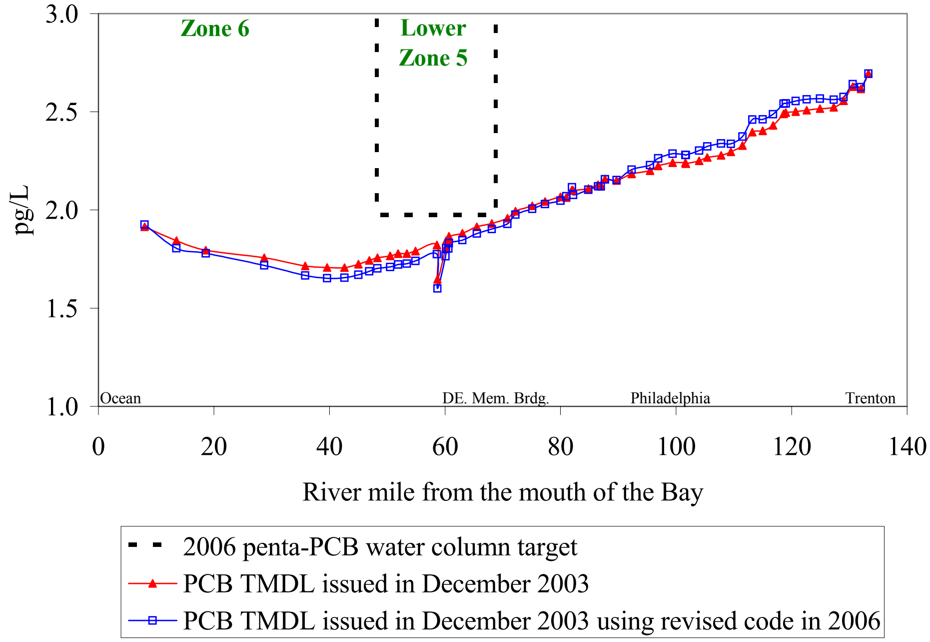


Figure 10: Comparison and validation of Zones 2 to 5 TMDLs established in 2003 using the revised DELPCB model code and input conditions (smaller range in Y-axis scale). Blue and red solid lines show median water column Penta-PCBs concentrations from 99th and 100th year of the simulation using the old and revised code.

3.3.3 Step 2: Determination of usable assimilative capacity for Zone 6

No external loadings were assigned for Zone 6 during the development of the Zones 2 to 5 PCB TMDLs in 2003 with exception of the assignment of the ocean boundary at 1.975 pg/L of penta PCBs (25% of the applicable water quality criterion for the State of Delaware). As discussed in Section 3.2.1 of the Guiding Principles, the Stage 1 TMDL for Zone 6 of the Delaware Estuary, is built upon TMDLs developed for Zones 2 to 5 in 2003. Total Maximum Daily Loads developed for Zones 2 to 5 will not be changed either by the use of revised version of the model or by this Stage-1 Zone 6 TMDL development.

In this Step, the ocean boundary is assigned a zero concentration of penta-PCBs, so that the assimilative capacity can be obtained for Zone 6. Assimilative capacities at the two potential critical locations of interest are shown in Figure 11. The assimilative capacity at upstream critical point (at River Mile 68.75) is about 0.095 pg/L. The assimilative capacity at the head of the Bay (at River Mile 48.3) is about 0.527. Influences from ocean boundary to these two critical locations are different. A much higher influence of the ocean to the critical location at the head of the Bay are expected because of its proximity.

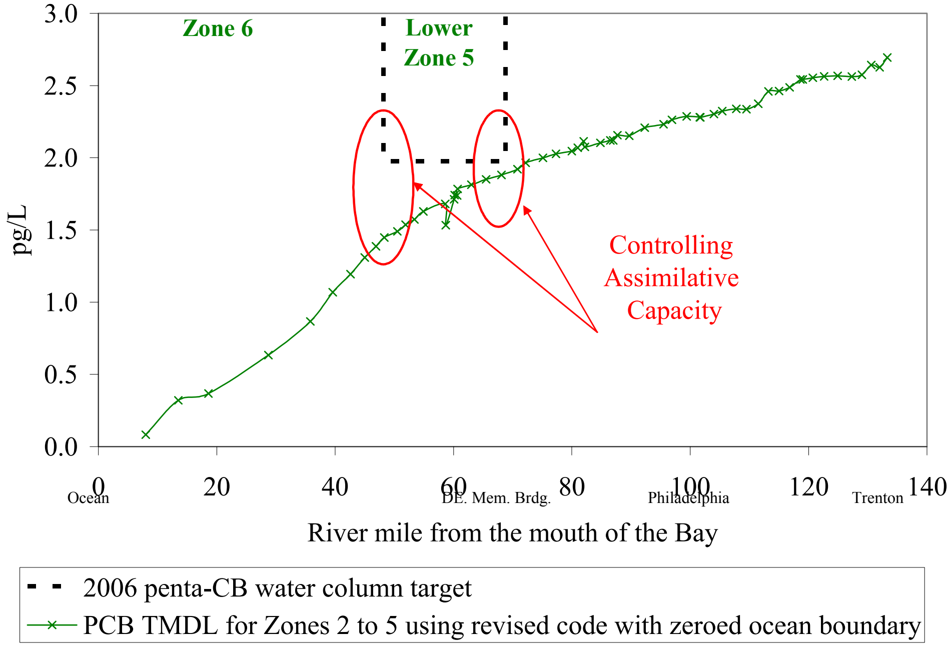


Figure 11: 100 year simulation results under the Zones 2 to 5 TMDLs with zero penta-PCB concentration for the ocean boundary. The solid green line represents median values for 99th and 100th year.

3.3.4 Step 3: Calculation of allowable loadings from WLAs and LAs without the ocean influence

As discussed in the Section 3.2.1 of the Guiding Principles, all point and non-point source discharges are allowed to discharge at the applicable water quality criterion of 64 pg/L of Total PCBs or 16 pg/L of penta PCB in this calculation. This approach is justified because the influences from sum of WLAs and LAs compared to the Ocean boundary were found to be very minimal. All the inflows into the Zone 6 are estimated from available USGS tributary gaging data. The median daily flow for the representative cycling year is 17.84 cubic meters per second, which includes point source, non-point source, and tributary inflows into Zone 6.

Model simulations, without considering the influence of the ocean boundary, suggest that even with all the sources are discharging at 16 pg/L of penta PCBs, the influences of point and non-point sources are 0.0003 pg/L at River Mile 68 and 0.001pg/L at River Mile 48, respectively. Individual allocations may have to be lowered to meet a TMDL for a local tributary, and are subject to change when the Stage-2 PCB TMDLs are developed for the entire Delaware Estuary (Zones 2 to 6).

3.3.4.1 Calculation of Individual allowable loadings for point sources

The wasteload allocation portion of the TMDL represents those source categories that are regulated under the NPDES program. There are two types of WLAs to be considered for the Zone 6 TMDL. One category consists of municipal and industrial NPDES point sources and the other type is municipal separate storm sewer systems or MS4s. There are no combined sewer overflow (CSOs) systems in Zone 6.

Eight NPDES point source dischargers have been identified for individual wasteload allocations. The wasteload allocations for those eight permittees consisting of 12 discharges are calculated based on their permitted flow multiplied by the applicable penta-water quality target of 16 pg/L. Calculation results for the individual allowable penta-PCB loadings before allocating margin of safety are listed in Appendix 1. The total inflow from the eight NPDES dischargers is 1.306 m^3/sec. The sum of the allowable loadings assigned to these 12 discharges is about 1.81 mg/day of penta-PCBs.

Twenty (20) Municipal Separate Storm Sewer Systems (MS4s) are also considered and they are listed in Appendix 2. 7.2 percent of the remainder of the inflows (16.534 m^3/sec) are assigned to the flows from the MS4s for Zone 6. This flow is 1.190 m^3/sec. Therefore, the allowable loadings for MS4s in Zone 6 is calculated by multiplying the MS4 flow rate of 1.190 m^3/sec times the 16 pg/L water quality target for penta-PCBs. After unit conversions, the gross, allowable loadings for penta-PCBs before considering margin of safety for municipal separate storm sewer systems are 1.65 mg/day.

The gross WLA for Zone 6 is therefore 3.451 mg/day for penta-PCBs before the margin of safety is set aside (see Appendix Table 1.1).

3.3.4.2 Calculation of allowable loadings for non-point sources without the ocean influence

The load allocation portion of the TMDL represents the remaining source categories including contaminated sites, non-NPDES regulated stormwater discharges, tributaries, and air deposition. Subtracting 2.497 m^3/sec of point source inflow rate from the total inflow of 17.84 m^3/sec, 15.343 m^3/sec of inflows are assigned to these other non-point sources. Therefore, the gross load allocation (LA), excluding the influence from the ocean, is obtained by multiplying this flow rate of 15.343 m^3/sec by the 16 pg/L water quality target for penta-PCBs. After unit conversions, the gross LA is 21.21 mg/day.

About 14 percent of the total allowable loadings of penta-PCBs are allocated to point source discharges in Zone 6 before considering the influence from the ocean boundary (Figure 12).

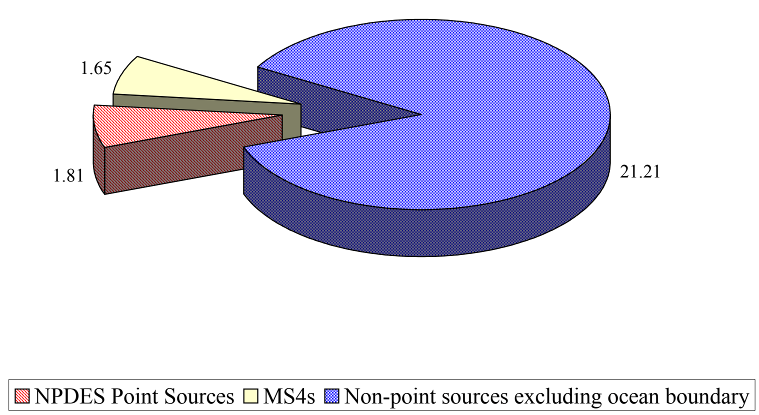


Figure 12: Allowable loadings for point and non-point sources in mg/day for the Delaware Bay excluding influences from the ocean without 5 percent of MOS reservation.

3.3.5 Step 4: Determination of ocean boundary concentration

The mouth of Delaware Bay is one of the downstream boundaries in the DELPCB model. The other downstream boundary is the western end of the C&D Canal which is located in Zone 5. In establishing the Stage-1 PCB TMDLs for Zones 2 through 5, these downstream boundaries were set at the water quality criteria of 7.9 pg/L of Total PCBs. In the Zone 6 TMDL development, the ocean boundary is the only downstream boundary of concern. A fixed concentration can be assigned at the downstream boundary since the TMDL is established under the steady state, or equilibrium conditions. As the applicable water quality criterion in Zone 6 is now 64 pg/L, the ocean boundary was set at a value of 16 pg/L. However, because of the reversing tidal flows and massive volume of ocean water entering the Bay during the flooding tide, exceedances can occur at the critical locations by the influence of the ocean boundary (Figure 13). Section 4.20.4B.1 of the Commission's Water Quality Regulations specify that in establishing WLAs, the concentrations at the boundaries of the area of interest shall be set at the lower of actual data or the applicable water quality criteria (DRBC, 1996). Even though the exceedances are not occurring within Zone 6, the ocean boundary condition has to be reduced below this criteria so as not to cause any violations in Zone 5.

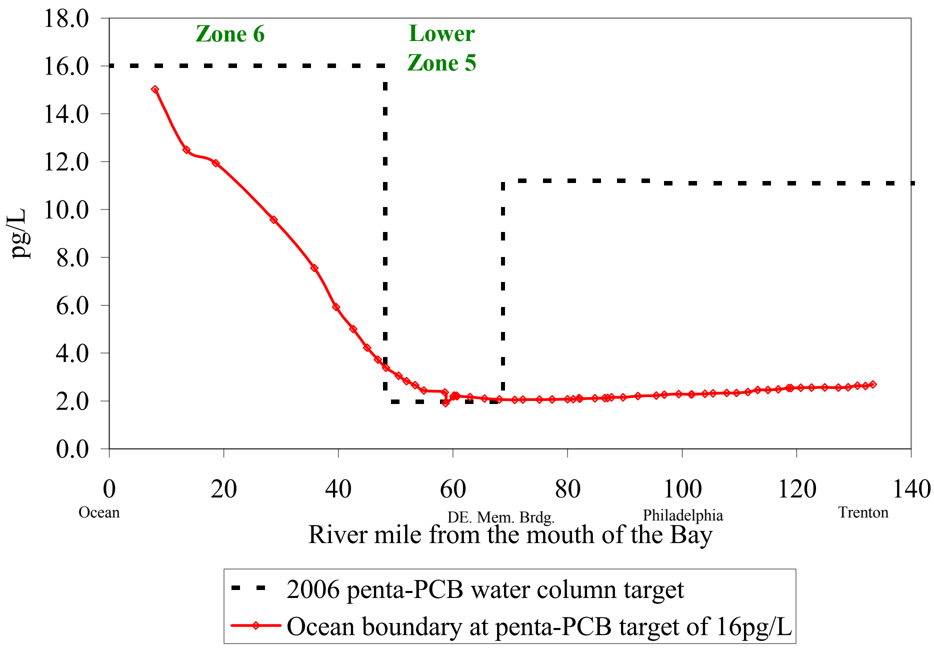


Figure 13: Simulation results under the loading conditions developed up to Step 3 and assigned ocean boundary at the penta-PCB water quality target of 16pg/L.

A series of simulations were performed while lowering the ocean downstream boundary concentration from 16 pg/L until no violations was observed at the critical locations. In these simulations, daily loadings established for Zones 2 to 5 are maintained and th Zone 6 WLAs and LAs, which are calculated in the previous Step 3, are input to the model as distributed loadings based on sizes of model segments. The ocean boundary concentration that did not cause any violations at critical locations was determined to 3.62 pg/L of penta-PCBs. Even though the applicable water quality target for penta-PCBs in Delaware Bay is 16 pg/L, the ocean boundary has to be limited to 3.62 pg/L. These critical locations exist because of changes in the water quality criteria in Zones 2 - 6.

3.3.6 Step 5: Determination of the equilibrium air concentration of penta-PCBs

Step 5 in developing TMDL for penta-PCBs for Zone 6 of the Delaware Estuary is to include the exchange of penta-PCBs between the gas phase in the atmosphere and truly dissolved penta-PCBs in the water. In the current model framework, the gas phase air concentrations are assigned, and are not dynamically simulated by the model. However, when the TMDL is achieved there should be close to zero net exchange between the water and air. It was therefore necessary to estimate the gas phase concentration that would be in equilibrium with the water quality targets and then confirm that the water quality targets are still being met.

Equilibrium, atmospheric gas phase concentration for penta-PCBs with truly dissolved water column under the TMDL conditions can be calculated using the following relationship (see Section 3.3.5; DRBC, 2003c)

$$C_W \times H/RT_K = C_A$$

where:
C_W = truly dissolved fraction of the chemical in water, mg/L
C_A = atmospheric gas phase concentration, mg/L
H = Henry's Law Constant, atm-m^3/day
R = universal gas constant
T_K = water temperature in degrees Kelvin

The truly dissolved fraction of the penta-PCBs in Zone 6 is extracted from the model simulation results determined under the loading conditions from Step 4. The equilibrium atmospheric gas phase concentration for penta-PCBs are then calculated. The results are presented in Figure 14 for the one-year cycling period. Step 4 and 5 are iteratively repeated until the difference between the simulation results and water quality target is less than 0.02 pg/L at the most restrictive of the two critical locations.

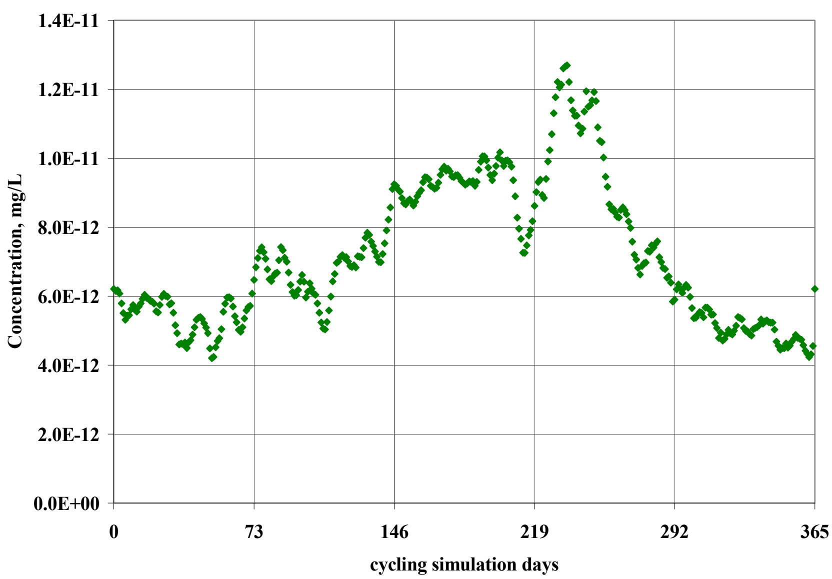


Figure 14: Yearly, back calculated, equilibrium, gas phase penta-PCB concentration for Delaware Bay.

The penta-PCB water quality model is then run for 200 years with the conditions obtained from Step 3, 4, and 5 including the loadings from the model boundaries (3.62 pg/L for the ocean boundary) and to each estuary zone, initial penta-PCB concentrations in the sediment, and with the calculated, median, equilibrium gas phase penta-PCB concentrations during the one year model cycling period. The purpose of this simulation is to confirm that the penta-PCB concentrations in the sediments (Figure 15) and the penta-PCB gas phase air concentrations are in equilibrium with the estuary concentrations that will meet the water quality target of 1.975 pg/L at the critical location when all fate processes are enabled in the model (Figure 16). The ocean boundary is limited to 3.62 pg/L by the critical location at River mile 48.2 where the interface between the Zone 5 and 6 is located. This simulation result confirms that under the assigned daily loadings from Zones 2 to 6, inputs from boundary interfaces, exchanges with sediment and atmosphere, the water column penta-PCB concentrations meet the penta-PCB water quality target.

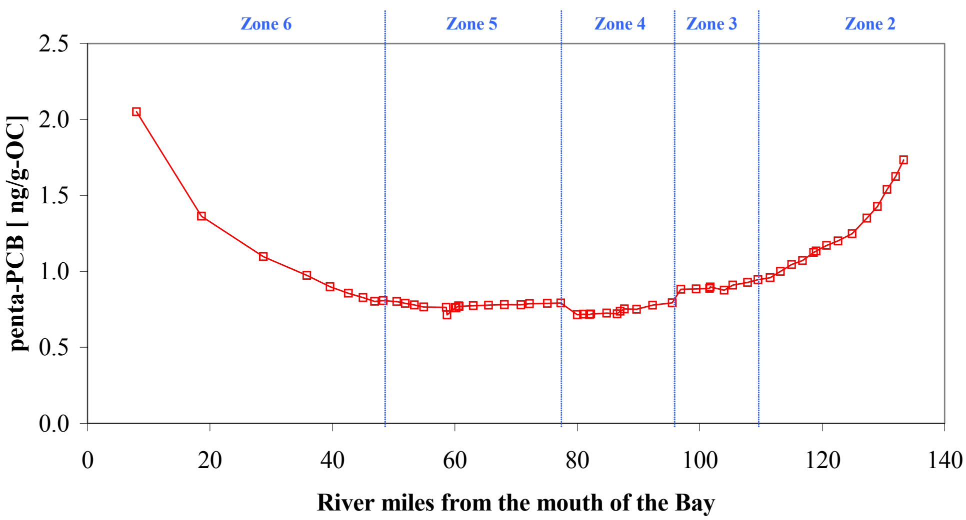
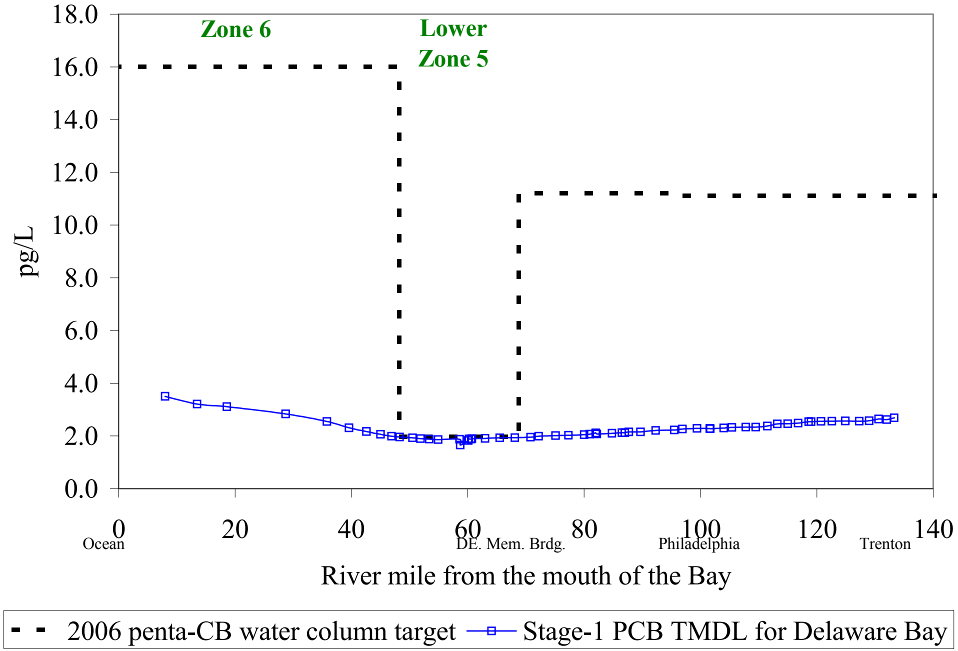


Figure 15: Equilibrium, carbon normalized sediment penta-PCB concentrations after 200year simulation.



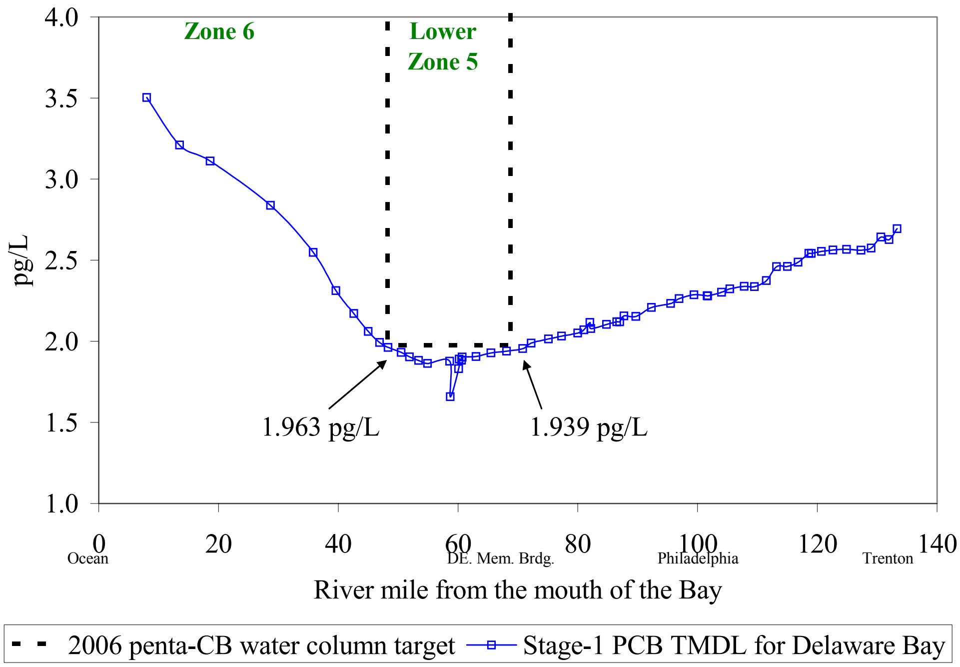


Figure 16: Simulation results after the Step 5 of the TMDL development process. The lower figure is an expansion of the upper figure with a finer scale for the penta-PCB concentration.

3.3.7 Step 6: Determination of ocean boundary as a load

TMDL development is a process of determining allowable loadings of a pollutant of concern that does not result in exceedances of water quality standards. A TMDL is expressed as a unit of daily loading. As described in Step 4 of this TMDL calculation (Section 3.3.5), the ocean boundary is determined as a unit of concentration under the existing modeling framework. The amount and direction of loading flux at this boundary is internally calculated within the model as influenced by tidal conditions and concentration gradients. The updated version of DELPCB model used in Zone 6 TMDL development, has been revised to track mass exchanges of PCBs between segments throughout the simulation. This update allowed the quantitation of the influence of the ocean into Delaware Bay as a unit of daily loading. The ocean boundary is limited to a concentration of 3.62 pg/L to achieve the applicable penta-PCB water quality target at the critical location at the head of the Bay. The influence from the ocean boundary is extracted from the 100 year model simulation results under the conditions obtained up to previous Step 5. The average daily loadings from the ocean boundary is calculated to be 444.45 mg/day of penta- PCBs under the TMDL condition. This amount is added to LA portion calculated in Step 3 of 21.21 mg/day to complete the gross load allocation for non-point sources. The gross allocation to the non-point sources in Zone 6 is 465.66 mg/day before the margin of safety is set aside.

3.3.8 Step 7: Reservation of a Margin of Safety

The TMDL and allocations to WLAs and LAs is calculated through Step 6. As a final step, a portion of the TMDL must be allocated to a margin of safety. The Commission's Toxics Advisory Committee made several recommendations on the policies and procedures to be used to establish allocations for Zones 2 to 5 in 2003. Federal regulations at 40 CFR Part 130.7(c)(1) require a margin of safety or MOS to be included in a TMDL to account for any lack of knowledge concerning the relationships between pollutant loadings and receiving water quality. Commission regulations (Section 4.30.7B.2.b.) also require that a portion of the TMDL be set aside as a margin of safety, with the proportion reflecting the degree of uncertainty in the data and resulting water quality-based controls.

The margin of safety can be incorporated either implicitly in the design conditions used in establishing the TMDL or explicitly by assigning a proportion of each TMDL. Both of these approaches were considered by the Toxics Advisory Committee in the development of the Stage 1 TMDLs for Zones 2 - 5. This committee recommended that an explicit margin of safety of 5% be assigned in allocating the zone-specific TMDLs at that time. This recommendation was based upon the use of a one year cycling period for the hydrodynamic and water quality model that mimics the period of record for the two major tributaries to the estuary rather than design tributary flows; and the use of tide data, precipitation data and the actual effluent flows that occurred during the one year cycling period. Since the TMDL for Zone 6 is developed using similar design conditions, this recommendation is also implemented in the development and allocation of the Zone 6 TMDL.

From Section 3.3.4.1 (Step 3), the gross WLA is 3.45 mg/day, and from Section 3.3.7 (Step 6), the gross LA is 465.66 mg/day before reserving a margin of safety. A total maximum daily loading or TMDL for Zone 6 is therefore 469.11 mg/day of penta PCBs. The TMDL and its allocation to WLAs, LAs and a MOS is summarized in Table 2.

Table 2: TMDL for penta-PCBs for Zone 6 (Delaware Bay) in milligrams per day.

TMDL	WLAs	LAs	MOS
469.11 mg/day	3.28 mg/day	442.38 mg/day	23.46 mg/day

4. TMDL, WLAs AND LAs FOR TOTAL PCBs

As discussed in Section 3.2.1, the TMDL for Total PCBs will be extrapolated from the penta homolog results using the observed ratio in the Delaware Estuary of the penta homolog to total PCBs. This approach was recommended by the expert panel established by the Commission due to time limitations and the technical difficulty in developing and calibrating a PCB model for each of the ten PCB homologs. Figure 6 presents the ratio of penta-PCBs to Total PCBs for each zone based upon currently available data. EPA finds this extrapolation to be reasonable and supported by the best available data.

For Stage 1 TMDL, a fixed value of 0.25 was used to scale up the TMDL, WLAs, LAs and MOSs for Total PCBs. Table 3 summarizes the TMDL for Zone 6 of Delaware Estuary for Total PCBs as well as the allocations to WLAs, LAs and the MOSs. As indicated in Table 3, 94.3% of the TMDL is allocated to the load allocation portion of the TMDL. Individual WLAs for the NPDES discharges are listed in Table 4.

Table 3: Apportionment of the TMDL for penta-PCBs and Total PCBs for Zone 6 in milligrams per day.

	TMDL	WLAs	LAs	MOS
penta-PCB	469.11 mg/day	3.28 mg/day	442.38 mg/day	23.46 mg/day
Total PCBs	1876.45 mg/day	13.12 mg/day	1769.51 mg/day	93.82 mg/day
Percent of TMDL	-	0.7%	94.3%	5.0%

Table 4: Calculation of individual wasteload allocations (WLAs) for Total PCBs for point sources with 5 percent reserved for a MOS.

Facility	NPDES No.	DSN	Permitted Flow (MGD)	Permitted Flow (m^3/sec)	WLA (mg/day)	MOS (mg/day)
City of Dover, McKee Run	DE0050466	001	1.250	0.0548	0.2877	0.0151
		004	0.006	0.0003	0.0014	0.0001
		005	0.001	0.0000	0.0002	0.0000
Harrington STP	DE0020036	001	0.750	0.0329	0.1726	0.0091
Kent County STP	DE0020338	001	15.000	0.6572	3.4523	0.1817
Reichhold Chemicals	DE0000591	001	0.150	0.0066	0.0345	0.0018
		002*	0.005	0.0002	0.0011	0.0001
		003*	0.032	0.0014	0.0074	0.0004
Millville City	NJ0029467	001A	5.000	0.2191	1.1508	0.0606
Cumberland County UA (CCUA)	NJ0024651	001A	7.000	0.3067	1.6111	0.0848
Glass Tubing Americas – Millville Tubing	NJ0004171	005A	0.514	0.0225	0.1183	0.0062
Lower Alloways Creek – Canton Village	NJ0062201	001A	0.050	0.0022	0.0115	0.0006
MS4s	-	-	27.171	1.1904	6.2535	0.3291
Total			56.929	2.49	13.10	0.69

* Flow is estimated based on their drainage area, assumed runoff coefficient, and 45 inch of annual rainfall.

5. STAGE 1 TMDLS FOR THE DELAWARE ESTUARY

5.1 Stage 1 TMDLs, WLAs and LAs for Total PCBs for the entire Delaware Estuary

Stage 1 TMDLs for Total PCBs for Zones 2 - 5 the tidal Delaware River were established by the U.S. EPA in 2003. This report presents the Stage 1 TMDL for Total PCBs for water quality management Zone 6 (the Delaware Bay). As discussed in Section 3.2.1, a guiding principle was to maintain the TMDLs that were established for Zones 2 to 5 while developing the TMDL for Zone 6. Thus, TMDLs representing Stage 1 PCB TMDLs for the entire Delaware Estuary have now been completed. Table 5 summaries zone-specific TMDLs, WLAs and LAs for Total PCBs for the entire Delaware Estuary. Figure 16 shows the relative percentage apportionment of the TMDLs and their components among the zones of the Delaware Estuary.

Table 5: TMDLs, WLAs, LAs and MOS for Total PCBs for the entire Delaware Estuary

Estuary Zone	TMDL	WLA	LA	MOS
	mg/day	mg/day	mg/day	mg/day
Zone 2	257.36	11.03	233.46	12.87
Zone 3	17.82	5.67	11.26	0.89
Zone 4	56.71	6.54	47.34	2.84
Zone 5	48.06	15.63	30.04	2.40
Zone 6	1876.45	13.12	1769.51	93.82
Entire Estuary	2256.40	51.99	2091.61	112.82

Relatively larger portions of TMDLs are allocated to Zones 2 and 6 because of the large influence from the upstream and downstream boundaries, the Delaware River at Trenton and Ocean, respectively.

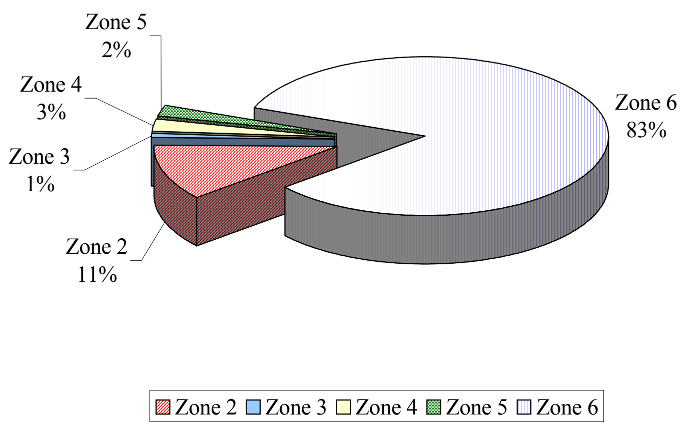


Figure 17: Stage 1 TMDL for Total PCBs for the entire Delaware Estuary

In 2003, the ocean boundary was set at 1.975 pg/L in Stage 1 TMDLs for Zones 2 to 5 because the applicable water quality target for penta-PCBs in Zone 6 was 1.975 pg/L. This applicable water quality target in Zone 6 has changed to 16 pg/L. However, the ocean boundary has to be limited to 3.62 pg/L in this Zone 6 TMDL development because an exceedance occurs at the critical location at the head of the bay. Still, the change in the applicable water quality target in Zone 6 allows the ocean boundary to be set at a higher concentration while still meeting the water quality target. Figure 17 demonstrates that the simulation results based on the Stage 1 TMDLs for Zones 2 to 6 condition utilize more of the assimilative capacity in lower Zone 5 and Zone 6 compared to the Stage 1 Zone 2 - 5 TMDLs developed in 2003.

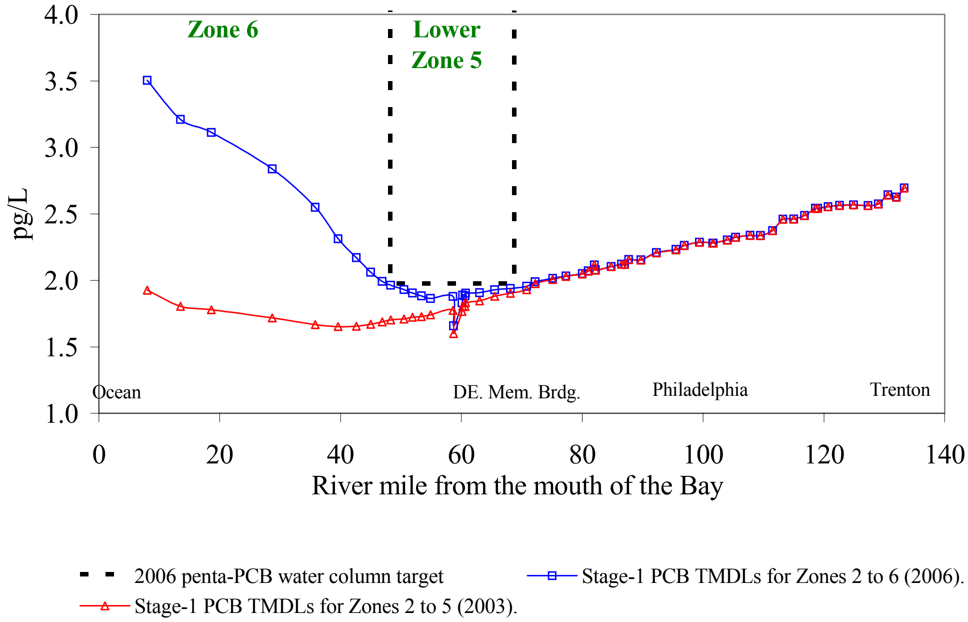


Figure 18: Comparison of 100 year simulation results under Stage - 1 PCB TMDLs developed in 2003 and 2006.

5.2 Mass Fluxes under the TMDL conditions

PCB mass loadings and net fluxes of penta-PCBs calculated internally by the model are summarized in Appendix 3. Appendix Table 3.1 contains the results for penta-PCBs and Appendix Table 3.2 contains the results for Total PCBs in a tabular format. Various types of mass flux inputs and exchanges are included. A positive sign indicates flux of PCBs into the Estuary while a negative sign indicates a flux out of the Estuary. The categories of fluxes summarized by individual Zone include: external loads, boundary loads, exchanges between zones, gas phase exchanges between air-water interfaces, net sediment-water diffusion, and net settling and resuspension of particulate PCBs. All are expressed in the unit of milligrams/day. External loadings are sum of WLAs and LAs excluding influences from boundaries. These loadings are calculated as allowable loadings per zone, and match the results presented in Table 4 of the TMDL Report (DRBC, 2003c) for penta PCBs, for example.

Two upstream and two downstream boundary exchanges are summarized and all four boundaries act as a source of PCBs into the Delaware Estuary. The largest input into the estuary is from the ocean boundary. Net advective movement between zones is also summarized. Net downstream transport occurred in all of interfaces with exception of the downstream boundary interface. The direction of net advective transport at the downstream boundary, or at the mouth of the Bay is upstream under the TMDL condition.

As described in Section 3.1 and Section 3.3.6, the TMDL has to be calculated under the equilibrium condition. Thus, there will be no net exchanges between the truly dissolved PCBs in the water column and gas phase PCBs in the atmosphere. As indicated in the mass flux tables, the net exchange of penta-PCBs is close to, but does not achieve no net exchange. Two explanations are possible for not having net zero exchanges between the water column and atmosphere under the TMDL condition. Gas phase exchanges between water column and atmosphere for Zones 2, 3, and 6 are positive for PCBs (Appendix Table 3.2). About 840 mg/day of total

PCBs are volatilized from Zone 6 under the TMDL condition. This magnitude of volatilization flux is about 100 times more than that of Zone 2, and more than 1000 times higher than in Zone 5. The reason for the large net gaseous flux exchanges in Zone 6 are the larger surface area in Zone 6 compared to other water quality management zones. The surface area normalized gas phase exchange flux are in same order of magnitude as the flux in Zones 2, 4, and 6. The reason for any existence of net gaseous exchanges under the TMDL condition is because gaseous PCB concentrations for the atmosphere are calculated and assigned for spatially average (median) condition for the entire lower bay rather than model segment by segment. In Stage 2 TMDLs development, the model will be refined so that segment-specific gaseous PCB concentrations can be assigned to achieve true equilibrium conditions.

Pore water diffusion provides a source of PCBs to water column by squeezing the sediment layer when the burial of solids (carbon) and PCBs occurs in the model. Because the model was calibrated to have a net burial of solids at any point of the Estuary in the Stage 1 TMDL development, based on limited core data, the sediment layers act as a net sink for PCBs. Net settling of solids (carbon) causes the net sink for the PCBs under the TMDL condition. This net settling to the sediment layer provides approximately 25 percent of the total assimilative capacity at the critical location in Stage 1 TMDLs for Zones 2 to 5. Solids, or carbon dynamics in the model are expected to be refined in Stage 2 TMDLs development utilizing more recent survey results.

The mass flux exchange table provides valuable insight of the direction and the magnitude of flux exchanges between media when the TMDL condition is met. Under the Stage-1 TMDLs for the Delaware Estuary for Zone 2 through Zone 6, PCB loadings are allocated for point and non-point sources including boundaries. These loadings into the Estuary are dissipated to the atmosphere by volatilization and to the sediment layer by net burial to maintain the applicable water quality criteria.

6. REFERENCES

Delaware River Basin Commission. 1996. Administrative Manual - Part III, Water Quality Regulations. Delaware River Basin Commission. West Trenton, NJ. October 1996.

Delaware River Basin Commission. 1998. Study of the Loadings of Polychlorinated Biphenyls from Tributaries and Point Sources Discharging to the Tidal Delaware River. Delaware River Basin Commission. West Trenton, NJ. June 1998.

Delaware River Basin Commission. 2002. Administrative Manual, Rules of Practice and Procedure. Delaware River Basin Commission. West Trenton, NJ. May 2002.

Delaware River Basin Commission. 2003a. DYNHYD5 Hydrodynamic Model (Version 2.0) and Chloride Water Quality Model for the Delaware Estuary. Delaware River Basin Commission. West Trenton, NJ. September 2003.

Delaware River Basin Commission. 2003b. PCB Water Quality Model for the Delaware Estuary (DELPCB). Delaware River Basin Commission. West Trenton, NJ. September 2003.

Delaware River Basin Commission. 2003c. Total Maximum Daily Loads for Polychlorinated Biphenyls (PCBs) For Zones 2 - 5 of the Tidal Delaware River. West Trenton, NJ. December 2003.

Delaware River Basin Commission. 2006. Revised Calibration of the Water Quality Model of the Delaware Estuary for Penta-PCBs and Carbon. Delaware River Basin Commission. West Trenton, NJ. September 2006.

Greene R.W. and R.W. Miller. 1994. Summary and Assessment of Polychlorinated Biphenyls and Selected Pesticides in Striped Bass from the Delaware Estuary. Delaware Department of Natural Resources & Environmental Control. Dover, DE. March 1994.

Hauge, P. 1993. Polychlorinated Biphenyl (PCBs), Chlordane, and DDTs in Selected Fish and Shellfish From New Jersey Waters, 1988-1991: Results from New Jersey's Toxics in Biota Monitoring Program. New Jersey Department of Environmental Protection. Trenton, NJ. 95pp.

National Oceanic and Atmospheric Administration. 1989. A Summary of Data on Tissue Contamination from the First Three Years (1986-1988) of the Mussel Watch Project. NOAA Technical Memorandum NOS OMA 49, August 1989.

U.S. Environmental Protection Agency. 1991. Guidance for Water Quality-based Decisions: The TMDL Process. Office of Water. Washington, D.C. EPA 440/4-91-001.

U.S. Environmental Protection Agency. 1999. Method 1668, Revision A: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by HRGC/HRMS. Office of Water. Washington, D.C. EPA-821-R-00-002. December 1999.

U.S. Environmental Protection Agency. 2000. Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000). Office of Water. Office of Science and Technology. Washington, D.C. EPA-822-B-00-004. October 2000.

U.S. Fish & Wildlife Service. 1991. Assessment of Organochlorine and Metal Contamination in the Lower

Delaware River Estuary (AFO-C91-04). U.S. Fish and Wildlife Service, Environmental Contaminants Division. Annapolis, MD.

Appendix 1

Point source discharges included in the WLAs
for penta-PCBs for the Zone 6 TMDL

Table 1.1: Calculation of wasteload allocations for penta-PCBs for NPDES discharges without reserving margin of safety.

Facility	NPDES No.	DSN	Permitted Flow - MGD	Flow (m^3/sec)	WQ Target (pg/L)	Load (mg/day)
City of Dover, McKee Run	DE0050466	001	1.250	0.0548	16	0.0757
		004	0.006	0.0003	16	0.0004
		005	0.001	0.0000	16	0.0001
Harrington STP	DE0020036	001	0.750	0.0329	16	0.0454
Kent County STP	DE0020338	001	15.000	0.6572	16	0.9085
Reichhold Chemicals	DE0000591	001	0.150	0.0066	16	0.0091
		002*	0.005	0.0002	16	0.0003
		003*	0.032	0.0014	16	0.0019
Millville City	NJ0029467	004	5.000	0.2191	16	0.3028
Cumberland County UA (CCUA)	NJ0024651	004	7.000	0.3067	16	0.4240
Glass Tubing Americas – Millville Tubing	NJ0004171	008	0.514	0.0225	16	0.0311
Lower Alloways Creek – Canton Village	NJ0062201	004	0.050	0.0022	16	0.0030
MS4s	-	-	27.171	1.1904	16	1.6457
Total			56.929	2.49		3.45

* Flow is estimated based on the drainage area contributing to the outfall, an assumed runoff coefficient, and 45 inches of annual rainfall.

Appendix 2

Wasteload Allocation Estimates for Municipal Separate Storm Sewer Systems (MS4s) in Watersheds in Delaware and New Jersey that Drain to Zone 6

A November 22, 2002 EPA Memorandum entitled, "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Stormwater Source and NPDES Permit Requirements Based on Those WLAs" clarified existing regulatory requirements for municipal separate storm sewer systems (MS4s) connected with TMDLs, i.e. that where a TMDL has been developed, the MS4 community must receive a WLA rather than a LA (U.S. EPA, 2002). In this document, EPA identified two options for assigning MS4 WLAs. This Appendix outlines the method used to assign Zone 6 with a single categorical WLA for multiple point source discharges of storm water.

Appendix Table 2-1 identifies the municipalities in New Jersey and Delaware that drain to tributaries of Delaware Bay (Zone 6).

In order to estimate the portion of the Load Allocation (LA) that corresponds to separate storm sewer systems (MS4) so that these MS4 allocations could be converted to Wasteload Allocations (WLAs) we only considered MS4's likely to discharge to the mainstem Delaware or tidal portions of tributaries. We used GIS land use coverages to estimate MS4 service area. The total, potential runoff area for Zone 6 is about 1370 mi^2 and urban area for the listed municipalities is about 94 mi^2. Since delineated MS4 service areas have not been identified for many communities, we estimated MS4 service area is about 74 percent of urban area, or 69 mi^2. Therefore, MS4 coverage area is about 5 % of total, potential runoff area. Since the MS4 area tends to have more impermeable surfaces compared to the natural land coverage area, forest for example, it is expected to have higher runoff rates in MS4 coverage area. Based on runoff estimations performed for allocations for MS4s in Zones 2 to 5 (DRBC, 2003, Appendix 6), MS4 areas generate an average about 135 % more runoff compared to the other types of land coverage. This relationship was applied to this Zone 6 MS4 flow estimation. Therefore, 7.2 percent of the potential runoff will be captured and discharged through MS4s. 7.2 percent of the remainder of the inflows (a total inflows minus traditional NPDES inflows: 16.534 m^3/sec) is equivalent to a flow of 1.190 m^3/sec.

Appendix Table 2.1 - Municipalities in Delaware and New Jersey designated as Phase II Separate Stormwater Sewer Systems (MS4s) that drain to Zone 6

STATE	MUNICIPALITY	COUNTY	NJPDES #
DE	DELAWARE DEPT. OF TRANSPORTATION	KENT	DE0051144
DE	DOVER CITY	KENT	DE0051161
DE	DOVER AIR FORCE BASE	KENT	DE0051187
NJ	BUENA BORO	ATLANTIC	NJG0149314
NJ	BUENA VISTA TWP	ATLANTIC	NJG0154989
NJ	CAPE MAY POINT BORO	CAPE MAY	NJG0150401
NJ	DENNIS TWP	CAPE MAY	NJG0150291
NJ	LOWER TWP	CAPE MAY	NJG0151092
NJ	MIDDLE TWP	CAPE MAY	NJG0149250
NJ	WEST CAPE MAY BORO	CAPE MAY	NJG0151866
NJ	BRIDGETON CITY	CUMBERLAND	NJG0147826
NJ	MILLVILLE CITY	CUMBERLAND	NJG0149063
NJ	VINELAND CITY	CUMBERLAND	NJG0152765
NJ	CLAYTON BORO	GLOUCESTER	NJG0150754
NJ	FRANKLIN TWP	GLOUCESTER	NJG0151025
NJ	GLASSBORO BORO	GLOUCESTER	NJG0148270
NJ	MONROE TWP	GLOUCESTER	NJG0148946
NJ	NEWFIELD BORO	GLOUCESTER	NJG0149187
NJ	WASHINGTON TWP	GLOUCESTER	NJG0153664
NJ	PITTSGROVE TWP	SALEM	NJG0154512

Appendix Table 2.2: Summary of the Zone 6 TMDLs for penta-PCBs and Total PCBs including the allocation to MS4s.

	TMDL mg/day	**MOS** mg/day	**Load Allocation** mg/day	**Wasteload allocation minus MS4s** mg/day	**Allocations to MS4s** mg/day
Penta-PCBs	469.11	23.46	442.38	1.72	1.56
Total PCBs	1876.45	93.82	1769.51	6.86	6.25

Appendix 3

Summary of mass flux exchanges for penta-PCBs and Total PCBs
for Zones 2 to 6 under the TMDL conditions

Table 3.1: Summary of mass flux exchanges for the Stage 1 penta-PCB TMDL for Zones 2 to 6

Mass Flux Type (penta-PCB)	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	All Zones
External Loads, mg/day	6.61	4.46	4.57	12.01	24.66	52.31
Boundary*, mg/day	71.04		14.58	2.94	444.45	533.01
Downstream interface Advection, mg/day	-66.53	-68.03	-78.70	-77.38	445.45	
Air-Water Exchange, mg/day	-2.55	-0.44	1.03	0.19	-209.42	-211.19
Net Sediment-Water Diffusion, mg/day	1.54	0.96	1.22	7.12	152.47	163.32
Net of Settling and Resuspension, mg/day	-8.45	-3.35	-8.84	-21.39	-481.71	-523.74
Net Sediment-Water Exchange, mg/day	-6.91	-2.39	-7.62	-14.27	-329.24	-360.42
Surface Area, km^2	21.96	20.98	32.04	146.53	1690.23	1911.74
Air-Water Exchange per unit area, mg/day-km^2	-0.116	-0.021	0.032	0.001	-0.124	-0.110
Net Sediment-Water Diffusion per unit area, mg/day-km^2	0.070	0.046	0.038	0.049	0.090	0.085
Net of Settling and Resuspension per unit area, mg/day-km^2	-0.385	-0.160	-0.276	-0.146	-0.285	-0.274
Net Sediment-Water Exchange per unit area, mg/day-km^2	-0.315	-0.114	-0.238	-0.097	-0.195	-0.189

*Four major boundaries are considered in the model

Zone 2 - Upstream boundary of Delaware River at Trenton
Zone 4 - Upstream boundary of Schuylkill River at Philadelphia
Zone 5 - Downstream boundary of C&D Canal at Chesapeake City
Zone 6 - Downstream boundary at the mouth of the Bay (Ocean)
All Zones - Net fluxes into the entire estuary from four boundaries

Table 3.2: Summary of mass flux exchanges for the Stage 1 Total PCB TMDL for Zones 2 to 6

Mass Flux Type (total-PCBs)	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	All Zones
External Loads, mg/day	26.45	17.82	18.27	48.06	98.65	209.25
Boundary*, mg/day	284.15		58.33	11.76	1777.79	2132.03
Downstream interface Advection, mg/day	-266.12	-272.12	-314.79	-309.52	1777.79	
Air-Water Exchange, mg/day	-10.20	-1.77	4.16	0.75	-837.68	-844.77
Net Sediment-Water Diffusion, mg/day	6.14	3.86	4.89	28.49	609.90	653.28
Net of Settling and Resuspension, mg/day	-33.81	-13.39	-35.37	-85.56	-1926.82	-2094.94
Net Sediment-Water Exchange, mg/day	-27.67	-9.53	-30.48	-57.07	-1316.92	-1441.67
Surface Area, km^2	21.96	20.98	32.04	146.53	1690.23	1911.74
Air-Water Exchange per unit area, mg/day-km^2	-0.464	-0.084	0.130	0.005	-0.496	-0.442
Net Sediment-Water Diffusion per unit area, mg/day-km^2	0.280	0.184	0.153	0.194	0.361	0.342
Net of Settling and Resuspension per unit area, mg/day-km^2	-1.540	-0.638	-1.104	-0.584	-1.140	-1.096
Net Sediment-Water Exchange per unit area, mg/day-km^2	-1.260	-0.454	-0.951	-0.389	-0.779	-0.754

* Four major boundaries are considered in the model:

Zone 2 - Upstream boundary of Delaware River at Trenton
Zone 4 - Upstream boundary of Schuylkill River at Philadelphia
Zone 5 - Downstream boundary of C&D Canal at Chesapeake City
Zone 6 - Downstream boundary at the mouth of the Bay (Ocean)
All Zones - Net fluxes into the entire estuary from four boundaries

EXHIBIT G

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 2 2006

OFFICE OF WATER

MEMORANDUM

SUBJECT: Clarification Regarding "Phased" Total Maximum Daily Loads

FROM: Benita Best-Wong, Director
Assessment and Watershed Protection Division

TO: Water Division Directors
Regions I - X

This memorandum clarifies the *Guidance for Water Quality-Based Decisions: The TMDL Process*, issued in 1991, by explaining EPA's interpretation of the term "phased TMDL" as used in EPA guidance, and explaining the distinction between "phased TMDLs," "staged implementation," and "adaptive implementation." Phased TMDLs are a matter of TMDL development while staged implementation and adaptive implementation are post-development implementation concepts. Greater attention to these distinctions has emerged since EPA issued the 1991 Guidance and promulgated the Water Quality Guidance for the Great Lakes system in 1995, thus warranting today's additional clarification.

Current EPA guidance for developing TMDLs speaks of a "phased approach to developing TMDLs," frequently referred to as "phased TMDLs."[i] This concept has sometimes been misinterpreted and resulted in TMDLs that are not calculated to meet applicable water quality standards. This misinterpretation is not consistent with EPA's interpretation of 40 CFR Part 130.7. The regulations require all TMDLs to be calculated to achieve applicable water quality standards.[ii] EPA's interpretation was affirmed by a recent court decision.[iii]

BACKGROUND

The 1991 Guidance

The 1991 Guidance discusses the use of "phased TMDLs" in two situations.

In the first situation, the Guidance addresses waters impaired by both point and nonpoint sources where the wasteload allocation to point sources is predicated on nonpoint source loading reductions, i.e., where point sources receive a higher wasteload allocation because the TMDL assumes that reduced loads will come from nonpoint sources. In such cases, the Guidance recommends that some additional provision in the TMDL, such as a schedule and description of the implementation mechanisms for nonpoint source control measures, be included to provide reasonable assurance that the nonpoint source measures will achieve the expected load reductions. Such additional provisions also assure compliance with the federal regulations at 40 CFR 130.2(i), which provide that in order for wasteload allocations to be made less stringent, more stringent load allocations must be "practicable."

In the second situation, the Guidance recommends the phased approach for situations where available data only allow for "estimates" of necessary load reductions or for "non-traditional problems" where predictive tools may not be adequate to characterize the problem with a sufficient level of certainty.[iv]

In both of these situations, the phased approach has sometimes been misinterpreted to mean that a phased TMDL may be calculated to improve water quality, but not to meet water quality standards. However, the Guidance clearly indicates that **all** **TMDLs must be** set at levels that meet water quality standards:

> "Under the phased approach the TMDL has LAs (load allocations) and WLAs (wasteload allocations) calculated with margins of safety **to meet water quality standards** (emphasis added)."[v]

Additional text in the 1991 Guidance recommends that TMDLs established under the phased approach include a schedule for installation and evaluation of nonpoint source control measures, data collection, and assessment of water quality standards attainment. The Guidance also recommends that the schedule include a time frame within which water quality standards are expected to be met and within which controls will be re-evaluated if water quality standards have not been attained. The information would be used to determine whether the TMDL needs to be revised.

The Water Quality Guidance for the Great Lakes

In addition to the two scenarios described in the 1991 Guidance, there is a third scenario described in the Great Lakes Water Quality Guidance which has also sometimes been referred to as a phased TMDL:

> "Some TMDLs may be based on attaining water quality standards over a period of time, with specific controls on individual sources being implemented **in stages** (emphasis added). Determining this reasonable period of time in which water quality standards will be met is a case-specific determination..."[vi]

As with all TMDLs, these TMDLs must be established at a level necessary to meet water quality standards. However, in this situation, the time frame in which water quality standards will be achieved is based on a planned staged implementation of controls and a determination of the appropriateness of this timeframe is made on a case specific basis. Additionally, the types of additional measures that are recommended for inclusion in phased TMDLs as envisioned in the 1991 Guidance, such as monitoring to verify load reductions, evaluation of effectiveness of controls, and revision of load and wasteload allocations as necessary, are required by the Great Lakes regulations.

CLARIFICATION

Based on program experience since 1991, it is apparent that many TMDLs may be established based on data that could subsequently be improved and that may involve a certain degree of uncertainty. Additionally, most TMDLs include both point and nonpoint sources. Therefore, most TMDLs could fit the conditions of the first scenario described in the 1991 Guidance and a meaningful distinction between a phased TMDL, as described in that scenario, and a regular TMDL does not exist. Moreover, the concept of adaptive implementation has come to the fore since the 1991 Guidance was issued. In its 2001 report, *"Assessing the TMDL Approach to Water Quality Management"*[vii] the National Research Council highlighted the need for EPA to encourage adaptive implementation of TMDLs. Therefore we are proposing the following clarification of the terms "phased TMDLs," "adaptive implementation," and "staged implementation."

Phased TMDLs

We recommend the use of the term "phased TMDLs" be limited to TMDLs that for scheduling reasons need to be established despite significant data uncertainty and where the State expects that the loading capacity and allocation scheme will be revised in the near future as additional information is collected. In other words, phased TMDLs would be reserved for the second scenario described in the 1991 Guidance.

The phased TMDL approach would be used in situations where limited existing data are used to develop a TMDL and the State believes that the use of additional data or data based on better analytical techniques would likely increase the accuracy of the TMDL load calculation and merit development of a second phase TMDL. Such significant uncertainty may arise, for example, because the State is using a surrogate to interpret a narrative standard, or because there is little information regarding the loading capacity of a complex system such as an estuary and it is difficult to predict how the a water body will react to the planned load reductions. An example of a phased TMDL could be a TMDL for phosphorus in a lake watershed where there are uncertain loadings from the major land uses and/or limited knowledge of in-lake processes. In such a case, the loading capacity of the water body may be difficult to establish and the State may decide to include a schedule for establishing a revised TMDL based on follow-up monitoring. Phased TMDLs may also occur when a revision of the applicable standard is underway and will necessitate development of a second phase, revised TMDL to comply with the new standard.

All phased TMDLs must include all elements of a regular TMDL, including load allocations, wasteload allocations and a margin of safety. As with any TMDL, each phase must be established to attain and maintain the applicable water quality standard.[viii] In addition, EPA recommends that a phased TMDL document or its implementation plan include a monitoring plan and a scheduled timeframe for revision of the TMDL. (These elements would not be an intrinsic part of the TMDL and would not be approved by EPA, but may support a rationale for approving the TMDL. See also "Nonpoint Source Program and Grants Guidelines for states and Territories, Federal Register Vol. 68, pp 60653-74.)

Since phased TMDLs will in all likelihood need to be revised and therefore require more overall effort, States should carefully consider the necessity of such TMDLs, for example to meet consent decree deadlines or other mandatory schedules Upon revision of the loading capacity, wasteload, or load allocations, the TMDL would require re-approval by EPA.

TMDLs with Adaptive Implementation and Trading Provisions

Adaptive implementation is an iterative implementation process that makes progress toward achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities. The National Research Council report suggests that adaptive implementation include "immediate actions, an array of possible long-term actions, success monitoring, and experimentation for model refinement."[ix] By using the adaptive implementation approach, one can utilize the new information available from monitoring following initial TMDL implementation efforts to appropriately target the next suite of implementation activities.

Phased TMDLs are an example of the adaptive implementation approach because each new phase utilizes new information to reevaluate the original TMDL. However, even for TMDLs where there is little uncertainty regarding the loading capacity of the water body and the necessary load reductions, an adaptive implementation approach can be a useful tool. Implementation of TMDLs can take many years and when uncertainty about the effectiveness of implementation activities exists, TMDLs would benefit from containing elements that would facilitate adaptive implementation such as, for example, provisions for a flexible load allocation/waste load allocation scheme. EPA is currently working to clarify how TMDLs can be written to provide for adjustments in the load and wasteload allocations in approved TMDLs.

EPA understands that not all TMDLs can be implemented using adaptive implementation methods due to the more intensive monitoring and added administrative steps associated with this iterative approach. Nonetheless, EPA believes that in appropriate cases it should be feasible for States to develop TMDLs that facilitate implementation of practicable controls while additional data collection and analysis are conducted to guide implementation actions. Follow-up monitoring is integral to the adaptive implementation approach. Monitoring addresses uncertainty in the efficacy of implementation actions and can provide assurance that implementation measures are succeeding in attaining water quality standards, as well as inform the ongoing TMDL implementation strategy. If adaptive implementation activities reveal that a TMDL loading capacity needs to be changed, the revision would require EPA approval. In most cases adaptive implementation is not anticipated to lead to the re-opening of a TMDL. Instead, it is a tool used to improve implementation strategies.

Another adaptive implementation tool to consider is water quality trading. Water quality trading can involve one or more TMDLs in a watershed context and include both point and nonpoint sources. Water quality trading is an effective TMDL implementation tool. More information about the feasibility of trading can be found in the Water Quality Trading Assessment Handbook.[x] One successful trading example is the Long Island Sound TMDL for nitrogen where municipal dischargers participate in a nitrogen reduction credit exchange program.

TMDLs with Staged Implementation

The third type of TMDL, described in the Great Lakes Initiative, is different from the two preceding types. While not a "phased TMDL," it is a TMDL that anticipates implementation in several distinct stages. It is also different from the adaptive implementation scenario because it is anticipated that the load and wasteload allocations will not require any significant adjustments. Instead, implementation actions will be staged over a period of time. For example, EPA has approved mercury TMDLs where the wasteload allocation to point sources (which would be implemented within five years through the NPDES process) was predicated on long-term reductions in atmospheric mercury deposition. We believe that the appropriate terminology for such a TMDL, if a label needs to be applied, would be "staged implementation."

SUMMARY

EPA is providing this clarification to ensure that there is a common understanding of the concepts discussed above and that the term "phased TMDL" is not used interchangeably to describe all three scenarios. This clarification does not imply that all TMDLs must fit neatly within one of these models. We recognize that some TMDLs will require "staged implementation" to a degree, particularly if they include nonpoint sources, and that in many of these cases the staging will be significant. This staging could also go hand-in-hand with adaptive management, such that some clearly needed control measures are implemented, while others are staged until additional information is collected.

If you have any questions please contact me or have your staff contact Valentina Cabrera-Stagno in the Watershed Branch at (202) 566-2022.

cc:
Water Quality Branch Chiefs, Regions I-X
Permit Branch Chiefs, Regions I-X
Regional TMDL Coordinators, Regions I-X

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[i] US EPA 1991. Guidance for Water-Quality-based Decisions: The TMDL Process, EPA440-4-91-001 http://www.epa.gov/OWOW/tmdl/decisions/

[ii] Part 130 of Title 40 of the Code of Federal Regulations, section 130.7, contains the regulations currently governing the Total Maximum Daily Load program, which were issued in 1985 and 1992

[iii] Minnesota Center for Environmental Advocacy v. EPA, No. 03-5450 (D. Minn. June 23, 2005)

[iv] US EPA, 1991 (page 22).

[v] US EPA, 1991 (page 22).

[vi] Part 132, Appendix F of Title 40 of the Code for Federal Regulations, Chapter I, contains the regulations governing the Total Maximum Daily Load program in the Great Lakes, which were issued in 1995.

[vii] National Research Council, 2001. Assessing the TMDL Approach to Water Quality Management. National Academy Press. Washington, DC.

[viii] Part 130 of Title 40 of the Code of Federal Regulations, section 130.7

[ix] National Research Council, 2001 (page 94).

[x] US EPA 2004. Water Quality Trading Assessment Handbook, EPA841-B-04-001

EXHIBIT H

From: Ponzetti, Jeanne (ECY)
To: ECY RE ECOLOGY LIBRARY; Froese, Ruth (ECY); Niemi, Cheryl (ECY)
Subject: RE: AO 19-01 Ecology Publication # 06-03-024
Date: Wednesday, July 31, 2019 11:34:54 AM
Attachments: Report - Spokane PCB TMDL - 6-19-06 Draft for web.doc

Hello Cheryl and Lisa,
The draft report is attached here.
I was able to find it in electronic form. We do not have a printed version in our hardcopy EAP files; I suspect it was never printed because of the draft status.
Note that the front page and footers say "Do not cite or quote."
Cheryl, regarding your question about it being obsolete… Within the agency, definitions of "removed" versus "obsolete" publications have changed over time. There's been a recent push to change all "removed" publications to "obsolete" publications. I'm guessing this was "removed" from the web, then later marked obsolete. That would explain the publication's status on the spreadsheet. This was well before my time so I'm just speculating.
I hope this helps! Let me know if you need anything else.
Best wishes,
Jeanne
Jeanne Ponzetti
Technical Editor | Publications Coordinator
Environmental Assessment Program
Washington State Department of Ecology
jeanne.ponzetti@ecy.wa.gov
(360) 407-6764

From: ECY RE ECOLOGY LIBRARY
Sent: Monday, July 29, 2019 3:25 PM
To: Ponzetti, Jeanne (ECY) ; Froese, Ruth (ECY)
Subject: FW: AO 19-01 Ecology Publication # 06-03-024
Hi, Jeanne and Ruth,
I don't think that Ecology and the State library have this publication in either format. If that agrees with your records, would you please send electronic and paper copies (assuming you have it)? Also, please let me know whether you sent Cheryl a copy or would like me to do that.
Thanks!
LIsa

From: Niemi, Cheryl (ECY) <cnie461@ECY.WA.GOV>
Sent: Monday, July 29, 2019 12:54 PM
To: ECY RE ECOLOGY LIBRARY <ecologylibrary@ECY.WA.GOV>
Subject: AO 19-01 Ecology Publication # 06-03-024
Hi.
I'm looking for Ecology Publication # 06-03-024. This website indicates it is obsolete and not available on the Ecology website:
https://fortress.wa.gov/ecy/publications/SummaryPages/0603024.html .
This website indicates it is not obsolete:
http://awwecology/sites/asi/publications/_layouts/15/WopiFrame.aspx?sourcedoc={32B916A0-E9FB-4F87-A29A-78BBF80BE374}&file=RemovedRecords.xlsx&action=default&DefaultItemOpen=1 ,

see row 79.
Please tell me how to access this draft report, either a hard copy or electronic.
Thank you.
Cheryl

Cheryl A. Niemi
Surface Water Quality Standards Specialist
Department of Ecology
P.O. Box 47600
Olympia WA 98504
360.407.6440
cheryl.niemi@ecy.wa.gov
This e-mail may be subject to public disclosure.

HONORABLE BARBARA J. ROTHSTEIN

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
AT SEATTLE

SIERRA CLUB; and CENTER FOR ENVIRONMENTAL LAW AND POLICY, Plaintiffs, and SPOKANE TRIBE OF INDIANS, Plaintiff-Intervenor, v. MICHELLE PIRZADEH; MICHAEL REGAN, and UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, Defendants and SPOKANE COUNTY; KAISER ALUMINUM WASHINGTON LLC; and STATE OF WASHINTGON DEPARMTNET OF ECOLOGY, Defendant-Intervenors.	No. 11-cv-1759-BJR [PROPOSED] ORDER GRANTING SUMMARY JUDGMENT

SMITH & LOWNEY, P.L.L.C.
2317 EAST JOHN STREET
SEATTLE, WASHINGTON 98112
(206) 860-2883

Upon consideration of Plaintiffs' motion for summary judgment, and the arguments and evidence submitted by the parties regarding the motion, the Court hereby GRANTS summary judgment to Plaintiffs, and finds that Defendants are liable under 33 U.S.C. § 1365 for the failure to perform their nondiscretionary duties under 33 U.S.C. § 1313(d) to approve or disapprove the Spokane River PCB TMDL constructively submitted to the Environmental Protection Agency by the Washington Department of Ecology, and if disapproval, to issue a federal TMDL. Defendants are ORDERED to develop and approve a Spokane River PCB TMDL within 90 days.

DATE this ______ day of ____________, __________

____
HON. BARBARA J. ROTHSTEIN
UNITED STATES DISTRICT JUDGE

SMITH & LOWNEY, P.L.L.C.
2317 EAST JOHN STREET
SEATTLE, WASHINGTON 98112
(206) 860-2883