Executive Correspondence

Log No: 8588 | **Gov Log No:** None

Date Assigned: 12/23/2014 **Date Due:** 01/07/2015 **Date Completed:**

Constituent: **Louws, Jack**

Subject: TMDL Request for dispute resolution

Assigned to: Bartlett, Heather

Organization: WQ

Coordinate With: None Required

Signature Required: PROGRAM MANAGER

CC (To be noted on letter)

Not Required

Phone Log (If Appropriate)

Contact Person	In	Out
Bullock, Terilynn		

Comments:

No comments at this time

WHATCOM COUNTY
EXECUTIVE'S OFFICE
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Jack Louws
County Executive

December 18, 2014

VIA EMAIL – ORIGINAL TO BE MAILED

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Heather Bartlett
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Re: Whatcom County Request for Dispute Resolution – Oral Presentation Requested
Lake Whatcom Watershed Total Phosphorus and Bacteria
Total Maximum Daily Loads Water Quality Improvement Report
And Implementation Strategy

Dear Ms. Bellon and Ms. Bartlett:

Whatcom County requests Dispute Resolution on the Lake Whatcom Watershed Total Phosphorus and Bacteria Total Maximum Daily Loads Water Quality Improvement Report and Implementation Strategy issued November 2014 (Publication No. 13-10-012) (hereafter TMDL) pursuant to Ecology Water Quality Program Policy 1-25. Whatcom County is fully committed continuing with its planned actions to clean up Lake Whatcom and implementing its existing Phase II Western Washington Municipal Stormwater Permit (MS4 Permit) requirements, which regulates discharges of stormwater from municipal separate storm sewer systems.

With regard to the TMDL, Whatcom County has done and will continue to do its fair share in cleaning up the Lake; however, as currently drafted, the TMDL places virtually the entire burden of cleaning up Lake Whatcom on the shoulders of the County. While Ecology has properly determined that non-point sources contribute a significant load to the Lake, the TMDL improperly and inequitably requires the County to clean up the vast majority of that load instead of assigning responsibility to non-point sources. This mistake is compounded by Ecology's plan

to implement the County's obligations by vastly expanding its MS4 Permit boundary. With regard to these requirements and several others, the County respectfully requests dispute resolution with hope that an acceptable resolution is achieved that results in cleaning up Lake Whatcom to the maximum extent practicable through the use of reasonable and achievable targets and actions for the County.

1. Reasons for Dispute Resolution Request

(A) Ecology's Use of Surrogates is Arbitrary and Erroneous.

Despite the Environmental Protection Agency's (EPA) decision to eliminate the use of surrogates in TMDLs, as well as recent case law invalidating them, Ecology's TMDL employs the use of surrogates in an extremely attenuated fashion, creating the term "effective developed acres" as a surrogate for dissolved oxygen."[1] Ecology also calculated the phosphorus daily load "based on adjusting the effective developed acres target to meet water quality standards." *Id.* Because "effective developed acres" and flow are not pollutants contained in the federal or state water quality standards, they cannot serve as the basis for a TMDL. Ecology's rationale with regard to phosphorus is equally flawed, conceding that there is no numeric water quality criterion for phosphorus, instead relying on "aesthetic values" that supposedly are implicated because phosphorus has an effect on dissolved oxygen by simulating algal growth and excess algae can affect aesthetic values. According to Ecology, the "TMDL will use dissolved oxygen as the criteria to determine loading limits for total phosphorus, which will be linked back to land use practices, nutrient deposition and transport processes."[2]

Ecology's approach directly conflicts with EPA guidance issued on November 26, 2014, which removed language that previously allowed the use of surrogates for pollutant parameters when establishing targets for TMDL loading capacity.[3] EPA's new guidance is not surprising in light of several recent court cases, including the federal court ruling in *Virginia Department of Transportation v. EPA,* 2013 WL 53741 (E.D. Va. 2013) where the court held that EPA exceeded its authority in establishing a flow-based TMDL for Accotink Creek in Fairfax, Virginia. EPA's 2014 guidance replaces a 2010 guidance document on the same subject and states that the 2010 guidance should no longer be used.

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[1] Lake Whatcom Watershed Total Phosphorus and Bacteria TMDLs, page 5.

[2] TMDL at p. 10.

[3] U.S. Environmental Protection Agency Memorandum from Andrew D. Sawyers, Director, Office of Wastewater Management and Benita Best-Wong, Director, Office of Wetlands, Oceans and Watersheds, to Water Division Directors Regions 1-10, dated November 26, 2014, Subject: "Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements based on Those WLAs." ("This memorandum replaces the November 12, 2010, memorandum on the same subject; the Water Division Directors should no longer refer to that memorandum or guidance.") While the 2010 memorandum contained a lengthy discussion about the use of surrogates in TMDLs, none of that language appears in the 2014 memorandum.

Ecology attempts to justify its use of surrogates by referencing the following text from a 1998 Federal Advisory Committee Report: "When the impairment is tied to a pollutant for which a numeric criterion is not possible or where the impairment is identified but cannot be attributed to a single traditional "pollutant," the state should try to identify another (surrogate) environmental indicator that can be used to develop a quantified TMDL, using numeric analytical techniques where they are available, and best professional judgment (BPJ) where they are not." TMDL at p. 5. However, because EPA's most recent guidance abandons its endorsement of the use of surrogates, a 1998 report the predated EPA's 2014 guidance provides no support for Ecology's position.[4]

EPA's decision to withdraw the use of surrogates is supported by and consistent with its regulations. "Pollutants" are defined in the Clean Water Act (CWA), as well as in EPA's implementing regulations (and Washington's NPDES permit regulations) to mean dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water." CWA § 502(6), 33 U.S.C. § 1362; *see also* 40 C.F.R. § 122.2; and WAC 173-220-030 (19). This definition includes many specific substances, but ***not*** the flow of water or "effective developed acres." The federal regulations provide that TMDLs may be established "using a pollutant-by pollutant or biomonitoring approach" (*e.g.,* directly measuring aquatic life), 40 C.F.R § 130.7(c)(1)(i), "for all ***pollutants*** preventing or expected to prevent attainment of water quality standards." 40 C.F.R. §0 130.7(c)(1)(ii) (emphasis supplied). The regulations do not authorize the use of non-pollutant surrogates. In contrast to the definition of "pollutants" for which a TMDL is required, the CWA defines "pollution" more generally and more broadly to include "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." CWA § 509(19), 33 U.S.C. § 1362(19). Because Washington State does not have any specific TMDL regulations, the federal regulations apply to the Lake Whatcom TMDL and the federal TMDL regulations do not support Ecology's position.

This statutory distinction between "pollutant" and "pollution" is fundamental to the structure and scope of the Clean Water Act, which makes pollutants the authorized focus of the TMDL program. *See, e.g.,* CWA § 303(d)(1)(C), 33 U.S.C. § 1313(d)(1)(C) ("Each State shall establish for the waters identified in paragraph (1)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load, for those ***pollutants*** which the Administrator identifies under section 1314(a)(2) of this title as suitable for such calculation.") (emphasis added); CWA § 402(p)(3)(B)(iii), 33 U.S.C. § 1342(p)(3)(B)(iii). Because effective developed acres" and flow are not pollutants, they cannot serve as surrogates for actual pollutants in TMDLs and, therefore, Ecology's surrogate approach is arbitrary and erroneous.

[4] *See also* EPA 2010 Guidance at p. 5 "Using Surrogate for Pollutant Parameters When Establishing Targets for TMDL Loading Capacity," which section has been removed from EPA's 2014 Guidance.

(B) Requiring Whatcom County to Assume Responsibility for Non-Point Source Discharges and Expanding the County's MS4 Permit Boundary is Arbitrary and Erroneous.

Astonishingly, the TMDL requires Whatcom County to assume responsibility for ***all non-point sources and its MS4 point source discharges,*** for all areas over which it has land use authority (except commercial forests). "The Stormwater Management Program required by the permit is the primary means of regulating all stormwater. The program will be applied across the watershed and be used to control both discharges into the municipal stormwater system and discharges direct to receiving waters."[5] These requirements will be included in an order, permit modification or at the next permit issuance after approval of the TMDL by EPA. "In any subsequent permit modification, the actions included in the Administrative Order will be incorporated into Appendix 2 of the Municipal Stormwater Permit. *Id.* Because it highly likely that a significant portion of runoff from the commercial forests will ultimately reach the area for which Whatcom County is responsible, the County is essentially responsible for cleaning up the commercial forest phosphorus load as well, even though the County has no control over that area (as Ecology acknowledges).

Even if we assume that the commercial forest area runoff will remain isolated from the County area (it will not), Ecology's approach results in more than a 300% increase in the County's MS4 Permit boundary.[6] As Ecology knows, there are 66 pages of MS4 Permit requirements,[7] excluding the appendices. The appendices, Stormwater Management Manual for Western Washington, technical manuals, and other guidance referenced in the Permit add hundreds of pages of additional regulatory requirements. Consequently, contrary to Ecology's public statements that expanding the Permit boundary is nothing more than implementing some BMPs, the expanded boundary and corresponding Permit requirements represents an extraordinary burden for the County.

The reasonable assurance portion of the TMDL is virtually devoid of any meaningful attempt to evaluate or consider alternative methods of implementing the non-point source load allocation, despite the fact that Ecology has many examples of doing so for other TMDLs. There are numerous instances where Ecology has prepared non-point source implementation plans that involve education, working with conservation districts, agricultural interests, and other non-point sources to implement TMDL load allocations. We are aware of no other instance in the State of Washington where Ecology had wholesale converted a non-point source load of this magnitude into a point source load for a local government and implemented that requirement by expanding a MS4 Permit boundary.

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[5] TMDL, p. 28

[6] Including the commercial forest area runoff results in a 900% increase in runoff and corresponding phosphorus load that the County is responsible for.

[7] The Phase II Permit for Western Washington and Appendix 1-9 are incorporated by reference. http://www.ecy.wa.gov/programs/wq/stormwater/municipal/phaseIIww/wwphiipermit.html

The County previously raised its concerns with the expanded Permit boundary in its comments to the draft TMDL and in the County Executive's letter to Director Maia Bellon dated August 8, 2013. While the County was hopeful that Ecology would reconsider its position, the final TMDL continues to place the non-point source burden on the County with a stated intention of implementing that requirement by expanding the MS4 Permit Boundary. Rather than repeat the legal arguments contained in our August 8th letter, the letter is attached and its contents incorporated by reference. For all of the reasons set forth in that letter and as set forth above, the County's Permit boundary must not be expanded beyond the Phase II boundary set forth in the Phase II MS4 Permit for Western Washington. In return, the County will agree to require the developed areas outside of Whatcom County's Phase II MS4 Permit boundary to comply with the Minimum Technical Requirements set forth in Appendix 1 of the Phase II MS4 Permit, which provides an equivalent level of control.

(C) Reducing Phosphorus by 87% or Assuming that 87% of Developed Area Can Function as a Forest is Arbitrary and Erroneous.

As previously stated in the County's prior comments, the County has significant concerns that retrofitting 87% of existing development is an unattainable goal for the community. Assuming that phosphorus can be reduced by 87% is an equally flawed assumption. The County has not been able to identify any feasible or practicable way to infiltrate or store the huge volumes of water required to match runoff associated with forested conditions. Much of the watershed has soil and slope conditions that limit infiltration rates. In the areas where the County has tried small-scale infiltration, it has received complaints from adjacent property owners related to foundation cracking and basement water damage.

While the TMDL references practices such as storage, the reality is that storage without treatment will not remove phosphorus. Ecology has stated that water may need to be stored for months, but has provided no feasible method by which to store and treat that volume of water. Moreover, the County is unaware of any practical stormwater treatment technology that can reliably reduce phosphorus to the levels of natural forested conditions. Finally, retrofitting on a watershed scale is economically infeasible and will impose a severe economic hardship that Whatcom County and the private citizens within the regulated area simply cannot afford. The discussion of cost implications is largely academic, however, since no amount of money will allow the County to achieve an unattainable goal.

(D) Requiring a Reduction of 50% or More of Fecal Coliform in Areas that Have No Development is Arbitrary and Erroneous.

The TMDL reductions are based on the "statistical rollback" approach. Because fecal coliform concentrations are highly variable, application of the rollback approach results in target geometric mean values that, in many cases, are far below the state standard of 50 cfu/100 mL. The TMDL requires substantial fecal coliform reductions in forested basins, such as the Smith

and Olsen Creek basins, where wildlife is likely to be the primary source. Recent source tracking studies have shown that wildlife can also be significant sources of fecal coliform loads in more developed basins. It is unreasonable to require the County to reduce fecal coliform bacteria loads from wildlife.

The geometric mean targets are far lower than the median fecal coliform concentrations in stormwater treatment BMP effluent contained in the International Stormwater BMP Database (Geosyntec and Wright Water Engineers 2012). Moreover, stormwater treatment measures would not affect bacteria loads from wildlife located in or directly adjacent to creeks. Under these circumstances, the fecal coliform targets are arbitrary and erroneous.

(E) The Assumptions in the TMDL are Arbitrary and Erroneous.

The County previously expressed concerns with both the assumptions and projections associated with the continuous flow modeling that forms the basis of the draft TMDL Load Allocations (LAs) and Wasteload Allocations (WLAs) and implementation plan. The watershed (HSPF) and Lake response (CE-QUAL-W2) models used to derive the WLs and LAs were based on limited data. Review of the CE-QUAL-W2 model concluded that the model cannot discern the very small changes in dissolved oxygen that form the basis for the WLAs and LAs because the model is very sensitive to parameters like wind shear coefficient. The HSPF model was calibrated based on very limited storm event data. It has not been recalibrated based on the extensive storm event monitoring conducted by the County and City since 2007, nor has it been updated to explicitly incorporate soil and slope data. There is considerable uncertainty associated with phosphorus loads from the watershed as well as the Lake's response to these loads. The failure to rely upon accurate and reasonable assumptions in developing the TMDL is arbitrary and erroneous.

(F) The TMDL and Implementation Plan Must Include Meaningful 10-Year Reviews. Ecology's "Concurrence" in County Plans and Budgets Should Not Be Unreasonably Withheld.

The TMDL acknowledges that it is based on little data and contemplates additional data and information gathering, yet provides little assurance that the data or the information will result in different load and waste load allocations and corresponding adjustments in implementation actions. The failure to include meaningful 10-year review periods is arbitrary and erroneous. As discussed above, the TMDL suffers from not only little data, but also a number of assumptions that appear to be incorrect.

To account for this, the County requests that the TMDL be revised to include clear, 10-year review periods that will require LAs and WLAs to be adjusted (up or down) with corresponding adjustments in the implementation actions. Each 10-year period should also allow for a Use Attainability Analysis or a Site Specific Criteria to be considered if data or information collected supports that approach. An alternate approach is to employ a phased TMDL.

The TMDL requires the County to prepare budgets and timelines for Ecology's concurrence; however, the term "concurrence" is undefined. To address this issue, the County requests that the TMDL include language that Ecology will not unreasonably withhold its concurrence on County submittals that are prepared consistent with the TMDL's requirements and consistent with usual and customary County planning and budgeting assumptions and practices.

2. Prior Communications on Issues

The foregoing issues were raised by Whatcom County either in formal comment letters, written communications, or verbally in conversations between County staff and Ecology. The final TMDL and response to comments largely failed to address these issues.

3. Applicable Authority

The applicable legal authority referenced above is incorporated into this section by reference. Additionally, the Department of Ecology is required to respond to all comments submitted on the draft TMDL. Pursuant to 40 CFR Section 130.7(c)(ii) and the Memorandum of Agreement between the Department of Ecology and EPA, Ecology must ensure that the TMDL submittals to EPA include responsiveness Summaries to public comments as described in 40 CFR Section 25.8. Under 40 CFR Section 25.8, the response to comments must include "the agency's specific responses in terms of modifications to the proposed action or an explanation for rejection of proposals made by the public." Ecology failed to comply with these requirements by essentially ignoring comments and information presented by Whatcom County in its comments.

Ecology's obligation to respond to public comments is heightened by the lack of transparency in the TMDL as to the source and basis for the LAs and WLAs. For example, Ecology has not provided any realistic method whereby the County can achieve the requirement to have 87% of the developed area function like a forest (i.e., rollback 87% of the developed area). The non-point source reasonable assurance analysis is virtually absent. How is it "equitable" to assign the County responsibility for cleaning up both non-point and point-source contributions to Lake Whatcom and to do so by expanding the County's MS4 Permit boundary?

4. Copies of Related Correspondence

All issues raised in this request for dispute resolution that were included in written comment letters previously submitted by Whatcom County on the draft TMDL are in the possession of Ecology. Additionally, attached to this letter are copies of EPA guidance documents, select comment letters and related communications regarding the TMDL.

5. Relief Requested

Whatcom County requests that the TMDL be modified to address the concerns referenced above.

6. Request for Oral Presentation

Whatcom County requests an opportunity to present its case for dispute resolution, in person, before the dispute resolution panel as provided in WQP 1-25. Whatcom County reserves its right to be represented at the oral presentation by employees of the County, its consultants, and attorneys. Thank you for consideration of the foregoing request for dispute resolution.

Sincerely,

Jack Louws
County Executive

cc: Steve Hood, Washington State Department of Ecology (w/ enclosures – via email)
Kelly Susewind, Washington State Department of Ecology (w/ enclosures – via email)
Kirk Christensen, Whatcom County (w/ enclosures – via email)
Gary Stoyka, Whatcom County (w/ enclosures – via email)

Enclosures:
(1) EPA November 26, 2014 Memorandum
(2) EPA November 12, 2010 Memorandum
(3) Whatcom County letter to Steve Hood dated June 3, 2008
(4) Whatcom County letter to Steve Hood dated September 17, 2008
(5) Whatcom County letter to Steve Hood dated May 28, 2013
(6) Whatcom County letter to Maia Bellon, Ecology Director, dated August 8, 2013
(7) Ecology letter to Whatcom County Executive Jack Louws, dated September 3, 2013
(8) Whatcom County letter to Kelly Susewind dated November 14, 2013

WHATCOM COUNTY
PUBLIC WORKS DEPARTMENT

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June 3, 2008

Steve Hood
Washington State Department of Ecology
1440-10th Street, Suite 102
Bellingham, WA 98225

Dear Steve:

Re: Response to Lake Whatcom Water Quality Study Findings

Thank you for providing Whatcom County the opportunity to review and comment on the preliminary draft "Lake Whatcom Watershed Total Phosphorus and Bacteria TMDL: Water Quality Study Findings" report dated April 21, 2008.

Protecting the beneficial uses of Lake Whatcom is a top priority for Whatcom County. The County has already devoted substantial effort toward protecting the lake in the following areas:

- Education programs to reduce phosphorus and bacteria pollution.
- Installation of stormwater treatment facilities.
- Adoption of the Lake Whatcom Comprehensive Stormwater Management Plan.
- Participation in land acquisition to reduce future development.
- Strict development regulations in the watershed.
- Inter-jurisdictional cooperation.

Ecology's preliminary draft report is based on an extensive array of studies by Ecology, WWU, and others. The County appreciates Ecology's time and concerted effort to develop a detailed understanding of Lake Whatcom and its watershed and to provide a scientifically valid basis for TMDL development and implementation. It is in the County's best interest to have a sound technical basis for the TMDL, since TMDL compliance could potentially entail controversial land use regulations and costly capital improvements.

Given the very limited time frame provided for review of the preliminary report, the County was not able to thoroughly evaluate the models and other supporting materials on which the report is based. Therefore, our comments should be regarded as preliminary and subject to amendment based on more detailed review of the water quality report and its supporting documents and models.

Lake Whatcom TMDL Response
June 3, 2008

General Comments

Ecology's preliminary draft report indicates that the Lake Whatcom Watershed TMDL will prescribe large reductions in phosphorus and fecal coliform loads. The phosphorus load reduction estimates are based on a lake response model (CE-QUAL-W2) developed by Portland State University and a watershed loading model (HSPF) developed by CDM and the Cadmus Group. The HSPF model is based on an existing HFAM model developed by Hydrologic Services for the City of Bellingham.

The models appear to be well done and mainly limited by the complexity of the natural systems they are intended to simulate and the data and resources available to the modelers. Despite the substantial modeling efforts to date, there are still several areas of uncertainty that may affect TMDL establishment and/or implementation. Areas of uncertainty include:

- Ability of the CE-QUAL-W2 model to accurately simulate years outside the calibration period.
- Ability of the HSPF model to simulate nutrient loads during runoff events.
- Ability of the HSPF model to estimate phosphorus loads from specific land uses and simulate transport pathways.
- Ability of the HSPF model to support TMDL implementation planning.

Achieving the large phosphorus load reductions prescribed in Ecology's draft report will require costly retrofits and potentially controversial changes in development and land use regulations. Thus, effective TMDL implementation must garner strong public support and substantial funding. To gain this support, we will need to demonstrate to our citizens and elected officials that the TMDL allocations are necessary, appropriate, defensible, and that proposed control measures will actually work. Additional evaluations may help reduce the uncertainties summarized above and aid in TMDL development and implementation. Additional model evaluations should include:

- Run the CE-QUAL-W2 model for at least one more year.
- Run the "Bathtub" model to provide an independent "reality check" on the CE-QUAL-W2 model.
- Extend the HSPF model through 2007 to allow comparison with recent tributary monitoring data.
- Evaluate the HSPF-simulated phosphorus loads and pathways for each land use cover and sub-basin in light of available soil and slope data as well as the 2007 tributary monitoring data.

The preliminary draft report indicates that the TMDL will require major reductions in fecal coliform loads for a number of tributaries to the lake. The reductions are based on the "statistical rollback" approach which Ecology has used to develop a number of other fecal coliform TMDLs. Application of this approach to the Lake Whatcom watershed results in target geometric mean values that in many cases are far below the state standard of 50 cfu/100 mL. Reaching these very low targets will be very challenging, especially in areas with large wildlife populations. Microbial source tracking (MST) could help determine the key sources of fecal

pollution in the Lake Whatcom watershed and help focus control efforts where they will be most effective.

Specific Comments

As noted above, the following comments should be regarded as preliminary since we have not been provided adequate time to thoroughly review all of the materials on which the draft report is based.

1. Page 13. The report should clarify that the HSPF model was used to simulate phosphorus loads only. Other inputs to the lake were estimated using regression equations developed by Ecology.

2. Page 14. The report discusses filtering through the soil as a potential strategy for reducing phosphorus loads. Ecology's 2005 groundwater study found relatively high phosphorus concentrations in groundwater entering the lake. Preliminary review of the HSPF model indicates that the model assumes interflow concentrations as high as 70 ug/L. Do these high groundwater values indicate that infiltration may not be appropriate in some areas?

3. Page 19. The report states that "It is known that the increased nutrient loading to the Lake is primarily associated with runoff from human development in the Lake Whatcom watershed." Is this based on the HSPF model?

4. Page 20. The draft report suggests using "developed acres" as a surrogate measure for phosphorus loading. We are unsure that expressing load reductions in terms of "developed acres" is a good way to communicate the magnitude of the reductions. Phosphorus load per acre of developed area could vary considerably from place to place within the watershed depending on the nature of the development, development regulations in place at the time of construction, stormwater treatment retrofits, proximity to streams or stormwater conveyances, soils, and other factors. Therefore, it might be more appropriate to express the load reductions in terms of mass per unit time rather than "developed acres." Please provide a clear definition of the measure "developed acres."

5. Page 24. The report states that phosphorus loads entering the lake have increased in recent years and that the increases closely correlate with development and human activities. Is this based on the WWU studies? If so, it would be helpful to include the citation(s) here.

6. Page 24. The report mentions that lake bottom sediments could play an important role in the phosphorus cycle. Were lake sediment samples collected and analyzed for this water quality study? If so, were the results used in the lake response model? If not, what uncertainty does this impart in the estimates of the TMDL settings?

7. Page 27. The report mentions that if a stream exceeds the fecal coliform standards due to natural sources, there is no allowance for human sources to "measurably

increase" the bacterial pollution. Fecal coliform concentrations are often highly variable, so it can be hard to tell whether apparent differences are real.

8. Page 33. The report notes that the Hydrolab dissolved oxygen measurements were highly variable and often failed to meet targets. Was the Hydrolab data used to calibrate the CE-QUAL-W2 model?

9. Page 35. The report notes that the CE-QUAL-W2 model is very dependent on initial conditions because the two-year model calibration period is much shorter than the estimated water residence time in the lake (15 years or more). The dependence on two years (2002 and 2003) of data for calibration of the model and the subsequent computation of the TMDL for phosphorus is problematic. It is true that the model application is well-calibrated to the datasets for 2002 and 2003, but it is often the case that examination of data from additional years identifies important hydrodynamic or water quality conditions that were not encountered in the calibration years. Although the entire lake is modeled and two years are available on which to test the load reduction scenarios, only results from two model segments (61 and 62) and a five-month period are used in the DO-deficit analysis. Thus the analysis is based on an even smaller set of model results than evident at first glance. For these reasons, and because the datasets required to simulate one more year appear to be available, another year ought to be included in the analysis.

   As an illustration of the degree to which the model application is tuned to the two years, consider the wind sheltering coefficient used to calibrate vertical temperature profiles (Figure 1). This dimensionless number multiplies the observed wind speed to increase or decrease its value and consequently increase or decrease wind mixing and surface heat exchange. In the Lake Whatcom application, the coefficient is varied by both segment and date. Values as high as 3.3 and as low as 0.80 are used, meaning 330% or 80% of the observed wind speed is used and various locations and times.

   In the calibration, the coefficients are varied to accommodate the dates of the observed temperature profiles. Thus a value of 180% was used in segment 61 in the period immediately prior to the observation on 6/10/2003, and a value of 120% was used in the period immediately prior to the observation on 7/15/2003. This approach is common and generally accepted for model calibration, but it does limit the model to the years for which it was calibrated. When extending the model to other years, a set of new wind sheltering coefficients would be required based on observed temperature profiles.

   Since the wind sheltering coefficients were calibrated to specific years, simply applying these coefficients to another year would introduce epistemic uncertainty (i.e., uncertainty due to inaccurate or incomplete information). This uncertainty could be reduced by having a third calibration year, preferably a wet year, as 2002 was dry and 2003 was average.

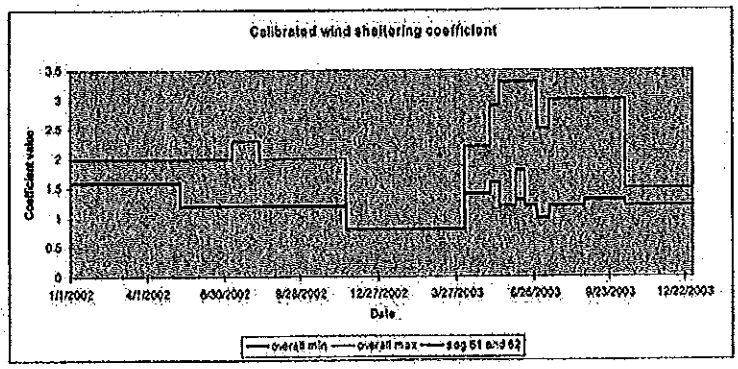

Figure 1 Wind sheltering coefficient for the two calibration years

A second example of calibrating to a specific year is the modeled water balance (accounting of inflows and outflows). To reproduce the observed water surface elevation, it is common practice to introduce an inflow or outflow that is not measured, but instead is inferred from the change in lake storage (which is known from the water surface elevation observations) and the inflows and outflows (which are known from measurements or estimated with a watershed model). The value of this makeup flow is shown for the two simulation years in Figure 2. Most of the values are within the range of the known tributary flows, but some are significantly greater.

This approach is correct in that it makes use of all known datasets and forces the model to reproduce the observed water surface elevation. However, not only does it make the model less predictive, it introduces potentially large phosphorus sources and sink which accompany the makeup flows. For Lake Whatcom, the makeup flow is assumed to be coming from groundwater in Branch 1 when the value is positive and returning to groundwater when negative.

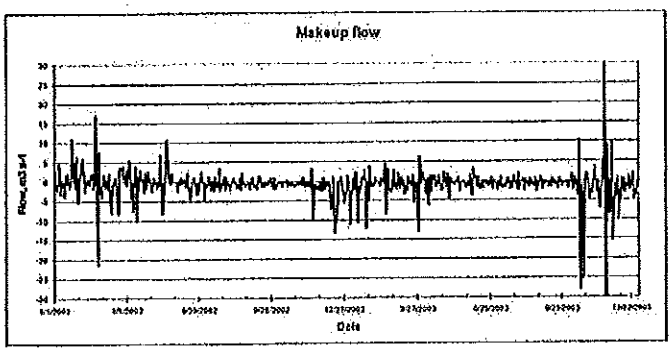

Figure 2 Additional inflow/outflow required to close the water balance

The following two approaches can be taken to examine the implications of the year-specific calibration. First, and at a minimum, the impacts of varying the wind sheltering coefficients and the makeup flows should be examined through sensitivity simulations. These simulations should proceed completely through the TMDL calculation ("load reductions") inasmuch as this is the endpoint of interest. It may be that the differential method of calculating the dissolved oxygen (DO) concentrations (i.e., subtracting the baseline results from the results of a reduction scenario) operates to cancel wind speed effects, but it is worthwhile investigating for the small increment in resources required.

Secondly, and as noted above, another year of data should be assembled and the model exercised for this additional year using the existing calibration parameters. For this simulation, the computed and observed data should be compared and the TMDL calculation reproduced.

10. Page 36. The report describes how Ecology used a regression model to estimate tributary inputs for parameters other than phosphorus. How well did the regression equations account the observed variability in the parameters of interest?

11. Page 38. The report describes how the HSPF model was developed to simulate tributary inflows and phosphorus concentrations which were then inputted to the CE-QUAL-W2 model. The report notes that the model estimates pollutant loading based on build-up and wash-off rates as well as loss of pollutant with infiltration or instream processes. Model parameters specified by the user indicate the rate of accumulation and maximum storage of total phosphorous in the surface while interflow and groundwater transport of phosphorous are controlled by user-specified concentrations. Model parameters are specified for each pervious land surface used in the model.

    Simulation of total phosphorous using accumulation/wash-off allows for calibration of the HSPF model to observed total phosphorous. However, the model parameters resulting from the calibration may not accurately simulate the phosphorous pathways to streams/conveyances. Since the model does not simulate sediment or deposition of organic matter, the simulated wash off/accumulation-based loads may have been increased in order to match observed total phosphorous measurements. Additional evaluation is likely to improve understanding of the key phosphorus forms and transport pathways in the watershed which in turn will aid in the identification of control measures.

12. Page 38. The report notes that the model simulates phosphorus losses due to infiltration or instream processes. Based on our preliminary review of the HSPF model, it does not appear to simulate losses due to infiltration or instream processes. Rather, the model appears to simulate phosphorous transport via interflow and groundwater pathways to account for phosphorous concentrations in streams during periods with no surface runoff. If interflow and groundwater are currently important phosphorus transport pathways, it may be more difficult to capture and treat stormwater from developed areas. Moreover, if the model simulations are accurate, construction of new infiltration facilities might delay but not prevent phosphorus transport to the

streams and the lake. As noted in the preceding comment, additional evaluation of phosphorus transport pathways may prove useful with regard to identification of appropriate control measures.

13. Page 38. The report notes that the HSPF model was calibrated to tributary flow and water quality data at six tributaries. The results were then extrapolated to the other 16 sub-basins in the watershed based on comparison of land use covers, soils, and other factors. An independent review of the HSPF model by Tetra Tech (Butcher 2008) noted that the model setup does not directly make use of soil and slope data, but assigns parameters during calibration of individual watersheds. The Tetra Tech review noted that "Potential problems could arise in translation from gaged and ungaged watersheds (where the parameters presumably represent a weighted average across the contained soils and slopes) to ungaged watersheds." The Tetra Tech review suggested that subdividing land use categories by overlying land use with soil hydrologic group and slope range may have been preferable. Additional evaluation of the relationships between phosphorus loads, land uses, soils, and slopes, combined with a more detailed comparison of the sub-basins, is necessary to improve understanding of the uncertainties associated with the extrapolation of HSPF parameters from gaged to ungaged sub-basins in the watershed.

14. Page 41. Table 5 in the report lists the estimate groundwater phosphorus concentrations and flow rates that were used in the CE-QUAL W-2 model. The groundwater phosphorus concentrations (0.138 to 0.175 mg/L) are higher than maximum interflow and groundwater concentrations used in the HSPF model, and several times higher than the typical concentrations observed in the tributaries during baseflow conditions. Moreover, phosphorus in interflow or groundwater discharges to the tributaries would presumably be in soluble forms; however, soluble phosphorus concentrations in the tributaries have generally been low. Additional evaluation of the potential for phosphorus transport in the subsurface is necessary for selection of control measures.

15. Page 42. The report notes that the CE-QUAL-W2 model was updated in 2007 to allow simulation of interactions between the lake bottom sediments and the water column. It is important that the report be expanded to include a discussion of relative contribution of external loads which are subject to reduction, and internal loads which cannot be reduced should be quantified. Tools are available in CE-QUAL-W2 to provide these values, namely, examining the flux output (the rate at which nutrients move from one compartment to another) and examining the function of the code using the debugger.

16. Page 43. The report refers to obtaining initial conditions by running 2003 multiple times, saving the output from the end of this looping simulation, and using this output as the initial conditions for the Base, Full Buildout, and Full Rollback scenarios. The rationale and experiments made to support this approach are detailed on Page 43. This method is meant to reconcile the long residence time of Lake Whatcom with the limitations of having just two years of data with which to work.

In model applications to other lakes, the looping approach is used to initialize flow and temperature fields, both of which are strongly driven by boundary conditions. However, use of this method for the complex nutrient cycles that are the crux of the problem for Lake Whatcom shows the difficulty of the long residence time/two year dataset conundrum. The difficulty shows up when the nitrogen values become limiting and an arbitrary value ("greater than 0.5% of the nutrient limitations") is required to stop the looping process. This outcome perhaps points to some fundamental inconsistency between the model, the modeling approach, and the datasets available. Extending the model to another year and examining the nutrient fluxes in detail may clarify the appearance of nitrogen limitation in the looping simulations.

Although the Lake Whatcom CE-QUAL-W2 model application is certainly comprehensive and well-executed, it would be worth running a second model to further examine the behavior of the Lake Whatcom system. Using a second, simpler model to check and verify a more complex model is commonly done as a quality assurance procedure. In this case, the United States Army Corps of Engineers (USACE) steady state eutrophication model, BATHTUB, can be run with minimal additional effort as all the inputs are readily available in electronic format. Multiple upstream reaches with different loading characteristics can be used as inflows to the lake and internal and atmospheric loads are considered. BATHTUB output includes predicted nutrient concentrations and overall water and nutrient balances, algae as chlorophyll, Secchi depth, and hypolimnetic oxygen depletion.

17. Page 44. The report states that "Measures to reduce phosphorus in surface tributaries may or may not affect groundwater phosphorus loading." As discussed in preceding comments, the HSPF model appears to assume that interflow and groundwater in the sub-basins can contain relatively high concentrations of phosphorus. The CE-QUAL-W2 model assumes that groundwater carries high phosphorus concentrations (up to 0.175 mg/L) and loads (~1,876 lbs for the 2003 simulation) to the lake. Additional evaluation of phosphorus transport in the subsurface will be very helpful in the selection of control measures.

18. Page 48. Table 9, "Percentages per Subbasin by Land Use Category–Full Rollback Scenario" list significant percentages of developed land uses. Page 44 of the report indicates that the Full Rollback scenario assumes that all land uses are "Mixed Forest."

19. Page 53. The report indicates that Ecology plans to express TMDL allocations for phosphorus in terms of "developed acres" and assumes that "mixed forests" represent phosphorus loadings under natural conditions. This implies that the relationships between land use and phosphorus loads are well understood in this watershed. As noted in preceding comments, the HSPF model is calibrated at the sub-basin level, and many of the sub-basins contain multiple land use covers and a wide range of soils and slopes. Additional evaluations will help improve understanding of relationships between land uses and phosphorus loadings.

20. Page 53. The report summarizes the phosphorus loadings simulated by the HSPF model. The Tetra Tech review noted that the model could be underestimating peak flows. The HSPF modelers had little storm event water quality data available for calibration. Storm event samples collected by the County during 2007 generally had higher phosphorus concentrations than the samples used for model calibration. Thus, the HSPF model could be underestimating phosphorus loads during runoff events. Extension of the model through 2007 would allow a comparison of simulated to observed storm event data. If the simulated and observed flows and loads match fairly well, confidence in the model will be improved. If the comparison shows large differences, the model should be recalibrated using the 2007 storm event data and rigorous storm flow effort continued for future model validation.

21. Page 53. The report states that the Full Rollback scenario assumes that "mixed forest" covers nearly all of the watershed. As noted in preceding comments, the Tetra Tech review of the HSPF model suggested that major differences in phosphorous simulations between sub-basins may be due to differences in precipitation and soils and do not provide a strong foundation for attributing loads to individual land uses. This suggests that there may be considerable uncertainty associated with the application of the "mixed forest" loads to areas with different soils and other conditions.

22. Page 53. The report states, "This technical assessment determines the relationship between phosphorus loading and human development in the watershed." As discussed in the preceding comments, there is still uncertainty regarding land use/loading relationships which should be noted in the report.

23. The HSPF model simulates unit phosphorous loads (e.g. lbs/acre) from pervious "developed" land that are higher than unit phosphorous loads from impervious "developed" land. Pervious developed land has the highest unit phosphorous loading of any land use cover in the Base scenario model.

24. Page 53. The report indicates that in 2003 the Base scenario was used. Figure 3-8 in the HSPF model report (CDM 2007) shows that the simulated phosphorus loadings from 2000-2005 varied considerably (~4,000 lbs/yr to ~9,500 lbs/year). Running the CE-QUAL-W2 model for another year, as recommended above, is likely to improve understanding of how variations in flows and phosphorus concentrations affect DO in the lake.

25. Page 54. The report cites an example phosphorus reduction strategy involving infiltration. As noted in preceding comments, the HSPF and CE-QUAL-W2 models appear to assume that subsurface phosphorus transport could be significant in the Lake Whatcom watershed. Additional evaluation of phosphorus transport pathways in the watershed would be very helpful with regard to selection of appropriate control measures.

26. Page 54. Table 10 indicates that wasteload allocations would be "Based on point of stormwater discharge." This is somewhat unclear. Additional explanation or an example would be helpful.

27. Page 56. Table 11 lists the results of the HSPF modeling for "developed acres" and "forest & wetland acres" for each scenario. Several land uses are lumped in the "developed" category. The HSPF model report (CDM 2007) indicates that the model assumes that unit phosphorous loads (e.g. lbs/acre) from pervious "developed" areas are higher than unit phosphorous loads from impervious "developed" areas. In fact, the model assumes that pervious developed land has a higher unit phosphorous loading than agricultural land. It seems reasonable to assume that developed pervious areas, such as lawns and other landscaped areas, would have higher phosphorus accumulation rates than developed impervious areas. However, pervious areas would be expected to generate much less runoff and more interflow or groundwater flow than impervious areas. Phosphorus in interflow or groundwater would be subject to a variety of attenuation mechanisms, such as adsorption and chemical precipitation, which would reduce the amount reaching the sub-basin outlet. Additional evaluation of the accumulation/wash-off rates and transport pathways would be helpful.

28. Page 59. The report recommends several types of monitoring to aid in TMDL implementation. We agree that additional monitoring of the lake and tributaries is needed. As part of our current monitoring program, we have installed water quality sondes in a number of tributaries to monitor turbidity on a near-continuous basis. The results thus far suggest that it may be possible to use the continuous turbidity data to estimate total suspended solids and total phosphorus concentrations in at least some of the tributaries. This type of information could help discern trends or changes in tributary water quality during TMDL implementation. In addition, the results should be used to refine the HSPF model. Datasondes could also be used to provide frequent measurements of DO (and other parameters of interest) at key locations in the lake. We would expect to engage in the planning and implementation of additional monitoring activities related to the TMDLs.

29. Page 62. The "Listing Status" column in Table 12 indicates that most of the tributaries are on the draft 2008 303(d) list. Three streams are noted as failing to meet standards. Does Ecology plan to add these three streams to the 303(d) list?

30. Page 62. Table 12 lists the proposed target reductions for 11 tributaries to the Lake. The text indicates that reductions are based on the "statistical rollback" method. Application of this approach to the Lake Whatcom watershed results in target geometric mean values that in many cases are far below the state standard of 50 cfu/100 mL. The table shows that the 2002-2003 fecal coliform concentrations will need to be reduced between 26% and 95%.

    Traditional stormwater treatment measures (e.g., ponds, filters, swales) have limited capability to remove bacteria. Stormwater treatment measures would not affect bacteria loads from waterfowl and other wildlife living in riparian areas. Consequently,

source control is likely to be more appropriate than treatment in many instances. Microbial source tracking (MST) could help identify the most important sources in the watershed and help ensure that source control measures are properly focused.

31. Page 63. The report states that all dischargers covered by NPDES permits will be required to meet the bacteria targets at the mouth of each tributary and that the municipal stormwater dischargers will have Wasteload Allocations based on the stormwater discharge point. This is not entirely clear since municipal stormwater dischargers are covered by NPDES permits. Please clarify.

32. Page 64. The report recommends long-term monitoring of the tributaries to assess whether TMDL implementation has been effective at reducing bacteria levels and meeting standards. Fecal coliform concentrations in streams and stormwater tend be highly variable. This variability can mask changes in bacteria levels due to implementation of control measures. Collecting enough samples to discern changes or trends in fecal coliform concentrations may not be feasible, therefore, it may be more appropriate to monitor implementation of control measures. MST could also be helpful in assessing the effectiveness of control measures.

Summary of Preliminary Recommendations

Based on our preliminary review, we have identified six additional evaluations that will help address the questions or reduce the uncertainties described above. We are pleased to work with you to help implement these recommendations:

- Extend the CE-QUAL-W2 model to another year using the existing calibration parameters, compare the computed and observed data, and recalculate the TMDL allocations. This would help DOE, local governments, and the public understand the model's predictive capability.
- Run the "Bathtub" model to provide an independent "reality check" on the CE-QUAL-W2 model.
- Examine the CE-QUAL-W2 nutrient fluxes in more detail to help distinguish internal from external phosphorus loads and clarify the appearance of nitrogen limitation in the model looping simulations.
- Extend the HSPF model through 2007 to allow comparison of simulated to observed phosphorus concentrations and loads. If this comparison shows substantial differences, the model could be recalibrated using the 2007 data.
- Evaluate the HSPF-simulated phosphorus loads and pathways for each land use cover and sub-basin in light of available soil and slope data as well as the 2007 tributary monitoring data.
- Conduct a Microbial Source Tracking study to help identify sources of fecal coliform pollutions and provide a basis for development of control measures.

Conclusion

Protection of Lake Whatcom is critically important to Whatcom County. We are committed to doing our part to control pollution and preserve the beneficial uses of the lake. At the same, time we need to ensure that our control efforts are practical and cost effective. We intend to work closely with Ecology, the City of Bellingham, and other key stakeholders to protect Lake Whatcom.

We would appreciate a written response to our comments. If you would like to discuss our comments and suggestions, please contact me to arrange a meeting or conference call.

Sincerely,

K N. Christensen

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September 17, 2008

Steve Hood
Washington State Department of Ecology
1440-10th Street, Suite 102
Bellingham, WA 98225

Dear Steve:

Re: Lake Whatcom TMDL Draft Study Comments

Thank you for providing Whatcom County the opportunity to review and comment on the draft report, "Lake Whatcom Watershed Total Phosphorus and Bacteria TMDL: Water Quality Study Findings", dated August 15, 2008. The report is a revised version of a preliminary draft report dated April 21, 2008, to which Whatcom County and the City of Bellingham submitted written comments. The County comments on the preliminary draft report were contained in a letter to Ecology on June 3, 2008.

In reviewing the August 15 draft report, we noted that only some of our comments were taken into consideration. Our comments that were not fully addressed in that report are restated in this letter.

Protecting the beneficial uses of Lake Whatcom is a top priority for Whatcom County. The County has already devoted substantial effort and resources toward protecting the lake in the following areas:

- Education programs to reduce phosphorus and bacteria pollution.
- Installation of stormwater treatment facilities.
- Adoption of the Lake Whatcom Comprehensive Stormwater Management Plan.
- Participation in land acquisition to reduce future development.
- Strict development regulations in the watershed.
- Inter-jurisdictional cooperation.

Ecology's preliminary draft report is based on an extensive array of studies by Ecology, WWU, and others. The County appreciates Ecology's time and concerted effort to develop a detailed understanding of Lake Whatcom and its watershed and to provide a scientifically valid basis for TMDL development and implementation. It is in the County's best interest to have a sound technical basis for the TMDL as compliance could potentially entail controversial land use regulations and costly capital improvements.

Given the limited time frame available for review of the draft report, the County was not able to thoroughly evaluate the model changes made since the April 21 report was issued. Therefore, our comments should be regarded as preliminary and subject to amendment based on more detailed review.

General Comments

Ecology's August 2008 draft report indicates that the Lake Whatcom Watershed TMDL will prescribe large reductions in phosphorus and fecal coliform loads. The phosphorus load reduction estimates are based on a lake response model (CE-QUAL-W2) developed by Portland State University and a watershed loading model (HSPF) developed by CDM and the Cadmus Group. The HSPF model is based on an existing HFAM model developed by Hydrologic Services for the City of Bellingham.

The models appear to be well done and mainly limited by the complexity of the natural systems they are intended to simulate and the data and resources available to the modelers. Despite substantial modeling efforts to date, there are still several areas of uncertainty that may affect TMDL establishment and/or implementation. Areas of uncertainty include:

- Ability of the CE-QUAL-W2 model to accurately simulate years outside the calibration period.
- Ability of the HSPF model to simulate nutrient loads during runoff events.
- Ability of the HSPF model to estimate phosphorus loads from specific land uses and simulate transport pathways.
- Ability of the HSPF model to support TMDL implementation planning.

Ecology's recent modifications to the CE-QUAL-W2 model underscore the model's sensitivity and the uncertainty associated with the results. In response to comments on the April 21 draft, Ecology modified the lake water balance method to use a 7-day running average to "smooth" inflows. This small change in the model resulted in a 17% increase in the estimated groundwater load and a 12% reduction in the estimated phosphorus loading capacity of the lake.

Achieving the large phosphorus load reductions prescribed in Ecology's draft report will require costly retrofits and potentially controversial changes in development and land use regulations. Thus, effective TMDL implementation must garner strong public support and substantial funding. To gain this support, we will need to demonstrate to our citizens and elected officials that the TMDL allocations are necessary, appropriate, defensible, and that proposed control measures will actually work. Additional evaluations may help reduce the uncertainties summarized above and aid in TMDL development and implementation. Additional model evaluations should include:

- Run the CE-QUAL-W2 model for at least one more year.
- Run the USU lake response model (Stevens et al. 2007) to provide an independent "reality check" on the CE-QUAL-W2 model.
- Perform sensitivity analyses on the CE-QUAL-W2 to improve understanding of model uncertainty.
- Extend the HSPF model through 2007 to allow comparison with recent tributary monitoring data.
- Evaluate the HSPF-simulated phosphorus loads and pathways for each land use cover and sub-basin in light of available soil and slope data as well as the 2007 tributary monitoring data.

The August 2008 draft report indicates that the TMDL will require major reductions in fecal coliform loads for a number of tributaries to the lake. The reductions are based on the "statistical rollback" approach which Ecology has used to develop a number of other fecal coliform TMDLs. Application of this approach to the Lake Whatcom watershed results in target geometric mean values that in many cases are far below the state standard of 50 cfu/100 mL. Reaching these very low targets will be very challenging, especially in areas with large wildlife populations. Microbial source tracking (MST) could help determine the key sources of fecal pollution in the Lake Whatcom watershed and help focus control efforts where they will be most effective.

Specific Comments

As noted above, the following comments should be regarded as preliminary since we have not been provided adequate time to thoroughly review all of the materials on which the draft report is based.

1. Executive Summary, Page 13. The report states that phosphorus limits could be met with 85.5% fewer acres of development. The April 2008 version indicated a 74% reduction would be needed. According to Ecology's August 21 letter to Pete Kremen, this resulted from a change in the way the CE-QUAL-W2 model forces the simulated lake elevation to match the observed lake elevation. This change in the water balance method caused the model to increase the estimated phosphorus load from groundwater by about 17% or about 330 kg/yr.

   The increase from 74% to 85.5% is roughly equivalent to the phosphorus load from 400 acres of developed land. Retrofitting 400 acres of already developed land would be expensive, particularly in areas where soils are not conducive to infiltration. Thus, a relatively small change in the model produced a significant change in the TMDL allocation. This underscores the need for additional model analyses to provide a sound basis for management of the Lake Whatcom watershed.

2. Executive Summary, Page 13. The draft report states, "It will be up to local government leaders to develop strategies and pass laws that improve stormwater management so stormwater is absorbed, filtered, and released into the lake more naturally, as if the development is not there." The TMDL would require application of these strategies to areas that have already been developed. The report should note that (1) these management strategies may not be feasible in developed areas where soils have been compacted or covered by impermeable surfaces (especially areas with naturally low-permeability soils), and (2) new stormwater management regulations would apply primarily to new development or redevelopment.

3. Executive Summary, Page 15. The report notes that "unacceptable data have been removed from the analysis and questionable data qualified." Appendix B states, "Overall, Hydrolab® DO measurements often failed to meet targets. Paired readings had overall precision above 0.5 mg/L and the difference between pairs sometimes exceeded 1.0 mg/L." We understand that these Hydrolab DO measurements were used to calibrate the CE-QUAL-W2 model. Considering that the DO criterion driving this TMDL is 0.2 mg/L (maximum decrease from natural due to human influence), the reported variability seems high. Please describe how the observed variability in Hydrolab DO measurements was taken into account for this study. Also, please consider performing a sensitivity analysis to evaluate the effects of the Hydrolab DO variability on the CE-QUAL-W2 model results and TMDL allocations.

4. Executive Summary, Page 16. The report states, "One strategy used to filter 1.6 inches of precipitation through soil reduced phosphorus by 90%." The report should clarify that this text and Figure ES-2 refer to a modeling study from Massachusetts, not the Lake Whatcom study area. The report should note that Ecology has not yet assessed the feasibility or potential effectiveness of infiltration as a phosphorus removal strategy in the Lake Whatcom watershed.

5. Executive Summary, Page 16. The report discusses filtering through the soil as a potential strategy for reducing phosphorus loads. Ecology's 2005 groundwater study found relatively high phosphorus concentrations in groundwater entering the lake. Preliminary review of the HSPF model indicates that the model assumes interflow concentrations as high as 70 ug/L. The report should mention these high groundwater values and their implications with respect to infiltration as a phosphorus reduction measure in the Lake Whatcom watershed.

6. Executive Summary, Page 23. The draft report suggests using "developed acres" as a surrogate measure for phosphorus loading. We are unsure that expressing load reductions in terms of "developed acres" is a good way to communicate the magnitude of the reductions. Phosphorus load per acre of developed area could vary considerably from place to place within the watershed depending on the nature of the development, development regulations in place at the time of construction, stormwater treatment retrofits, proximity to streams or stormwater conveyances, soils, and other factors. For example, the data provided in Table ES-1 indicate that the phosphorus load per developed acre varied considerably from sub-basin to sub-basin (from -0.02 to 0.55 kg/acre/year). Therefore, it might be more appropriate to express the load reductions in terms of mass per unit time rather than "developed acres." Also, please provide a clear definition of "developed acres."

7. Why Are We Doing This TMDL Now, Page 50. The report mentions that lake bottom sediments could play an important role in the phosphorus cycle. However, the report also notes that lake sediment samples were not collected or analyzed for this water quality study. If so, were the results used in the lake response model? If not, what uncertainty does this impart in the estimates of the TMDL settings?

8. Bacteria, Page 31. The report mentions that if a stream exceeds the fecal coliform standards due to natural sources, there is no allowance for human sources to "measurably increase" the bacterial pollution. Fecal coliform concentrations are often highly variable, so it can be hard to tell whether apparent differences are real. Moreover, variability in fecal coliform concentrations can make it difficult to discern incremental changes due to bacteria control measures.

9. Goals and Objectives, Study Objectives, Page 36. The report states that it will be used to guide development of a summary implementation plan. Much of the watershed is in unincorporated Whatcom County, and the County has a strong interest in ensuring that the implementation strategy is practical and appropriate. Therefore, we would like to be involved in development of the summary implementation plan.

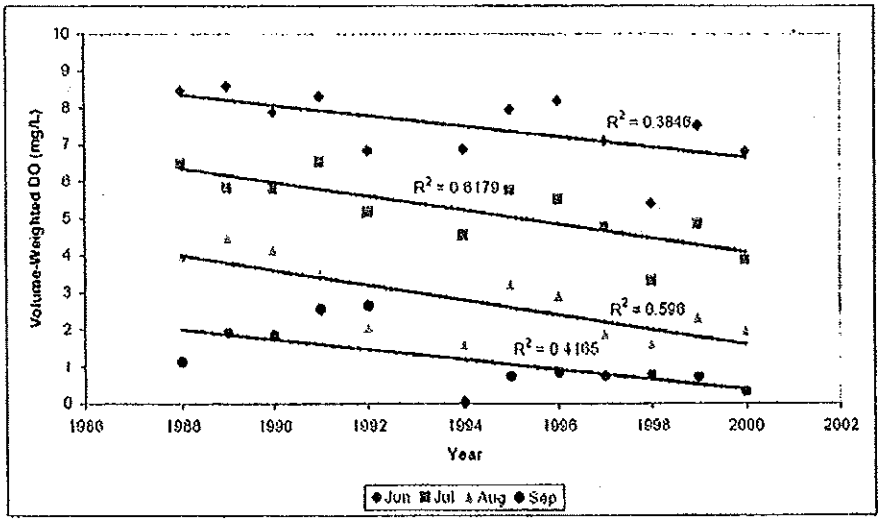
10. Study Quality Assurance Evaluation, Page 39. The report notes that the Hydrolab DO measurements were highly variable and often failed to meet targets. According to p. 4 of Appendix B, "Paired readings had overall precision above 0.5 mg/L and the difference between pairs sometimes exceeded 1.0 mg/L." The report states, "The dissolved oxygen data are considered acceptable for use as qualified data, for which the high observed variability must be taken into account." Please explain how the DO variability was taken into account in this TMDL study and discuss the implications of the DO variability with respect to the CE-QUAL-W2 model results.

11. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Page 41. The report notes that the CE-QUAL-W2 model is very dependent on initial conditions because the two-year model calibration period is much shorter than the estimated water residence time in the lake (15 years or more). The report also suggests that each additional calibration year may marginally increase model effectiveness, but to significantly improve the model, many additional years would have to be calibrated.

    The dependence on two years (2002 and 2003) of data for calibration of the model and the subsequent computation of the TMDL for phosphorus is problematic. It is true that the model application is well-calibrated to the datasets for 2002 and 2003, but it is often the case that examination of data from additional years identifies important hydrodynamic or water quality conditions that were not encountered in the calibration years. Although the entire lake is modeled and two years are available on which to test the load reduction scenarios, only results

from two model segments (61 and 62) and a five-month period are used in the DO-deficit analysis. Thus the analysis is based on an even smaller set of model results than evident at first glance. For these reasons and because the datasets required to simulate another year appear to be available, at least one more year ought to be included in the analysis.

12. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Page 41. The report states that there is not much to be gained running just one more year when a simulation of 15 years is called for. We believe, however, that in fact, running one more year would provide a great deal of information and confidence in the model results. Moreover, long-term simulations are at the core of the problem. Note the year-to-year variability in the observations in the following figure from Cusimano, et al. (2002):



The downward trends computed from the monthly observations were an important factor in identifying deterioration in water quality in Lake Whatcom. The CE-QUAL-W2 model should reproduce these trends and then show improvements under the corrective scenarios. The rate of recovery is an important issue for planning purpose and could also be addressed with long term model simulations.

13. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Page 43. The report states that sensitivity analysis could be a useful tool to better understand the models as well as the watershed and lake process contributing to lake DO dynamics. The report indicates that due to lack of resources, sensitivity analyses have not yet been conducted for the HSPF and CE-QUAL-W2 models.

We agree that sensitivity analyses should be conducted for both models to improve confidence in the results and provide a stronger foundation for decision-making by Ecology and local governments. Several comments in this letter describe the specific sensitivity analyses that should be conducted.

14. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Pages 50-51. The report suggests that the wind sheltering coefficients used in the model should be applicable to future applications of the model for other years. This could be examined by conducting two additional simulations: One simulation with all wind sheltering coefficients set to 0.8 (minimum value used in the model) and 3.3 (maximum value). The resulting profiles and hypolimnetic volumes should be nearly identical to those computed with the present simulations. These simulations

should proceed completely through the TMDL calculation ("load reductions") inasmuch as this is the endpoint of interest.

15. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Page 51. The report states that "calibration of the lake model showed that this program produced a water balance with wide swings between in- and outflows between time steps. To further reduce the impact of load fluxes produced by these flows, the water balance was smoothed with a seven-day running average."

    The water balance algorithm used for the April 2008 version of this report introduced an inflow or outflow that is not measured, but instead is inferred from the change in lake storage (known from water surface elevation observations) and the inflows and outflows (known from measurements or estimated with a watershed model). Figure 1 shows the makeup flows used in the April 2008 model. Most of the values are within the range of the known tributary flows, but some are significantly greater. For Lake Whatcom, the makeup flow was assumed to come from groundwater in Branch 1 when the value is positive, and returning to groundwater when negative.

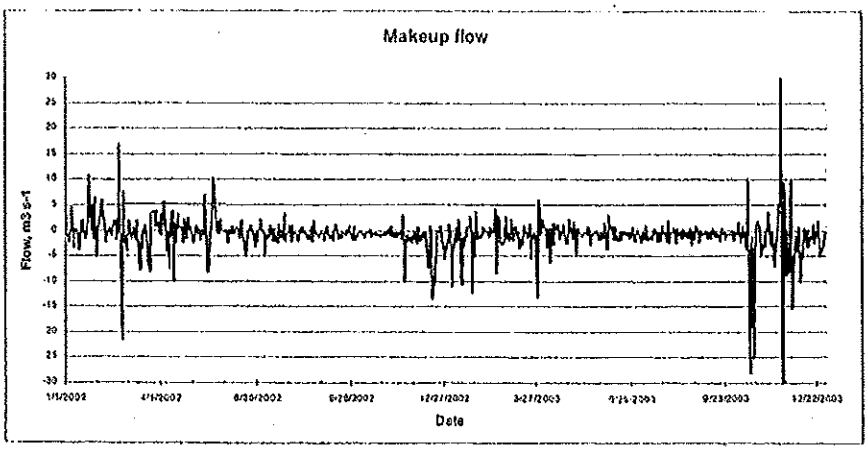


Figure 1 - Additional inflow/outflow required to close the water balance

The August 2008 version of the report describes how this water balance approach was modified by using a seven-day running average to "smooth" the estimated inflows assuming outflows are through Whatcom Creek. The change in the water balance procedure resulted in a substantial reduction of phosphorus load allocation. This suggests that the CE-QUAL-W2 model may be very sensitive to input parameters and underscores the need for sensitivity analyses.

16. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Page 42. The report describes how Ecology used a regression model to estimate tributary inputs for parameters other than phosphorus. Appendix G contains the raw output from the regression analyses. However, the report does not describe how well the regression equations account for the observed variability in the parameters of interest, nor does it discuss the uncertainty associated with using the regression equations to provide input to the CE-QUAL-W2 model. Moreover, the report doesn't discuss how the lack of water quality data from storm events might affect the regressions. Please revise the report to discuss these issues.

17. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Development of HSPF Watershed Model, Page 44. The report indicates that Base scenario used tributary loads simulated for 2003. Figure 3-8 in the HSPF model report (CDM 2007) shows that the simulated phosphorus loadings from 2000-2005 varied considerably (~4,000 lbs/yr to ~9,500 lbs/year). Running the CE-QUAL-W2 model for another year, as recommended above, is likely to improve understanding of how variations in flows and phosphorus concentrations affect DO in the lake.

18. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Development of HSPF Watershed Model, Pages 44-45. The report describes how the HSPF model was developed to simulate tributary inflows and phosphorus concentrations and which were then inputted to the CE-QUAL-W2 model. The report notes that the model estimates pollutant loading based on build-up and wash-off rates as well as loss of pollutant with infiltration or instream processes. Model parameters specified by the user indicate the rate of accumulation and maximum storage of total phosphorous in the surface while interflow and groundwater transport of phosphorous are controlled by user-specified concentrations. Model parameters are specified for each pervious land surface used in the model.

    Simulation of total phosphorous using accumulation/wash-off allows for calibration of the HSPF model to observed total phosphorous. However, the model parameters resulting from the calibration may not accurately simulate the phosphorous pathways to streams/conveyances. Because the model does not simulate sediment or deposition of organic matter, the simulated wash off/accumulation-based loads may have been increased in order to match observed total phosphorous measurements. Additional evaluation is likely to improve understanding of the key phosphorus forms and transport pathways in the watershed which in turn will aid in the identification of control measures.

19. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Development of HSPF Watershed Model, Page 45. The report notes that the model simulates phosphorus losses due to infiltration or instream processes. Based on our preliminary review, the HSPF model appears to simulate phosphorous transport via interflow and groundwater pathways to account for phosphorous concentrations in streams during periods with no surface runoff. If interflow and groundwater are important phosphorus transport pathways, it may be more difficult to capture and treat stormwater from developed areas. Moreover, if the model simulations are accurate, construction of new infiltration facilities might delay but not prevent phosphorus transport to the streams and the lake. As noted in the preceding comment, additional evaluation of phosphorus transport pathways may prove useful with regard to identification of appropriate control measures.

20. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Development of HSPF Watershed Model, Page 45. The report notes that the HSPF model was calibrated to tributary flow and water quality data at six tributaries. The results were then extrapolated to the other 16 sub-basins in the watershed based on comparison of land use covers, soils, and other factors. An independent review of the HSPF model by Tetra Tech (Butcher 2008) noted that the model setup does not directly make use of soil and slope data, but assigns parameters during calibration of individual watersheds. The Tetra Tech review noted, "Potential problems could arise in translation from gaged and ungaged watersheds (where the parameters presumably represent a weighted average across the contained soils and slopes) to ungaged watersheds." The Tetra Tech review suggested that subdividing land use categories by overlying land use with soil hydrologic group and slope range may have been preferable. Additional evaluation of the relationships between phosphorus loads, land uses, soils, and slopes, combined with a more detailed comparison of the sub-basins, is necessary to improve understanding of the uncertainties associated with the extrapolation of HSPF parameters from gaged to ungaged sub-basins in the watershed.

21. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Development of CE-QUAL-W2 Lake Model, Page 48. Table 5 in the report lists estimated groundwater phosphorus concentrations and flow rates that were used in the CE-QUAL W-2 model. The groundwater phosphorus concentrations (0.138 to 0.175 mg/L) are higher than maximum interflow and groundwater concentrations used in the HSPF model, and several times higher than the typical concentrations observed in the tributaries during baseflow conditions. Moreover, phosphorus in interflow or groundwater discharges to the tributaries would presumably be in soluble forms; however, soluble phosphorus concentrations in the tributaries have generally been low. The report suggests several possible reasons for the apparent discrepancies (e.g., phosphorus attenuation in "well-aerated" stream sediments, phosphorus uptake by plants and algae in the stream). However, these attenuation mechanisms appear unlikely to account for the large observed differences. Additional evaluation of the potential for phosphorus transport in the subsurface is necessary for selection of control measures.

22. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Development of CE-QUAL-W2 Lake Model, Page 49. The report notes that the CE-QUAL-W2 model was updated in 2007 to allow simulation of interactions between lake bottom sediments and the water column. It is important that the report be expanded to include a discussion of relative contribution of external loads which are subject to reduction, and internal loads which cannot be reduced should be quantified. Tools are available in CE-QUAL-W2 to provide these values, namely, examining the flux output (the rate at which nutrients move from one compartment to another) and examining the function of the code using the debugger. Please amend Table 5.5 and the accompanying text to include external as well as internal phosphorus loads.

23. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Development of CE-QUAL-W2 Lake Model, Pages 51-52. The report refers to obtaining initial conditions by running 2003 multiple times, saving the output from the end of this looping simulation, and using this output as the initial conditions for the Base, Full Buildout, and Full Rollback scenarios. This method is meant to reconcile the long residence time of Lake Whatcom with the limitations of having just two years of data with which to work.

    In model applications to other lakes, the looping approach is used to initialize flow and temperature fields, both of which are strongly driven by boundary conditions. However, use of this method for the complex nutrient cycles that are the crux of the problem for Lake Whatcom shows the difficulty of the long residence time/two year dataset conundrum. The difficulty shows up when the nitrogen values become limiting, and an arbitrary value ("greater than 0.5% of the nutrient limitations") is required to stop the looping process. This outcome perhaps points to some fundamental inconsistency between the model, the modeling approach, and the datasets available. The report (page 52) notes that the two years of calibration (2002 and 2003) represent a dry and an average year, hence wet years with larger nitrogen loading are not represented. Extending the model to another year and examining the nutrient fluxes in detail may clarify the appearance of nitrogen limitation in the looping simulations.

    Although the Lake Whatcom CE-QUAL-W2 model application is certainly comprehensive and well-executed, it would be worthwhile to run a second model to further examine the behavior of the Lake Whatcom system. Using a second, simpler model to check and verify a more complex model is commonly done as a quality assurance procedure. In this case, the lake response model developed for Lake Whatcom by Utah State University (Stevens et al. 2007) could be used to provide an independent check of the CE-QUAL-W2 results. Multiple upstream reaches with different loading characteristics can be used as inflows to the lake, and internal and atmospheric loads are considered.

24. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Natural and Future Conditions Scenarios, Page 52. The report states that the Full Rollback scenario assumes that "mixed forest" covers nearly all of the watershed. As noted in preceding comments, the Tetra Tech review of the HSPF model suggested that major differences in phosphorous simulations between sub-basins may be due to differences in precipitation and soils and do not provide a strong foundation for attributing loads to individual land uses. This suggests that there may be considerable uncertainty associated with the application of the "mixed forest" loads to areas with different soils and other conditions.

25. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Natural and Future Conditions Scenarios, Page 53. The report states that "Measures to reduce phosphorus in surface tributaries may or may not affect groundwater phosphorus loading." As discussed in preceding comments, the HSPF model appears to assume that interflow and groundwater in the sub-basins can contain relatively high concentrations of phosphorus. The CE-QUAL-W2 model assumes that groundwater carries high phosphorus concentrations (up to 0.175 mg/L) and loads (~2,200 kg/yr for the 2003 simulation) to the lake. Additional evaluation of phosphorus transport in the subsurface will be very helpful in the selection of control measures.

26. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Loading Capacity Page 63. The report indicates that Ecology plans to express TMDL allocations for phosphorus in terms of "developed acres" and assumes that "mixed forests" represent phosphorus loadings under natural conditions. This implies that the relationships between land use and phosphorus loads are well understood in this watershed. As noted in preceding comments, the HSPF model is calibrated at the sub-basin level, and many of the sub-basins contain multiple land use covers and a wide range of soils and slopes. The data contained in Table 11 indicate that phosphorus loads per developed acre varied considerably (from -0.02 to 0.55 kg per developed acre per year) among sub-basins. Additional evaluations are needed to help improve understanding of relationships between land uses and phosphorus loadings.

27. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Loading Capacity, Pages 63-67. The report summarizes the phosphorus loadings simulated by the HSPF model. Tetra Tech's review noted that the model could be underestimating peak flows. The HSPF modelers had little storm event water quality data available for calibration. Storm event samples collected by the County during 2007 generally had higher phosphorus concentrations than the samples used for model calibration. Thus, the HSPF model could be underestimating phosphorus loads during runoff events. Extension of the model through 2007 would allow a comparison of simulated to observed storm event data. If the simulated and observed flows and loads match fairly well, confidence in the model will be improved. If the comparison shows large differences, the model should be recalibrated using the 2007 storm event data with rigorous storm flow effort continued for future model validation.

28. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Loading Capacity, Page 63. The report states, "This technical assessment evaluated the relationship between phosphorus loading and human development in the watershed." As discussed in the preceding comments, there is still uncertainty regarding land use/loading relationships which should be noted in the report.

29. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Loading Capacity, Pages 63-67. The HSPF model simulates unit phosphorous loads (e.g. kg/acre) from pervious "developed" land that are higher than unit phosphorous loads from impervious "developed" land. Pervious developed land has the highest unit phosphorous loading of any land use cover in the Base scenario model. The report should discuss this issue and its implications for phosphorus management in the watershed.

30. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Loading Capacity, Page 64. The report discusses the land use assumptions associated with the Partial Rollback scenario and states, "In some areas, greater reductions in mass of phosphorus for each unit of land converted are achieved and in other areas less is achieved. But similarly a mass of phosphorus entering the lake may affect the dissolved oxygen differently based on where it enters the lake." These statements highlight the difficulties associated with using "developed acres" as a surrogate for phosphorus loading capacity and a means to estimate load reductions. If (as these statements suggest) phosphorus loads associated with developed areas and the impacts of these loads on the lake vary from place to place, the impacts of a given "developed acre" would vary as well. The phosphorus load reduction associated with retrofitting a "developed acre" in one location may be quite different from another location in the watershed. Moreover, due to site constraints, it may not be feasible to achieve 100% control of phosphorus by retrofitting a developed area.

31. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Loading Capacity, Page 64. The report states that "it is anticipated that restoring natural hydrology through storage and infiltration will be used as a source control measure to prevent phosphorus from entering stormwater." The report should note that this strategy may not be feasible in all areas due to site constraints (e.g. low permeability soils). Alternative strategies may be needed in these areas.

32. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Loading Capacity, Page 64. The report cites an example of phosphorus reduction strategy involving infiltration. As noted in preceding comments, the HSPF and CE-QUAL-W2 models appear to assume that subsurface phosphorus transport could be significant in the Lake Whatcom watershed. Additional evaluation of phosphorus transport pathways in the watershed would be very helpful with regard to selection of appropriate control measures.

33. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Loading Capacity, Page 64. The report discusses infiltration as a phosphorus source control strategy and suggests that, "If this type of pollution strategy were in place for a road or roof, only 10% of the actual acres would count as developed acres that generate phosphorus loading at 2002-03 levels." This statement is not clear. Figure 39 suggests that roofs and road surfaces contribute much less than 90% of the phosphorus load from developed areas.

    The HSPF model indicates that pervious developed land has the highest unit phosphorous loading of any land use cover in the Base scenario. Please explain how pervious developed areas would be addressed by the example strategy.

34. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Process for Determining Load and Wasteload Allocations, Page 67. Table 11 lists the results of the HSPF modeling for "developed acres" and "forest and wetland acres" for each scenario. Several land uses are lumped in the "developed" category. The HSPF model report (CDM 2007) indicates that the model assumes that unit phosphorous loads (e.g. lbs/acre) from pervious "developed" areas are higher than unit phosphorous loads from impervious "developed" areas. In fact, the model assumes that pervious developed land has a higher unit phosphorous loading than agricultural land. It seems reasonable to assume that developed pervious areas, such as lawns and other landscaped areas, would have higher phosphorus accumulation rates than developed impervious areas. However, pervious areas would be expected to generate much less runoff and more interflow or groundwater flow than impervious areas. Phosphorus in interflow or groundwater would be subject to a variety of attenuation mechanisms, such as adsorption and chemical precipitation, which would reduce the amount reaching the sub-basin outlet.

Additional evaluation of the accumulation/wash-off rates and transport pathways would be helpful.

35. TMDL Analyses, Dissolved Oxygen and Total Phosphorus, Monitoring, Page 70. The report recommends several types of monitoring to aid in TMDL implementation. We agree that additional monitoring of the lake and tributaries is needed. As part of our current monitoring program, we have installed water quality sondes in a number of tributaries to monitor turbidity on a near-continuous basis. The results thus far suggest that it may be possible to use the continuous turbidity data to estimate total suspended solids and total phosphorus concentrations in at least some of the tributaries. This type of information could help discern trends or changes in tributary water quality during TMDL implementation. In addition, the results should be used to refine the HSPF model. Datasondes could also be used to provide frequent measurements of DO (and other parameters of interest) at key locations in the lake. Future DO monitoring in the lake should use optical sensors and include more rigorous QA/QC to reduce uncertainty. We would expect to engage in the planning and implementation of additional monitoring activities related to the TMDLs.

36. TMDL Analyses, Bacteria, Pages 73-74. Table 12b lists the proposed target reductions for 11 tributaries to the Lake. The text on page 73 indicates that reductions are based on the "statistical rollback" method. Application of this approach to the Lake Whatcom watershed results in target geometric mean values that in many cases are far below the state standard of 50 cfu/100 mL. Table 12b shows that the 2002-2003 fecal coliform concentrations will need to be reduced as much as 96%.

    Traditional stormwater treatment measures (e.g., ponds, filters, swales) have limited capability to remove bacteria. Stormwater treatment measures would not affect bacteria loads from waterfowl and other wildlife living in riparian areas. Consequently, source control is likely to be more appropriate than treatment in many instances. Microbial source tracking (MST) could help identify the most important sources in the watershed and help ensure that source control measures are properly focused.

37. TMDL Analyses, Bacteria, Page 73. The report notes that the target geometric means are more stringent than the water quality criteria and states, "This is consistent with fecal coliform bacteria reductions resulting from source control." Please explain why the low geometric means are related to source control.

38. TMDL Analyses, Bacteria, Page 77. The report recommends long-term monitoring of the tributaries to assess whether TMDL implementation has been effective at reducing bacteria levels and meeting standards. Fecal coliform concentrations in streams and stormwater tend be highly variable. This variability can mask changes in bacteria levels due to implementation of control measures. Collecting enough samples to discern changes or trends in fecal coliform concentrations may not be feasible; therefore, it may be more appropriate to monitor implementation of control measures. MST could also be helpful in assessing the effectiveness of control measures.

39. Recommendations, Dissolved Oxygen and Phosphorus, Page 79. The report recommends the phosphorus allocations listed in Tables 10 and 11. We recommend conducting the additional HSPF and CE-QUAL-W2 evaluations listed in the "Summary of Recommendations" section of this letter and using the results to refine the phosphorus load allocations before submittal to EPA.

40. Recommendations, Dissolved Oxygen and Phosphorus, Page 79. The report recommends refining the HSPF model if some basins are not responding to implementation as predicted by

the current model. We recommend that the watershed loading model be refined sooner so that it can be used to support development of the TMDL implementation plan.

41. Recommendations, Bacteria, Page 80. Microbial Source Tracking should be done to help identify key bacteria sources and support development of appropriate control measures.

Summary of Preliminary Recommendations

Based on our review, we have identified seven additional evaluations that will help address the questions or reduce the uncertainties described above. We are pleased to work with you to help implement these recommendations:

- Extend the CE-QUAL-W2 model by another year using the existing calibration parameters, comparing the computed and observed data, and recalculating the TMDL allocations. This would help Ecology, local governments, and the public understand the model's predictive capability.
- Perform sensitivity analyses on the CE-QUAL-W2 model to evaluate the sensitivity of the model to changes in input parameters.
- Run the lake response model developed by USU (Stevens et al. 2007) to provide an independent "reality check" on the CE-QUAL-W2 model.
- Examine the CE-QUAL-W2 nutrient fluxes in more detail to help distinguish internal from external phosphorus loads and clarify the appearance of nitrogen limitation in the model looping simulations.
- Extend the HSPF model through 2007 to allow comparison of simulated to observed phosphorus concentrations and loads. If this comparison shows substantial differences, the model could be recalibrated using the 2007 data.
- Evaluate the HSPF-simulated phosphorus loads and pathways for each land use cover and sub-basin in light of available soil and slope data as well as the 2007 tributary monitoring data.
- Conduct a Microbial Source Tracking study to help identify sources of fecal coliform pollutions and provide a basis for development of control measures.

Conclusion

Protection of Lake Whatcom is critically important to Whatcom County. We are committed to doing our part to control pollution and preserve the beneficial uses of the lake. At the same time, we need to ensure that our control efforts are practical and cost effective. We intend to work closely with Ecology, the City of Bellingham, and other key stakeholders to protect Lake Whatcom.

We would appreciate a written response to our comments. If you would like to discuss these comments and suggestions, please contact me to arrange a meeting or conference call.

Sincerely,

Kirk N. Christensen, P.E.
Stormwater Manager
Whatcom County Public Works

cc: Bill Reilly, Stormwater Manager, City of Bellingham

References

Stevens, D.K., B. Neilson, and J. S. Horsburgh. 2007. WRIA-1 Wide Coarse Loading and Stream Response Modeling, and Lake Whatcom Watershed and Lake Response Modeling, Report Accompanying Beta Model Project Report, Task 6 Surface Water Quality Modeling. Utah Water Research Laboratory, Utah State University, Logan, Utah 84322-8200. 31 December.

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711 for Washington Relay Service • Persons with a speech disability c

September 3, 2013

County Executive Jack Louws
311 Grand Ave, Suite 106
Bellingham, WA 98225-4082

RE: Lake Whatcom Public Comment Draft Phosphorus and Bacteria TMDL (TMDL) Volume 2 – February 13, 2013

Dear Executive Louws:

Thank you for your August 8, 2013, letter questioning the Washington State Department of Ecology's (Ecology) recommendation to expand permit coverage proposed in the TMDL. Director Bellon asked me to respond to you on her behalf.

In your letter, you provided some corrected citations to federal laws and regulations that will help us provide a more accurate response to comments in our Final TMDL. Thank you for catching those errors. The meeting with your staff on the afternoon of August 8, 2013, was productive; it will help us respond more thoroughly to all of the comments submitted by Whatcom County as part of the TMDL process.

The Lake Whatcom TMDL identified the developed area outside of what is currently regulated by Whatcom County under the Western Washington Municipal Stormwater Permit (MS4 permit) as a significant source of pollution which must be reduced to meet the TMDL. This area needs to achieve reductions equivalent to the areas regulated under your MS4 permit. The TMDL identified the runoff from that area as a proposed wasteload allocation. Ecology hasn't made a commitment as to when or whether expanded permit coverage would be required. As long as Whatcom County can demonstrate that the area is being addressed with equivalent control to the area regulated by your MS4 permit, Ecology can continue to defer requiring expansion of your coverage area.

Your letter estimates that the recommendation would result in a 900% increase in area covered by Whatcom County under the MS4 permit. That estimate reflects a misunderstanding. The TMDL proposes that the 60% of the watershed area zoned Commercial Forest remain outside of your MS4 permit. The TMDL recommendation will require a more than 300% increase in the area covered by your permit. Even though 80% of the area proposed for inclusion is still forested, and by default in compliance with the permit and with the TMDL, we recognize it does

double the area of existing development you will need to address, and the areas requiring inspection of BMPs will increase over time as more of the area is developed.

The recommendation to expand the coverage area was originally developed for inclusion in the draft 2012-2013 MS4 permit[1]. That draft permit contained the recommendation to cover the entire watershed. Whatcom County commented[2] that the expansion would correctly be addressed after the TMDL was approved by EPA. Whatcom County also made the comment that you lack land use authority over the commercial forest. The TMDL recommendation was revised to remove the commercial forest land.

One basis for the recommendation was that Whatcom County had more stringent development regulations for areas addressed by the MS4 permit than for the rest of the Lake Whatcom watershed. That rationale was addressed by your recent adoption of watershed-wide development regulation. It also reflected a desire to have a single annual report addressing progress implementing a stormwater management program covering the entire watershed, and progress toward meeting TMDL goals. If the area outside of the watershed is not covered by a permit as you note in item #3, you cannot be obligated to report by the permit; however, we will have a need to demonstrate that the developed area outside the permit is receiving equivalent protection to continue to defer coverage.

Your specific concerns about our authority to expand your permit coverage area are addressed below.

1. **Ecology's cited authority does not support its approach.**

As you noted, the corrected reference to section 402(p)(2) of the Clean Water Act and 40CFR122.26(9)(i) are exceptions that allow issuing permits for discharges composed entirely of previously unregulated stormwater. As the area proposed by the TMDL for regulation is not currently regulated, and meets the exceptions listed under 402(p)(2)(E) and 40CFR122.26(9)(i)(C), we feel we have the authority to require permit coverage for the discharge. When or if that area is covered by a permit, your objection to including it in your current permit should be weighed against the administrative burden of having a second permit with essentially the same requirements as the existing permit.

2. **The Phase II Permit does not support Ecology's approach.**

You have correctly identified the current geographic area covered by your MS4 permit. To implement the proposed changes the existing permit would have to be modified, a new permit issued, or the changes could be incorporated into a future permit. Ecology did not receive any public comment recommending how we address the permit modification. We have the flexibility to work with Whatcom County on an approach that meets the TMDL goals most efficiently. We

[1] http://www.ecy.wa.gov/programs/wq/stormwater/municipal/2012draftMUNIpermits.html
[2] http://www.ecy.wa.gov/programs/wq/stormwater/municipal/MUNIdocs/2012comments/WWWhatcomCounty.pdf

will need to respond to petitions to cover the area, and we will need to confirm that pollution controls are equivalent to the controls in the permitted area to continue to defer expanding the coverage area.

3. **Ecology's approach is contradicted by its own guidance.**

You correctly recognize that your permit cannot obligate you to take actions outside of the area covered by your permit as part of a TMDL, but your letter incorrectly concludes that areas needing controls cannot be required to have permit coverage as a result of a TMDL. Ecology thinks that local government is in a much better position than Ecology to regulate stormwater from the residential areas around Lake Whatcom. If necessary you can be required to cover that area under an MS4 permit. The programs you have set up in response to the MS4 permit, and the investments you have made in support of the TMDL, are recognized by us as a sustainable path to achieving reductions in Lake Whatcom that will take decades of work.

I would like to close by thanking you for the hard work that has already been achieved by the Whatcom County Administration and Whatcom County Council. Ecology recognizes approval of Ordinance 2013-043 addressing the Lake Whatcom Overlay District as the culmination of more than a decade of difficult work on development regulations. We believe it sets a good foundation for beginning the work we have ahead of us to address phosphorus from existing development to support a healthy Lake Whatcom.

If you have any additional questions, please contact Doug Allen at (360) 715-5203 or doug.allen@ecy.wa.gov.

Sincerely,

Donald M Susewind

Kelly Susewind, P.E., P.G.
Water Quality Program Manager

cc: Bill Moore, Water Quality Program, Department of Ecology
Doug Allen, BFO Manager, Department of Ecology

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 26 2014

OFFICE OF WATER

MEMORANDUM

SUBJECT: Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs"

FROM: Andrew D. Sawyers, Director
Office of Wastewater Management

Benita Best-Wong, Director
Office of Wetlands, Oceans and Watersheds

TO: Water Division Directors
Regions 1 - 10

This memorandum updates aspects of EPA's November 22, 2002 memorandum from Robert H. Wayland, III, Director of the Office of Wetlands, Oceans and Watersheds, and James A. Hanlon, Director of the Office of Wastewater Management, on the subject of "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs" (hereafter "2002 memorandum"). Today's memorandum replaces the November 12, 2010, memorandum on the same subject; the Water Division Directors should no longer refer to that memorandum for guidance.

This memorandum is guidance. It is not a regulation and does not impose legally binding requirements on EPA or States. EPA and state regulatory authorities should continue to make permitting and TMDL decisions on a case-by-case basis considering the particular facts and circumstances and consistent with applicable statutes, regulations, and case law. The recommendations in this guidance may not be applicable to a particular situation. EPA may change or revoke this guidance at any time.

Background

Stormwater discharges are a significant contributor to water quality impairment in this country, and the challenges from these discharges are growing as more land is developed and more impervious surface is created. Stormwater discharges cause beach closures and contaminate shellfish and surface drinking water supplies. The increased volume and velocity of stormwater discharges causes streambank erosion, flooding, sewer overflows, and basement backups. The decreased natural infiltration of rainwater reduces groundwater recharge, depleting

our underground sources of drinking water.[1] There are stormwater management solutions, such as green infrastructure, that can protect our waterbodies from stormwater discharges and, at the same time, offer many other benefits to communities.

Section III of the 2002 memorandum recommended that for NPDES-regulated municipal and small construction stormwater discharges, effluent limits be expressed as best management practices (BMPs) or other similar requirements, rather than as numeric effluent limits. The 2002 memorandum went on to provide guidance on using "an iterative, adaptive management BMP approach" for improving stormwater management over time as permitting agencies, the regulated community, and other involved stakeholders gain more experience and knowledge. EPA continues to support use of an iterative approach, but with greater emphasis on clear, specific, and measurable permit requirements and, where feasible, numeric NPDES permit provisions, as discussed below.

Since 2002, States and EPA have obtained considerable experience in developing TMDLs and WLAs that address stormwater sources (see Box 1 in the attachment for specific examples). Monitoring of the impacts of stormwater discharges on water quality has become more sophisticated and widespread.[2] The experience gained during this time has provided better information on the effectiveness of stormwater controls to reduce pollutant loadings and address water quality impairments. In many parts of the country, permitting agencies have issued several rounds of stormwater permits. Notwithstanding these developments, stormwater discharges remain a significant cause of water quality impairment in many places, highlighting a continuing need for more meaningful WLAs and more clear, specific, and measurable NPDES permit provisions to help restore impaired waters to their beneficial uses.

With this additional experience in mind, on November 12, 2010, EPA issued a memorandum updating and revising elements of the 2002 memorandum to better reflect current practices and trends in permits and WLAs for stormwater discharges. On March 17, 2011, EPA sought public comment on the November 2010 memorandum and, earlier this year, completed a nationwide review of current practices used in MS4 permits[3] and industrial and construction stormwater discharge permits. As a result of comments received and informed by the reviews of EPA and state-issued stormwater permits, EPA is in this memorandum replacing the

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[1] See generally Urban Stormwater Management in the United States (National Research Council, 2009), particularly the discussion in Chapter 3, *Hydrologic, Geomorphic, and Biological Effects of Urbanization on Watersheds.*

[2] Stormwater discharge monitoring programs have expanded the types pollutants and other indices (e.g., biologic integrity) being evaluated. This information is being used to help target priority areas for cleanup and to assess the effectiveness of stormwater BMPs. There are a number of noteworthy monitoring programs that are ongoing, including for example those being carried out by Duluth, MN, Capitol Region Watershed District, MN, Honolulu, HI, Baltimore or Montgomery County, MD, Puget Sound, WA, Los Angeles County, CA, and the Alabama Dept. of Transportation, among many others. See also Section 4.2 (Monitoring/Modeling Requirements) of EPA's *Municipal Separate Storm Sewer System Permits: Post-Construction Performance Standards & Water Quality-Based Requirements – A Compendium of Permitting Approaches* (EPA, June 2014), or "MS4 Compendium" available at http://water.epa.gov/polwaste/npdes/stormwater/upload/sw_ms4_compendium.pdf, for other examples of note.

[3] See EPA's MS4 Permit Compendium, referenced in the above footnote.

November 2010 memorandum, updating aspects of the 2002 memorandum and providing additional information in the following areas:

- Including clear, specific, and measurable permit requirements and, where feasible, numeric effluent limitations in NPDES permits for stormwater discharges;
- Disaggregating stormwater sources in a WLA; and
- Designating additional stormwater sources to regulate and developing permit limits for such sources.

Including Clear, Specific, and Measurable Permit Requirements and, Where Feasible, Numeric Effluent Limitations in NPDES Permits for Stormwater Discharges

At the outset of both the Phase I and Phase II stormwater permit programs, EPA provided guidance on the type of water quality-based effluent limits (WQBELs) that were considered most appropriate for stormwater permits. See Interim Permitting Policy for Water Quality-Based Limitations in Storm Water Permits [61 FR 43761 (August 26, 1996) and 61 FR 57425 (November 6, 1996)] and the Phase II rulemaking preamble 64 FR 68753 (December 8, 1999). Under the approach discussed in these documents, EPA envisioned that in the first two to three rounds of permit issuance, stormwater permits typically would require implementation of increasingly more effective best management practices (BMPs). In subsequent stormwater permit terms, if the BMPs used during prior years were shown to be inadequate to meet the requirements of the Clean Water Act (CWA), including attainment of applicable water quality standards, the permit would need to contain more specific conditions or limitations.

There are many ways to include more effective WQBELs in permits. In the spring of 2014, EPA published the results of a nationwide review of current practices used in MS4 permits in *Municipal Separate Storm Sewer Systems Permits: Post-Construction Performance Standards & Water Quality-Based Requirements – A Compendium of Permitting Approaches* (June 2014). This MS4 Compendium demonstrates how NPDES authorities have been able to effectively establish permit requirements that are more specifically tied to a measurable water quality target, and includes examples of permit requirements expressed in both numeric and non-numeric form. These approaches, while appropriately permit-specific, each share the attribute of being expressed in a clear, specific, and measurable way. For example, EPA found a number of permits that employ numeric, retention-based performance standards for post-construction discharges, as well as instances where permits have effectively incorporated numeric effluent limits or other quantifiable measures to address water quality impairment (see the attachment to this memorandum).

EPA has also found examples where the applicable WLAs have been translated into BMPs, which are required to be implemented during the permit term to reflect reasonable further progress towards meeting the applicable water quality standard (WQS). Incorporating greater specificity and clarity echoes the approach first advanced by EPA in the 1996 Interim Permitting Policy, which anticipated that where necessary to address water quality concerns, permits would be modified in subsequent terms to include "more specific conditions or limitations [which] may include an integrated suite of BMPs, performance objectives, narrative standards, monitoring triggers, numeric WQBELs, action levels, etc."

EPA also recently completed a review of state-issued NPDES industrial and construction permits, which also revealed a number of examples where WQBELs are expressed using clear, specific, and measurable terms. Permits are exhibiting a number of different approaches, not unlike the types of provisions shown in the MS4 Compendium. For example, some permits are requiring as an effluent limitation compliance with a numeric or narrative WQS, while others require the implementation of specific BMPs that reduce the discharge of the pollutant of concern as necessary to meet applicable WQS or to implement a WLA and/or are requiring their permittees to conduct stormwater monitoring to ensure the effectiveness of those BMPs. EPA intends to publish a compendium of permitting approaches in state-issued industrial and construction stormwater permits in early 2015.

Permits for MS4 Discharges

The CWA provides that stormwater permits for MS4 discharges "shall require controls to reduce the discharge of pollutants to the maximum extent practicable ... and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants." CWA section 402(p)(3)(B)(iii). Under this provision, the NPDES permitting authority has the discretion to include requirements for reducing pollutants in stormwater discharges as necessary for compliance with water quality standards. *Defenders of Wildlife v. Browner*, 191 F.3d 1159, 1166 (9th Cir. 1999).

The 2002 memorandum stated "EPA expects that most WQBELs for NPDES-regulated municipal and small construction stormwater discharges will be in the form of BMPs, and that numeric limitations will be used only in rare instances." As demonstrated in the MS4 Compendium, NPDES permitting authorities are using various forms of clear, specific, and measurable requirements, and, where feasible, numeric effluent limitations in order to establish a more objective and accountable means for reducing pollutant discharges that contribute to water quality problems.[4] Where the NPDES authority determines that MS4 discharges have the reasonable potential to cause or contribute to a water quality standard excursion, EPA recommends that the NPDES permitting authority exercise its discretion to include clear, specific, and measurable permit requirements and, where feasible, numeric effluent limitations[5] as necessary to meet water quality standards.

NPDES authorities have significant flexibility in how they express WQBELs in MS4 permits (see examples in Box 1 of the attachment). WQBELs in MS4 permits can be expressed as system-wide requirements rather than as individual discharge location requirements such as

[4] The MS4 Compendium presents examples of different permitting approaches that EPA has found during a nationwide review of state MS4 permits. Examples of different WQBEL approaches in the MS4 Compendium include permits that have (1) a list of applicable TMDLs, WLAs, and the affected MS4s; (2) numeric limits and other quantifiable approaches for specific pollutants of concern; (3) requirements to implement specific stormwater controls or management measures to meet the applicable WLA; (4) permitting authority review and approval of TMDL plans; (5) specific impaired waters monitoring and modeling requirements; and (6) requirements for discharges to impaired waters prior to TMDL approval.

[5] For the purpose of this memorandum, and in the context of NPDES permits for stormwater discharges, "numeric" effluent limitations refer to limitations with a quantifiable or measurable parameter related to a pollutant (or pollutants). Numeric WQBELs may include other types of numeric limits in addition to end-of-pipe limits. Numeric WQBELs may include, among others, limits on pollutant discharges by specifying parameters such as on-site stormwater retention volume or percentage or amount of effective impervious cover, as well as the more traditional pollutant concentration limits and pollutant loads in the discharge.

effluent limitations on discharges from individual outfalls. Moreover, the inclusion of numeric limitations in an MS4 permit does not, by itself, mandate the type of controls that a permittee will use to meet the limitation.

EPA recommends that NPDES permitting authorities establish clear, specific, and measurable permit requirements to implement the minimum control measures in MS4 permits. With respect to requirements for post-construction stormwater management, consistent with guidance in the 1999 Phase II Rule, EPA recommends, where feasible and appropriate, numeric requirements that attempt to maintain pre-development runoff conditions (40 CFR § 122.34(b)(5)) be incorporated into MS4 permits. EPA's MS4 Compendium features examples from 17 states and the District of Columbia that have already implemented retention performance standards for newly developed and redeveloped sites. See Box 2 of the attachment for examples.

Permits for Industrial Stormwater Discharges

The CWA requires that permits for stormwater discharges associated with industrial activity comply with section 301 of the Act, including the requirement under section 301(b)(1)(C) to contain WQBELs to achieve water quality standards for any discharge that the permitting authority determines has the reasonable potential to cause or contribute to a water quality standard excursion. CWA section 402(p)(3)(A), 40 CFR § 122.44(d)(1)(iii). When the permitting authority determines, using the procedures specified at 40 CFR § 122.44(d)(1)(ii), that the discharge causes or has the reasonable potential to cause or contribute to an in-stream excursion of the water quality standards, the permit must contain WQBELs as stringent as necessary to meet any applicable water quality standard for that pollutant. EPA recommends that NPDES permitting authorities use the experience gained in developing WQBELs to design effective permit conditions to create objective and accountable means for controlling stormwater discharges. See box 3 in the attachment for examples.

Permits should contain clear, specific, and measurable elements associated with BMP implementation (*e.g.*, schedule for BMP installation, frequency of a practice, or level of BMP performance), as appropriate, and should be supported by documentation that implementation of selected BMPs will result in achievement of water quality standards. Permitting authorities should also consider including numeric benchmarks for BMPs and associated monitoring protocols for estimating BMP effectiveness in stormwater permits. Benchmarks can support an adaptive approach to meeting applicable water quality standards. While exceeding the benchmark is not generally a permit violation, exceeding the benchmark would typically require the permittee to take additional action, such as evaluating the effectiveness of the BMPs, implementing and/or modifying BMPs, or providing additional measures to protect water quality.[6] Permitting authorities should consider structuring the permit to clarify that failure to implement required corrective action, including a corrective action for exceeding a benchmark, is a permit violation. EPA notes that, as many stormwater discharges are authorized under a general

[6] For example, Part 6.2.1 of EPA's 2008 MSGP provides: "This permit stipulates pollutant benchmark concentrations that may be applicable to your discharge. The benchmark concentrations are not effluent limitations; a benchmark exceedance, therefore, is not a permit violation. Benchmark monitoring data are primarily for your use to determine the overall effectiveness of your control measures and to assist you in knowing when additional corrective action(s) may be necessary to comply with the effluent limitations ..."

permit, NPDES authorities may find it more appropriate where resources allow to issue individual permits that are better tailored to meeting water quality standards for large industrial stormwater discharges with more complex stormwater management features, such as multiple outfalls and multiple entities responsible for permit compliance.

All Permitted Stormwater Discharges

As stated in the 2002 memorandum, where a State or EPA has established a TMDL, NPDES permits must contain effluent limits and conditions consistent with the assumptions and requirements of the WLAs in the TMDL. See 40 CFR § 122.44(d)(1)(vii)(B). Where the TMDL includes WLAs for stormwater sources that provide numeric pollutant loads, the WLA should, where feasible, be translated into effective, measurable WQBELs that will achieve this objective. This could take the form of a numeric limit, or of a measurable, objective BMP-based limit that is projected to achieve the WLA. For MS4 discharges, CWA section 402(p)(3)(B)(iii) provides flexibility for NPDES authorities to set appropriate deadlines for meeting WQBELs consistent with the requirements for compliance schedules in NPDES permits set forth in 40 CFR § 122.47.

The permitting authority's decision as to how to express the WQBEL(s), either as numeric effluent limitations or as BMPs, with clear, specific, and measurable elements, should be based on an analysis of the specific facts and circumstances surrounding the permit, and/or the underlying WLA, including the nature of the stormwater discharge, available data, modeling results, and other relevant information. As discussed in the 2002 memorandum, the permit's administrative record needs to provide an adequate demonstration that, where a BMP-based approach to permit limitations is selected, the BMPs required by the permit will be sufficient to implement applicable WLAs. Permits should also include milestones or other mechanisms where needed to ensure that the progress of implementing BMPs can be tracked. Improved knowledge of BMP effectiveness gained since 2002[7] should be reflected in the demonstration and supporting rationale that implementation of the BMPs will attain water quality standards and be consistent with WLAs.

EPA's regulations at 40 CFR § 122.47 govern the use of compliance schedules in NPDES permits. Central among the requirements is that the effluent limitation(s) must be met "as soon as possible." 40 CFR § 122.47(a)(1). As previously discussed, by providing discretion to include "such other provisions" as deemed appropriate, CWA section 402(p)(3)(B)(iii) provides flexibility for NPDES authorities to set appropriate deadlines towards meeting WQBELs in MS4 permits consistent with the requirements for compliance schedules in NPDES permits set forth in 40 CFR § 122.47. See *Defenders of Wildlife v Browner*, 191 F.3d at 1166. EPA expects the permitting authority to document in the permit record the basis for determining that the compliance schedule is "appropriate" and consistent with the CWA and 40 CFR § 122.47. Where a TMDL has been established and there is an accompanying implementation plan that provides a schedule for an MS4 to implement the TMDL, or where a comprehensive, integrated plan addressing a municipal government's wastewater and stormwater obligations under the NPDES program has been developed, the permitting authority should consider such

[7] See compilation of current BMP databases and summary reports available at http://water.epa.gov/infrastructure/greeninfrastructure/gi_performance.cfm, which has compiled current BMP databases and summary reports.

schedules as it decides whether and how to establish enforceable interim requirements and interim dates in the permit.

EPA notes that many permitted stormwater discharges are covered by general permits. Permitting authorities should consider and build into general permits requirements to ensure that permittees take actions necessary to meet the WLAs in approved TMDLs and address impaired waters. A general permit can, for example, identify permittees subject to applicable TMDLs in an appendix, and prescribe the activities that are required to meet an applicable WLA.

Lastly, NPDES permits must specify monitoring requirements necessary to determine compliance with effluent limitations. See CWA section 402(a)(2); 40 CFR 122.44(i). The permit could specify actions that the permittee must take if the BMPs are not performing properly or meeting expected load reductions. When developing monitoring requirements, the NPDES authority should consider the variable nature of stormwater as well as the availability of reliable and applicable field data describing the treatment efficiencies of the BMPs required and supporting modeling analysis.

Disaggregating Stormwater Sources in a WLA

In the 2002 memorandum, EPA said it "may be reasonable to express allocations for NPDES-regulated stormwater discharges from multiple point sources as a single categorical wasteload allocation when data and information are insufficient to assign each source or outfall individual WLAs." EPA also said that, "[i]n cases where wasteload allocations are developed for categories of discharges, these categories should be defined as narrowly as available information allows." Furthermore, EPA said it "recognizes that the available data and information usually are not detailed enough to determine waste load allocations for NPDES-regulated stormwater discharges on an outfall-specific basis."

EPA still recognizes that "[d]ecisions about allocations of pollutant loads within a TMDL are driven by the quantity and quality of existing and readily available water quality data," but has noted the difficulty of establishing clear, specific, and measurable NPDES permit limitations for sources covered by WLAs that are expressed as single categorical or aggregated wasteload allocations. Today, TMDL writers may have more information—such as more ambient monitoring data, better spatial and temporal representation of stormwater sources, and/or more permit-generated data—than they did in 2002 to develop more disaggregated TMDL WLAs.

Accordingly, for all these reasons, EPA is again recommending that, "when information allows," WLAs for NPDES-regulated stormwater discharges be expressed "as different WLAs for different identifiable categories" (*e.g.*, separate WLAs for MS4 and industrial stormwater discharges). In addition, as EPA said in 2002, "[t]hese categories should be defined as narrowly as available information allows (*e.g.*, for municipalities, separate WLAs for each municipality and for industrial sources, separate WLAs for different types of industrial stormwater sources or dischargers)." EPA does not expect states to assign WLAs to individual MS4 outfalls; however, some states may choose to do so to support their implementation efforts. These recommendations are consistent with the decision in *Anacostia Riverkeeper, Inc. v. Jackson*, 2011 U.S. Dist. Lexis 80316 (July 25, 2011).

In general, states are encouraged to disaggregate the WLA when circumstances allow to facilitate implementation. TMDL writers may want to consult with permit writers and local authorities to collect additional information such as sewer locations, MS4 jurisdictional boundaries, land use and growth projections, and locations of stormwater controls and infrastructure, to facilitate disaggregation. TMDLs have used different approaches to disaggregate stormwater to facilitate MS4 permit development that is consistent with the assumptions and requirements of the WLA. For example, some TMDLs have used a geographic approach and developed individual WLAs by subwatershed[8] or MS4 boundary (*i.e.*, the WLA is subdivided by the relative estimated load contribution to the subwatershed or the area served by the MS4). TMDLs have also assigned percent reductions[9] of the loading based on the estimated wasteload contribution from each MS4 permit holder. Where appropriate, EPA encourages permit writers to identify specific shares of an applicable wasteload allocation for specific permittees during the permitting process, as permit writers may have more detailed information than TMDL writers to effectively identify reductions for specific sources.

Designating Additional Stormwater Sources to Regulate and Developing Permit Limits for Such Sources

The 2002 memorandum states that "stormwater discharges from sources that are not currently subject to NPDES regulation may be addressed by the load allocation component of a TMDL." Section 402(p)(2) of the Clean Water Act (CWA) requires industrial stormwater sources, certain municipal separate storm sewer systems, and other designated sources to be subject to NPDES permits. Section 402(p)(6) provides EPA with authority to identify additional stormwater discharges as needing a permit.

In addition to the stormwater discharges specifically identified as needing an NPDES permit, the CWA and the NPDES regulations allow for EPA and NPDES authorized States to designate additional stormwater discharges for regulation. See:
40 CFR §§122.26 (a)(9)(i)(C), (a)(9)(i)(D), (b)(4)(iii), (b)(7)(iii), (b)(15)(ii) and 122.32(a)(2). Accordingly, EPA encourages permitting authorities to consider designation of stormwater sources in situations where coverage under NPDES permits would, in the reasonable judgment of the permitting authority and, considering the facts and circumstances in the waterbody, provide the most appropriate mechanism for implementing the pollution controls needed within a watershed to attain and maintain applicable water quality standards.

If a TMDL had previously included a newly permitted source as part of a single aggregated or gross load allocation for all unregulated stormwater sources, or all unregulated sources in a specific category, the NPDES permit authority could identify an appropriate allocation share and include a corresponding limitation specific to the newly permitted stormwater source. EPA recommends that any additional analysis used to identify that share and develop the corresponding limit be included in the administrative record for the permit. The

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[8] Wissahickon Creek Siltation TMDL (Pennsylvania) www.epa.gov/reg3wapd/tmdl/pa_tmdl/wissahickon/index.htm.
[9] Liberty Bay Watershed Fecal Coliform Bacteria TMDL (Washington). https://fortress.wa.gov/ecy/publications/SummaryPages/1310014.html and Upper Minnehaha Creek Watershed Nutrients and Bacteria TMDL (Minnesota) http://www.pca.state.mn.us/index.php/view-document.html?gid=20792

permit writer's additional analysis would not change the TMDL, including its overall loading cap.

In situations where a stormwater source addressed in a TMDL's load allocation is not currently regulated by an NPDES permit but may be required to obtain an NPDES permit in the future, the TMDL writer should consider including language in the TMDL explaining that the allocation for the stormwater source is expressed in the TMDL as a "load allocation" contingent on the source remaining unpermitted, but that the "load allocation" would later be deemed a "wasteload allocation" if the stormwater discharge from the source were required to obtain NPDES permit coverage. Such language would help ensure that the allocation is properly characterized by the permit writer should the source's regulatory status change. This will help the permit writer develop limitations for the NPDES permit applicable to the newly permitted source that are consistent with the assumptions and requirements of the TMDL's allocation to that source.

If you have any questions please feel free to contact us or Deborah Nagle, Director of the Water Permits Division, or Tom Wall, Director of the Assessment and Watershed Protection Division.

cc: Association of Clean Water Administrators
TMDL Program Branch Chiefs, Regions 1 – 10
NPDES Permits Branch Chiefs, Regions 1 – 10

Attachment: MS4 and Industrial Stormwater Permit Examples

ATTACHMENT: MS4 and Industrial Stormwater Permit Examples

BOX 1. Examples of WQBELs in MS4 Permits:

1. Numeric expression of the WQBEL: The MS4 Permit includes a specific, quantifiable performance requirement that must be achieved within a set timeframe. For example:
   - Reduce fine sediment particles, total phosphorus, and total nitrogen loads by 10 percent, 7 percent, and 8 percent, respectively, by September 30, 2016 (2011 Lake Tahoe, CA MS4 permit)
   - Restore within the 5-year permit term 20 percent of the previously developed impervious land (2014 Prince George's County, MD MS4 permit)
   - Achieve a minimum net annual planting rate of 4,150 planting annually within the MS4 area, with the objective of an MS4-wide urban tree canopy of 40 percent by 2035 (2011 Washington, DC MS4 permit)
   - Discharges from the MS4 must not cause or contribute to exceedances of receiving water limits for Diazinon of 0.08µg/L for acute exposure (1 hr averaging period) or 0.05µg/L for chronic exposure (4-day averaging period), OR must not exceed Diazinon discharge limits of 0.072 µg/L for acute exposure or 0.045µg/L for chronic exposure (2013 San Diego, CA Regional MS4 permit)

2. Non-numeric expressions of the WQBEL: The MS4 Permit establishes individualized, watershed-based requirements that require each affected MS4 to implement specific BMPs within the permit term, which will ensure reasonable further progress towards meeting applicable water quality standards.
   - To implement the corrective action recommendations of the Issaquah Creek Basin Water Cleanup Plan for Fecal Coliform Bacteria (part of the approved Fecal Coliform Bacteria TMDL for the Issaquah Creek Basin), King County is required during the permit term to install and maintain animal waste education and/or collection stations at municipal parks and other permittee owned and operated lands reasonably expected to have substantial domestic animal use and the potential for stormwater pollution. The County is also required to complete IDDE screening for bacteria sources in 50 percent of the MS4 subbasins, including rural MS4 subbasins, by February 2, 2017 and implement the activities identified in the Phase I permit for responding to any illicit discharges found (2013 Western Washington Small MS4 General Permit)
   - For discharges to Segment 14 of the Upper South Platte River Basin associated with WLAs from the approved *E. coli* TMDL, the MS4 must identify outfalls with dry weather flows; monitor priority outfalls for flow rates and *E. coli* densities; implement a system maintenance program for listed priority basins (which includes storm sewer cleaning and sanitary sewer investigations); install markers on at least 90% of storm drain inlets in areas with public access; and conduct a public outreach program focused on sources that contribute *E. coli* loads to the MS4. By November 30, 2018, dry weather discharges from MS4 outfalls of concern must not contribute to an exceedance of the *E. coli* standard (126 cfu per 100 ml for a geometric mean of all samples collected at a specific outfall in a 30-day period) (2009 Denver, CO MS4 Permit)

3. Hybrid approach with both numeric and non-numeric expressions of the WQBEL:
   - Discharges of trash from the MS4 to the LA River must be reduced to zero by Sept. 2016. Permittees also have the option of complying via the installation of defined "full capture systems" to prevent trash from entering the MS4 (2012 Los Angeles County, CA MS4 Permit).
   - To attain the shared, load allocation of 27,000 metric tons/year of sediment in the Napa River sediment TMDL, municipalities shall determine opportunities to retrofit and/or reconstruction of road crossings to minimize road-related sediment delivery (≤ 500 cubic yards/mile per 20-year period) to stream channels (2013 CA Small MS4 General Permit).

Box 2. Examples of Retention Post Construction Standards for New and Redevelopment in MS4 Permits

- 2009 WV small MS4 permit: Keep and manage on site the first one inch of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation.
- 2011 DC Phase I MS4 permit: Achieve on-site retention of 1.2" of stormwater from a 24-hour storm with a 72-hour antecedent dry period through evapotranspiration, infiltration and/or stormwater harvesting.
- 2012 Albuquerque, NM Phase I MS4 permit: Capture the 90th percentile storm event runoff to mimic the predevelopment hydrology of the previously undeveloped site.
- 2010 Anchorage, AK Phase I MS4 permit: Keep and manage the runoff generated from the first 0.52 inches of rainfall from a 24 hour event preceded by 48 hours of no measureable precipitation.
- 2013 Western WA small MS4 permit: Implement low impact development performance standards to match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year flow to 50% of the 2-year flow.

BOX 3. Examples of WQBELs in Industrial (including Construction) Stormwater Permits:

1. Numeric expression of the WQBEL: The permit includes a specific, quantifiable performance requirement that must be achieved:
   - Pollutant concentrations shall not exceed the stormwater discharge limits specified in the permit (based on state WQS), including (for example): Cadmium-0.003 mg/l; Mercury-0.0024 mg/l; Selenium-0.02 mg/l (2013 Hawaii MSGP)
   - Beginning July 1, 2010, permittees discharging to impaired waters without an EPA-approved TMDL shall comply with the following effluent limits (based on state WQS), including (for example): Turbidity-25 NTU; TSS-30 mg/l; Mercury-0.0021 mg/l; Phosphorus, Ammonia, Lead, Copper, Zinc-site-specific limits to be determined at time of permit coverage (2010 Washington MSGP)
   - If discharging to waters on the 303(d) list (Category 5) impaired for turbidity, fine sediment, or phosphorus, the discharge must comply with the following effluent limit for turbidity: 25 NTU (at the point of discharge from the site), or no more than 5 NTU above background turbidity when the background turbidity is 50 NTU or less, or no more than a 10% increase in turbidity when background turbidity is more than 50 NTU. Discharges to waterbodies on the 303(d) list (Category 5) for high pH must comply with the numeric effluent limit of pH 6.5 to 8.5 su (2010 Washington CGP) (2010 Washington CGP)

2. Narrative expression of the WQBEL: The permit includes narrative effluent limits based on applicable WQS:
   - New discharges or new dischargers to an impaired water are not eligible for permit coverage, unless documentation or data exists to show that (1) all exposure of the pollutant(s) of concern to stormwater is prevented; or (2) the pollutant(s) of concern are not present at the facility; or (3) the discharge of the pollutant(s) of concern will meet instream water quality criteria at the point of discharge (for waters without an EPA-approved TMDL), or there is sufficient remaining WLAs in an EPA-approved TMDL to allow the discharge and that existing dischargers are subject to compliance schedules to bring the waterbody into attainment with WQS (2011 Vermont MSGP; similar requirements in RI, NY, MD, VA, WV, SC, AR, TX, KS, NE, AZ, CA, AK, OR, and WA permits)
   - In addition to other applicable WQBELs, there shall be no discharge that causes visible oil sheen, and no discharge of floating solids or persistent foam in other than trace amounts. Persistent foam is foam that does not dissipate within one half hour of point of discharge (2014 Maryland MSGP)

3. Requirement to implement additional practices or procedures for discharges to impaired waters:
   - For sediment-impaired waters (without an approved TMDL), the permittee is required to maintain a minimum 50-foot buffer zone between any disturbance and all edges of the receiving water (2009 Kentucky CGP)
   - For discharges to impaired waters, implement the following: (1) stabilization of all exposed soil areas immediately, but in no case later than 7 days after the construction activity in that portion of the site has temporarily or permanently ceased (as compared to 14 days for no-impaired waters); (2) temporary sediment basins must meet specified design standards if they will serve an area of 5 or more acres (as compared to 10 or more acres for other sites); (3) retain a water quality volume of 1 inch of runoff from the new impervious surfaces created by the project (though this volume reduction requirement is for discharges to all waters, not just impaired waters) (2013 Minnesota CGP).
   - If the site discharges to a water impaired for sediment or turbidity, or to a water subject to an EPA-approved TMDL, the permittee must implement one or more of the following practices: (1) compost berms, compost blankets, or compost socks; (2) erosion control mats; (3) tackifiers used with a perimeter control BMP; (4) a natural buffer of 50 feet (horizontally) plus 25 feet (horizontally) for 5 degrees of slope; (5) water treatment by electro-coagulation, flocculation, or filtration; and/or (6) other substantially equivalent sediment or turbidity BMP approved by the state (2010 Oregon CGP)

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May 28, 2013

Steve Hood
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Re: Comments on TMDL Report Volume 2

Dear Steve:

Thank you for providing Whatcom County (County) the opportunity to review and comment on the "Public Review Draft Lake Whatcom Watershed Total Phosphorus and Bacteria Total Maximum Daily Loads, Volume 2, Water Quality Improvement Report and Implementation Strategy," dated February 2013. The draft report follows Volume 1 (November 2008) to which Whatcom County submitted written comments. The County comments on both the preliminary draft report and the draft report of Volume 1 were contained in letters to Ecology dated June 3, 2008, and September 17, 2008, respectively.

In reviewing the Volume 2 draft report, we noted that only a few of our previous comments were addressed. All of our prior comments that have not been addressed are incorporated by reference because they are reasonable and valid.

Our key concerns include the following:

(1) Wasteload allocations (WLAs) are focused on stormwater discharges, but the models used to derive the WLAs are based on very limited stormwater data (two storms sampled at a few of the numerous tributaries to the lake).

(2) Retrofitting 87% of the existing developed area so that runoff matches forest conditions is infeasible for many reasons, including the fact that it would require infiltration volumes substantially greater than volumes under natural forested conditions because evapotranspiration, canopy interception, and forest floor storage volumes would need to be infiltrated. Most of the watershed soils have been formed on bedrock and have very low permeabilities in their lower horizons.

(3) Proposed WLAs are based on a model-simulated comparison of whole-lake dissolved oxygen (DO) under simulated baseline and natural conditions. Protection of the water supply, recreation, aquatic life, and other designated uses of the lake is a more reasonable and appropriate goal than meeting a model-simulated DO value in the deepest portion of the lake.

In addition, we have the following comments related more specifically to Volume 2:

1. We would like to reiterate our previous comment that we do not believe that expressing load reductions in terms of "effective developed acres" is appropriate or reasonable. This method of expressing load

reductions does not accurately communicate the magnitude of the reductions. Phosphorus load per acre of developed area could vary considerably from place to place within the watershed depending on the nature of the development, the development regulations in place at the time of construction, stormwater treatment retrofits, proximity to streams or stormwater conveyances, soils, and other factors. Therefore, it would be more appropriate to express the load reduction in terms of mass per unit time rather than effective developed acres. This would provide a more flexible and direct method for accounting of load reductions through targeting of various management measures in priority locations. As you are probably aware, in January 2013, a federal court in Virginia ruled that runoff and other "nonpollutants" could not be used as surrogates for pollutants to meet a total maximum daily load (Accotink Creek TMDL). Consequently, we urge you to reconsider your approach.

2. *Page vii.* The executive summary specifies methods for managing runoff to reduce phosphorus levels so they more closely mimic forested conditions. Methods specified include: (1) providing storage to promote infiltration, (2) rainwater harvesting, and (3) decreasing impervious surfaces. Methods should also include the application of devices that provide filtration. There may be areas where space is limited and underground structural filtration devices could provide an effective mechanism for reducing phosphorus. We recommend adding this to the list of options. In relation to this comment, we request removing the fifth paragraph on page x as it seems to dismiss this practice as a viable option.

3. *Page ix.* A large, detailed map in the document should be included to help reflect the various land use areas and zoning and sub-basin boundaries described in the report. For example, the report discusses how land zoned for commercial forest has been removed from the WLAs and is listed separately as a load allocation, but there is no map that shows those areas.

4. *Page x.* In some areas the report states that the requirement is 87% conversion of effective developed acres so that runoff from these acres is similar to forested conditions. In others (see bottom of page 15 and top of page 16) it states that an 87% reduction in phosphorus loading is needed. These two goals are not the same. As land uses and runoff concentrations differ throughout the watershed, the goal of reducing 87% effective developed acres (i.e. 87% of the 2010 developed area functions as forest) does not equate to 87% reduction in phosphorus. At the top of page 22, it states that "When 87% of the developed land within each sub-basin is modeled as forest land, the lake meets the water quality standards." Later on the same page it states that "In this TMDL, the annual loading from the base condition (calendar year 2003) is reduced by 87% in order to meet water quality standards." In addition to our prior comments outlining our disagreement with expressing WLAs in terms of 87% reduced effective developed acres, there is significant inconsistency in how the WLA is expressed throughout the report.

5. *Page xvi.* The report states that "The permit must also require that the wasteload allocations in the TMDL are met as a part of permit compliance." It then states that "Permits for the discharge of stormwater may use mandatory activities as the means of meeting the wasteload allocations, instead of only requiring direct water quality monitoring measurements." On page xvii it states that "...the permit requirement to comply with the wasteload will be expressed as actions that must be taken under the NPDES Phase II Municipal Stormwater permit." Underlines have been added in the previous sentences for emphasis. Other sentences to the same effect are scattered throughout the report implying that WLAs must be met under the municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) permit.

   A significant body of law and regulation around this topic has concluded that the requirement to meet WLAs is a subset of the requirement to meet water quality standards. Additionally, Washington's Phase II MS4 Permit contains a compliance pathway that recognizes that MS4 discharges are different from

other types of discharges and entitled to the "maximum extent practicable" or "MEP" standard. Consequently, MS4 compliance with WLAs established by TMDLs is subject to the MEP standard established in the Clean Water Act and Washington State's compliance pathway.

6. *Page xvi.* The second paragraph states that "the allocation is based on a unit load method." The third paragraph defines unit load as "the total load in the watershed divided by the total area of the watershed." This definition appears inconsistent with the first sentence of paragraph 2 which states, "In the DO TMDL, the total phosphorus loading levels are associated with the developed land area." As noted on page 15 of the report, only 12% of the watershed has been developed. Please clarify.

7. *Page xvi.* The second paragraph states that "In the DO TMDL, the total phosphorus loading levels are associated with the developed land area." Given that 88% of the watershed is undeveloped, what is the rationale for this approach?

8. *Pages xvi-xvii.* It states in the second paragraph that "In this TMDL, instead of estimating the area that is subject to the NPDES permit, the allocation is based on a unit load method." And in the third paragraph it states, "... because the boundary of the land that drains to storm drainage systems is not mapped, we cannot accurately separate load allocations from wasteload allocations. In this situation, loading capacity has been listed as a waste load allocation." On page 2 it states that "To avoid more stringent requirements being placed on the permit, the Stormwater Management Program must provide reasonable assurance that load allocations will be met."

   Several similar references throughout the document combine areas outside of the MS4 permit's jurisdiction with permitted areas. Under TMDL requirements, non-point sources are required to comply with load allocations and an implementation plan is required. For MS4 point sources, WLAs are addressed in the MS4 NPDES permit within the context of the MEP standard, and actions toward addressing the TMDL are implemented in the stormwater management plan (SWMP) that is part of the permit. It is important from a regulatory standpoint that these areas are distinguished from each other and kept separate given that they are subject to different standards.

   In Washington Department of Ecology Municipal Stormwater Permit Criteria for Designating Phase II Bubble Cities, the MS4 must either serve a substantial population or area, or it must be contiguously located to an already regulated municipal storm sewer. The forest areas in the Lake Whatcom watershed do not meet either of these requirements for inclusion in the permit.

9. *Pages 4-5.* The report states that there are two surrogate measures. The first surrogate measure is listed as the reduction in effective developed acres. As we understand, the reduction in effective developed acres reflects reduced phosphorus loading, which in turn reflects improved DO levels. The second surrogate measure is listed as the 2003 annual load. Listing the 2003 annual load as a surrogate is confusing. As defined in the glossary of the report (page 52), a surrogate is an environmental indicator that is used to develop a quantified TMDL when a numeric criterion for the specified pollutant is not possible. We do not see how the 2003 annual load is a surrogate for a pollutant parameter. We suggest that the description of the 2003 annual load as a surrogate is removed. In addition, it seems that phosphorus is the surrogate for DO and there is no need for an additional surrogate of effective developed acres (see also Comment 1).

10. *Pages 11-13.* It is very difficult to understand what was done and how it affects the TMDL. Was the HSPF model updated to include new land use information? If so, was consideration given to re-calibrating the model using the substantial amount of storm event monitoring data collected by the County and City since 2007?

11. *Page 21, Figure 5.* This graph is difficult to interpret. In the report it states that the green line, representing the cumulative dissolved oxygen at 87% rollback from the Existing Conditions scenario, is about 0.2 milligram per liter (mg/L) lower in oxygen than a comparable volume of water under the Full Rollback scenario. However, in the figure it appears as if the full rollback and 87% rollback have the same results. Based on this figure, it seems as if there should be an additional allowance for loads as it does not appear that the full or 87% rollback are below criteria, and there is an allowance for 0.2 mg/L below criteria.

12. *Pages 22-23.* It would help to provide clarification to the formulas by adding the word "annual" in front of the definition for items C and F. It would also be helpful to add the word "annual" to the column headers in Table 5.

13. *Pages 22-23.* The Loading Capacity section of the report is difficult to follow. Specifically, it is hard to understand how Tables 3, 5, 6, and 7 relate to each other. As an example, Table 6 indicates that the Silver Beach sub-basin encompasses 328 acres while Table 3 lists the total area of this sub-basin is 712 acres. In addition, it is hard to know how to apply areal loadings given that the reach number is not provided for sub-basins. We request that sufficient information be provided for the document user to be able to track how mass loads were calculated from areal loading rates. It would help if we had the ability to take the areas from Table 3 and the annual mass loads from Table 6 and determine how they were derived from Table 5. This could require an additional table connecting reaches in Table 5 with tributary sub-basin names in Table 6 in order to allow for an accounting of areas.

14. *Page 28, Table 7.* "Waste Load Allocations for municipal stormwater dischargers in the watershed covered by NPDES permits" includes a number of areas that are not covered by the County's municipal NPDES permit (e.g., Smith, Olsen, and Blue Canyon). These forested basins have low population densities that do not meet the criteria for inclusion in a Phase II municipal NPDES permit.

15. *Page 30.* It seems the title to Table 10 and column 4 of Table 10 should refer to WLAs and not LAs.

16. *Page 30.* The statements regarding loading capacity for fecal coliform are inaccurate to the extent that they include forested areas because the MS4 permit does not cover these areas.

17. *Page 30.* Table 10 indicates that fecal coliform levels in Smith and Olsen Creeks will need to be reduced substantially. Considering that these basins are forested with little or no developed land or agricultural use, the observed fecal coliform loads are likely from wildlife. Therefore, it is inappropriate to include these as WLAs in the County's MS4 permit.

18. *Page 30.* The report refers to Table 10 and states that "the associated wasteload can be re-categorized as a load allocation, provided the same level of control remains in place when the discharge was regulated by a permit." This implies that all of the area listed in Table 10 is currently covered by MS4 permits. This is not the case. Large portions of the listed basins are outside the County or City MS4 and therefore cannot be covered by an MS4 permit.

19. *Page 31.* The report suggests that the County and City will be responsible for refining the models developed by Ecology. Exactly how would this be accomplished?

20. *Page 31.* The report states that if the improved models indicate that the previous models were overly protective, the most expensive and least effective implementation measures can be eliminated. In fact, if the models indicate that the previous models were overly protective (or prescriptive), the TMDL's WLAs and LA's should be modified.

21. *Page 38.* The report states that the models were calibrated to runoff from forest areas during 2002-03. The data set used for calibrating Ecology's HSPF model did not include samples collected during large storm events when mass wasting or channel erosion are more likely to occur. The Washington State Department of Natural Resources estimated that legacy forest practices have increased sediment inputs by about 14,844 tons per year over a 90-year period, and that about 95% of the sediment increase was associated with mass wasting (WDNR, 1997; Grizzel, 2001). Because the HSPF model was calibrated with data collected when mass wasting or road erosion from past forest practices was not occurring, the "full rollback" scenario may under-predict current phosphorus loads of forest areas, yet provide a reasonable estimate of phosphorus loads from natural forests. If so, the difference between natural- and base-year phosphorus loads to the lake could be less than the TMDL assumes.

Protection of Lake Whatcom is critically important to Whatcom County, and we have already devoted substantial effort toward protecting the lake. We are committed to doing our part to control pollution and preserve the beneficial uses of the lake. At the same time, we need to ensure that our control efforts are practical and cost-effective. We intend to continue to work closely with Ecology, the City of Bellingham, and other key stakeholders to protect Lake Whatcom.

We are requesting that you provide specific written responses to each of our comments. Further, we request that DOE delay finalization of the TMDL until our comments can be satisfactorily addressed. With the significant technical issues we have noted above, finalizing the TMDL at this time without addressing these issues will reduce the ability of Whatcom County and DOE to successfully implement the TMDL.

If you would like to discuss these comments, contact me to arrange a meeting or conference call.

Sincerely,

Joseph P. Rutter For C.B.

Chris Brueske, P.E.
Assistant Director
Whatcom County Public Works

cc: Dan Gibson, Whatcom County Chief Civil Deputy Prosecutor
Kirk N. Christensen, P.E., Whatcom County Public Works Stormwater Manager
Maia Bellon, Director, Washington State Dept. of Ecology Director

WHATCOM COUNTY
EXECUTIVE'S OFFICE
County Courthouse
311 Grand Avenue, Suite #108
Bellingham, WA 98225-4082

Jack Louws
County Executive

August 8, 2013

VIA EMAIL
HARD COPY TO FOLLOW

Ms. Maia Bellon, Director
Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Re: Lake Whatcom Public Comment Draft Phosphorous and Bacteria TMDL
Volume 2 - February 13, 2013

Dear Ms. Bellon:

Thank you for meeting with us in May. We appreciated the opportunity to share with you Whatcom County's commitment to improving water quality in Lake Whatcom, and we are continuing to work with your staff in the Bellingham Field Office to develop a TMDL that can be successfully implemented by Whatcom County and Ecology.

While there are many technical issues that we are currently discussing with staff from the Bellingham Field Office, I am writing to you now to request your attention on one specific issue that has arisen in our ongoing review of the Draft TMDL. The Bellingham Field Office has informed us that in order to implement the Lake Whatcom TMDL, it intends to increase the geographical area over which Whatcom County will be held responsible by approximately 900%. To implement these requirements, Ecology apparently intends to unilaterally expand Whatcom County's Phase II Municipal Stormwater Permit coverage area, despite the fact that the Phase II Permit contains very specific Permit coverage boundaries for Whatcom County (and all other Permittees) that are much more limited than the expanded area proposed by Ecology.

As you know, the TMDL process recognizes that there are point and non-point sources of pollution. Both sources must be addressed in the TMDL, but the law does not do that by wholesale converting non-point sources into point sources. Similarly, when incorporating stormwater waste load allocations into Municipal Stormwater Permits, only the area where the TMDL and permit boundary overlap can be included in as part of the Permit. Areas outside of the permit boundary must be addressed through non-point source actions that are the responsibility of the landowners. The approach proposed by the Bellingham Field Office would assign responsibility for point and non-point sources to Whatcom County and implement that

approach by placing all of these sources within the Phase II Permit boundary for Whatcom County. There is no support in the law, the Permit, or Ecology's own guidance for that approach.

We hope that once you have reviewed our letter that you will lend your assistance so that we can move forward collaboratively with appropriate solutions to improve water quality in Lake Whatcom. The following portions of the letter provide additional information about our concerns.

1. Ecology's cited authority does not support its approach.

Ecology's draft response to comment WC17 (attached) states as follows:

> "Ecology is proposing expanding the permit requirements to all of the land in Lake Whatcom Watershed over which Whatcom County has Land Use authority which drains to an MS4. All development that increase phosphorous loading over natural rates is "significant" in the context of CWA 402(p)(4)(E). 40 CFR26(9)(i)(C) makes clear that stormwater discharges that are identified in a TMDL and would not otherwise be regulated can be required to have a permit. Whatcom County will have an opportunity to appeal that decision when Ecology takes formal action to expand the coverage through an administrative order or permit reissuance."

Ecology's referenced citations do not support its approach for several reasons. First, CWA 402(p)(4)(E) does not exist. Second, assuming that Ecology actually intended to reference 402(p)(2)(E), that section has nothing to do with expanding the ***coverage area*** of a Phase II jurisdiction already permitted under the Phase II Permit. That fact is made clear from the text of 402(p)(1) and (2), which contemplate a situation where there is ***no*** NPDES Permit issued prior to October 1, 1994 and then sets forth circumstances under which a Permit can be issued. Here, Whatcom County has been issued coverage under the Western Washington Phase II Municipal Stormwater Permit in accordance with Section 402(p)(3)(B) and the coverage area is defined in that Permit.

Third, the federal regulation referenced by Ecology (40 CFR26(9)(i)(C)) does not exist either. Fourth, assuming, however, Ecology actually intended to reference 40 CFR 122.26(9)(i)(C), that section is equally inapplicable. As the introductory language of 40 CFR (9)(i) makes clear, subsection (C) only applies to those situations where a discharger is not otherwise required to obtain a Permit. Because Whatcom County is already covered under the Phase II Permit, 40 CFR 122.26(9)(i)(C) is inapplicable.

2. The Phase II Permit does not support Ecology's approach.

Condition S1.A.2 of Ecology's Western Washington Phase II Municipal Stormwater Permit clearly specifies the geographic area of Permit coverage as follows:

A. Geographic Area of Permit Coverage

This Permit is applicable to owners or operators of regulated small municipal separate storm sewer systems (MS4s) located west of the eastern boundaries of the following counties: Whatcom, Skagit, Snohomish, King, Pierce, Lewis and Skamania.

2. For all counties required to have coverage under this Permit, the geographic area of coverage is the urbanized area and urban growth areas associated with permitted cities under the jurisdictional control of the county. The geographic area of coverage also includes any urban growth area contiguous to permitted urbanized areas under the jurisdictional control of the county.

For Whatcom County, the geographic area of coverage also includes the unincorporated Birch Bay urban growth area.

In the face of this clear language, there is no support for Ecology's approach. We are troubled by Ecology's statement that it can unilaterally change the Permit boundary by "administrative order or permit reissuance." Whatcom County, as well as all other local governments that have obtained coverage under this General Municipal Stormwater Permit, rely on the Permit's coverage area to implement their stormwater program. To our knowledge, Ecology has never told the Phase II permittees that it expects to change the Permit boundary to implement any TMDLs and we know of no instance when it has done so. It is virtually certain that if Ecology were to move forward with the Bellingham Field Office approach, other local governments would be quite concerned.

*3. **Ecology's approach is contradicted by its own guidance.***

Ecology's recent guidance about how to manage water quality improvement actions (attached), contains the following language: "Where the boundary of a Phase I or II stormwater permit overlays a TMDL boundary will determine the permit areas where a TMDL WLAs apply and where implementation actions should be focused to improve water quality. ***Areas outside the permit, but within a TMDL, requires a strategy of working with individual landowners to reduce their non-point source pollution.***" (emphasis added)

Ecology's guidance employs the correct approach: if the Phase II Permit boundary does not overlay the TMDL, then that area is not the Phase II permittee's responsibility. Instead, Ecology must work with individual landowners to reduce the non-point source pollution. Unfortunately, Ecology's approach with the Lake Whatcom TMDL takes the opposite approach by ignoring the permit boundary and directing Whatcom County to take responsibility for both point and non-point sources.

In summary, we are greatly concerned with Ecology's approach, which is unsupported by the CWA, the Permit, and Ecology's guidance. Both point and non-point sources have obligations and responsibilities for improving water quality in Lake Whatcom. Whatcom County is

absolutely committed to the protection of Lake Whatcom, as evidenced by our aggressive capital program targeting phosphorus removal and our comprehensive development regulations. The additional regulatory challenges posed by expansion of the Phase II Permit boundary could divert local resources from these important programs, and may ultimately detract from the effectiveness of our local efforts. Whatcom County and Ecology have a shared goal of protecting Lake Whatcom, and I look forward to continuing to work with you toward that goal. If you would like additional information or if a meeting would be helpful, please let me know. Again, thank you for your attention to this issue.

Very truly yours,

Jack Louws
Whatcom County Executive

cc: Kelly Susewind, Ecology, Water Quality Program Manager
Bill Moore, Ecology Water Quality Program
Doug Allen, Ecology Bellingham Field Office

Using GIS to Inform and Manage Water Quality Improvement Actions

DEPARTMENT OF ECOLOGY State of Washington

Presented at GIS day 2012, Olympia WA, November 14, 2012
Ecology Publication no. 13-10-004

Introduction

The Washington State Department of Ecology's Water Quality Program has authority for implementing the Federal Clean Water Act, including:

- •Maintaining and updating the state water quality standards
- •Conducting a water quality assessment
- •Developing and implementing Total Maximum Daily Load (TMDL) projects
- •Implementing the National Pollutant Discharge System (NPDES)

Ecology is accountable to the U.S. Environmental Protection Agency (EPA) for the regulatory work we do, and also to the public, to efficiently use public funds to improve water quality and provide information to residents about how the work we do affects them.

The Water Quality Program is investing in and improving its GIS assets. This may enable Ecology to better use its regulatory information to manage water quality improvement actions, and to communicate that information with stakeholders and the public throughout the state.

The process of improving water quality is complex and involves interpreting large amounts of data. This poster generally describes how these GIS assets are used to get from the identification of a polluted water body, to understanding where the pollution comes from, and then connecting the point and non-point sources of pollution to regulatory actions for clean up.

1 Water Quality Data Collection

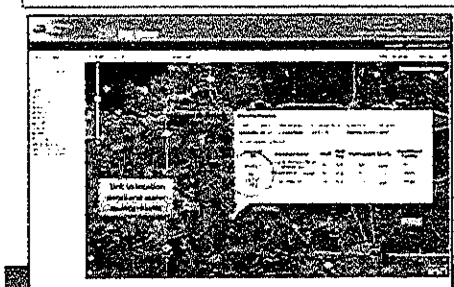
Everything begins with collecting water quality data. Ecology maintains the Environmental Information Management (EIM) system that houses all of the data (water, soil, air, and other types of environmental measurements) collected by Ecology and many other stakeholders throughout Washington State, and allows a user to query water quality data using a web form as well as the EIM Map Viewer.

EIM is publicly accessible on the internet (www.ecy.wa.gov/eim/)

Available EIM data includes:

- •Project information
- •Monitoring station locations[1] and descriptions
- •Monitoring results, collection information, and data quality assurance information

Many of Ecology's databases utilize EIM's data for water quality investigations. Data from projects conducted by Ecology and paid for by Ecology grant money are required to be entered into EIM.

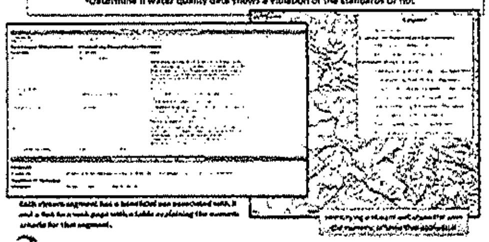


2 Surface Water Quality Standards

The surface water quality standards are the basis for protecting and regulating the quality of surface waters in Washington State such as rivers, lakes, estuaries and coastal waters. The standards specify designated and potential uses of water bodies in the state and set numeric criteria to protect those uses. Every surface water body has a set of designated uses that must be maintained to specific swimmable and fishable levels.

Ecology has GIS features representing the numeric water quality criteria for designated uses and special conditions. These features are used by Ecology staff to:

- •Determine the effluent limits placed on NPDES permits
- •Determine the numeric criteria on which to base a TMDL allocation
- •Determine if water quality data shows a violation of the standards or not



3 Water Quality Assessment

Every 2-4 years, Washington's Water Quality Assessment compiles a list of the status of water bodies in the state based on water quality data in EIM. The assessed waters are grouped into categories describing the water quality status compared to regulatory pollution control levels in the state's surface water quality standards. The impaired waters list (Category 5) is comprised of those waters that do not meet minimum pollution levels and are therefore not supporting the designated uses assigned to that waterbody (such as aquatic habitat, swimming, fishing, or shellfish harvesting). To determine impairments:

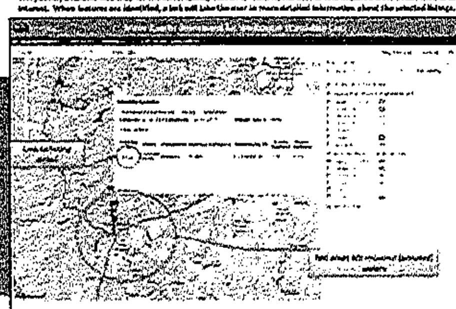
- •A statewide call for water quality data to be submitted to EIM is made
- •High quality data is analyzed and compared to the water quality standards. This work is completed using the Water Assessment Tracking System (WATS), a customized database and web map application
- •NHD stream reaches are categorized by their level of impairment (range from good to polluted or "impaired") for specific pollutants

The water quality assessment GIS features[1] show the location and extent of all assessment listings, the pollutant, the category of impairment, the basis for the listing, and references to the source data in EIM.

These tools are available at: http://www.ecy.wa.gov/programs/wq/303d/2012/index.html

The public web map and data query form includes the capability to send Ecology comments on proposed listings during each assessment cycle.

The publicly available web map for the water quality assessment allows the user to find impaired waters near their area of interest. When features are identified, a link will take the user to more detailed information about the selected listings.



4 TMDL Project Development

GIS is an important tool for developing a TMDL project and is part of how Ecology identifies where TMDLs apply as regulatory features. The foundational water quality study for a TMDL project usually involves hydrologic modeling with inputs derived from GIS including: digital elevation models (DEMs), soil and geology features, stream channel geometry, precipitation, and land cover to name a few.

Some of the ways GIS is used for in the development of TMDLs include:

- Designing water quality monitoring networks using GIS to determine the best monitoring locations. Land ownership boundaries, stormwater permit boundaries, and locations of NPDES permits are some of the key GIS features considered in the design of a monitoring network
- Delineating riparian vegetation along river corridors and quantifying inputs to models that calculate the amount of riparian shade over a river or stream.
- Conducting analyses of land use and land cover data to identify current land uses that could be contributing to non-point source pollution in areas where water quality monitoring shows impairments. We use land use designations from the Statewide tax parcel GIS feature to inventory the land use types within a TMDL project area.

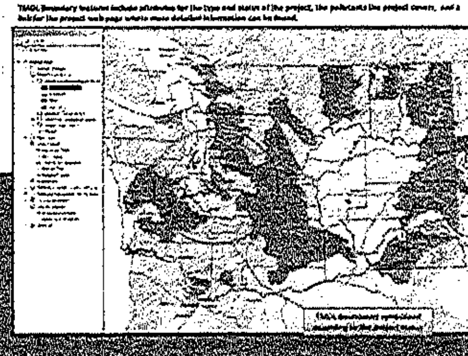
TMDL GIS Features

Once a TMDL has been approved by the EPA, the TMDL boundary[1] becomes the key GIS feature showing the area where the TMDL applies. Land owners and stakeholders within that boundary will need to implement Best Management Practices (BMPs) to address land use problems that contribute to pollution; or NPDES permittees may need to apply further treatment to their effluent to reduce or eliminate their pollution from the water body.

Ecology utilizes TMDL boundaries in several ways.

- •Identify where special conditions may apply to NPDES permittees
- •Guide implementation of the TMDL and WQ improvement actions in the watershed
- •Plan where new projects should be started next

TMDL Boundary features include attributes for the type and status of the project, the pollutants the project covers, and a link for the project web page where more detailed information can be found.



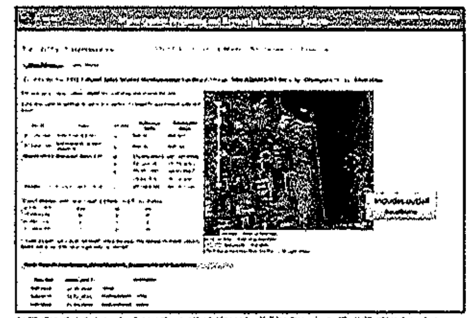
5 Permitting and Reporting Information System (PARIS)

PARIS is the database system Ecology uses to track and share information related to National Pollution Discharge Elimination System (NPDES) for individual permits and general permits including:

- •Construction, Industrial, and Sand & Gravel Stormwater
- •Concentrated Animal Feeding Operations (CAFOs)
- •Fish Hatcheries
- •Aquatic Pesticides

A user can search for a specific facility or type of permit and retrieve a report that includes a GIS-based map showing the facility location (available as the Facility/Site GIS feature[1]) and its outfalls. This information is valuable both to Ecology staff for regulatory business needs and to the public to determine what point sources affect their water bodies of interest.

PARIS is available at: http://www.ecy.wa.gov/programs/wq/permits/paris/index.html

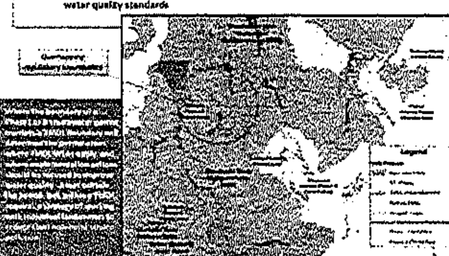


Facility Reports include inset map showing the facility and outfall locations along with other facility information.

Municipal Stormwater Permits

The municipal stormwater permit boundary feature is important for:

- •Defining the area of responsibility for pollution reduction activities required under the Phase I and II Municipal Stormwater General Permit
- •Comparing with TMDL boundaries to identify areas where additional permit limits and actions (called wasteload allocations or WLAs) to protect water quality apply. A TMDL project sets pollutant WLAs so that stormwater discharges will not result in violations of water quality standards



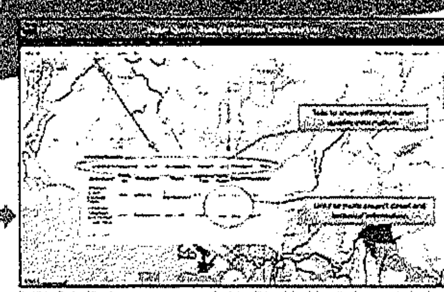
6 Water Quality Atlas

In 2012, the Water Quality Atlas was released to Ecology staff. It is a webmap tool that combines all of the GIS features discussed above and allows an Ecology user to identify multiple water quality regulatory attributes for a user-specified location.

The atlas is used by permit managers, TMDL coordinators, and others at Ecology to identify the regulatory features that must be considered for:

- •Administering permits
- •Developing TMDL projects
- •Identifying polluted waters that affect their project areas

When a point is identified on the map, a pop up box opens, and the user can click on the different tabs to view summaries of those data layers, and link to more detailed information on the web.



National Hydrography Dataset (NHD)[1]

Ecology adopted the NHD (1:24,000 scale) as the standard stream network used by the agency. The water quality assessment listings and the water quality standards are based on the NHD; they are basically event tables that "hang" on the NHD framework for map display purposes.

Future Plans

While not all of this information is publicly available at this time, over the next several years the Water Quality Program will continue to improve its public web maps and data query tools to put this data into the hands of the public, watershed stakeholders, and state and local government. This will better inform decisions that prevent, control, and reduce water pollution in the state.

Future improvements and additional GIS data will include:

- •A public version of the Water Quality Atlas
- •TMDL related GIS features including waste load allocation target points and numeric
- •Expansion of Municipal Stormwater Permittee information in PARIS
- •GIS features for the water quality standards including the beneficial uses and supplemental spawning period features
- •GIS features depicting groundwater nitrate impacted areas

Footnote:

[1] GIS data features can be downloaded at: http://www.ecy.wa.gov/services/gis/data/data.htm

WHATCOM COUNTY
PUBLIC WORKS DEPARTMENT
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November 14, 2013

VIA EMAIL
HARD COPY TO FOLLOW

Kelly Susewind, P.E., P.G.
Water Quality Program Manager
Washington State Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

RE: Lake Whatcom TMDL

Dear Kelly:

Thank you for your letter to Whatcom County Executive Jack Louws dated September 3, 2013 regarding the draft Lake Whatcom TMDL. We are pleased that Ecology has confirmed that the County may establish equivalent protection in areas of the Lake Whatcom watershed outside of the NPDES Phase II Permit area and look forward to working with Ecology on demonstrating equivalency. We are hopeful that grant funding will be available to assist us in this endeavor and welcome Ecology's help and support in identifying and securing those funds.

We do continue to have significant concerns (as previously expressed) that retrofitting 87% of existing development is an unattainable goal for our community. Our previous comments have explained our concerns with both the assumptions and projections associated with the continuous flow modeling that forms the basis of the draft TMDL load and wasteload allocations. Moreover, we have not been able to identify any reasonable or practicable way to infiltrate or store the huge volumes of water required to match runoff associated with the forested conditions. The following draft response to our written comments from the Bellingham Field Office (BFO), dated July 2, 2013, does not give us confidence that Ecology has carefully considered the very real challenges associated with these issues:

> *"Loss of transpiration losses will require additional storage. Rainwater harvest replacing other water use may make significant contributions to runoff reduction in many cases. In the most extreme cases water may need to be stored for months for infiltration durring [sic] the summer."*

The fact is that the County will not be able to achieve compliance with the TMDL's targets by harvesting or storing water for months. Retrofitting on a watershed scale is economically infeasible. Using the Juanita Creek report's estimated cost of approximately $180 million per square mile (half of which was

to be borne by private citizens) and accounting for the lower density and smaller area in the Lake Whatcom watershed, a conservative estimate is that it would cost in excess of $100 million for the urban growth area within the Lake Whatcom watershed alone. This estimate does not include the costs for winter storage facilities. This is a financial burden that Whatcom County and the private citizens within the regulated area simply cannot afford. The discussion of cost implications is largely academic, however, since no amount of money will allow us to achieve an unattainable goal. Further, it is worth noting that in areas where we have tried small-scale infiltration, we have received complaints from adjacent property owners related to foundation cracking and basement water damage.

We believe that some of our concerns could potentially be addressed through an implementation plan with reasonable timelines and actions that would allow the County to make measureable progress towards the objectives of the TMDL, with opportunities to revisit assumptions in the model and the standards that form the basis of the draft TMDL after a reasonable period of time working toward implementation. We would like to meet with you and your staff to discuss the implementation plan in more detail.

Again, we appreciate your willingness to work with Whatcom County toward a TMDL that can be successfully implemented in the Lake Whatcom watershed and we look forward to hearing from you.

Sincerely,

Chris C. Brueske, P.E.
Assistant Director

cc: Director Mala Bellon

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 1 2 2010

OFFICE OF
WATER

MEMORANDUM

SUBJECT: Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs"

FROM: James A. Hanlon, Director
Office of Wastewater Management

Denise Keehner, Director
Office of Wetlands, Oceans and Watersheds

TO: Water Management Division Directors
Regions 1 - 10

This memorandum updates aspects of EPA's November 22, 2002 memorandum from Robert H. Wayland, III, Director of the Office of Wetlands, Oceans and Watersheds, and James A. Hanlon, Director of the Office of Wastewater Management, on the subject of "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs" (hereafter "2002 memorandum").

Background

Section III of the 2002 memorandum "affirm[ed] the appropriateness of an iterative, adaptive management best management practices (BMP) approach" for improving stormwater management over time as permitting agencies, the regulated community, and other involved stakeholders gain more experience and knowledge. Since 2002, States and EPA have obtained considerable experience in developing TMDLs and WLAs that address stormwater sources. The technical capacity to monitor stormwater and its impacts on water quality has increased. In many areas, monitoring of the impacts of stormwater on water quality has become more sophisticated and widespread. Better information on the effectiveness of stormwater controls to reduce pollutant loadings and address water quality impairments is now available. In many parts of the country, permitting agencies have issued several rounds of permits for Phase I municipal separate storm sewer systems (MS4s), Phase II MS4s, and stormwater discharges associated with industrial activity, including stormwater from construction activities. Notwithstanding these developments, stormwater discharges remain a significant cause of water quality

impairment in many places, highlighting a continuing need for more useful WLAs and better NPDES permit provisions to restore impaired waters to their beneficial uses.

With this additional experience in mind, EPA is updating and revising the following four elements of the 2002 memorandum to better reflect current practices and trends in permits and WLAs for stormwater discharges:

- Providing numeric water quality-based effluent limitations in NPDES permits for stormwater discharges;
- Disaggregating stormwater sources in a WLA;
- Using surrogates for pollutant parameters when establishing targets for TMDL loading capacity; and
- Designating additional stormwater sources to regulate and treating load allocations as wasteload allocations for newly regulated stormwater sources.

EPA is currently reviewing other elements of the 2002 memorandum and will consider making appropriate revisions in the future.

Providing Numeric Water Quality-Based Effluent Limitations in NPDES Permits for Stormwater Discharges

In today's memorandum, EPA is revising the 2002 memorandum with respect to water quality-based effluent limitations (WQBELs) in stormwater permits. Since 2002, many NPDES authorities have documented the contributions of stormwater discharges to water quality impairment and have identified the need to include clearer permit requirements in order to address these impairments. Numeric WQBELs in stormwater permits can clarify permit requirements and improve accountability and enforceability. For the purpose of this memorandum, numeric WQBELs use numeric parameters such as pollutant concentrations, pollutant loads, or numeric parameters acting as surrogates for pollutants, such as such as stormwater flow volume or percentage or amount of impervious cover.

The CWA provides that stormwater permits for MS4 discharges shall contain controls to reduce the discharge of pollutants to the "maximum extent practicable" and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants. CWA section 402(p)(3)(B)(iii). Under this provision, the NPDES permitting authority has the discretion to include requirements for reducing pollutants in stormwater discharges as necessary for compliance with water quality standards. *Defenders of Wildlife v. Browner*, 191 F.3d 1159, 1166 (9th Cir. 1999).

Where the NPDES authority determines that MS4 discharges have the reasonable potential to cause or contribute to a water quality standard excursion, EPA recommends that, where feasible, the NPDES permitting authority exercise its discretion to include numeric effluent limitations as necessary to meet water quality standards. The 2002

memorandum stated "EPA expects that most WQBELs for NPDES-regulated municipal and small construction stormwater discharges will be in the form of BMPs, and that numeric limitations will be used only in rare instances." Those expectations have changed as the stormwater permit program has matured. EPA now recognizes that where the NPDES authority determines that MS4 discharges and/or small construction stormwater discharges have the reasonable potential to cause or contribute to water quality standards excursions, permits for MS4s and/or small construction stormwater discharges should contain numeric effluent limitations where feasible to do so. EPA recommends that NPDES permitting authorities use numeric effluent limitations where feasible as these types of effluent limitations create objective and accountable means for controlling stormwater discharges.

The Clean Water Act (CWA) requires that permits for stormwater discharges associated with industrial activity comply with section 301 of the Act, including the requirement under section 301(b)(1)(C) to contain WQBELs for any discharge that the permitting authority determines has the reasonable potential to cause or contribute to a water quality standard excursion. CWA section 402(p)(3)(A), 40 CFR 122.44(d)(1)(iii). When the permitting authority determines, using the procedures specified at 40 CFR 122.44(d)(1)(ii) that the discharge causes or has the reasonable potential to cause or contribute to an in-stream excursion of the water quality standards, the permit must contain effluent limits for that pollutant. EPA recommends that NPDES permitting authorities use numeric effluent limitations where feasible as these types of effluent limitations create objective and accountable means for controlling stormwater discharges.

Where WQBELs in permits for stormwater discharges from MS4s, small construction sites or industrial sites are expressed in the form of BMPs, the permit should contain objective and measurable elements (e.g., schedule for BMP installation or level of BMP performance). The objective and measureable elements should be included in permits as enforceable provisions. Permitting authorities should consider including numeric benchmarks for BMPs and associated monitoring protocols or specific protocols for estimating BMP effectiveness in stormwater permits. These benchmarks could be used as thresholds that would require the permittee to take additional action specified in the permit, such as evaluating the effectiveness of the BMPs, implementing and/or modifying BMPs, or providing additional measures to protect water quality.

If the State or EPA has established a TMDL for an impaired water that includes WLAs for stormwater discharges, permits for either industrial stormwater discharges or MS4 discharges must contain effluent limits and conditions consistent with the requirements and assumptions of the WLAs in the TMDL. See 40 CFR § 122.44(d)(1)(vii)(B). Where the WLA of a TMDL is expressed in terms of a surrogate pollutant parameter, then the corresponding permit can generally use the surrogate pollutant parameter in the WQBEL as well. Where the TMDL includes WLAs for stormwater sources that provide numeric pollutant load or numeric surrogate pollutant parameter objectives, the WLA should, where feasible, be translated into numeric WQBELs in the applicable stormwater permits.

The permitting authority's decision as to how to express the WQBEL(s), either as numeric effluent limitations or BMPs, including BMPs accompanied by numeric benchmarks, should be based on an analysis of the specific facts and circumstances surrounding the permit, and/or the underlying WLA, including the nature of the stormwater discharge, available data, modeling results or other relevant information. As discussed in the 2002 memorandum, the permit's administrative record needs to provide an adequate demonstration that, where a BMP-based approach to permit limitations is selected, the BMPs required by the permit will be sufficient to implement applicable WLAs. Improved knowledge of BMP effectiveness gained since 2002 should be reflected in the demonstration and supporting rationale that implementation of the BMPs will attain water quality standards and WLAs.

EPA's regulations at 40 CFR § 122.47 govern the use of compliance schedules in NPDES permits. Central among the requirements is that the effluent limitation(s) must be met "as soon as possible." 40 CFR 122.47(a)(1). EPA expects the permitting authority to include in the permit record a sound rationale for determining that any compliance schedule meets this requirement. Where a TMDL has been established and there is an accompanying implementation plan that provides a schedule for an MS4 to implement the TMDL, the permitting authority should consider the schedule as it decides whether and how to establish enforceable interim requirements and interim dates in the permit.

Lastly, NPDES permits must specify monitoring requirements necessary to determine compliance with effluent limitations. See CWA section 402(a)(2); 40 C.F.R. 122.44(i). Where WQBELs are expressed as BMPs, the permit must require adequate monitoring to determine if the BMPs are performing as necessary. When developing monitoring requirements, the NPDES authority should consider the variable nature of stormwater as well the availability of reliable and applicable field data describing the treatment efficiencies of the BMPs required and supporting modeling analysis.

Disaggregating Stormwater Sources in a WLA

As stated in the 2002 memorandum, EPA expects TMDL authorities will make separate aggregate allocations to NPDES-regulated storm water discharges (in the form of WLAs) and unregulated storm water (in the form of LAs). EPA also recognized that the available data and information usually are not detailed enough to determine waste load allocations for NPDES-regulated storm water discharges on an outfall-specific basis.

EPA still recognizes that decisions about allocations of pollutant loads within a TMDL are driven by quantity and quality of existing and readily available water quality data. However, today, TMDL writers may have better data or better access to data and, over time, may have gained more experience since 2002 in developing TMDLs and WLAs in a less aggregated manner. Moreover, since 2002, EPA has noted the difficulty of establishing clear, effective, and enforceable NPDES permit limitations for sources covered by WLAs that are expressed as single categorical or aggregated wasteload allocations.

Accordingly, for all these reasons, EPA recommends that WLAs for NPDES-regulated stormwater discharges should be disaggregated into specific categories (e.g., separate WLAs for MS4 and industrial stormwater discharges) to the extent feasible based on available data and/or modeling projections. In addition, these disaggregated WLAs should be defined as narrowly as available information allows (e.g., for MS4s, separate WLAs for each one; and, for industrial sources, separate WLAs for different sources or types of industrial sources or discharges.)

Where appropriate, EPA encourages permit writers to assign specific shares of the wasteload allocation to specific permittees during the permitting process.

Using Surrogate for Pollutant Parameters When Establishing Targets for TMDL Loading Capacity

Many waterbodies affected by stormwater discharges are listed as impaired under Section 303(d) due to biological degradation or habitat alteration, rather than for specific pollutants (e.g., metals, pathogens, sediment). Impairment can be due to pollutants where hydrologic changes such as quantity of flow and variation in flow regimes are important factors in their transport. Since the stormwater-source impairment is usually the result of the cumulative impact of multiple pollutants and physical effects, it may be difficult to identify a specific pollutant (or pollutants) causing the impairment. Using a surrogate parameter in developing wasteload allocations for waters impaired by stormwater sources may, at times, be the appropriate approach for restoring the waterbodies.

In the 2009 report *Urban Stormwater Management in the United States,* the National Research Council suggests: "A more straightforward way to regulate stormwater contributions to waterbody impairment would be to use flow or a surrogate, like impervious cover, as a measure of stormwater loading . . . Efforts to reduce stormwater flow will automatically achieve reductions in pollutant loading. Moreover, flow is itself responsible for additional erosion and sedimentation that adversely impacts surface water quality."

Therefore, when developing TMDLs for receiving waters where stormwater sources are the primary source of impairment, it may be suitable to establish a numeric target for a surrogate pollutant parameter, such as stormwater flow volume or impervious cover, that would be expected to provide attainment of water quality standards. This is consistent with the TMDL regulations that specify that TMDLs can be expressed in terms of mass per time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)).

Where a surrogate parameter is used, the TMDL document must demonstrate the linkage between the surrogate parameter and the documented impairment (e.g., biological degradation). In addition, the TMDL should provide supporting documentation to indicate that the surrogate pollutant parameter appropriately represents stormwater pollutant loadings. Monitoring is an essential undertaking to ensure that compliance with the effluent limitations occurs.

Recent examples of TMDLs using flow or impervious cover as surrogates for pollutants in setting TMDL loading targets include: the Eagleville Brook (CT) TMDL and the Barberry Creek (ME) TMDL which used impervious cover as a surrogate; and, the Potash Brook (VT) TMDL which used stormwater flow volume as a surrogate.

Designating Additional Stormwater Sources to Regulate and Treating Load Allocations as Wasteload Allocations for Newly Regulated Stormwater Sources

The 2002 memorandum states that "stormwater discharges from sources that are not currently subject to NPDES regulation may be addressed by the load allocation component of a TMDL." Section 402(p)(2) of the Clean Water Act (CWA) requires industrial stormwater sources, certain municipal separate storm sewer systems, and other designated sources to be subject to NPDES permits. Section 402(p)(6) provides EPA with authority to identify additional stormwater discharges as needing a permit.

In addition to the stormwater discharges specifically identified as needing an NPDES permit, the CWA and the NPDES regulations allow for EPA and NPDES authorized States to designate, additional stormwater discharges for regulation. See 40 CFR 122.26 (a)(9)(i)(C), (a)(9)(i)(D), (b)(4)(iii), (b)(7)(iii), (b)(15)(ii) and 122.32(a)(2). Since 2002, EPA has become concerned that NPDES authorities have generally not adequately considered exercising these authorities to designate for NPDES permitting stormwater discharges that are currently not required to obtain permit coverage but that are significant enough to be identified in the load allocation component of a TMDL. Accordingly, EPA encourages permitting authorities to consider designation of stormwater sources in situations where coverage under NPDES permits would afford a more effective mechanism to reduce pollutants in stormwater discharges than available nonpoint source control methods.

In situations where a stormwater source addressed in a TMDL's load allocation is not currently regulated by an NPDES permit but may be required to obtain an NPDES permit in the future, the TMDL writer should consider including language in the TMDL explaining that the allocation for the stormwater source is expressed in the TMDL as a "load allocation" contingent on the source remaining unpermitted, but that the "load allocation" would later be deemed a "wasteload allocation" if the stormwater discharge from the source were required to obtain NPDES permit coverage. Such language, while not legally required, would help ensure that the allocation is properly characterized by the permit writer should the source's regulatory status change. This will help ensure that effluent limitations in a NPDES permit applicable to the newly permitted source are consistent with the requirements and assumptions of the TMDL's allocation to that source.

Such recharacterization of a load allocation as a wasteload allocation would not automatically require resubmission of the TMDL to EPA for approval. However, if the TMDL's allocation for the newly permitted source had been part of a single aggregated or gross load allocation for all unregulated stormwater sources, it may be appropriate for the NPDES permit authority to determine a wasteload allocation and corresponding

effluent limitation specific to the newly permitted stormwater source. Any additional analysis used to refine the allocation should be included in the administrative record for the permit. In such cases, the record should describe the basis for (1) recharacterizing the load allocation as a wasteload allocation for this source and (2) determining that the permit's effluent limitations are consistent with the assumptions and requirements of this recharacterized wasteload allocation. For purposes of this discussion, it is assumed that the permit writer's additional analysis or recharacterization of the load allocation as a wasteload allocation does not change the TMDL's overall loading cap. Any change in a TMDL loading cap would have to be resubmitted for EPA approval.

If you have any questions please feel free to contact us or Linda Boornazian, Director of the Water Permits Division or Benita Best-Wong, Director of the Assessment and Watershed Protection Division.

cc: Association of State and Interstate Water Pollution Control Administrators
Water Quality Branch Chiefs, Regions 1 -- 10
Permits Branch Chiefs, Regions 1 – 10