Third-Party TMDL Development

Tool Kit

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Preserving & Enhancing the Global Water Environment

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Contents

What Is a TMDL?	5
What Is a Third-Party TMDL?	5
Basic Steps of a Third-Party TMDL	7
Appendix 1. Third-Party TMDL Case Studies	17
Appendix 2. Glossary	28

What Is a TMDL?

What Is a TMDL?

A total maximum daily load (TMDL) specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards.

The Clean Water Act

The goal of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Under Sec. 303(d) of CWA, states, territories, and authorized tribes are required to develop lists of waterbody segments impaired by a pollutant and needing a TMDL. These impaired waters do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology. Impaired waters lists are submitted for approval to the U.S. Environmental Protection Agency (EPA) every even-numbered year on April 1. States, territories, and authorized tribes also establish a priority ranking of the listed waterbodies, taking into account the severity of pollution and uses to be made of the water (for example, fishing, swimming, and drinking water). TMDLs must then be developed for these waters unless a TMDL alternative exists. EPA issued regulations that implement CWA Sec. 303(d) in 1985 and 1992. These are available at www.gpoaccess.gov/ecfr/ under Title 40, Part 130, Subpart 130.7.

Components of a TMDL

The total load, or "loading capacity," of a waterbody is set at a level necessary to achieve the applicable water quality standards. The TMDL calculation is made up of wasteload allocations (WLAs) and load allocations (LAs) that allocate pollutant loadings to point and nonpoint pollutant sources, respectively. Point sources are defined by CWA as those transported by a discrete conveyance, whereas nonpoint sources are more diffuse in nature. A TMDL calculation must also contain a margin of safety (MOS) and a consideration of seasonal variation. A TMDL is described mathematically as

$$\mathbf{TMDL = \Sigma\ WLAs + \Sigma\ LAs + MOS}$$

What Is a Third-Party TMDL?

What Is a Third-Party TMDL?

The term third-party TMDL denotes a TMDL in which an organization or group other than the lead water quality agency takes responsibility for developing the TMDL document and supporting analysis. This is closely related to the situation in which a stakeholder collaborates with the lead agency in the completion of one or more steps in the TMDL process but does not have full responsibility for its development. A third party can be a watershed group, municipal wastewater or stormwater discharger organization, industrial discharger entity, other unit of government (such as a county, city, municipality, or land management agency), or nonpoint source organization (such as a farm bureau, irrigation and drainage district, or landowner).

What Is Different About a Third-Party TMDL?

Other than the third party taking the lead role for developing the TMDL document and supporting analysis, there is nothing different about a third-party TMDL. State agencies, rather than third parties, ultimately adopt TMDLs and submit them for approval to EPA. Thus, the elements of a TMDL developed by the third party must be adopted by the state. To ensure that third parties understand how their involvement will influence TMDL development, it is important that third-party projects include clear agreements about how the water quality decision agency will use the third-party products.

Levels of Third-Party Involvement

The ultimate regulatory responsibility for development of the TMDL generally lies with the state through its lead water quality agency, although EPA occasion-

ally will develop TMDLs to meet legal obligations. It is frequently appropriate, however, for third parties to be involved, and this degree of third-party participation can vary substantially, from leading the TMDL development effort to providing comments on state efforts. The State of Texas has developed guidance in this area titled *Public Participation in TMDL Projects: A Guide for Lead Organizations* (currently out of print and being revised in 2007). The guidance categorizes the levels of stakeholder participation in TMDL projects as "Involved," "Consultation," and "Collaboration." The action levels associated with the categories are described as follows:

- Involve – inform stakeholders and give them the opportunity to comment.
- Consult – work with stakeholders to ensure that they understand the issues and their ideas are considered.
- Collaborate – stakeholders provide advice and innovation in formulating the project and share in decision-making.

Other states may have somewhat different descriptions of the range of stakeholder involvement that their regulations and policies support. In general, states involve third parties at least to the extent of notice and comment on draft TMDLs. Stakeholder consultation can be either structured or unstructured through such forums as advisory groups and public meetings. Stakeholder collaboration goes the next step of sharing responsibility and decision-making for conducting certain steps of the TMDL process. This may include data collection, source assessment, and modeling to determine the loading capacity of the waterbody. Finally, the third party may take the lead in developing the TMDL. Third parties must consider whether they are interested in taking a lead role for the development of part or all of a TMDL. The four case studies included in Appendix 1 provide prospective third parties with a better understanding on which to base this decision. Several benefits to third-party involvement and some common pitfalls are outlined in the next two sections.

Potential Benefits of Third-Party Participation in TMDL Development

Third parties are often very familiar with local watershed issues. They can provide valuable insights to the TMDL process. The involvement and economic support of third parties can leverage state funds, as well as the resources and expertise of other agencies and nongovernmental organizations. Greater funding can improve data quality and analysis supporting the TMDLs. Although the state must sanction TMDL decisions, third-party entities can be directly involved in decisions on TMDL approaches. This may improve the level of stakeholder support for the TMDL, increasing the likelihood of effective implementation of pollutant controls. The involvement of more nongovernmental entities may also increase the degree of public understanding of TMDLs and water quality protection issues through more opportunities for public involvement and education.

Potential Pitfalls for Third Parties

Third parties also should consider some of the common pitfalls to third-party TMDLs prior to making a decision to proceed with one. Third-party TMDLs often can be more expensive and time-intensive than more traditional agency-driven TMDLs simply because of the greater time it takes to develop a TMDL while including more stakeholders and potentially more detailed studies and data collection. The third party should consider whether it has adequate staff and technical resources. The needs of the state are important in any decision about whether to develop a third-party TMDL. The state may not have adequate staff resources to participate, which can slow the process, or the state may be on a shorter timeframe than the third-party process will allow. The third party needs to be aware that many "innovative" approaches that entities would like to see in TMDLs may not meet TMDL or CWA requirements and, therefore, are not possible. In many cases, the process can be sidetracked if parties introduce non-TMDL issues or if the third party is viewed by others as a biased entity serving the interests of a subset of stakeholders.

Basic Steps of a Third-Party TMDL

Figure 1 presents the steps that third parties should follow in TMDL development.

Step 1. Decide Whether the Third-Party Approach Is Right for the Situation

It is important for third parties to take the time early in the process to determine whether a third-party TMDL is the right approach to address their concerns. Before making a decision to embark on developing a third-party TMDL, the third party should carefully evaluate the level of effort that will be needed to perform the TMDL study, write the TMDL, get the TMDL approved, and ultimately achieve the required water quality endpoints. Sidebar 1 contains a list of questions that third parties considering leading the development of a TMDL should review. If the answers to the questions do not indicate that leading the development of a third-party TMDL is the best approach, the third party may want to stay involved in the TMDL process at a different level of participation.

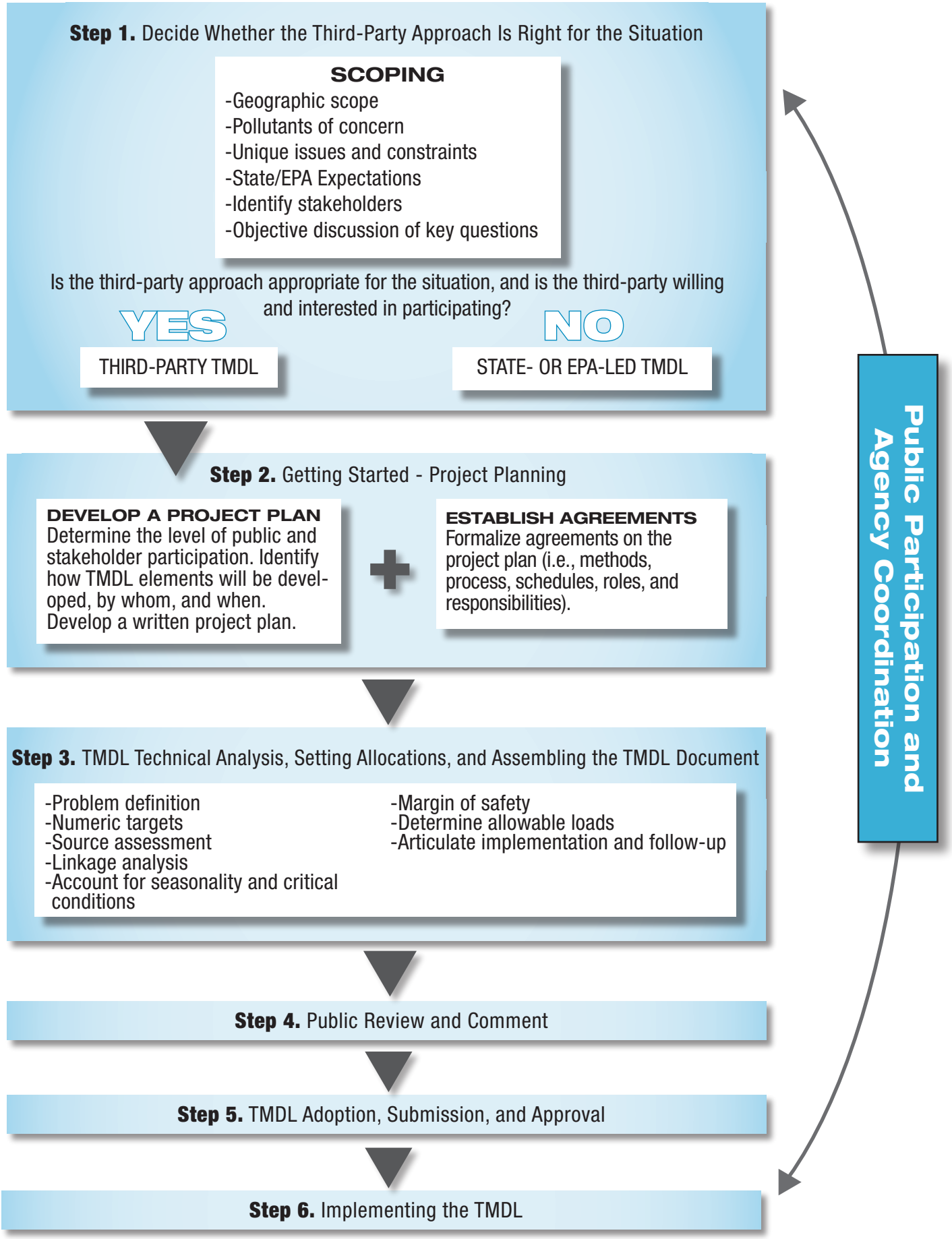
When answering the question, "Is a TMDL the right vehicle?" the third party should be clear about its interests as they relate to developing a TMDL. For example, if the third party believes that the listed impairment is not due to poor water quality but rather is a function of a flawed water quality standard, then perhaps its efforts would be better focused on seeking to change the water quality standard. Likewise, if available data indicate that the impaired water is materially "different" from a typical water to which the water quality standard for the pollutant of concern applies, then perhaps the third party should consider pursuing development of a site-specific water quality standard. If the TMDL will not address the major pollutant(s) of concern to the third party, perhaps it would be better engaged leading an effort to develop a watershed plan addressing the pollutant(s) of concern. In the specific cases where a water quality impairment is already being addressed by the state through other pollution control requirements, the third party may be better served by documenting this and working with the state to move the water to Category 4b on the state's integrated report (see Sidebar 2).

Sidebar 1. Is the Third-Party TMDL Approach Right for Your Situation?

1. Is a TMDL the right vehicle, or is a water quality standards change or a watershed plan preferable?
2. Does the state have the time, resources, and interest in collaborating with you to develop the TMDL? If the state has already started the TMDL, there is little chance it will want to transition it to a third party.
3. Can you support and facilitate an inclusive stakeholder group? Do you have access to good facilitation skills? You may want to engage a neutral facilitator with experience in watershed planning or TMDL development.
4. Can you develop a TMDL objectively? If you already "know" what the TMDL and its allocations should be, you probably cannot be objective. What is the reputation of your group among likely stakeholders? Even if you think you can be objective, the other stakeholders may not agree.
5. Does the project have sufficient financial resources?
6. Does the project have access to sufficient human and organizational resources?
7. Can you complete the TMDL within an appropriate timeframe? If not, both funding and people's interest and available time may run out.
8. Is there agreement with TMDL decision-makers on how they will use third-party work products?

As part of the scoping step to determine whether to lead a third-party TMDL, the third party must contact the state water quality agency to determine if the state is interested in third-party development of the particular TMDL. The state must be willing to use third-party products and have the staff time to participate in the process for a successful TMDL. The third party also may want to contact other potential stakeholders to discuss their interests and needs. Sidebar 3 lists some possible topics that should be explored in these conversations and meetings.

Figure 1. Third-Party TMDL Development Process



Sidebar 2. Alternatives to TMDLs (i.e., Category 4b)

U.S. EPA has recognized that alternative pollution control requirements may obviate the need for a TMDL. Segments are not required to be included on the CWA Sec. 303(d) list if technology-based effluent limitations required by the act; more stringent effluent limitations required by state, local, or federal authority; or "[o]ther pollution control requirements (e.g., best management practices) required by local, State or Federal authority" are stringent enough to implement applicable water quality standards within a reasonable period of time. States that report the condition of their waters according to EPA's Integrated Reporting Guidance report these segments in Category 4b of their integrated report. The guidance, including additional information on EPA's expectations for Category 4b, is available at www.epa.gov/owow/tmdl.

Another important issue to consider during this project planning phase is the estimated cost of developing the TMDL. The third party must decide whether — acting alone or in collaboration with interested stakeholders — it can finance the TMDL either directly or through a grant. A third party should, as accurately as possible, estimate TMDL development costs and establish funding sources before beginning TMDL development. Third parties typically fund the majority of third-party TMDL costs. Sidebar 4 lists some possible funding sources.

Finally, it is critical for the third party to ensure that it has or can acquire the professional expertise needed for the more technical aspects of TMDL development and that there is a "critical mass" of committed stakeholders willing and able to devote the time needed to "steer" the process. Third parties should be realistic when estimating the time required to develop a TMDL. The process, especially when significant stakeholder input and review are achieved, can be a lengthy endeavor, taking from several months to a few years. Sidebar 5 lists some of the expertise that is likely to be needed to develop a TMDL.

At the end of this step, it is important that the third party conduct a "reality check," to make sure that leading a TMDL is worth the time, effort, and resources required.

Step 2. Getting Started — Project Planning

Develop a Project Plan

After completing Step 1 and determining that a third-party TMDL is appropriate, the actual work of developing the TMDL begins. This step of the process can be broken into discrete stages. The first stage is to plan the project approach in significantly more detail. This entails determining the specific tasks that must be completed to

Sidebar 3. Possible Topics To Explore With Interested Parties Who May Be Asked To Join the Third-Party TMDL Project

1. What are their needs, interests, and outcome preferences with respect to the pollutant(s) that would be the focus of the TMDL?
2. Do they think a third-party TMDL is a good idea?
3. Would they be willing to commit significant time and, at the very least, personnel resources to the effort?
4. What resources could they bring to the project (such as funding, specialized expertise, knowledge of the watershed, and the ability to network or bring others to the table)?
5. What role do they see their group playing? Would they like to play a leadership role, including perhaps serving on a management or steering committee? Would they rather be an active participant in one or multiple steps of the TMDL development? Would they rather serve in the role of an objective reviewer?

Sidebar 4. Possible Sources of TMDL Funding

1. Discharger funds:
   - Fees from municipal and/or stormwater management districts, agencies, or authorities.
   - Fees and donations from industrial wastewater dischargers.
   - Contributions and donations from businesses (and others) that discharge into or use the affected water for recreation.
2. State or local governments.
3. Federal grants:
   - www.Grants.gov.
   - *Catalog of Federal Funding Sources for Watershed Protection* (cfpub.epa.gov/fedfund).
   - *Directory of Watershed Funding Resources* (www.epa.gov/owow/funding.html).
   - Other EPA funds (not likely to be a significant source).

produce the TMDL and identifying who is responsible for completing each task. For example, will in-house expertise be used, or will consultants be needed? If consultants are needed, what type of consulting services and expertise will be required, how will the third party select the consultants, and how will it pay for their services? Are there interested stakeholders with needed expertise who can be approached to donate services and time?

If a number of groups or individual stakeholders (or both) make up the third party, should the third party establish a management or steering committee that is tasked with further developing the overall "Process" and "Procedures" portions of the TMDL project plan? Steering committee responsibilities could include establishing other committees (such as a technical advisory group), clarifying roles and responsibilities, and reaching agreement on clear decision-making methods, rules, and other matters. During this timeframe, the roles of the regulators who ultimately will have to review and approve the TMDL should be clarified further.

Sidebar 5. Types of Expertise Likely To Be Needed

- Hydrology
- Data organization and management
- Water quality modeling
- Data evaluation
- Facilitation of water quality planning projects
- Legal and regulatory expertise for water quality standards interpretation and mediating agreements between parties

As a part of project planning, an inventory of existing data, studies, and overall knowledge available on the water quality issues should be developed. If a technical advisory group has been established, the third party should use this group or committee to review and comment on everything from available data that will be used to develop the TMDL, to the approach that will be used to quantify the TMDL pollutant load allocations (such as watershed modeling or another method), to reviews of technical work products.

As presented in Figure 1 and throughout this Tool Kit, public participation should apply to all steps of the TMDL process. However, there is no "one size fits all" model for public participation in a TMDL process. Each community of stakeholders and set of water quality challenges is different, and the public participation structure should reflect those differences. Deciding on the most appropriate public participation structure is best achieved by assessing a number of variables and conditions that will affect and, therefore, influence the process. As part of project planning, determining the level of public and stakeholder participation in the TMDL process is important and shapes the types of steering and advisory committees needed. The steps in Sidebar 6 can be followed to assist in determining the type of approach to use.

Formalize Agreements

The objective of the next stage is to make the project "transparent" by documenting the process and the procedures through which the TMDL will be developed. One common characteristic of successful TMDLs led by third parties has been the existence of clearly defined TMDL development processes and procedures and a

Sidebar 6. Determine the Type of Public and Stakeholder Participation in the TMDL Process

1. **Identify stakeholders.** Identifying the broad range of stakeholders is a key first step. Not all stakeholders are equally involved with a TMDL decision.
2. **Identify desired outcomes.** Potential third parties should have a comprehensive understanding of what they seek to achieve through the TMDL effort. This also informs the public process. The public is a collection of stakeholders and interests, each at various stages of understanding of a water quality issue. The intended outcomes of third-party sponsors, state agencies, and EPA may differ from other stakeholders. Ideally, the third-party sponsors (in collaboration with regulating agencies) will identify preliminary desired outcomes as they develop the project plan. These outcomes may evolve over time, but identifying them early is essential to help educate potentially involved stakeholders about the basis for TMDL actions. In later steps, third parties should ask stakeholders what their intended outcomes are. This is necessary to understand public sentiment but also entails some risk, since asking such questions can create false expectations among stakeholders. Therefore, it is essential for third parties to be sensitive and tactical in how they craft questions, outreach materials, and speaking points.
3. **Assess the public's role and impacts to the public.** The role of public stakeholders can vary. For example, the impact of a TMDL on the public for a waterbody bordered by public lands is different from that of a waterbody bordered by residences. Equitably assessing the impacts to the affected public is a first step in determining their role. Involving potentially affected stakeholders in this assessment is equally valuable. While some project sponsors avoid asking such questions of the public, not asking means members of the public may presume potential impacts and assume that project sponsors are "hiding" something. This can be avoided by sharing with stakeholders anticipated impacts for them to review, affirm, and revise.
4. **Design the public participation process.** Public participation should not happen by accident. While it is wise to allow for flexibility in these efforts, it also is beneficial to be intentional about what is being done and why. Once the role of the public has been assessed, the next step is to design a public process that fits the roles, expectations, and outcomes. An important consideration for third parties leading TMDL development is what is being achieved by the public process. The International Association of Public Participation (see www.iap2.org/associations/4748/files/spectrum.pdf), which is not directly related to TMDL development, describes the following spectrum of public participation:
   - Inform.
   - Consult.
   - Involve.
   - Collaborate.
   - Empower.

   Each successive level involves heightened levels of public participation and expectations about the role stakeholders will have in the outcomes. A process designed largely to inform the public could rely on public meetings with a fairly strict presentation structure. A process designed to consult with stakeholders might include focused workshops wherein stakeholders are asked to interact with project sponsors. A process designed to collaborate would include designated stakeholder spokespersons working in a structured negotiation to create mutually acceptable recommendations. Empowerment (infeasible in a TMDL effort) would replicate methods used to collaborate but would defer final decision-making authority to affected stakeholders. In each case, a critical responsibility of the third-party sponsors is to describe the goal and define expectations. The highest degree of risk to any public participation process is to have stakeholders and sponsors working with different expectations about the purpose of the process and the use of derived information and recommendations.

clearly defined mechanism (a formalized project plan) for modifying those processes and procedures, should the need arise. Developing and agreeing on a well-defined project plan can take time. However, experience has demonstrated that this time is well spent, because it not only builds in accountability and transparency, it provides the third party and other stakeholders with a common objective, reducing the potential for misunderstandings. Sidebar 7 lists the qualities of a successful project that can guide the project planning efforts.

The project plan should include a set of written procedures establishing methods, the schedule for completing the specific tasks, and roles and responsibilities. Establishing project schedules may be extremely difficult, but third-party groups should avoid the temptation to establish schedules only for the "next couple of steps." The schedule should be detailed, realistic, and well thought out. The only way to set realistic dates for various milestones is to identify, for each major milestone, at least the next level of key actions that must

Sidebar 7. Qualities of Successful Projects

1. **Conduct early, broad project scoping.** Stakeholders who are considering participating in a TMDL should make sure that this is what they really want. They should contact other parties who might have similar interests, investigate funding, and secure commitments. They also should clarify geographical and pollutant scopes for the TMDL as much as possible.
2. **Coordinate early with the state and EPA to clarify expectations.** Discuss the project at an early point with the state and EPA to determine that a third-party TMDL effort would meet with state approval and what expectations and constraints would accompany the effort.
3. **Make clear agreements on who will do what, and when.** It is critical to make written agreements with regulators and formal collaborators to avoid misunderstandings so that each party knows what is expected.
4. **Focus early on implementation needs and methods.** In order to determine what stakeholders are likely to be affected by the TMDL outcome, it is important for the third-party TMDL to consider implementation needs and methods at an early point in the process. This may indicate what additional stakeholders should be contacted about possible involvement.
5. **Use independent technical and peer review.** Consider using an independent technical and peer reviewer to provide additional assurance to others of the objective, unbiased, and technically sound basis for the TMDL.
6. **Use a facilitator or process assistance if needed.** Facilitation can
   - encourage team development,
   - help set and enforce ground rules,
   - ensure participation by all members,
   - allow for the respectful free flow of ideas,
   - coordinate with outside organizations as necessary,
   - keep meetings on track and focused,
   - coordinate outreach to help ensure all appropriate stakeholders are involved early in the process,
   - publicize meetings to help ensure consistent attendance, and
   - ensure distribution of meeting proceedings, group reporting, and materials.
7. **Set clear decision rules.** The decision-making process for third-party TMDL development should be in writing and as transparent as possible to provide increased assurance of an unbiased process. This will enhance the likelihood of state approval.
8. **Do not get stuck in process, but move forward and make decisions.** There may be an increased tendency for the third-party TMDL process to bog down and get stuck because of stakeholder involvement in decision-making. It is important that all parties follow the agreed-upon schedule for TMDL completion.

be completed in order to accomplish each milestone. Among the elements that should be included in the project plan is a schedule of how often the steering committee and any subcommittees will meet.

The plan should clearly identify which parts of the TMDL the third party will take the lead to develop and which sections, if any, EPA, the state, or another involved party will take the lead to develop. The entities may want to sign a memorandum of agreement between the third party, the state, and possibly EPA to formalize the arrangement.

Step 3. TMDL Technical Analysis, Setting Allocations, and Assembling the TMDL Document

Regardless of whether the traditional state regulatory agencies, EPA, or a third party develops the TMDL, the TMDL must contain certain elements and provisions to comply with CWA. The elements that are described in Step 3 document the linkage between receiving waters and pollutant sources and allocate pollutant loads such that water quality standards are attained. These minimum elements are described in EPA's 1991 *Guidance for Water Quality Based-Decisions: The TMDL Process.* A convenient checklist of elements necessary for EPA regions to approve TMDLs is included in the *Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992.* These and other guidance documents are available on EPA's Web site at www.epa.gov/owow/tmdl/policy.html. Additionally, technical guidance on certain types of TMDLs, such as nutrient, pathogen, and sediment TMDLs, is available at www.epa.gov/owow/tmdl/techsupp.html.

Sidebar 8. Tips and Traps

1. Set TMDLs, load allocations, and wasteload allocations numerically and comprehensively to avoid ambiguity.
2. Ensure that TMDLs meet all applicable water quality standards. CWA requires this. The TMDL process cannot be used as a "back door" method to change water quality standards.
3. Many uncertainties exist in TMDL development. Environmental data and modeling are often imprecise. Acknowledge uncertainties, but do not allow the process to be paralyzed by them. Adaptive management can ensure that decisions made today will be re-evaluated in the future.
4. Working with state and key interest holders during TMDL development can help ensure successful TMDL adoption and implementation.

The following elements are included as a cursory overview of the necessary components of an approvable TMDL. For more detailed guidance, see EPA and state TMDL Web sites.

1. Identify and describe the impaired waterbody, including its location, the impaired designated use, and the pollutant of concern.
2. Characterize the watershed and pollutant sources. This includes delineating the watershed; quantifying land use and land management practices; describing hydrologic and geologic characteristics; and identifying and locating loads from all pollutant sources (point and nonpoint).
3. Describe applicable water quality standards and water quality objectives and targets. All TMDLs must link back to the existing water quality standards applicable to that waterbody and the pollutant of concern. Water quality standards include the designated use of the water, applicable numeric or narrative criteria, and the state's antidegradation policy for that water. A quantitative target must be identified to signify the attainment of the water quality standard. In some cases, a surrogate measure will be used to measure attainment of a narrative criterion — for example, turbidity for sediment, or chlorophyll for eutrophication. When the pollutant of concern is not explicitly addressed by the water quality target, a linkage between the two should be made.
4. Link the pollutant of concern to water quality within the impaired waterbody. The TMDL should describe the cause-and-effect relationship between the impaired waterbody and the pollutant sources and determine the total loading capacity. This is often accomplished by using a water quality simulation

model. Critical flow and water level conditions, as well as seasonality, must be considered when linking pollutant loading with water quality.

5. Develop a pollutant allocation scenario. Load allocations attributed to current and future nonpoint sources, including natural background sources, must be identified through reasonably accurate estimates via data analysis or water quality simulation modeling. Wasteload allocations attributed to current and future point sources must also be identified. Each individual point source must be assigned a WLA from which National Pollutant Discharge Elimination System permit limitations are established.
6. Assign an MOS to account for uncertainty or lack of knowledge about the relationship between pollutant loads and water quality. The MOS may be explicitly set aside as a specific fraction of the TMDL loading capacity, or it may be implicit and accounted for by making conservative assumptions when developing the pollutant allocation scenario.
7. Ensure that seasonal variation in pollutant loads is considered and that the allocations are protective enough to meet standards in all seasons.
8. Provide assurance that nonpoint source pollution controls will be implemented. In cases where a waterbody is impaired by both point and nonpoint sources, and the WLA was established on the premise that nonpoint source load reductions would occur, there must be reasonable assurance that those load reductions can be effected through best management practices and other control measures.
9. Develop a monitoring plan to track water quality improvement. Adequate monitoring is crucial to ensure that corrective measures implemented to achieve the TMDL pollutant allocation are effective and to compile data to inform future adjustments to TMDL implementation activities (i.e., adaptive implementation).
10. Develop a TMDL implementation plan. While CWA does not specifically require this element, a plan for implementing corrective measures to achieve the TMDL pollutant allocation is essential if water quality improvements are to be realized. In addition, stakeholders often focus on the implementation elements of a TMDL. Thus, by including implementation plans in TMDLs, third parties will ensure stakeholder engagement in the TMDL process.
11. Ensure public participation and review. See Step 2 for more information about public participation.

A Note on Setting Allocations

Setting pollutant allocations can be the most controversial part of TMDL development. Third parties, which are often point sources in the watershed, are sometimes viewed as biased entities. In the interest of greater stakeholder confidence in the TMDL, state agencies are often best suited to make allocation decisions. Many barriers exist to developing allocations that satisfy all stakeholders. In addition to basic technical and environmental considerations, this step introduces economic, social, and political considerations. Although some flexibility in allocations is possible, the sum of all allocations must meet the water quality standards in all segments of the waterbody. This step can often be a bottleneck to completing a TMDL successfully. A third party or state agency taking charge of this step should budget sufficient time and resources. Being clear with stakeholders about how allocation scenarios are designed and tested (i.e., how allocations are selected) can make this process easier. Keeping an eye toward implementation and factoring in implementation tools, abilities, and constraints during allocation selection are also important in gaining stakeholder confidence in the outcome of the TMDL.

Upon completion of the technical analysis and allocation decision process, the elements of the technical analysis and their accompanying supporting documentation are assembled into the TMDL document that will undergo public review and comment consistent with the applicable procedures and forums used for public involvement in that particular state and EPA region.

Step 4. Public Review and Comment

Ideally, public and stakeholder participation are part of the entire TMDL development process (see Step 2). However, after the development of the draft TMDL document, review is crucial. Additionally, it is recommended that third parties have some public review of their products before they are presented to the state agency. The

state agencies and EPA should indicate upfront their expectations about public participation and stakeholder involvement. Third parties can manage or assist the public participation process by conducting public meetings to share information on the methods, data, and assumptions that go into developing the TMDL, testifying in public hearings held by the state, and assisting the state in responding to comments. This public review should be used to re-evaluate the TMDL and make adjustments where appropriate. Third parties or state agencies should be clear how public input will be used and considered. Not all suggestions from stakeholders can be incorporated into the TMDL, and the level of discretion exercised by the TMDL developer should be made clear.

Step 5. TMDL Adoption, Submission, and Approval

TMDLs are submitted by states to EPA for approval. Third parties cannot directly submit TMDLs to EPA, which is why states must be onboard with all third-party efforts. The process for TMDL approval varies by state, since some states have formal TMDL adoption procedures that must occur prior to submission to EPA. Third parties may have to be involved in state adoption procedures to ensure their success. Early on, third parties should consult with the applicable state agency and EPA on their respective processes. This feedback from the agencies will guide the project planning, including the necessary steps that will lead to the TMDL approval.

In order for EPA to approve a TMDL, it requires the minimum elements described in Step 3 to be in place and documentation supporting those elements to be incorporated into the administrative record. By utilizing the checklist used by EPA in reviewing and approving TMDLs, the third party can anticipate what documentation will have to be provided to support the TMDL. The use of this template can help organize the information in a manner that facilitates review. Involving state and EPA staff throughout the development process will make reviewers proficient in the nuances of the TMDL, its analysis, and the rationale for decisions regarding allocation, monitoring, and implementation. In addition, clear and detailed documentation on methods, analysis, results, and conclusions, as well as overt public participation, will aid in the TMDL approval process.

CWA Sec. 303(d) does not require the development of TMDL implementation plans. But while implementation planning is optional within TMDLs from the federal perspective, states may have requirements and expectations for necessary follow-up in implementing the TMDL. In some states, these requirements may be formal and include an economic analysis justifying dedication of resources to implement the corrective actions prescribed by the TMDL or an analysis of the net impact of implementing the TMDL on state and local resources. However, whether or not implementation plans are required by the state, inclusion of an implementation plan in a TMDL can be useful for gaining stakeholder buy-in and ensuring that the TMDL results in water quality improvement.

Step 6. Implementing the TMDL

A TMDL is nothing but paper unless there is a concerted effort to see that the pollutant load reductions specified in the TMDL are implemented. Wasteload allocations in TMDLs are implemented by point sources through enforceable water quality-based discharge limits in National Pollutant Discharge Elimination System permits authorized under CWA Sec. 402. Load allocations in TMDLs are implemented by nonpoint sources through a wide variety of state, local, and federal programs (which may be regulatory, nonregulatory, or incentive-based, depending on the program), as well as through voluntary actions by citizens. Implementation is a coordination exercise involving the third party, other interested parties, the public, and the state agencies. In cases of nationally or regionally significant waterbodies, EPA may become involved in the post-TMDL follow-up steps to stay abreast of progress in improving the water quality of the resource of concern.

Just as TMDL development was guided by a project work plan that assigned responsibility for accomplishing the analysis and developing the elements needed

to produce a TMDL, implementation of that TMDL must be guided by a detailed implementation plan. Such a plan presents a timeline for installing necessary control practices, conducting follow-on monitoring within the waterbody and the watershed, and performing additional studies that could lead to adjustments to the desired endpoints of the TMDL and the associated allocations to the pollutant sources. Ideally, implementation planning will take advantage of the momentum generated while developing the TMDL. The transition from analysis to action then becomes seamless and expedites water quality improvement.

The implementation plan also should outline the feedback process that allows post-TMDL information and analysis to support adjustments to the TMDL or the implementation strategy. This feedback process is often referred to as adaptive implementation. Adaptive implementation involves taking some initial, informed corrective action, observing responses in the waterbody to those corrective measures, and then making necessary adjustments prior to proceeding with the implementation of additional corrective measures. Water quality monitoring undertaken during implementation should be extrinsically linked to the feedback process.

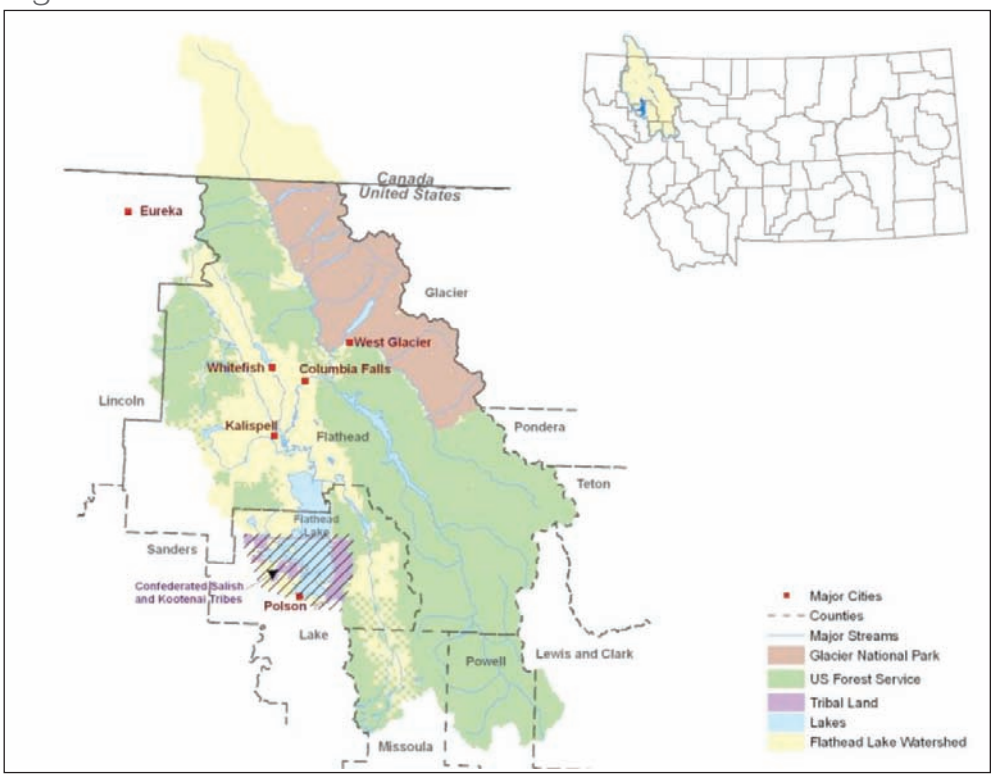
Implementation can require the investment of significant time and resources. The respective roles of the state and local jurisdictions and private parties in supporting those investments should be defined and coordinated prior to embarking on the implementation phase of the TMDL process. Investments take the form of capital improvements, dedication of labor, incentives for altering land use activities, collecting and analyzing monitoring data, and conducting research studies to address uncertainty within the original TMDL analysis.

Third parties should expect to immerse themselves in the implementation stage of the TMDL to ensure that the TMDL is acted upon in accordance with their vision of how water quality improvements should be accomplished and that the division of responsibility is borne equitably among all the interested parties. In many cases, the involvement of the third parties jumpstarts the implementation process faster than would occur through the more traditional agency-driven TMDL process. The result is an accelerated improvement in the condition of the impaired water and a more directed and cohesive community effort in watershed and water quality management.

Appendix 1. Third-Party TMDL Case Studies

1. Flathead Lake, Mont.

Figure 1. Flathead Lake Watershed



Lead Organization

The Flathead Basin Commission (FBC) initially assumed the lead role for total maximum daily load (TMDL) development. FBC was created by the Montana Legislature as a nonregulatory organization to monitor and protect water quality in Flathead Lake. FBC includes 23 members representing a wide cross-section of citizens and local, state, tribal, federal, and provincial agency representatives. The Montana Department of Environmental Quality (DEQ) ultimately assumed the lead role for TMDL development.

Stakeholders

FBC, DEQ, the Flathead Lake Biological Station, the Confederated Salish Kootenai Tribe (CKST), Canada, five counties and associated governmental entities, multiple municipalities, Flathead National Forest, the timber and agricultural industries, and others.

Partnership Description

FBC formed a partnership with the Flathead Lake Biological Station (a University of Montana research and education center) and CKST. FBC also contracted with a consultant. The Flathead Lake Biological Station conducted much of the water quality monitoring and data analysis. CKST conducted technical analyses and provided technical support. FBC's role was to oversee the effort, involve the public, and focus on implementation of a voluntary nutrient reduction strategy.

Role of State Regulatory Agency

The role of DEQ transitioned from providing technical, regulatory, and funding support prior to 2000 to taking the lead role in preparing the TMDL document after 2000.

Role of Regional Regulatory Agency

U.S. Environmental Protection Agency (EPA) Region 8 provided limited technical and regulatory support during the TMDL development. EPA's ultimate role was to review and approve the final TMDL document.

Funding Sources

EPA funded the initial TMDL project in 1993 with two separate grants, one to DEQ and CKST jointly. DEQ passed the funds from its grant on to the Flathead Lake Biological Station. The second grant was provided to FBC through a Clean Water Act Sec. 319 grant, and much of this money was used to hire a consultant to perform technical tasks and oversee implementation activities.

Watershed Description

The Flathead Lake Watershed encompasses approximately 7000 mi^2 in the northern Rocky Mountains (see Figure 1). The western half of Glacier National Park and the Bob Marshal Wilderness area are located within the

watershed. Flathead Lake's headwaters are in British Columbia, and the southern half of Flathead Lake is within the CKST reservation. Approximately 72% of the watershed is forested, with urban and agricultural land uses found predominantly in the lower relief valley bottoms. The region is experiencing rapid population growth and suburban sprawl.

TMDL Parameter and Source Characterization

This TMDL focused on nutrients (nitrogen and phosphorus). Both point and nonpoint sources were considered, including municipal wastewater treatment facilities, agriculture, urban areas, septic systems, silviculture, and natural background nutrient loading. Source loads were quantified by subwatershed (total tributary loads), based on long-term monitoring data, and by source category (for example, urban areas, managed forest, septic systems), based on synoptic sampling results, simple calculations, and available data.

Project Overview

Motivation to use third-party approach. In the late 1990's, DEQ was promoting a third-party approach for TMDL development and sought out watershed stakeholder groups that might be interested in taking on TMDL projects. Given FBC's role of monitoring and protecting water quality in Flathead Lake, it was appropriate at that time for the commission to work with DEQ to prepare the TMDL.

Type of work performed (technical, political, etc.). The third party and partners performed various types of activities, including

- contract and grant management,
- public involvement,
- hosting of meetings,
- agency coordination,
- water quality monitoring,
- data analysis,
- development and implementation of a voluntary nutrient reduction strategy, and
- document preparation.

Unique circumstances.

- The watershed encompasses three distinct jurisdictional entities with regulatory authority over water quality, including British Columbia, the State of Montana, and the CKST reservation.
- The watershed includes a large number of varied stakeholders.
- The watershed has international significance and includes the Crown of the Continent Ecosystem, Glacier National Park, and the Bob Marshal Wilderness Area.
- State and federally listed endangered and threatened fish and wildlife, including bull trout, grizzly bears, and several lesser known species, occur within the watershed.
- The watershed is experiencing extremely rapid population growth, which is a highly political and contentious issue locally.
- A statewide TMDL schedule was imposed by the courts in Montana in 2000.
- Montana's TMDL Program was evolving and maturing rapidly throughout the entire Flathead Lake TMDL process.

Challenges

The challenges and unique circumstances presented above are interrelated. Additionally, the third party, FBC, struggled with interpretation of water quality standards issues and TMDL protocols; only limited guidance was available in Montana relative to the development of TMDLs; and the applicable water quality standards for nutrients were narrative in format. Interpretation of narrative standards is especially challenging, even for the regulatory agencies. Finally, the consultant hired by the third party to prepare the second draft of the TMDL document had never prepared a TMDL document. The learning curve was too steep, given the complex issues and schedule.

Outcome

The third party completed and submitted a TMDL document to DEQ in 1999. It was not approved, because it did not adequately address programmatic requirements. A second draft TMDL document was prepared in 2000 and reviewed by various stakeholders and DEQ. It was determined that the second TMDL document did not adequately address programmatic requirements. Ultimately, given a court-imposed sched-

ule and comments from various stakeholders urging DEQ to play a more active role in the TMDL development process, DEQ took over responsibility and completed the nutrient management plan and TMDL for Flathead Lake in 2001. The TMDL contained a phased allocation format. Various phases are ongoing to develop a better understanding of the relative importance of point and nonpoint sources in the watershed so that final allocations can be assigned to each significant source. FBC also is implementing its voluntary nutrient reduction strategy, which serves as one mechanism to implement components of the TMDL.

Implementation Planning

The final Montana DEQ TMDL (prepared by DEQ) was accepted by FBC and most of its partners, and it serves as the basis for FBC's voluntary nutrient reduction strategy. Implementation is ongoing and currently focuses primarily on voluntary nonpoint sources. Additional studies are also ongoing to finalize the allocation strategy for both point and nonpoint sources.

Timeframe

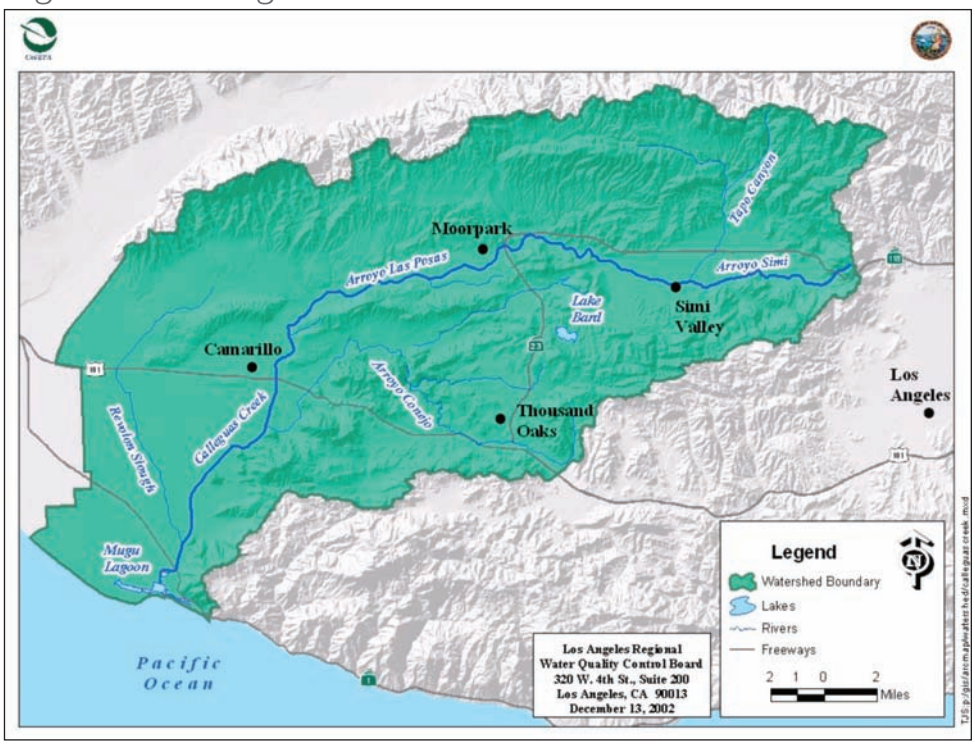
The third party was in a leadership role relative to TMDL development from 1993 until 2000. DEQ assumed leadership of the TMDL in 2000. EPA approved the TMDL document on March 31, 2002.

Lessons Learned

- Interpretation of complex, narrative water quality standards issues should be the responsibility of the state or federal water quality agency responsible for their development and enforcement.
- TMDL development in watersheds with a large number of varied stakeholders and multiple jurisdictions is a significant challenge for third-party TMDL leadership.
- It is very difficult for third parties to develop approvable TMDL documents without good guidance and examples. This is the responsibility of the water quality regulatory agencies.
- The state and federal water quality agencies responsible for TMDL development must be actively aware and involved in the entire third-party TMDL process.
- The third-party approach may not provide the responsible agency with sufficient schedule flexibility in states with court-imposed schedules.
- Without appropriate guidance, third parties and their project partners (including consultants) often lack sufficient technical and regulatory experience to produce sound scientific and approvable TMDL products. It is imperative that third parties understand the magnitude and complexity of the effort before deciding to proceed with a third-party TMDL.

2. Calleguas Creek, Calif.

Figure 2. Calleguas Creek Watershed



Lead Organization

Calleguas Watershed Group (CWG).

Stakeholders

CWG, the California Regional Water Quality Control Board (RWQCB), EPA Region 9, agricultural groups, environmental groups.

Partnership Description

CWG approached EPA and RWQCB with a proposal to take a lead role in TMDL development. After initial work on nutrient TMDLs, CWG, EPA, and RWQCB decided that a more formal technical and procedural agreement was the best approach. The three groups signed a memorandum of agreement (MOA) that included schedules, coordination procedures, and approaches for several additional TMDLs over a 5-year period.

Role of State Regulatory Agency

RWQCB is primarily responsible for TMDL development in the Los Angeles region. RWQCB staff were closely involved in each stage of planning and execution of the project. The state entered into a detailed MOA with CWG detailing roles, responsibilities, schedules, and other project understandings.

Role of Regional Regulatory Agency

EPA Region 9 was involved from the start of the process. It provided approximately $1 million in funding over several years. EPA technical staff were closely involved in the development of technical approaches and allocation planning during the project.

Funding Sources

EPA provided $1 million in funding through grants to CWG. Local water districts and wastewater agencies contributed approximately $4 million.

Watershed Description

The TMDLs address the Calleguas Creek Watershed (see Figure 2). Calleguas Creek drains a 340-mi^2 coastal watershed located north of Los Angeles. Land use is rapidly changing from undeveloped and agricultural land uses to urban and suburban residential land uses. Most of the waters in the watershed are ephemeral or downstream from wastewater reclamation plans and, therefore, are effluent-dependent. Pollutant problems identified include chlorides and other salts, nutrients, metals, organic pesticides, sediment, and aquatic toxicity. Water quantity management issues are closely intertwined with quality issues as the stakeholders struggle to manage groundwater quality, water supply concerns, and surface water quality issues.

TMDL Parameters and Source Characterization

Pollutants included nutrients, metals, pesticides, toxicity, other organic toxicants, sediment, and other salts.

CWG hired a technical contractor to conduct the

data collection, modeling, and analysis to develop the recommendations for the TMDLs. Pollutant loadings were characterized through analysis of water quality data and wet weather loading model results.

Project Overview

Motivation to use third-party approach. CWG was formed to develop watershed-scale solutions to water supply and water quality issues. The principal driver behind the initial efforts of the group was concern about salts in wastewater effluent discharges and the need to provide for disposal of brines generated through wastewater treatment. From this work, it became apparent that TMDLs would be necessary as a planning mechanism through which water quality control burdens would be apportioned within the watershed.

Process used. CWG approached EPA Region 9 and RWQCB with a proposal to take the lead role in the development of TMDLs. CWG has hired a contractor to perform the technical work for TMDL development. CWG convened several technical and policy advisory committees to oversee the process and provided for independent peer review by a team of outside scientists identified by EPA, RWQCB, and CWG. EPA and the state assigned senior technical staff to work with the contractor and CWG staff throughout the process. Stakeholders, including environmental groups, have had input throughout the process. Stakeholder support has generally been strong.

Type of work performed (technical, political, etc.). The group and its contractor have collected monitoring data, performed complex modeling and other water quality analysis, assessed options for numeric targets, completed source analysis, developed TMDL and allocation scenarios, and led a negotiation process to develop a TMDL package for consideration by RWQCB. The group also has completed work designed to support adoption of site-specific copper standards based on EPA's 1994 water effect ratio recalculation method.

Unique circumstances. In California, specific implementation plans must be adopted concurrent with TMDL adoption. CWG has developed implementation plans that specify responsible parties, required actions, monitoring plans, follow-up studies, and associated schedules for consideration by the state.

Challenges

These TMDLs were developed through two different processes. Phase 1 TMDLs focused upon nutrient-related effects. The CWG group and its contractor unilaterally developed the nutrient TMDL recommendations without coordinating closely with the state, EPA, or other stakeholders. As a result, misunderstandings and miscommunications between the regulatory agencies and CWG arose that made it difficult for the state to rely fully on the CWG technical work to adopt the TMDLs. The nutrient TMDLs were adopted with some modifications.

The Phase 2 TMDLs were developed using a more formal process through which formal agreements on the project's scope and methods were reached in advance with the state and EPA, and other stakeholders were more fully involved early in the process. This more collaborative approach has reduced misunderstandings and enabled the TMDLs to be adopted without extensive reworking by the state or EPA.

Environmental groups have not participated in the process as much as expected. Some groups had concerns that they were unable to conduct detailed technical reviews of the complex TMDL modeling and analysis work. The state and CWG developed a plan that allowed independent technical experts to review the science on behalf of the environmental groups. This alleviated some of the groups' concerns. The groups do have difficulty participating regularly in the intensive TMDL advisory group meetings that accompany the TMDL public process.

Outcome

The TMDL work was completed mostly on schedule. A large set of toxicity, PCB, organic pesticide, and sediment TMDLs were completed, adopted, and approved by EPA through this partnership, in addition to the original nutrient TMDLs. All consent decree schedules have been met.

All parties are reasonably satisfied with the partnership so far and believe ongoing and intensive involvement in each step of the process is key to timely completion of the TMDLs and resolution of issues that arise during the process.

Implementation Planning

Under California law, TMDL decisions must be accompanied by an implementation plan that specifies the implementation approach and responsibilities of individual allocation holders. CWG and its contractors developed detailed, phased implementation plans for each of the TMDLs they developed. These plans provide several years to conduct follow-up monitoring and studies that may support TMDL revisions in the future and to begin implementation of treatment upgrades, stream restoration projects, and improved nonpoint source management practices. The group is interested in devising cross-cutting implementation approaches that address pollutant discharges to surface water while also addressing water supply and groundwater protection needs. It was a challenge to develop the TMDLs through a stepwise approach while also addressing this desire for more coordinated, comprehensive implementation approaches.

Timeframe

EPA and RWQCB developed and established the chlorides TMDLs in 2002. The first CWG-led TMDLs (for nutrients) were developed from 2000 to 2002, adopted by the state in 2002, and approved by EPA in 2003. The second-phase CWG-led TMDLs (for several other pollutant groups) are being developed over a 5-year period between 2003 and 2007. The TMDL groupings and timeframes for completion are as follows:

- organophosphate pesticides and toxicity (2005);
- legacy chlorinated pesticides, PCBs (2005);
- metals (2006);
- salts and trace elements (2007); and
- bacteria (2007).

Lessons Learned

Close involvement by state and EPA water quality staff has been critical to ensuring that the analytical approaches would result in approvable TMDLs. The completion of a formal MOA between the state and CWG has assisted in keeping the project largely on schedule. Difficulties in supporting environmental group involvement throughout the process have hampered efforts to build support for the proposed TMDLs among all stakeholders. Efforts to develop site-specific water quality standards concurrently have been less successful, as the state and EPA have limited capacity to address TMDL adoption and water quality standards changes simultaneously. The existence of consent decree deadlines helped keep the project moving on schedule. CWG leadership has probably improved the prospects for TMDL adoption and implementation.

3. Lower Truckee River, Nev.

Lead Organizations

City of Reno, Nev., and City of Sparks, Nev.

Stakeholders

Reno, Sparks (regulated communities); Washoe County, Paiute Tribe of Pyramid Lake (downstream interests); Nevada Department of Environmental Protection (DEP), EPA Region 9 (regulators).

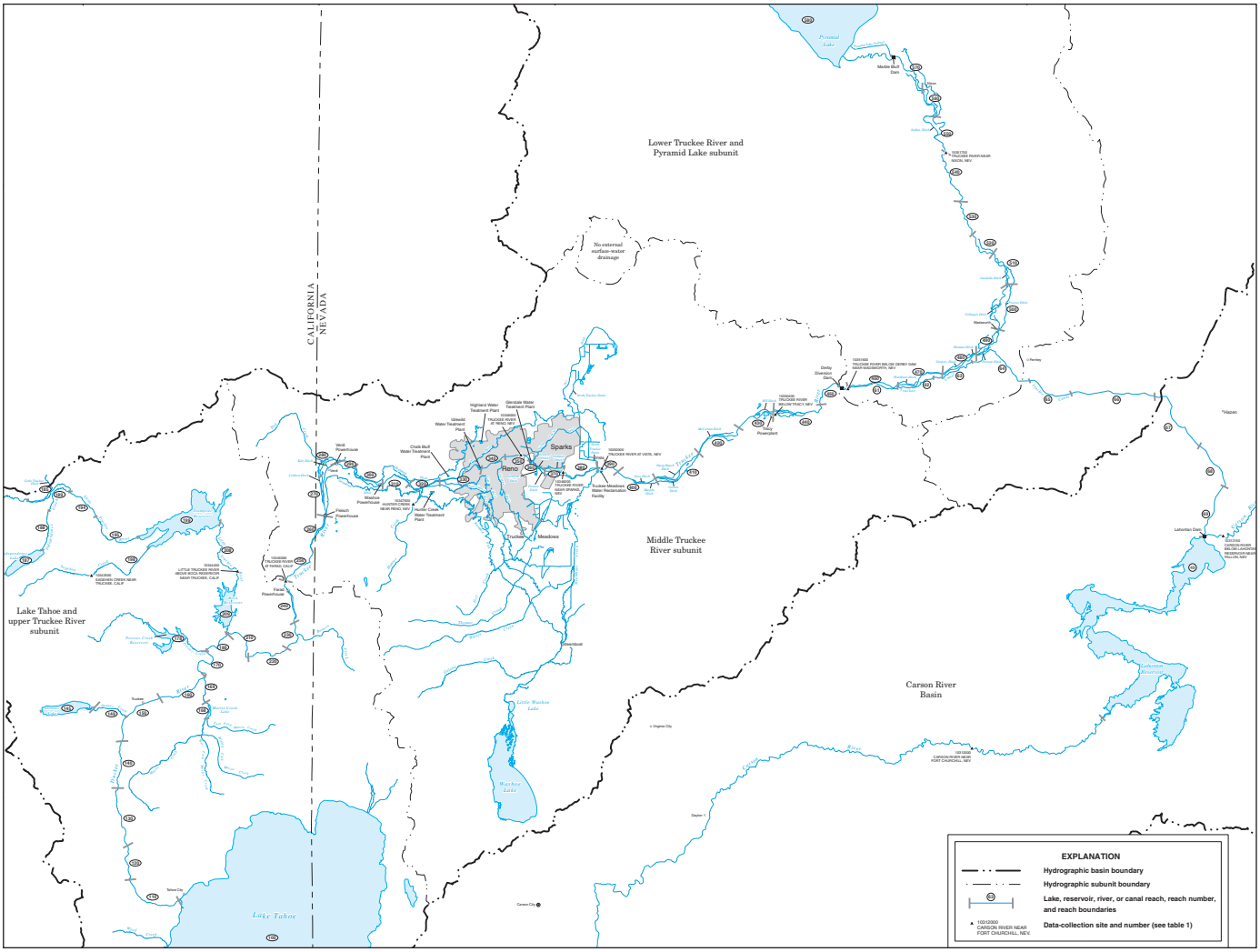
Partnership Description

The cities contracted the Center for Collaborative Policy at the California State University at Sacramento to assess the stakeholders and identify any issues that would hinder a collaborative effort to reach agreements on this issue. This assessment, currently under way, has identified up to 35 interested parties having a stake in the outcome of the Lower Truckee River TMDL.

Role of State Regulatory Agency

DEP remains the primary manager of the state TMDL

Figure 3. Lower Truckee River Watershed



Fecal Coliform Total Maximum Daily Load for the Upper North Buffalo Creek Watershed, City of Greensboro, Guilford County- Final Report. January 2004. City of Greensboro and NC Division of Water Quality.

process, although its role in this effort has not been clearly determined. DEP has insisted that the process be comprehensive in dealing with multiple pollutants (for example, total dissolved solids (TDS), phosphorus, nitrogen) and impacts (Pyramid Lake, Lahonton Reservoir).

Role of Regional Regulatory Agency

EPA Region 9 has been engaged in discussions with the cities on their proposal to revisit the 1994 nitrogen TMDL. The regional office has a staff person in place in Carson City who will represent the agency in the proceedings of the TMDL review and revision.

Funding Sources

The project has been wholly funded by the cities of Reno and Sparks through their sewer utility fund. Approximately $2 million has been spent on technical studies addressing the work included in the 1994 TMDL and the output from the proprietary model used to establish the wasteload allocations, particularly for the nitrogen wasteload allocations. As the scope of the project expands in terms of participation and objectives, the question of cost distribution for the project will be an issue.

Watershed Description

The Lower Truckee River flows from the California–Nevada state line to Pyramid Lake (see Figure 3). The U.S. Bureau of Reclamation diverts a large portion of the Truckee flow into the neighboring Carson River Basin, where the water is stored within Lahonton Reservoir for irrigation purposes. The region's population is growing at a considerable rate, raising questions about the adequacy of the 1994 TMDL nitrogen load allocations in terms of necessary treatment levels and corresponding benefit to the river and its aquatic life. Water quality issues within Pyramid Lake extend to TDS and phosphorus level impacts to the lake and its uses. Members of the Paiute Tribe reside in the area surrounding the lake.

TMDL Parameter and Source Characterization

The primary focus is an update of the 1994 TMDL for nitrogen and is chiefly in response to requests from the cities of Reno and Sparks. The scoping of the project likely will be expanded to include phosphorus, as well as the TDS levels reaching Pyramid Lake. One issue was that the wasteload allocations in the 1994 TMDL were derived from a proprietary simulation model, with limited available expertise to run the model and large uncertainty about the effects of nitrogen control to the river.

Project Overview

Motivation to use third-party approach. In 1994, a TMDL was developed for total nitrogen, total phosphorous, and TDS loads to the river before it flowed into Pyramid Lake. Since that time, the cities of Reno and Sparks have monitored water quality, developed new simulation modeling, and enhanced data collection to look at in-river ecology. Because of growth in the region and the uncertainty in the original model output and prediction on beneficial impact to the river, the cities determined that it was necessary to revisit the original nitrogen TMDL.

Type of work performed (technical, political, etc.). The cities of Reno and Sparks have used several consultants to conduct technical studies and develop a representative model of the Truckee River system to assess water quality impacts from varied pollutant load levels. They also contracted the Center for Collaborative Studies at the California State University at Sacramento to assess the likely success and scope of a collaborative effort among interested parties and, if such a process was deemed to be beneficial, to facilitate the process and move it toward resolution. The assessment process is currently under way.

Unique circumstances. There are historic conflicts between the cities and the tribe over certain issues that may confound the process to resolve the nitrogen allocation issue. Negotiated tradeoffs and linkages on diverse issues may result from this process. Furthermore, the state insists that the process be comprehensive and that all issues surrounding Truckee River water quality be addressed.

Challenges

The chief challenge will be in identifying and including all the appropriate stakeholders that are key to reach-

ing resolution of the issue. The balance between being inclusive and being unwieldy will be a complicated calculation.

Outcome

The successful outcome will be allocations assigned to the cities' of Reno and Sparks wastewater treatment facilities that will (1) allow for regional growth, (2) be based on transparent and scientifically based data, and (3) provide protection to the river, Pyramid Lake, and surrounding resources and uses.

Implementation Planning

Implementation will be a function of the degree of resolution that results from the collaborative process and assessment. The primary implementation mechanism will be the operation of the regional wastewater treatment facilities. Other issues may arise that will require additional implementation considerations.

Timeframe

Resolution of the nitrogen issue, if it is to occur, is expected by the cities in June 2007. Resolution of other issues remains uncertain.

Lessons Learned

While too early to establish lessons from the strict third-party approach, this case study does point to the intertwining of issues and interested parties that bring complexity to the initial TMDL issue and likely will result in a more comprehensive arrangement than first visualized by the major stakeholders using this approach.

4. North Buffalo Creek; Greensboro, N.C.

Lead Organization

City of Greensboro, N.C., Department of Water Resources, Stormwater Management Division.

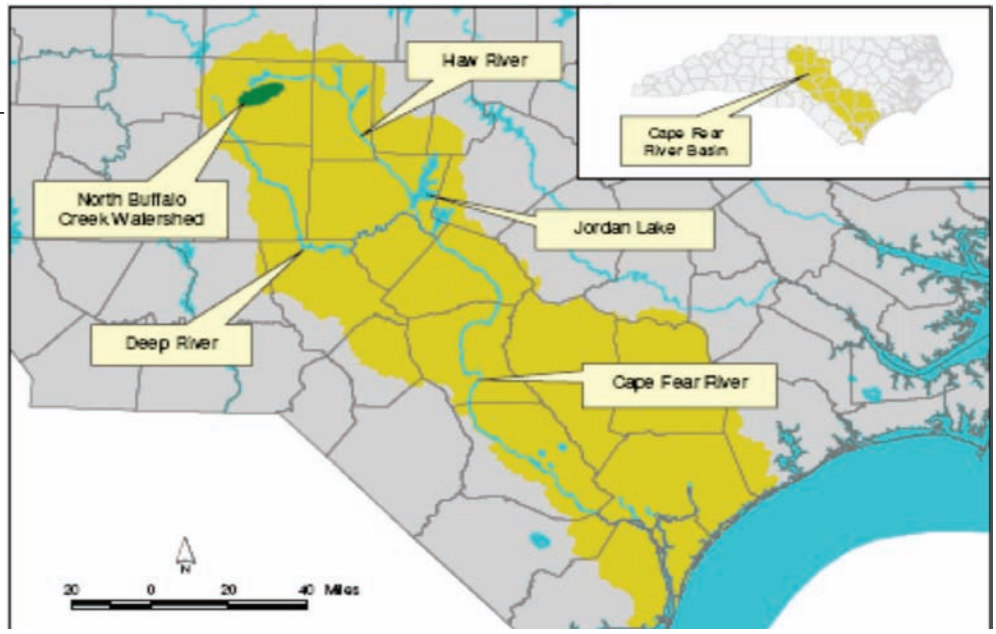
Stakeholders

City of Greensboro, North Carolina Division of Water Quality (DWQ), and interested citizens.

Partnership Description

A stakeholder advisory group was developed for the TMDL. The advisory group included representatives from city and state government, as well as interested citizens. All advisory group participants were invited to participate. The role of the advisory group was to review, advise, and critique progress and products of the modeling contractor that was hired by the City of Greensboro.

Figure 4. North Buffalo Creek Watershed



Role of State Regulatory Agency

DWQ provided consultation and oversight to the City of Greensboro to keep the process and product (TMDL) on track with DWQ and EPA requirements.

Role of Regional Regulatory Agency

EPA Region 4 was not involved until the final approval of the TMDL.

Funding Sources

The City of Greensboro, Department of Water Resources, Stormwater Management Division, funded the project. Subsequent to the TMDL being approved, DWQ provided $50,000 from a Clean Water Act Sec. 319 grant to offset costs associated with hiring a modeling contractor.

Watershed Description

The North Buffalo Creek Watershed is located in the headwaters of the Cape Fear River Basin in Guilford County, N.C. (see Figure 4). Upstream of the TMDL compliance point, the watershed has a drainage area of 21.8 mi^2. This area includes part of downtown Greensboro, which is considered built-out. The dominant land use is residential, followed by forests and roads. North Buffalo Creek is used for recreational activities, such as wading, fishing, and swimming.

TMDL Parameter and Source Characterization

The TMDL was developed for fecal coliform. Approximately 8.7 mi of the upper North Buffalo Creek were listed as impaired on North Carolina's 2002 Sec. 303(d) list. The relevant fecal coliform criteria state that "fecal coliforms shall not exceed a geometric mean of 200 cfu/100ml based upon at least five consecutive samples examined during any 30 day period, not exceed 400 cfu/100ml in more than 20% of the samples examined during such period." With few exceptions, water quality samples in North Buffalo Creek exceeded both criteria.

The primary sources of fecal coliform for North Buffalo Creek were largely determined based on the informed professional judgment of the advisory committee. For modeling purposes, fecal coliform production rates were based on literature values. The sources characterized by the modeling contractor in the watershed were

- exfiltrating sanitary sewers,

- failing septic systems,
- illicit discharges,
- pets,
- sewer system overflows, and
- waterfowl.

Project Overview

Motivation to use third-party approach. Selected staff with the City of Greensboro had been involved with previous third-party TMDLs in Mecklenburg County, N.C. The city staff believed that these TMDLs had been effective in engaging local officials, and, thus, engaged city elected officials would likely be more proactive in dealing with fecal coliform sources. Additionally, the City of Greensboro was interested in having more control over the TMDL process, protecting its interests by taking the initiative in developing the TMDL and preemptively addressing fecal coliform sources identified through the TMDL development process.

Process used. The TMDL was developed using WinHSPF (Hydrological Simulation Program FORTRAN). North Buffalo Creek was divided into subwatersheds for modeling purposes. Both an explicit and an implicit margin of safety (MOS) were employed. The explicit MOS involved setting the TMDL target instream concentration at 180 cfu/100ml. The implicit MOS involved using conservative modeling assumptions when developing the model. The model was calibrated for both hydrology and water quality. Model verification was not discussed. Broad source category (municipal separate storm sewer systems and nonpoint sources) reductions were specified in the TMDL. Detailed source loads were provided only for a single month in 1998, which was defined through modeling as the "critical target period." Modeling included data from August 1998 through August 2001.

Type of work performed (technical, political, etc.). Primarily technical and modeling work was performed. Modeling results were presented to the advisory group periodically, and the modeling contractor made modifications based on that feedback. There has been some increased awareness about the North Buffalo Creek TMDL within the city's political system; however, this increased awareness was minimal and primarily due to increased awareness within the city's professional staff.

Unique circumstances. The TMDL was developed for fecal coliform. The primary contamination comes from nonpoint sources. Little, if any, field investigation was performed as the TMDL was being developed. Subsequent to the TMDL being approved, the city has conducted two microbial source tracking studies to get a better understanding of specific source locations.

Challenges

No specific challenges were noted.

Outcome

EPA approved the TMDL for North Buffalo Creek in April 2004.

Implementation planning

No implementation planning was included in the TMDL. City staff have indicated that no specific implementation has resulted because of the North Buffalo Creek TMDL. Additional source characterization studies have been conducted, however, to better refine the fecal coliform sources in the watershed.

Timeframe

North Buffalo Creek TMDL development began in early 2003. The TMDL was approved in April 2004. This is much longer than it would have taken if the TMDL had been developed by DWQ.

Lessons Learned

From the state's perspective,

- a TMDL development process initiated by a third party takes longer, and
- staff must be assigned to "consult" during TMDL development and ensure that the product meets state and EPA requirements.

From the city's perspective,

- there is a focus on protecting its self-interest by taking the initiative to develop the TMDL,
- control over which sources are to be addressed and how is an issue, and
- increasing awareness among city professional staff and elected leaders is a goal.

Appendix 2. Glossary

Adaptive implementation — a process that allows for the evaluation of the adequacy of the TMDL in achieving the water quality standard. As stream monitoring continues to occur, staged or phased implementation enables water quality improvements to be recorded as they are being achieved, providing a measure of quality control and ensuring that the most cost-effective practices are implemented first.

Allocation scenario — proposed combination of point source and nonpoint source pollutant loads being considered to meet a water quality goal.

Background levels — chemical, physical, and biological levels representing conditions that would result from natural processes, such as weathering and dissolution.

Clean Water Act (CWA) — the series of legislative acts that form the foundation for protection of U.S. water resources, including the Water Quality Act of 1965, Federal Water Pollution Control Act of 1972 (PL92-500), Clean Water Act of 1977, and Water Quality Act of 1987. CWA Secs. 305(b) and 303(d) deal specifically with water quality assessment and TMDL development.

Designated use — those uses specified in water quality standards for each waterbody or segment. Recreational uses; the propagation and growth of a balanced, indigenous population of aquatic life; wildlife; and the production of edible and marketable natural resources are generally stated as "fishable and swimable" uses. Other uses may be industrial water supply, irrigation, and navigation.

Endpoint — a measurable goal or target. Assessment endpoints and measurement endpoints are two distinct types. An assessment endpoint is the formal expression of a valued environmental characteristic and should have societal relevance (i.e., an indicator). A measurement endpoint is the expression of measured response to a stress or disturbance. It is a measured value that is related to a specific environmental characteristic chosen as the assessment endpoint. The numeric criteria that are part of traditional water quality standards are good examples of measurement endpoints (targets).

Hydrology — the study of the distribution, properties, and effects of water on Earth's surface, in the soil and underlying rocks, and in the atmosphere.

Impaired water — a waterbody with chronic or recurring monitored violations of the applicable numeric and/or narrative water quality criteria.

Implementation plan — the document or section of a document detailing the suite of corrective actions needed to reduce pollution and remediate an impaired waterbody. Once fully implemented, the plan should result in the waterbody achieving a "fully supporting" status.

Load, loading, loading rate — the total amount of pollutants entering a waterbody from one or multiple sources, measured as a rate, as in weight per unit time or per unit area.

Load allocation (LA) — the portion of the loading capacity attributed to (1) the existing or future nonpoint sources of pollution and (2) natural background sources. Wherever possible, nonpoint source loads and natural loads should be distinguished.

Margin of safety (MOS) — a required component of the TMDL that accounts for the uncertainty in calculations of pollutant loading from point, nonpoint, and background sources.

Model — a system of mathematical expressions that describe both hydrologic and water quality processes. When used for the development of TMDLs, models can estimate the load of a specific pollutant to a waterbody and make predictions about how the load would change as corrective actions are implemented.

Monitoring — periodic or continuous sampling and measurement to determine the physical, chemical, and biological status of a particular medium, such as air, soil, or water.

Narrative criteria — non-numeric, qualitative guidelines that describe a desired water quality goal.

Nonpoint source pollution — pollution originating from diffuse sources on and above the landscape. Examples include rainfall and snowmelt runoff from fields, stormwater runoff from urban landscapes, roadbed erosion in forestry, and atmospheric deposition.

Numeric criterion — a measurable value determined for the pollutant of concern that, if achieved, is expected to result in the attainment of water quality standards in the listed waterbody.

Point source pollution — pollutant loads discharged through a discrete conveyance.

Pollutant — any substance of such character and in such quantities that when it reaches a body of water, it degrades the receiving water, rendering it unfit for some specified designated use. Specifically as defined in Clean Water Act Sec. 502(6), a pollutant means 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.

Receiving water — creeks, streams, rivers, lakes, estuaries, groundwater formations, or other bodies of water into which surface water, treated waste, or untreated waste are discharged.

Sec. 305(b) — section of the Clean Water Act that requires states to submit a biennial report in even-numbered years to the U.S. Environmental Protection Agency describing the quality of the state's waters. The Sec. 305(b) report describes the overall water quality conditions and trends in the state.

Sec. 303(d) — section of the Clean Water Act that requires states periodically to identify waters that do not or are not expected to meet applicable water quality standards. These waters are identified on the Sec. 303(d) Impaired Waters List. A TMDL must be developed for each waterbody on the Sec. 303(d) list. If a listed waterbody has multiple impairments, a TMDL must be developed for each impairment.

Stakeholder — any person or organization with a vested interest in TMDL development and implementation in a specific watershed.

Stressor — any substance or condition that adversely impacts the aquatic ecosystem.

Third party — a watershed group, municipal wastewater or stormwater discharger organization, industrial discharger entity, other unit of government (such as a county, city, municipality, or land management agency) or nonpoint source organization (such as a farm bureau, irrigation and drainage district, or landowner). A third-party TMDL is a TMDL in which an organization or group other than the lead water quality agency or organization (or its contractor) takes responsibility for developing the TMDL document and supporting analysis.

Total maximum daily load (TMDL) — a pollution "budget" that is used to determine the maximum amount of pollution a waterbody can assimilate without violating water quality standards. A TMDL is composed of pollution from permitted point sources (waste load allocations, or WLAs), pollution from nonpoint and natural background sources (load allocations, or LAs), and a margin of safety (MOS), which accounts for any uncertainty associated with estimating the load allocations. Mathematically, a TMDL is written as TMDL = WLAs + LAs + MOS. A TMDL is developed for a specific pollutant and can be expressed in terms of mass per time, toxicity, or other appropriate measures that relate to the water quality standard being violated.

Waste load allocation (WLA) — the portion of a receiving water's loading capacity that is allocated to one of its existing or future permitted point sources of pollution. The WLA is a type of water-quality-based effluent limitation.

Water quality — the biological, chemical, and physical conditions of a waterbody. It is a measure of a waterbody's ability to support beneficial uses.

Water quality criteria — general narrative statements that describe good water quality and specific numeric criteria that are based on specific levels of

pollutants that, if exceeded, would result in a waterbody not supporting a use.

Water quality standards — a group of statements that constitute a regulation describing specific water quality requirements. Water quality standards have the following three components: designated uses, water quality criteria to protect designated uses, and an anti-degradation policy.

Watershed — area that drains or contributes water to a particular point, stream, river, lake, or ocean. Larger watersheds are also referred to as basins. Watersheds range in size from a few acres for a small stream to large areas of the country.