NOV 19 2001

MEMORANDUM

SUBJECT: 2002 Integrated Water Quality Monitoring and Assessment Report Guidance

FROM: Robert H. Wayland III, Director
Office of Wetlands, Oceans and Watersheds

TO: EPA Regional Water Management Directors
EPA Regional Science and Technology Directors
State, Territory and Authorized Tribe Water Quality Program Directors

Introduction

Clean Water Act (CWA) Section 305(b) reports and Section 303(d) lists are highly visible ways of communicating about the health of the nation's waters. The quality and reliability of the information they contain becomes increasingly important as it is used to set priorities and to implement water quality controls and protection activities. For the first time, the Environmental Protection Agency (EPA) is providing states, territories, and authorized tribes with guidance for integrating the development and submission of 2002 305(b) water quality reports and Section 303(d) lists of impaired waters.

This guidance recommends that states, territories, and authorized tribes submit a *2002 Integrated Water Quality Monitoring and Assessment Report* (hereinafter referred to as the *Integrated Report*) that will satisfy CWA requirements for both Section 305(b) water quality reports and Section 303(d) lists. This *Integrated Report* will show the following information:

- delineation of water quality assessment units (AUs) based on the National Hydrography Dataset (NHD);
- status of and progress toward achieving comprehensive assessments of all waters;
- water quality standard attainment status for every AU;
- basis for the water quality standard attainment determinations for every AU;

- ! additional monitoring that may be needed to determine water quality standard attainment status and, if necessary, to support development of TMDLs for each pollutant/AU combination;
- ! schedules for additional monitoring planned for AUs;
- ! pollutant/AU combinations still requiring TMDLs; and
- ! TMDL development schedules reflecting the priority ranking of each pollutant/AU combination.

With the exception of the monitoring schedules and the delineation of assessment units (AUs), all of the data and information needed to support the *Integrated Report* was requested in guidance for earlier 305(b) reports and 303(d) lists. The data and information will simply be arrayed in a different manner in the 2002 *Integrated Report*.

Consistent with Section 106(e)(1) of the CWA, each state should develop a comprehensive monitoring and assessment strategy that describes the state's approach to obtaining data and information necessary to characterize the attainment status of all assessment units. Elements of an effective strategy should include: a description of the sampling approach (i.e. rotating basin, fixed or probabilistic station array), a listing of the parameters to be collected (i.e. physical, chemical, and biological), and a schedule (both long term and annually) for collecting data and information (for basic assessments and for TMDLs). The monitoring schedules requested for the 2002 *Integrated Report* should be consistent with the state's or territory's current comprehensive monitoring and assessment strategy.

The National Research Council (NRC) report, "Assessing the TMDL Approach to Water Quality Management," prepared in 2001 for Congress, emphasized the importance of state monitoring programs in supporting effective water quality management actions. The NRC report recommended that states commit to regular and planned monitoring. The request for monitoring schedules in this guidance responds to this specific NRC recommendation.

Today, the majority of the nation's waters remain unmonitored and unassessed. Yet Section 305(b) of the CWA requires that all waters be assessed every two years. It is not necessary nor practicable for states and territories to do site-specific monitoring of all waters to be able to make such an assessment of all waters. EPA believes that a probabilistic monitoring design applied over large areas, such as a state or territory, is an excellent approach to producing, with known confidence, a "snapshot" or statistical representation of the extent of waters that may or may not be impaired. A probabilistic monitoring design can assist a state or territory in determining monitoring priorities and in targeting monitoring activities. States and territories are encouraged to use probabilistic designs for water quality assessments and to include reports of these assessments with their *Integrated Reports.* A format for reporting assessments based on probability designs is included in Appendix B.

The *Integrated Report* will enhance the ability of water quality managers to display, access, and

integrate environmental data and information from all components of the water quality program (e.g., water quality standards, National Pollutant Discharge Elimination System (NPDES) permits, TMDLs, nonpoint source controls, and monitoring), as well as other media programs such as Superfund, Resource Conservation and Recovery Act (RCRA), and the Clean Air Act programs. This approach will help managers justify, on a watershed basis, resource allocations and future resource requirements. This approach will also allow water quality managers to focus TMDL resources on those waters that are actually impaired by pollutants.

EPA also anticipates that the development of an *Integrated Report* will benefit the public by providing a much clearer summary of the water quality status of the nation's waters and the management actions necessary to protect and restore them. A state or territory should provide the public an opportunity to review and comment on an integrated assessment of the status of all waters within its jurisdiction. This integrated assessment will include monitoring schedules, the assessment and listing methodology, and supporting data and information used to develop the *Integrated Report*.

This guidance updates previous guidance and, to the extent it is different, supercedes previous guidance. The statutory provisions in Sections 303(d) and 305(b) and EPA regulations described in this document contain legally binding requirements. This document does not substitute for those statutory provisions or regulations, nor is it a regulation itself. Thus, it does not impose legally binding requirements on EPA, states, or territories and may not apply to a particular situation based upon the circumstances. EPA, state, and territorial decision makers have the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. EPA may revise this guidance in the future, as appropriate.

This guidance does not, and cannot, change existing rules for listing and delisting. The existing regulations require states, territories, and authorized tribes, at the request of the Regional Administrator, to demonstrate good cause for not including waterbodies on the 303(d) list that were included on previous 303(d) lists (pursuant to 40 C.F.R. 130.7(b)(6)(iv)). Good cause includes, but is not limited to, more recent and accurate data, more sophisticated water quality modeling, flaws in the original analysis that led to the waterbody being listed, or changes in conditions, e.g. new control equipment, or elimination of discharges. Where a waterbody was previously listed based on certain data or information, and the state or territory removes the waterbody without developing or obtaining any new information, EPA will carefully evaluate the state's or territory's re-evaluation of the available information, and will not approve such removals unless the state's or territory's submission describes why it is appropriate under the current regulations to remove each affected waterbody. EPA has the authority to disapprove the list if EPA identifies existing and readily available information, available at the time the state or territory submitted the list, that shows a waterbody does not attain water quality standards. See 40 C.F.R. 130.7(b)(6)(iv).

In order to provide states and territories with the necessary time to integrate the requirements of Sections 305(b) and 303(d), EPA has extended the date for the submission of 303(d) lists of AUs still requiring the establishment of a TMDL to October 1, 2002. EPA will not invoke any Section 106 grant conditions pertaining to Section 305(b) reporting until after October 1, 2002. It may be difficult for a few states and territories to adopt the approach outlined in this guidance by October 1, 2002. In such cases, states and territories may choose to follow the existing guidance for Sections 305(b) and 303(d). Submissions following the existing guidance are also due by October 1, 2002. Indian tribes are not required to develop Section 305(b) reports to receive grants under Section 106. See 40 C.F.R. 130.4. [See Federal Register, Oct. 18, 2001, Vol. 66, No. 202, pp. 53044-53048] Accordingly, the provisions of this guidance related to Section 305(b) reports do not pertain to Indian tribes. However, the provisions of the guidance related to Section 303(d) do pertain to tribes authorized by EPA to establish 303(d) lists.

The remaining sections of this memo cover the following seven areas:

1. Assessment and Listing Methodologies,
2. Integrated Lists of Waters and Monitoring Schedules,
3. Supporting Data and Information,
4. Public Participation,
5. Submission to EPA,
6. EPA Action on Section 303(d) Lists, and
7. Support from EPA Regions and Headquarters.

Definitions

Definitions of terms as used only in this guidance are provided below:

Assessment Unit (AU). A waterbody whose attainment status is reported in the *Integrated Report*. An AU must be named and located based on the National Hydrography Dataset (NHD). Where the state's or territory's spatial resolution is on a finer scale than NHD, EPA will translate that resolution into the NHD system.

Water quality standard (standard). A water quality standard defines the water quality goals of an assessment unit (AU) by designating the use or uses to be made of the AU and by setting criteria, both numeric and narrative, necessary to protect the designated use(s). A water quality standard also includes the associated antidegradation policy as defined in regulation at 130.7(b)(3) and adopted by a state or territory.

Water quality standard is attained. The water quality standard is attained when all designated uses and associated criteria are met as determined in accordance with a state's or territory's assessment and listing methodology.

Water quality standard is threatened. The water quality standard is being attained, but non-attainment is predicted, in accordance with the state's or territory's assessment and listing methodology, by the time the next *Integrated Report* is due.

Water quality standard is not attained (impaired). The water quality standard is not attained in accordance with a state's or territory's assessment and listing methodology.

Assessment and Listing Methodologies

States and territories must provide a description of the assessment and listing methodology used to develop their Section 303(d) lists and Section 305(b) reports. This methodology should include a description of the processes and procedures used to assess the quality of the waters and explain how all existing and readily available data and information was assembled and used to determine the attainment status in each AU, consistent with the applicable water quality standards.

Data and information found in the following documents is existing and readily available data and should be considered as a basis for identifying impaired waters consistent with the state's or territory's water quality standards and assessment and listing methodology:

1. The Section 305(b) report, including the Section 314 lakes assessment;
2. The most recent Section 303(d) list;
3. The most recent Section 319(a) nonpoint assessment;
4. Reports of water quality problems provided by local, state, territorial or federal agencies, volunteer monitoring networks, members of the public or academic institutions;
5. Reports of dilution calculations or predictive models;
6. Fish and shellfish advisories, restrictions on water sports or recreational contact;
7. Reports of fish kills or abnormalities (cancers, lesions, tumors);
8. Water quality management plans;
9. Safe Drinking Water Act Section 1453 source water assessments;
10. Superfund and Resource Conservation and Recovery Act reports; and
11. The most recent Toxic Release Inventory.

Integrated Lists of Waters and Monitoring Schedules

Based on its assessment and listing methodology, each state or territory should report to EPA the water quality standard attainment status of all AUs in their jurisdiction. Each AU should be placed in only one of the five unique assessment categories. Monitoring needed to support water quality management actions for each AU should be scheduled by year for all categories. Each category and recommended monitoring is described below:

1. **Attaining the water quality standard and no use is threatened**. AUs should be listed in

this category if there are data and information that meet the requirements of the state's or territory's assessment and listing methodology and support a determination that the water quality standard is attained and no use is threatened. States and territories should consider scheduling these AUs for future monitoring to determine if the water quality standard continues to be attained.

2. **Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened.** AUs should be listed in this category if there are data and information, which meet the requirements of the state's or territory's assessment and listing methodology, to support a determination that some, but not all, uses are attained and none are threatened. Attainment status of the remaining uses is unknown because there is insufficient or no data or information. Monitoring should be scheduled for these AUs to determine if the uses previously found to be in attainment remain in attainment, and to determine the attainment status of those uses for which data and information was previously insufficient to make a determination.

3. **Insufficient or no data and information to determine if any designated use is attained**. AUs should be listed in this category where the data or information to support an attainment determination for any use is not available, consistent with the requirements of the state's or territory's assessment and listing methodology. To assess the attainment status of these AUs, the state or territory should obtain supplementary data and information, or schedule monitoring as needed.

4. **Impaired or threatened for one or more designated uses but does not require the development of a TMDL**.

   A. **TMDL has been completed**. AUs should be listed in this subcategory once all TMDL(s) have been developed and approved by EPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU will remain in Category 5 until all TMDLs for each pollutant have been completed and approved by EPA. Monitoring should be scheduled for these AUs to verify that the water quality standard is met when the water quality management actions needed to achieve all TMDLs are implemented.

   B. **Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.** Consistent with the regulation under 130.7(b)(i),(ii), and (iii), AUs should be listed in this subcategory where other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard (WQS) applicable to such waters. EPA expects that these requirements must be specifically applicable to the particular water quality problem. Monitoring should be scheduled for these AUs to verify that the water quality standard is attained as expected.

C. **Impairment is not caused by a pollutant**. AUs should be listed in this subcategory if the impairment is not caused by a pollutant. States and territories should consider scheduling these AUs for monitoring to confirm that there continues to be no pollutant-caused impairment and to support water quality management actions necessary to address the cause(s) of the impairment.

5. **The water quality standard is not attained. The AU is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL**. This category constitutes the Section 303(d) list of waters impaired or threatened by a pollutant(s) for which one or more TMDL(s) are needed. An AU should be listed in this category if it is determined, in accordance with the state's or territory's assessment and listing methodology, that a pollutant has caused, is suspected of causing, or is projected to cause an impairment. Where more than one pollutant is associated with the impairment of a single AU, the AU will remain in Category 5 until TMDLs for all pollutants have been completed and approved by EPA.

   For AUs listed in this category, states or territories should provide monitoring schedules that describe when data and information will be collected to support TMDL establishment and to determine if the standard is attained. EPA recommends that while the state or territory is monitoring the AU for a specific pollutant to develop a TMDL, it also monitor the watershed to assess the attainment status of other uses.

   A state or territory must submit a schedule for the establishment of TMDLs for all waters in Category 5. This schedule must reflect the state's or territory's own priority ranking of the listed waters.

A state or territory assessment and listing methodology should establish how biological monitoring will be used to determine if biological impairment of an AU exists, the cause of the impairment, and the appropriate listing category for the AU.

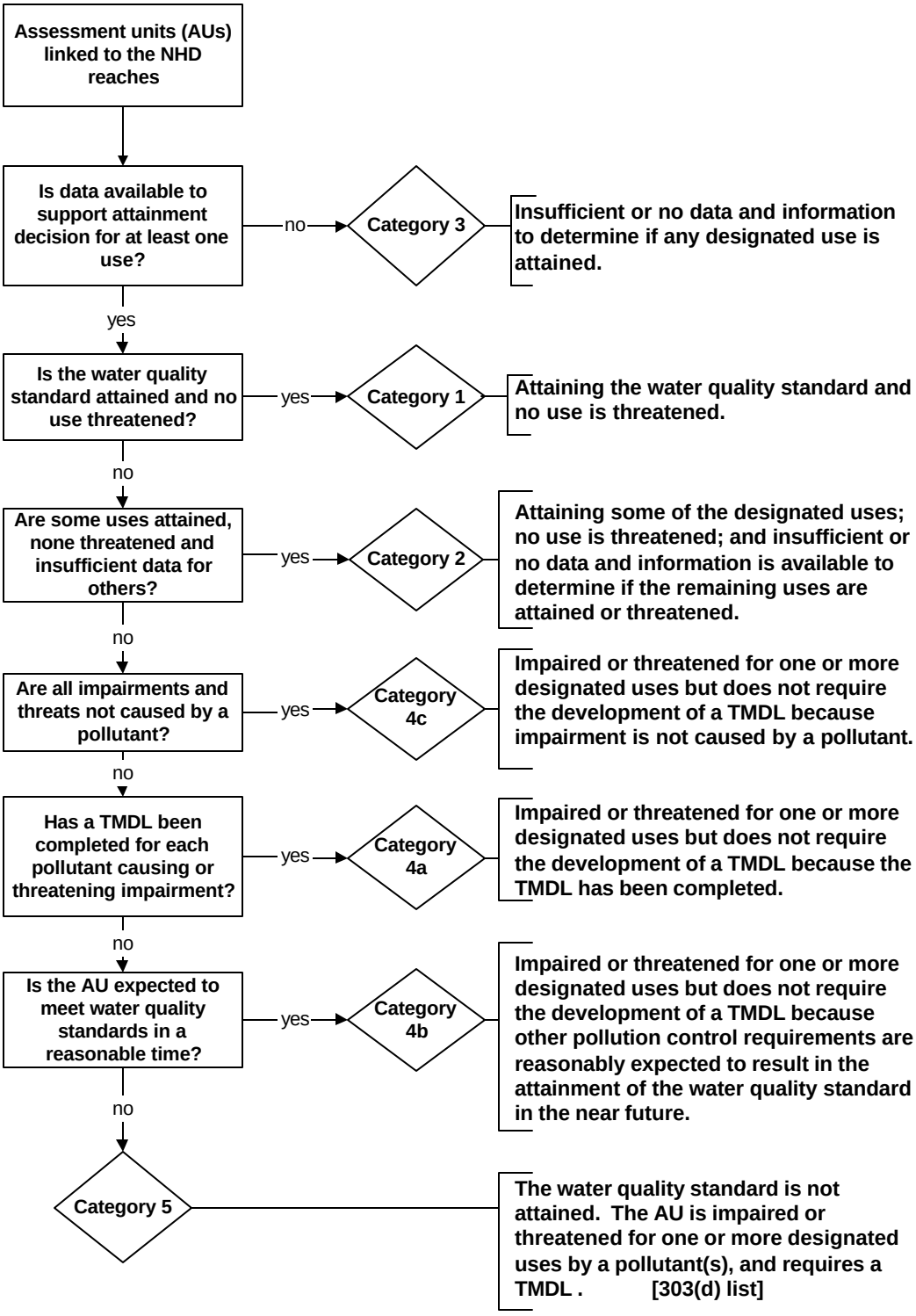
If a state or territory determines that an AU does not meet a use based on biological information, and the impairment is caused or is suspected to be caused by a pollutant(s), the AU should be listed in Category 5. If the state or territory believes that the impairment is not caused by a pollutant(s), the AU should be listed in Category 4c.

If a state or territory lists the AU in Category 5, but is uncertain that the impairment is caused by a pollutant, EPA recommends that the TMDL schedule include time for additional monitoring to confirm the cause of the impairment. If the additional monitoring determines the cause of the impairment to be a pollutant(s), the state or territory must complete a TMDL(s) for the pollutant(s). If the additional monitoring determines the impairment is not caused by a pollutant, the state or territory should move the AU to Category 4c.

Monitoring schedules should be consistent with state and territorial monitoring strategies and annual work plans required for Section 106 grants. Monitoring schedules should identify which AUs in each category will be monitored each year. EPA believes that, in many situations, a rotating basin approach is a preferred approach to water quality monitoring. The use of a rotating basin approach generally increases efficiency and coverage of monitoring activities and follow-up management actions including development of TMDLs, issuance of NPDES permits, and the review of water quality standards. EPA recommends that monitoring schedules be supportive of the rotating basin approach.

A logic diagram summarizing how AUs would be placed in the five categories described above can be found in Diagram 1 on the next page.

Diagram 1. Summary logic used to place assessment units (AUs) into each of the five categories in the *2002 Integrated Report*



Supporting Data and Information

Appendix A provides a summary of the data EPA requests states and territories submit. Appendix B documents the format and a detailed description of the data elements summarized in Appendix A. These data elements are included in EPA's Assessment Database, a relational database for tracking water quality assessments.

Public Participation

States and territories should provide for public participation in the development of their *Integrated Report* prior to its submission to EPA. EPA believes that public understanding of how standard attainment determinations are made for all AUs is crucial to the success of water quality programs and encourages active stakeholder participation in the assessment and listing process. States and territories should provide EPA with a summary of comments received and the responses made. EPA will consider how the state or territory addressed the comments on the *Integrated Report* when approving or disapproving the 303(d) list of AUs (Category 5).

Submission to EPA

States and territories must submit their *Integrated Report* to EPA by October 1, 2002. Submissions following the existing guidance are also due by October 1, 2002. The *Integrated Report* should include the following components:

1. An assessment and listing methodology;
2. The delineation of AUs based on the National Hydrography Dataset (NHD) as described in Appendix B, and an integrated list of all AUs in the state or territory in the five categories described in this guidance;
3. Data and information supporting the categorization of each AU in EPA's Assessment, Database format (Appendix B);
4. A description of the public participation process, and a summary of the comments received and the responses made to the comments; and
5. An assessment report based on a probability design if a component of the monitoring strategy.

States and territories are encouraged to share interim products (1- 5 above) and drafts of their *Integrated Report* with EPA prior to final submission. *Integrated Reports* may be submitted electronically using the Assessment Database.

EPA Action on Section 303(d) Lists

EPA will review and approve, partially approve/disapprove, or disapprove state or territorial 303(d) lists of impaired and threatened AUs requiring a TMDL (Category 5). EPA's review and approval of the 303(d) list will be based on a determination that the state's or territory's assessment and listing

methodology was used to prepare the list, that the assessment and listing methodology is scientifically sound, that it is consistent with the state's or territory's water quality standards, and that the state or territory reasonably considered all existing and readily available data and information, and listed all waters not attaining water quality standards. Upon completing its review of the 303(d) list, EPA will send a letter to the state or territory notifying it of full approval, partial approval/disapproval, or disapproval. If the list is partially approved/disapproved, or disapproved, EPA will develop a list for the state or territory. EPA will also provide 30 days for public comment on the EPA developed list.

Support from EPA Regions and Headquarters

Questions regarding the interpretation of this guidance should be directed to EPA Regions. Regions may direct questions to Michael Haire at EPA headquarters, 202-260-2734, haire.michael@epa.gov.

Appendices

Appendix A: Summary matrix of information required by category to be included in *2002 Integrated Water Quality Monitoring and Assessment Report*.

Appendix B: Data elements for *2002 Integrated Water Quality Monitoring and Assessment Report* and documentation for defining and linking assessment units to the National Hydrography Dataset.

cc: EPA Assistant Administrator for Water
EPA Regional Water Quality Branch Chiefs and Monitoring Branch Chiefs
EPA Regional TMDL, Monitoring and 305(b) coordinators
EPA OW Office Directors
EPA OW Division Directors
EPA OGC, Lee Schroer, Jim Curtin, Susmita Dubey
EPA ORD, Larry Reiter, Gilman Vieth, Mike McDonald, Barbara Brown,
Lee Mulkey, Tom Barnwell, Molly Whitworth
USGS, Robert Hirsch, Steve Sorenson, Mike Norris
USDA, Tom Christiansen
USFS, Warren Harper

APPENDIX A. INFORMATION TO BE INCLUDED IN 2002 INTEGRATED WATER QUALITY MONITORING AND ASSESSMENT REPORT

Data and Information	List Category						
	Attaining the water quality standard	Attaining some designated uses	Insufficient or no data and information to determine if any designated uses are attained	Impaired or threatened for one or more designated uses but not needing a TMDL			TMDL needed
				TMDL complete	Expected to meet the standard	Not impaired by pollutant	
	1	2	3	4a	4b	4c	5
Name of assessment unit (AU)	x	x	x	x	x	x	x
Type of AU	x	x	x	x	x	x	x
Location of AU based on NHD	x	x	x	x	x	x	x
Standard for AU	x	x	x	x	x	x	x
Assessment type	x	x	x	x	x	x	x
Assessment level	x	x	x	x	x	x	x
Assessment date	x	x	x	x	x	x	x
Observed effect	x	x	x	x	x	x	x
Standard attained	x	x	x	x	x	x	x
Designated Uses not attained (impaired)				x	x	x	x
Designated Uses attained but Threatened						x	x
Uses with Insufficient or No information		x	x	x	x	x	x
Non-pollutant impairment				x	x	x	x
Pollutant(s) for which TMDLs are required				x	x		x
Source(s) of pollutants				x	x		x
Lake trophic status	x	x	x	x	x	x	x
TMDL completion schedule							x
Date TMDL approved				x			x
Monitoring date	x	x	x	x	x	x	x

Appendix B. Data elements for *2002 Integrated Water Quality Monitoring and Assessment Report* and documentation for defining and linking Assessment Units to the National Hydrography Dataset.

The Clean Water Act (CWA) requires states and territories to report water quality monitoring and assessment information to satisfy CWA Sections 303(d) and 305(b). EPA recognizes that states and territories use a variety of monitoring designs which allow them to characterize waters of the United States at different scales. This reporting format accommodates jurisdiction-wide or watershed-level assessments based on probability designs and attainment decisions on individual assessment units (AUs). The purpose of this Appendix is to provide a consistent format for the *Integrated Report*. This appendix is organized as follows:

A. Reporting Assessment Unit (AU) Results
   1) Define the AUs
   2) Report AUs geographic information using the National Hydrography Dataset (NHD)
   3) Report on the trophic status for all lakes
   4) Report attainment decisions for the AU's standard and each of its designated use(s)
   5) Document how and when the attainment decision for each AU-designated use combination was determined
   6) Report any pollutants and non-pollutants causing impairments and their probable sources
   7) Report any observed effects of pollution for each AU-designated use combination
   8) Report on approved TMDLs and provide a schedule for establishing TMDLs
   9) Documenting the monitoring schedule

B. Reporting Attainment Decisions based on Probability Designs
   1) Identify the waters assessed through a probability design (Target Population)
   2) Report the geographic locations of the target populations using NHD
   3) Report attainment results for standards
   4) Report the precision and date of the attainment results
   5) Report all pollutants and non-pollutants causing impairment and their probable sources

C. Data Elements to be reported using EPA's Assessment Database or an equivalent relational database

D. Minimal Database Design to support Electronic Submission

A. Reporting AU Results

The following information should be submitted in order to identify and characterize AUs within the five categories outlined in this guidance. Jurisdictions should use a relational database to store and maintain their attainment results and, document decisions on standards attainment status, identify any pollutants or other types of pollution and their sources for all AUs not attaining standards, and report the assessment metadata for each attainment decision. All AU information should be provided in a database format, preferably using EPA's Assessment Database (ADB) software. Following is a brief description of the data elements EPA expects to receive in electronic format. The permissible value domains for these data elements should be used and can be downloaded from http://www.epa.gov/waters/reporting. This includes a standardized list of pollutants and non-pollutants, sources, assessment type and level codes.

1) Define the AUs

As described in this guidance, all waters referenced within state and territory standards documents should be assessed and reported on. These types of water may include, but are not limited to, lakes, rivers, estuaries, coastal shorelines, wetlands, oceans and ground water. The basic unit for assessing attainment status for 305(b) and 303(d) attainment is the AU.

The following descriptive information should be included for each AU:

- unique AU identifier (primary key)
- AU's type (river/stream, lake/reservoir, coastal shoreline, wetland, etc.)
- AU's size and units of measurement
- AU's name and location on the NHD
- AU's designated uses

2) Reporting AUs geographic information using the National Hydrography Dataset (NHD)

Each state and territory must define their AUs, in order to report the status of all of the Nation's waters in an effective and consistent manner. AUs are the basic unit of record for conducting and reporting the results of all water quality assessments. States and territories will be able to characterize all their AUs into one of the five categories by employing a systematic approach for AU documentation in conjunction with the principles described in this guidance.

Currently, state and territory AUs are defined using a wide range of criteria - from individual monitoring stations to Natural Resource Conservation Service watersheds. Sometimes these AUs are defined using geographic information systems (GIS) but more often are only described textually. As a consequence, it is extremely difficult to ensure adequate assessment of all waters. EPA strongly encourages states and territories to uniformly adopt the National Hydrography Dataset (NHD) reach addressing protocol for assigning AUs. Through a unique reach number and a position, reach

addresses precisely locate water features, such as AUs. These reach addresses get stored in a GIS compatible format. NHD reaches are typically defined from confluence to confluence and are the hydrographic equivalent of a street's block number. A reach address is analogous to a street address number. Additional NHD information and data is available from USGS, http://nhd.usgs.gov. EPA will provide hands on training to any interested jurisdiction on the protocols for linking water quality information to the NHD. Once the AU has a reach address, other critical water quality data -- such as the AUs position within the stream networks, flow, and any other information linked to the NHD -- becomes readily available.

States and territories should document the process used for defining AUs in their assessment methodologies. AUs should not span more than one water quality standard. The individual size of AUs will vary based upon assessment methodologies. AUs should, however, be larger than a sampling station but small enough to represent a homogenous standard attainment within individual assessment units. An individual assessment unit may comprise part of a NHD reach, an individual NHD reach, or a collection of NHD reaches and or parts of reaches.

The use of the NHD protocol for AU delineation provides powerful mapping and spatial analysis capabilities for all water quality characterization activities. This delineation approach will help target resources and activities such as scheduling monitoring, issuing permits, and targeting restoration measures. In particular, the application of NHD will provide much more spatial resolution in identifying AUs requiring the establishment of TMDLs. Furthermore, the incorporation of NHD will aid in developing and implementing management actions in individual and/or multiple AUs. Jurisdictions should use the NHD protocols for defining and linking the AUs covered by completed TMDLs or bundles of TMDLs. This TMDL specific geographic information should be submitted to EPA simultaneously with a TMDL's submission.
For each AU in Category 5, the use of the NHD convention clearly defines the geographic bounds affected by the TMDL. This should delineate the specific geographic location of the targeted AU, a clear description of the standard, and a more focused representation of the relevant watershed(s) which contribute point and non-point source pollutant loads. For example, in the establishment of a TMDL for a 303(d) listed AU, pollutant reduction efforts in a non-impaired AU may be the most logical and efficient action to the attainment of the standard in the impaired AU. By linking TMDLS to NHD the management actions throughout a watershed will be visible.

EPA recognizes that some states and territories may work with other spatial hydrographic data, however, states and territories should still provide NHD addresses for their AUs. NHD is currently being developed at higher resolutions and where complete jurisdictions may use these data. States and territories interested in developing higher resolution NHD are encouraged to work with United States Geological Survey (USGS).

The NHD-Reach Indexing Tool (RIT) is a useful tool for creating AU's reach addresses and can delineate user-defined polygons in wetlands, large estuaries, oceans, and near coastal AU's. All GIS coverages submitted to EPA should have unique AU identifiers that match those in the jurisdiction's assessment database. Table 1 lists the basic requirements for a GIS submission and the appropriate metadata that should be included.

Table 1. Reporting on AU Geographic Information

Water Type	GIS Coverage	Database Metadata
Rivers	River AUs should be included as a linear feature in a GIS coverage. NHD format is preferred.	Include standard metadata requirements for NHD event tables. A list of these requirements can be found at: http://www.epa.gov/waters/georef/nhdrit_datastructure.zip Otherwise provide Federal Geographic Data Committee (FGDC) "light" metadata about the coverage, as well as the location of an AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: http://www.fgdc.gov/metadata/contstan.html
Lakes	Lake AUs can be included as a linear or polygon feature in a GIS coverage. NHD format is preferred.	Include standard metadata requirements for NHD event tables. A list of these requirements can be found at: http://www.epa.gov/waters/georef/nhdrit_datastructure.zip. Otherwise provide Federal Geographic Data Committee (FGDC) "light" metadata about the coverage, as well as the location of a AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: http://www.fgdc.gov/metadata/contstan.html
Estuaries	Estuarine AUs should be included as a polygon feature in a GIS coverage.	Include Federal Geographic Data Committee (FGDC) "light" metadata about the coverage, as well as the location of a AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: http://www.fgdc.gov/metadata/contstan.html
Coastal Waters quality	Coastal shoreline AUs should be included as a linear feature in a GIS coverage. Other near coastal units (e.g., shellfish beds) should be reported as polygons.	Include standard metadata requirements for NHD event tables. A list of these requirements can be found at: http://www.epa.gov/waters/georef/nhdrit_datastructure.zip. Otherwise provide Include Federal Geographic Data Committee (FGDC) "light" metadata about the coverage, as well as the location of a AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: http://www.fgdc.gov/metadata/contstan.html

Water Type	GIS Coverage	Database Metadata
Wetlands	Wetlands AUs should be included as a polygon feature in a GIS coverage.	Include Federal Geographic Data Committee (FGDC) "light" metadata about the coverage, as well as the location of a AU identifiers in the coverage that can be joined to those in the database. FGDC metadata requirements can be found at: http://www.fgdc.gov/metadata/contstan.html

3) Report on the trophic status for all lakes

The trophic condition of all lakes must be reported using values found on http://www.epa.gov/waters/reporting .

4) Report attainment decisions for the AU's standard and each of its designated use(s)

EPA encourages states and territories to provide assessment information for every AU's designated use(s). Each AU's designated use should be assessed and reported to have one of the following conditions:

- Attaining standard
- Not Attaining standard
- Insufficient or no data and information - AUs with insufficient data and information to support an attainment determination for a standard.

For AUs which are not attaining one or more designated uses, jurisdictions should determine and report if the water is expected to attain its standard (i.e. all designated uses) in the near future. For these AUs, jurisdictions should report the other pollution control requirements which when implemented will result in the attainment of water quality standards. Jurisdictions should also report the dates these actions were or will be implemented and the anticipated year of attainment. This information is need by EPA to validate the assumptions jurisdictions used when placing AU's in category 4B.

Threatened waters are those AUs where a jurisdiction has determined that sufficient data exists to determine that all designated uses are being attained, and that non-attainment is predicted by the time the next *Integrated Report* is due to be submitted. These AUs should be included in Category 5.

5) Document how and when the attainment decision for each AU-designated use combination was determined

EPA requests the following information be included to document the attainment decision for each assessed AU designated use:

- Assessment date (e.g., December 20, 2003) - This date documents when the jurisdiction completed the technical analysis of data and made its decision on the AU's designated use attainment status. A common way to store a full Y2K-compliant date is in the character format YYYYMMDD (e.g., 20031220 for December 20, 2003).

- Assessment type - Jurisdictions should list all types of data they used to make each use attainment decision (e.g., physical/chemical monitoring, toxicity testing (e.g., bioassays), benthic macro-invertebrate surveys, etc.).

- Assessment level - Assessment levels, which range from 1 (least rigorous) to 4 (most rigorous) should be reported for each assessment type. Jurisdictions should provide definitions of their assessment levels in their assessment methodologies.

6) Report any pollutants and or non-pollutants causing impairment and their probable sources

Jurisdictions should report all of the pollutants or other types of pollution for impaired or threatened AUs. The list of acceptable pollutants and other types of pollution is available on http://www.epa.gov/waters/reporting. The list contains a complete set of chemical characteristics and non-pollutant causes of impairment. Jurisdictions should link the pollutant to the designated use or designated uses that are not being attained. Jurisdictions should also indicate the specific pollutant causing impairment when known.

Jurisdictions should also identify the probable sources contributing to an impairment. The sources should be documented using the list provided on http://www.epa.gov/waters/reporting . These sources need to be linked to the appropriate pollutant causing the impairment.

7) Report any observed effects of pollution for each AU-designated use combination

Jurisdictions should document and report any observed effects of pollution for each AU-designated use combination. Observed effects may include; fish lesions, fish kills, stream bottom deposits, low combined biota/habitat bioassessment. How jurisdictions use observed effects to make attainment decisions is dependent upon a jurisdictions' interpretation of their water quality standards and should be documented in their assessment methodology. Documenting observed effects is most important in AU's which are not attaining one or more designated uses but the pollutant or non-pollutant is unknown.

8) Report on approved TMDLs and provide a schedule for establishing TMDLs

Jurisdictions must submit an estimated schedule for establishing TMDLs for every pollutant on each AU in Category 5. This schedule must specify the month/ year for all TMDLs which will be established prior to the next *Integrated Report*, and the year for all others. In addition jurisdictions should indicate which of the pollutants on impaired AUs have an approved TMDL. Jurisdictions should indicate the date EPA approved these TMDLs and the EPA TMDL identification number. Information on the approval date and EPA TMDL identification number can be found on http://www.epa.gov/waters/reporting .

9) Documenting the monitoring schedule

The *Integrated Report* of all AUs should include monitoring schedules (reported as a year) for AUs that may be monitored and assessed prior to the submission of the next *Integrated Report*. The schedules should be consistent with the state's or territory's monitoring strategy and annual workplan.

B. Reporting assessments based on probability designs

State-wide or Watershed-level Assessments Based on Probability Designs

The following sections address the data requirements recommended by EPA for reporting probability-based assessments. This section of the guidance is EPA's first attempt at defining the data elements and format necessary to document a jurisdiction's assessment based upon probability based monitoring designs.

AUs which were part of a probability based sampling design may have data and information which satisfies the jurisdictions methodology for determining whether standards are attained or maintained. Generally, however, individual AUs that were part of the target population do not have enough data and information needed to make an attainment decision consistent with the jurisdictions methodology. These AUs should be placed in Category 3.

1) Identify the waters assessed through a probability design (Target Population)

Study area findings should be associated with the area's standard(s) and should be clearly documented along with the "Target Population" that was monitored to develop the indicator. For instance, wadeable perennial streams throughout a state and territory may be the target population for an indicator of biological integrity related to aquatic life support. Each probability survey project should be assigned an ID (a Probability Survey Project ID). Table 2 shows how this basic information on state probability survey projects should be organized.

2) Report the geographic locations of the target populations using NHD

Where the target population is not the same as an entire state, maps should be provided that use polygons to highlight a project's geographic area such as watershed units, eco-regions, or other geographic regions. States and territories are expected to have GIS polygon coverages related to each probability survey project. GIS coverages should conform to Federal Geographic Data Committee (FGDC) Geospatial Data Metadata Standards. State in-house probability survey project polygons should be available with basic FGDC-compliant metadata in either a shape file format or in a standard ESRI export file format (*.e00). Additional information can be found at: http://www.fgdc.gov/metadata/contstan.html.
Additional information to define the geographic frame (sample frame or "population") for a probability survey project should include such items as: the water type relevant to the project (e.g., rivers); or other "stratification" features (e.g., only for small wadeable streams identified as Horton-Sprawler Order 1-4).

States and territories are also expected to develop size estimates for the entire target population. States and territories should be able to document the GIS Hydrography coverage or other data layer used to develop their target population sizes.

3) Report probable attainment results for water quality standards

For each probability survey project, probable standard attainment results should be summarized using the format illustrated in Table 2. The table can be accompanied with graphics using pie charts or other business charting layouts. The presentation of the study's findings should apply a breakpoint that clearly defines the estimated percentage of the total target population meeting standards and the percentage not meeting standards. For each probability survey project, a description of the project methodology should be provided. Where there are a small number of standard project designs, a state can make reference to pertinent sections from its general monitoring design and assessment methodology materials. The estimated percentage of the target population meeting standards should also be accompanied by the precision of the estimate, in the form of 90 or 95% confidence intervals.

4) Report the precision and date of the probable attainment results

A major attraction of probability designs is that statistics can be developed that show the confidence levels associated with attainment results. States and territories should provide a discussion of the statistical tests they apply to produce the precision value information illustrated in Table 2. As with reporting for AU results, the assessment data should be included for each probability survey project indicating when the state and territory finished the technical analysis of data and made its decision on the standards attainment status. Table 2 illustrates how to display the assessment date in a Y2K-compliant format (YYYMMDD).

5) Report any pollutants and non-pollutants and their probable sources

Where possible, EPA requests that states and territories develop pollutant and source summary information for each of their probability survey projects using the format illustrated in Table 3. The maximum impact percentage in these tables should not exceed the percent for the use non-attainment results reported in Table 2 (a value of 25% for this hypothetical case).

Table 2. Reporting format for the attainment results calculated using a probabilistic monitoring design.

Project Name	*Target_Population*	*Project_ID*	*Type*	*Size*	*Units*	*Designated_Use*	*Percent_Attaining*	*Percent_Not_Attaining*	*As_Type*	*As_Qual*	*As_Date*	*Precision*	*Confidence*
Downstate Sample Survey	*All streams ordered 4 or greater in basin C*	*STX_1*	*River*	*100*	*mi*	*Aquatic Life*	*75%*	*25%*	*Biological*	*4*	*20000201*	*90%*	*+15*

Table 3. Reporting impairments and potential sources of impairment identified using a probabilistic monitoring design.

Project_ID	Designated_Use	Impairment_ID	Impairment_Percent	Source_ID	Source_Percent
STX_1	Aquatic Life	15	5%	2	70%
STX_1	Aquatic Life	166	10%	3	20%
STX_1	Aquatic Life	166	10%	3	10%

C. Data elements to be reported using EPA's Assessment Database or an equivalent relational database

Data elements to be reported using either EPA's Assessment Database or the relational database structure outlined in Section D, Minimal Database Elements to Support Electronic Submission are described in Table 4 below.

Table 4. Data Elements to be reported in the *2002 Integrated Report*.

Field Name	Field Type	Domain	Description	Include in Probability
AU_Name	Text	Free text	Name of the AU	Not Applicable (NA)
Location	Text	Free text Jurisdiction specific *Note This does not replace linking AU's to the NHD	Text description of the AU's location	NA
ID305B	Text	Free text Jurisdiction specific	Unique identifier for AU ID state defined	NA
AU_Type	Text	http://www.epa.gov/waters/reporting	Water type for the AU(e.g., River, Estuary, Wetland)	Y
AU_Size	Numeric	Dependent upon units used to measure	Size of the AU	Y
Size_Unit	Text	http://www.epa.gov/waters/reporting	Size unit (e.g., Miles if As_type is River)	Y
Trophic_Status	Text	http://www.epa.gov/waters/reporting	Trophic status of publicly owned lakes	N
Use_Desc	Text	Designated uses as described in state water quality standards	Description of the designated use which is being assessed	Y
Attainment	Text	Attaining, Not Attaining, Insufficient or No Information	The attainment status for a particular AU designated use	NA

Field Name	Field Type	Domain	Description	Include in Probability
Assmnt_Typ	Numeric	http://www.epa.gov/waters/reporting	Caption describing a category of data types used to make attainment/ impairment decision	Y
Assmnt_Qual	Numeric	http://www.epa.gov/waters/reporting	A score ranging from a lower range of 1 to an upper range of up to 4 indicating the reliability and precision of the applied for a category of standard-specific assessment type	Y
Assmnt_Date	Date	YYYYMMDD	Date the attainment decision was made	Y
Threatened_Flag	Text	Yes / NO	Flag used to indicate threatened waters. Threatened AUs are those AUs where uses are being attained, but non-attainment is predicted by the time the next *Integrated Report* is submitted.	NA
Monitoring_Scheduled_ Date	Date	YYYY	Date by which additional monitoring for attainment status will be completed	NA
Impairment_ID	Numeric	http://www.epa.gov/waters/reporting	EPA unique identifier assigned to pollutants, non-pollutants and observed effects.	Y

Field Name	Field Type	Domain	Description	Include in Probability
IMP_Group_ID	Numeric	EPA defined for pollutants and non-pollutants. State defined for observed effects or other impairment groupings	Used to group a collection of impairments into various categories such as pollutants and non-pollutants	Y
Source_ID	Numeric	http://www.epa.gov/waters/reporting	EPA identifier indicating the source of the pollutant.	Y
Enforceable_Action	Text	Free Text	Pollution control requirements other than a TMDL taken for AU to meet standard	NA
Action_Date	Date	YYYY	Year other pollution control requirement was / will be completed	NA
Expected_to_Attain_ Date	Date	YYYY	Date by which the AU is projected to attain its standard	NA
TMDL_Schedule	Date	YYYYMM	Date when the jurisdiction anticipates submitting the TMDL to EPA for approval	NA
TMDL_ID	Numeric	http://www.epa.gov/waters/tmdl	EPA assigned unique identifier for approved TMDLs	NA
PROJECT_ID	Text	Free text Jurisdiction specific	State assigned identifier used to uniquely identify the study / project.	Y
Precision	Numeric	1-100.00	Precision of the estimate, in the form of 90 or 95% confidence intervals.	Y

Field Name	Field Type	Domain	Description	Include in Probability
Confidence	Numeric	1-100.00	The confidence interval (% +) for the standard attainment decision	Y
Target_Population	Text	Free text Jurisdiction specific	Description of the project's target population	Y
Percent_Attaining	Numeric	1-100.00	Percent of target population attaining standard	Y
Percent_not_Attaining	Numeric	1-100.00 (not to exceed 1-Percent_Attaining)	Percent of target population not attaining designated standard	Y
Impairment_Percent	Numeric	Sum of all impairment percentages not to exceed the percent not attaining	Percent of non-attaining population impaired by a specific cause (30% non-attainment attributed to nitrogen)	Y
Source_Percent	Numeric	Sum of all source percentages not to exceed 100% for a given impairment	Percent of non-attaining population attributable to a particular source of pollution (e.g. of the 30% of nitrogen impaired waters 70% was potentially attributable to agricultural runoff.)	Y
Monitoring_Strat	BLOB	Free text	The jurisdiction's current monitoring strategy document stored in PDF, MS Word or Word Perfect Format	Y

Field Name	Field Type	Domain	Description	Include in Probability
Assessment_Method	BLOB	Free text	A copy of the assessment methodology used to make attainment decisions. Stored as PDF, MS Word or Word Perfect	Y

D. Minimal Database Design to support electronic submission of the Integrated Report

The data elements and business processes outlined in the previous three sections must be assembled into a relational database design. EPA's Assessment Database is one data base design capable of storing and reporting the attainment status of a jurisdiction's waters. States and territories should use EPA's Assessment Database to track the attainment status of their AUs and to submit the supporting information behind their *Integrated Report*. If a state or territory or authorized Tribe chooses not to use the Assessment Database, then at a minimum they should use the database design outlined in Diagram A with the data elements described in Table 4 to transmit their *Integrated Report* to EPA. EPA will provide any interested state or territory training and support using the Assessment Database.

Diagram A. Entity relationship diagram for the minimum elements needed to support an electronic submission of the *Integrated Report*.