DRAFT FOR PUBLIC COMMENT

Integrated Water Quality Monitoring and Assessment Methods

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1. Introduction

The US Environmental Protection Agency (USEPA) issued guidance (USEPA 2000a) for the development of an Integrated Water Quality Monitoring and Assessment Report (Integrated Report) by the States beginning with the Year 2002 submittal. This guidance recommends for the first time that States integrate their Water Quality Inventory Report (Section 305b of the Clean Water Act) and their Impaired Waterbodies List (Section 303d). The Integrated Report is intended to provide an effective tool for maintaining high quality waters and improving the quality of waters that do not attain water quality standards. The Integrated Report will also provide water resources managers and citizens with detailed information regarding the following:

- Delineation of water quality assessment units providing geographic display of assessment results;
- Progress toward achieving comprehensive assessment of all waters;
- Water quality standards attainment status;
- Methods used to assess water quality standards attainment status;
- Additional monitoring needs and schedules;
- Pollutants and watersheds requiring Total Maximum Daily Loads (TMDLs);
- Management strategies (including TMDLs) under development to attain water quality standards;
- TMDL development schedules.

The New Jersey Department of Environmental Protection (NJDEP) elected to develop an Integrated Report for New Jersey because this approach offers several significant improvements over the traditionally separate Water Quality Inventory and Impaired Waterbodies List Reports. Through the Integrated Report, EPA and NJDEP will begin to implement recommendations regarding comprehensive monitoring strategies included in the National Research Council's Report "*Assessing the TMDL Approach to Water Quality Management"* (National Research Council, 2001). This report emphasized the importance of science-based decision-making in both monitoring and assessment for developing an effective water quality management program.

The Integrated Report will streamline water quality reporting since data sources and assessment methods will be described in detail, providing a sound technical basis for assessment decisions. Assessment results will also be conveyed in a spatial context, allowing a clearer picture of water quality status and issues. Monitoring needs and schedules will be described, facilitating the articulation of monitoring priorities and identifying opportunities for cooperation with other agencies and watershed partners. TMDL needs and schedules will be defined to convey plans for water quality improvements. The public participation aspects will provide opportunities for data submittal and open discussion of water quality assessment methods and results.

However, these changes also bring new challenges. For example, a waterbody can be included in only one of the 5 categories (i.e., the category that conveys the highest degree of impairment) as a result of the integrated assessment. Thus, if a waterbody meets all applicable surface water quality standards except fecal coliform, the waterbody will be included in Category 5 - *"Water quality standard is not attained and a TMDL is required"* - until the fecal coliform TMDL is completed, even though all other water quality standards are met. Since this approach may result in an overly negative view of water quality, special attention will be given to presenting the overlapping results of multiple assessments to address this issue.

The Integrated Report will combine the non-regulatory requirements of the Water Quality Inventory Report (305b) with regulation driven List of Impaired Waterbodies (303d) (i.e., only the latter mandates TMDL development). Successful integration into a single report will require a careful meshing of requirements and procedures. In general, Category 5 of the Integrated Report will satisfy USEPA reporting requirements under Section 303d (Impaired Waterbodies) and the remaining Categories will document assessment under Section 305b (Water Quality Inventory). Therefore, the regulatory requirements (i.e., EPA approval and adoption; public participation, etc.) for 303d impaired waterbodies listing will only apply to Category 5 of the Integrated Report.

The methods used to develop the 2002 Integrated Report (and subsequent Reports) are described in this document (Methods Document). The goal of this Methods Document is to provide an objective and scientifically sound waterbody assessment methodology including:

- A description of the data that NJDEP will use to assess attainment of surface water quality standards;
- The quality assurance aspects of the data;
- A detailed description of the methods used to evaluate water quality standards attainment;
- The placement of waterbodies in one of 5 Categories.

This Methods Document will provide a companion to the 2002 Integrated Report. It is anticipated that this will be a living document and will be modified, as appropriate, to accompany subsequent Integrated Reports.

2.0 Statutory Authority and Guidance

The rules, regulations and guidance that are relevant for the development of the Integrated Report are briefly discussed below.

2.1 The Federal Water Pollution Control Act and its subsequent amendments are collectively known as the Clean Water Act (CWA). The CWA provides the statutory requirements for numerous water programs including Surface Water Quality Standards, Water Quality Inventory Report, Impaired Waterbodies List and Total Maximum Daily Loads (TMDLs).

2.2 Surface Water Quality Standards (SWQS) include water quality goals, policies, numeric and narrative criteria, and applicable design flows and waterbody classifications. Federal SWQS are promulgated by the USEPA. As required, New Jersey has adopted SWQS that are at least as stringent as the federal standards. New Jersey SWQS adopted at N.J.A.C. 7:9B in 1998 have received all USEPA approvals and were used to assess attainment of SWQS. Revisions to the NJ SWQS adopted in 2002 are undergoing final EPA review and will be used for subsequent Integrated Reports. The numerical criteria for some toxic parameters are found in USEPA's National Toxics Rule (CFR, 1989**).** The Delaware River Basin Commission (DRBC) adopted standards for the Delaware River, estuary and tributaries to the head of tide (DRBC, 1996). The New Jersey Department of Health and Senior Services (NJDHSS) establishes sanitary quality standards and beach closure procedures for ocean bay and lake bathing beaches (NJDHSS, 2000**).** The terms "applicable SWQS" and "applicable criteria" refer to the legally binding SWQS and criteria for the waterbody depending on jurisdiction and waterbody classification.

2.3 Water Quality Inventory Reports (305b) are prepared every two years by States and EPA as required under Section 305b of the CWA and contain assessments of water quality and descriptions of water resources management programs. Reports are used by Congress and USEPA to establish program priorities and funding for federal and state water resources management programs. EPA issues guidance as needed regarding the preparation of water quality inventory reports.

2.4 Impaired Waterbodies Lists (303d) are required under Section 303(d) of the CWA, and implementing federal regulations at 40 CFR 130.7. New Jersey regulations regarding Impaired Waterbodies Lists are found at N.J.A.C. 7:15-6. These regulations require identification of impaired waterbodies: those waters for which required pollution controls were not stringent enough to achieve the state's surface water quality standards. The state is required to establish TMDLs for the impaired waterbodies based on a priority ranking. Impaired Waterbodies Lists are required every two years and must be based on a documented methodology that includes an evaluation of existing and readily available data. Waterbodies continue to be included on subsequent Impaired Waterbodies Lists until: 1.) TMDLs are completed; 2.) Applicable criteria are met; or 3.) The original basis for the listing is shown to be flawed (See Section 7.3). Public participation in the development of Impaired Waterbodies Lists is required (See Section 10). USEPA is required to review and approve each state's 303(d) List (Category 5 in this Methods Document). In New Jersey, the final 303d List (Category 5) is adopted through the States Water Quality Management Plan as required in N.J.A.C. 7:15-6. (See Section 10).

A TMDL establishes allowable point and nonpoint source pollutant loads that a stream can assimilate and meet the applicable surface water quality standards criteria. TMDL implementation may result in more stringent discharge permit limits and/or non-point source best management practices (BMPs).

2.5 Integrated Report Guidance USEPA provided guidance to the States for developing Integrated Reports (USEPA 2002). The complete 2002 Integrated Report guidance is included in Appendix 1 and an overview of how NJDEP will assess waters based on this approach is described in Section 7 (Integrated Listing Guidance Methods). USEPA emphasized that the Integrated Report guidance does not alter the statutory provisions in sections 305b and 303d of the Federal Clean Water Act, nor does it change existing rules governing development of Impaired Waterbodies Lists discussed above. However, the guidance does update previous guidance, and to the extent that it is different, supercedes the previous guidance. USEPA guidance recommends the use of five categories to convey water quality standards attainment status.

The Integrated Report Guidance emphasizes the importance of monitoring and assessing waterbodies in each category to obtain the information needed, to assess progress toward attainment of SWQS, to address data gaps and to ensure that waterbodies which currently meet SWQS continue to do so.

3.0 General Data Requirements for the Integrated Report

3.1 Data Sources: NJDEP reviewed all existing and readily available data as required and is committed to using only data with acceptable quality assurance to develop the Integrated Report. Additional information on data sources is provided in Appendix 2: Data Sources for the 2002 Integrated Report.

3.2 Quality Assurance: NJDEP maintains a strong commitment to the collection and use of high quality data to support environmental decisions and regulatory programs. Quality Assurance Project Plans (QAPP) describe the procedures used to collect and analyze samples and ensure high quality data. The Department maintains a policy that an approved Quality Assurance Project Plan (QAPP) accompany all environmental data collection activities performed by, or for use by, the Department as outlined in the Department and USEPA Region 2's approved FY01-FY02 Departmental Quality Management Plan (NJDEP, 2001). NJDEP also published a Field Sampling Manual that includes approved procedures for sample collection, field quality assurance, sample holding times, and other data considerations. (NJDEP, 1992). Use of this manual, or equivalent field procedures, is required. Samples must be analyzed at a laboratory certified by NJDEP's Office of Quality Assurance, or federal laboratory (e.g., USGS National Water Quality Laboratory in Denver). The laboratory must use analytical methods certified by NJDEP, (N.J.A.C. 7:18), USEPA, or USGS.

The QAPPs of all routine ambient monitoring programs operated by NJDEP are approved annually prior to initiation of sampling. QAPPs are prepared and approved prior to initiating research projects used to collect fish tissue data and the Interagency Toxics in Biota Committee (TIBC) reviews data and risk assessment methods used to develop fish consumption advisories. The Site Remediation Program (SRP) also requires very extensive quality assurance documentation and QAPPs, which must be approved by NJDEP or USEPA, as required. NJDHSS oversees quality assurance procedures for the monitoring programs conducted by local health authorities (e.g., Lake Beach Monitoring).

All data and information submitted to NJDEP for consideration in the development of the Integrated Assessment is required to follow the Department's quality assurance guidelines (NJDEP, 2001).

3.3 Locational Data: Accurate locational data are particularly important for the Integrated Report because each assessment is linked to a waterbody. For some parameters (e.g., dissolved oxygen, temperature, and pH), the applicable SWQS criterion depends on specific stream classification areas established by regulation (N.J.A.C.7:9B). Accurate locational data will be needed to ensure appropriate comparisons to criteria and that sampling stations are located outside of regulatory mixing zones. NJDEP will accept monitoring data if sampling locations are accurate to within 200 feet. Digital spatial data (GIS or GPS) and USGS Quadrangle maps are acceptable ways of providing locational information. Only sampling data that are spatially referenced will be used to develop the Integrated Report. Sampling location data for all NJDEP monitoring programs are gathered using a Global Positioning System.

Locational data will be used to estimate the spatial extent of this assessment using the methods discussed in Section 6. EPA has encouraged states to increase the number and percent of waters assessed. Previous EPA guidance for Water Quality Inventory Reports included two types of spatial

assessments: monitored waters and estimated waters, which are defined for this Integrated Report Methodology as follows:

- **Monitored Waters**: assessment results applied to a waterbody based on monitoring site data using the hydrologic method for estimating spatial extent (discussed in Section 6). Given the high degree of confidence in these results for monitored waters, they will be used to place a waterbody in Categories 1 through 5.

- **Estimated Waters**: assessment results extrapolated from adjacent monitored waters using the hydrologic method for estimating spatial extent (discussed in Section 6). Extrapolations will be based on land use, possible pollution sources, and best professional judgement. Given the lower degree of confidence in these results for estimated waters, they will only be used to place a waterbody in Categories 2 and 3.

3.4 Electronic Data Management: In general, only electronic data are considered "readily available", due to the significant effort needed to computerize and analyze hard copy data to compare it with applicable SWQS. NJDEP uses electronic data from USEPA's Storage and Retrieval (STORET) system; USGS's National Water Information System (NWIS) and accepted data from special programs (e.g. USEPA's Helicopter Beach Monitoring Program and local monitoring entities) in Excel and Access. Microsoft databases are the norm for NJDEP database management and retrieval (i.e., Excel, Access). Consistent with NJDEP's STORET policy, STORET formatting is encouraged as a standard for data management.

3.5 Reference Reports In order to ensure a strong technical foundation for the Integrated Report, NJDEP requests "citeable" hard-copy reference reports for each data source. This request ensures that the monitoring entities are responsible for compiling the data, completing a detailed quality assurance review and can address questions regarding the dataset. Furthermore, citeable reports offer those who review the New Jersey Integrated Report an opportunity for independent evaluation of the underlying data. Written reports are available for most datasets and range from very basic raw data reports (that included a brief description of the monitoring program and tables of raw data) to very thorough peer-reviewed reports. Report availability is discussed in more detail in Appendix 2: Data Sources for the 2002 New Jersey Integrated Report.

3.6 Assessment of Waterbodies on Previous NJ Impaired Waterbodies List Waterbodies included on previous NJ impaired waterbodies list (i.e., 1998 303(d) List: See NJDEP, 1998) will be evaluated using all existing and readily available data that meets the data requirements specified in this Methods Document. If new data are available, the waterbody will be reassessed using the methods described in Section 4 and 5. If no new data are available and the integrated assessment does not justify moving it to an alternate category, the waterbody previously listed as impaired, will continue to be assessed as "non-attainment" as required by 40 CFR 130.7 and N.J.A.C. 7:15-6.

4.0 Numeric Water Quality Criteria Assessment

Numeric water quality criteria are available for conventional parameters (i.e. dissolved oxygen, pH, temperature), toxics (i.e. metals, organics, un-ionized ammonia) and sanitary quality (i.e., pathogens). It is important to note that water quality data will be compared to applicable numerical criteria and some parameters may be assessed alone or in combination to determine designated use attainment (e.g., pH and TSS data are integrated to evaluate industrial water supply designated uses).

Surface Water Quality Standards Considerations: The following aspects of the applicable numeric water quality criteria (N.J.A.C 7:9B, USEPA's National Toxics Rule and DRBC Water Quality Regulations) are considered in each assessment:

- **Design Flows**: Data must be collected when streams are at or above "design flows" in the applicable SWQS. Design flows in NJ SWQS are defined in N.J.A.C. 7:9B-1.5 and also apply to EPA's National Toxics Rule as follows:
  a) human carcinogenic effect based criteria: long term harmonic mean flow (i.e., number of daily flow measurements divided by the sum of the reciprocal of the flows);
  b) non-carcinogenic effect based criteria: minimum average 30 consecutive day flow with a statistical recurrence interval of 5 years (MA30CD5);
  c) acute aquatic life protection criteria: minimum average 1 day flow with a statistical recurrence interval of 10 years (MA1CD10); and
  d) chronic aquatic life protection criteria and all other criteria: minimum average 7-day flow with a statistical recurrence interval of 10 years (MA7CD10).

  The numerical stream water quality objectives for the Delaware Basin are based on MA7CD10 for streams where stream flow is not regulated. For streams where flow is regulated and the flows are significantly different from natural flows, the design flow may be altered to reflect these variations. (DRBC, 1996, pg. 92).
- **Antidegradation**: The SWQS antidegradation policies for Category 1 (C1) waters preclude changes in water quality except toward natural water quality.
- **Frequency of Exceedence**: The acceptable frequency of exceedence of applicable SWQS for conventional water quality parameters is 10% based on USEPA Guidance for the Preparation of Water Quality Inventory Reports (USEPA, 1997b). For toxics, the allowable frequency of exceedence is 1 in 3 years.
- **Magnitude of Exceedence**: The SWQS and EPA guidance do not provide methods to consider the magnitude of the exceedence. Therefore, the magnitude of an exceedence is not considered, (i.e., concentrations slightly above the criteria were considered exceedences of the criteria), providing a more conservative assessment.
- **Duration of Exceedence**: The SWQS include duration considerations for average concentrations over 1 hour for acute aquatic life criteria, 4 days for chronic aquatic life, 30 days for non-carcinogens and 70 years for carcinogens. In general, based on the current monitoring protocols (i.e., grab samples) it is not possible to consider the duration of exceedence. Therefore, individual exceedences were considered to extend over the applicable duration, providing a more conservative assessment.
- **Natural Conditions**: Waterbodies that do not meet applicable SWQS criteria potentially due to natural conditions will be carefully evaluated. If the excursions can not be conclusively attributed

to natural conditions, the waterbody will be classified as "non-attainment" providing a conservative analysis. If excursions can be attributed to natural conditions, the natural water quality will be used in place of the criteria, and the elevated levels will not be considered exceedences of the applicable criteria, as per N.J.A.C. 7:9B-1.5. These waterbodies may be candidates for development of site-specific criteria.

- **Threatened Waters:** Threatened waters are evaluated using EPA Guidance "If water quality now meets applicable water quality criteria but adverse water quality trends indicate that water quality criteria will not be met in 2 years, the waterbody is assessed as threatened and classified as non-attainment" based on guidance for the Integrated Report (USEPA, 2001).

4.1 Conventional Water Quality Parameters Assessment

Conventional water quality include parameters such as dissolved oxygen, pH, total phosphorus, total suspended solids, total dissolved solids, sulfate, temperature, chloride, and nitrate. Information regarding data sources is provided in Appendix II.

4.1.1 Data Requirements Specific for Conventional Parameters

In addition to the requirements provided in Section 3 (General Data Requirements), the data requirements for analysis of conventional water quality parameters are based upon sampling frequency, duration, and data age. The recommended sampling frequency is at least 10 samples collected at least quarterly for a minimum of 2 years. If data collection does not meet the preferred requirements, then an alternative assessment method applies to the more limited data sets with a minimum data requirement of at least 4 samples. These data requirements are intended to ensure that existing water quality conditions are accurately portrayed and do not characterize transitional conditions or use obsolete data.

Table 4.1: Data Requirements Specific to Conventional Water Quality Parameters

Data Considerations	Data Requirements Specific to Conventional Water Quality Parameters
Minimum Sampling Frequency	At least 10 samples, collected at least quarterly, over 2 years recommended. Modified assessment method for data not meeting recommended minimum . At least 4 samples required.
Data Age	Most recent 5 years of readily available data.
Spatial Extent of Assessment	Determined for each site using the hydrologic spatial assessment method described in Section 6.

4.1.2 Conventional Water Quality Parameters Assessment Method

Nutrients: The applicable numerical water quality criterion for total phosphorus in Category 2 streams is 0.1 mg/l or part per million (ppm) total phosphorous (TP); the applicable criterion for lakes is 0.05 ppm TP. In the past, NJDEP has assessed streams at lake inlets and outlets using 0.05 ppm TP to evaluate whether streams could contribute to lake eutrophication and to infer in-lake concentrations in the absence of monitoring data from the lake. For this Integrated Report all streams will be assessed using 0.1 ppm TP. Stream stations at lake inlets and outlets will also be used to evaluate lakes by comparing data to the lake criterion of 0.05-ppm TP.

In addition to the numerical water quality criteria for total phosphorus, the SWQS include narrative nutrient policies at N.J.A.C. 7:9B-1.5(g) that apply to all freshwaters of the state. The narrative nutrient policies preclude nutrient concentrations that cause objectionable algal densities, nuisance aquatic vegetation or render waters unsuitable for designated uses.

It is anticipated based on federal guidance (USEPA 1999) that differing eutrophication indicators will be needed to assess attainability of site-specific (i.e., lakes, reservoirs, streams, rivers) designated uses (i.e., aquatic life, recreation and water supply). For example, because of spatial and residence time concerns, NJDEP may need to monitor the following parameters for assessing the designated use attainment of aquatic life protection in a reservoir: dissolved oxygen, biological indicators, transparency, total phosphorous, and total nitrogen. In contrast a flowing stream for the same aquatic life protection may require information on biological indicators, periphyton biomass, dissolved oxygen, pH, soluble reactive phosphorous and total nitrogen (DIN). Similar concerns will need to be addressed in finding the appropriate monitored indicators protective of recreational and water supply designated uses for stream, lakes and reservoirs.

NJDEP, in alignment with EPA's recommendation (USEPA 2002), is investigating eco-regional specific nutrient criteria based on linking stressors (i.e., total phosphorous, nitrogen) with biological responses (i.e., periphyton diatoms, biomass, Chlorophyll a, diurnal DO, turbidity, etc.). Active field investigations and site specific studies are currently underway to investigate the relationships between nutrients (stressors) and response indicators (e.g. chlorophyll a, algal biomass and algal community structure) to determine if predictive stressor–response models may be constructed which are protective of designated uses and which can be used in future assessments. Through both applied research (e.g., algal densities) and practical re-assessments of historical data (e.g., nutrient cycling, watershed location, seasonality and stream flow) we will attempt to reconcile designated uses with monitored waterbodies.

Dissolved Oxygen: When assessing diurnal dissolved oxygen data, the individual analyses for a 24-hour period are averaged together for comparison to the 24-hour average criteria. For evaluation of the "not less than at any time" criteria the lowest DO value of the 24 hour period will be compared to the criteria.

Modified Water Quality Assessment: A modified assessment method will be developed and used for datasets that do not meet the preferred data requirements but still have value in assessing water quality. Examples of this type of data may include: 1.) datasets of less than 10 samples; 2.) sampling less than quarterly frequency; or 3.) the duration of sampling is less than 2 years. Datasets of these types will are evaluated on a case-by-case basis to determine if the data characterize the range of water quality variation that adequately represent conditions of existing water quality. If it is determined the data do not adequately represent existing water quality conditions based on these or other possible qualifying factors the result will be an assessment of "insufficient data". Additionally, "non attainment" waters require at least two exceedences to confirm water quality does not meet SWQS. This applies in circumstances when the number of samples is less than 10 and additional sampling that meet the recommended data requirements will not change the assessment result.

Table 4.2: Conventional Water Quality Parameters Assessment Method

Assessment Method	Result
Water Quality Assessment for Recommended Sampling Protocol	
10% or less of samples exceed applicable SWQS or excursions due to natural conditions	Full Attainment
Threatened Waters: Less than 10% of samples exceed applicable SWQS, but declining WQ trends indicate SWQS are likely to be exceeded in more than 10% of samples within 2 years	Non Attainment
More than 10% of samples exceed applicable SWQS	Non Attainment
Modified Water Quality Assessment	
10% or less of samples exceed applicable SWQS or excursions due to natural conditions with at least 8 samples	Full Attainment
10% or less of samples exceed applicable SWQS or excursions due to natural conditions with less than 8 samples or only one (1) sample exceeds applicable SWQS with less than 10 samples	Insufficient Data
Data does not adequately represent existing water quality conditions	Insufficient Data
More than 10% of samples exceed applicable SWQS and two (2) or more samples exceed applicable SWQS	Non Attainment

4.1.3 Development of an Assessment Method for Probabilistic Sampling Results: Probabilistic sampling design is based on a random selection of sampling locations so that each location has an equal chance of being sampled. This approach strengthens the statistical basis for data analysis since many statistical tests assume a probabilistic sampling design. Therefore, alternative assessment methods may be appropriate and necessary to evaluate data from probabilistic designs.

EPA recommends that states include probabilistic sampling to increase the number and percentage of waterbodies assessed. While probabilistic sampling can provide reasonable estimates of water quality with known confidence, application of the results to specific stream reaches is challenging. As discussed in Appendix II, the NJDEP's redesigned ASMN includes a probabilistic sampling component through the statewide status stations which are selected at random every year from the pool of ~800 AMNET sites. These ~800 sites are considered to be representative of a variety of watershed characteristics including land use, basin size and population density, based on an analysis done by USGS for the 2000 New Jersey Water Quality Inventory Report (NJDEP, 2001). New Jersey's probabilistic design is currently stratified by WMA: two statewide status sites per WMA are sampled quarterly for one year. While this approach facilitates broad spatial distribution of the randomly selected sites, the results cannot be readily applied to specific stream reaches as required for assessments in the Integrated Report (at this time).

EPA's 2002 Guidance (See Appendix I) states that assessment units sampled through a probabilistic design may not have enough data to make attainment decisions and, if so, these should be placed in Category 3. However, this approach minimizes the usefulness of probabilistic monitoring resources for Integrated Reporting. The following approaches are being explored to better utilize the statewide status station data:

1. Compare statewide status station data to data from sites with 8 or more samples if their spatial extent overlaps using the hydrologic method for determining spatial extent described in Section 6.
2. If assessment results are the same, extend the spatial assessment to include the statewide status station.
3. If assessment results are not the same, use the modified assessment method described above for stations with less than 8 samples
4. Assess the waterbody as "full attainment" if the maximum concentration at a statewide status station is less than 50% of the applicable criterion (this percentage is recommended because it indicates very good water quality and could be tested with data from sites with greater than 8 samples).
5. Aggregate data from statewide status sites based on various factors such as fall line, drainage area and land use utilizing GIS and the work completed to determine basin size and land uses for each of the 800 AMNET sites. If results indicate we can state with confidence (e.g., 95% level) that statewide status stations with smaller than X drainage and more than Y undeveloped land meet applicable criteria for one or more parameters, assess all statewide status sites with these characteristics as "full attainment". Conversely, if sites with other characteristics are estimated with significant confidence to not attain SWQS, assess all sites in that group as "Not attaining".

4.2 Toxic Water Quality Parameters Assessment

Toxic parameters include un-ionized ammonia, metals and organics. Organics include current and historical pesticides and volatile organic compounds (VOCs). Assessment methods for these parameters are discussed below.

4.2.1 Un-ionized Ammonia Assessment

The un-ionized ammonia assessment is conducted in waterbodies classified as FW and PL. Un-ionized ammonia is calculated from total ammonia concentrations using pH and temperature at the time of sampling.

Data Requirements Specific to Un-ionized Ammonia

In addition to the data requirements described in Section 3 (General Data Requirements), specific data requirements identified under Section 4.1.2 (Conventionals) apply to un-ionized ammonia.

Table 4.3: Un-ionized Ammonia Assessment Method

Assessment Method	Assessment
Water Quality Assessment for 8 or More Samples in 5 Years	
Less than or equal to 1 exceedence in 3 years of applicable SWQS criteria for AQLc or excursions were due to natural conditions	Full Attainment
Threatened Waters: Less than or equal to 1 exceedence in 3 years of applicable SWQS criteria for AQLc, but declining WQ trends indicate SWQS are likely to be exceeded within 2 years	Non Attainment
More than 1 exceedence in 3 years of applicable SWQS criteria for AQLc or included on 1998 Impaired Waterbodies List and no new data available.	Non Attainment
Water Quality Assessment for 4-7 Samples in 5 Years	
All samples met SWQS or excursions were due to natural conditions	Insufficient Data
One (1) sample exceeded applicable SWQS	Insufficient Data -
Two (2) or more samples exceeded applicable SWQS	Non Attainment

4.2.2 Metals

An Interagency 303d Technical Workgroup including representatives from NJDEP, USEPA Region II and USGS were tasked with developing a water quality assessment procedure for metals. This workgroup developed a procedure using New Jersey's Whippany River Watershed in a pilot project as per the USEPA Region 2 and NJDEP Memorandum of Agreement (MOA) for TMDL development (March 13, 2000). This metals procedure will be applied in assessing the results from the previous NJ Impaired Waterbodies List and current data.

Data Requirements for Assessment of Metals

In addition to the requirements provided in Section 3 (General Data Requirements) the following specific data requirements will be required for the assessment of metals.

Table 4.4: Data Requirements for Assessment of Metals

Data Consideration	Data Requirements for Assessment of Metals
Minimum Sampling Frequency	At least 4 samples collected within 5 years
Data Age	The most recent 5 years of readily available data
Flow Considerations	Three (3) stable baseflow samples and one (1) elevated flow sample recommended; Direct flow measurement preferred for baseflow samples, USGS should calculate flows from nearby stations as needed. See Notes below.
Metal Fraction	Total recoverable (TR) and dissolved fraction (DF) as needed for comparison to SWQS; Lab filter for DF preferred.
Spatial Extent of Assessment	Determined using the method for Statewide Status Stations described in Section 6.1.2: Spatial Extent of Ambient Stream Monitoring Network Stations
Notes:	
Stable Baseflow: flows that are above SWQS design flows, below long term daily median flow and less than 30% change from the previous day.	
Elevated flow: flows that are 10% or more above long term daily median flow.	

Form of Metal: Surface Water Quality Standards (SWQS) criteria for metals include human health (HH), acute aquatic life (AQLa) and chronic aquatic life (AQLc). HH criteria are based on TR form of the metal to protect human health from all forms of metals. Most AQL criteria are based on DF form of the metal; exceptions are AQLc for mercury and AQL for selenium. AQL criteria for cadmium, copper, lead, nickel, silver and zinc were calculated based on hardness at the time of sampling. The applicable criterion decreases as hardness decreases, due to the increased bioavailability of metals in low hardness waters.

To the extent available, total recoverable (TR) and dissolved fraction (DF) data will be compared to TR and DF criteria, respectively. Note that only TR data are collected in the Ambient Stream Monitoring Network (ASMN). TR concentrations above DF criteria will trigger additional sampling and not TMDL development. Metal translators in the DRBC Water Quality Regulations will be applied as appropriate.

Minimum Detection Limit: In some cases, the analytical minimum detection limit (MDL) will be higher than the applicable criterion (i.e., concentrations at or below the criterion are not measurable). This occurs for arsenic (MDL: 1 part per billion (ppb), HH criterion: 0.017 ppb); and mercury (MDL: 0.04 ppb, AQLc criterion: 0.012 ppb). In low hardness waters, AQLc criteria for cadmium, copper and lead will not be measurable in some samples. An exceedence will not be identified if the criterion and metal concentration are below the MDL; analyses with lower MDLs will be sought. An exceedence is identified if the criterion is below the MDL and the metal concentration is above the MDL and thus the criterion.

Aluminum, Beryllium and Iron: The 1998 303d List includes waterbodies that were identified as impaired for aluminum, beryllium and iron. Beryllium listings in FW and PL streams were based on criteria proposed by NJDEP that was later withdrawn. While Federal SWQS do not include criteria for beryllium, DRBC Water Quality Regulations include criteria for this metal, facilitating assessment of beryllium in the Delaware River. Iron listings were based on exceedences of Drinking Water Secondary Maximum Contaminant Level for iron. The secondary MCL is provided for taste and odor considerations, as the iron does not pose a threat to human health. NJDEP and Federal SWQS do not include criteria for iron.

The SWQS include a provision to protect against "toxic substances in toxic amounts" in N.J.A.C. 7:9B-1.5 (a). The criteria development process would include an evaluation of risks to human health and aquatic life for these metals and the development of appropriate criteria. Beryllium and iron will not be assessed in FW, PL, SE and SC classifications since criteria are not available. Beryllium will be assessed using the method below in waters under DRBC jurisdiction.

Table 4.5: Metals Assessment Method

Water Quality Assessment Method for Metals	**Assessment**
Applicable criterion is measurable and met in at least one of 3 stable baseflow samples and 1 elevated flow sample, with or without application of waterbody specific DF/TR ratios; or excursions are due to natural conditions (See notes)	Full Attainment
Applicable criterion is measurable and not met in any one of at least 3 stable baseflow and 1 elevated flow samples or applicable criterion is not met but detectable concentrations are found in one or more samples or included on 1998 Impaired Waterbodies List and no new data available.	Non-Attainment
One or more of the following applies: • Applicable criterion is not measurable; • Data from at least 3 stable baseflow and 1 elevated flow data are not available; • TR data from the ASMN exceeds an applicable dissolved criterion; • Elevated concentrations approaching or above the criterion occurred in field or laboratory blanks	Insufficient Data
Notes: Additional discussion is needed regarding waterbody specific DF/TR ratios	

4.2.3 Organics Assessment Method

The Department began collecting data for organics at its statewide status stations in 1997 through the redesigned ASMN. The statewide status stations are selected at random every year from the pool of ~800 AMNET sites. This probabilistic design is discussed in detail in Section 4.1.3. While this approach facilitates broad spatial distribution of the randomly selected sites, the results cannot be readily applied to specific stream reaches as required for assessments in the Integrated Report. NJDEP is investigating statistical approaches for developing probabilistic assessment methodologies (See Section 4.1.3: Development of an Assessment Method for Probabilistic Design).

5.0 Assessment Method for Designated Use Attainment

The SWQS identify specific designated uses for the waters of the State according to their waterbody classifications. Designated uses include aquatic life, recreational, fish consumption, drinking water, industrial water supply and agricultural water supply.

5.1. Aquatic Life Designated Use Assessment

The water quality requirements of many diverse species of aquatic life vary and are difficult to measure. Attainment of many of the numerical SWQS criteria are intended to protect aquatic life from the detrimental effects of poor water quality (e.g., dissolved oxygen, temperature, toxic pollutants). Attainment of SWQS for these parameters is discussed in Section 4. It is also important to evaluate important aquatic communities as direct indicators of aquatic life designated use attainment. Currently, numerical biocriteria for assessment of aquatic life designated uses have not been adopted in the NJSWQS. Biocriteria were promulgated by DRBC for the upper portions of the Delaware River that have been designated as Scenic and Recreational River and Delaware Water Gap; biocriteria are currently not available for other portions of the river. For waters where biocriteria are not available, the assessment of aquatic life designated uses is based on evaluation of existing and readily available biological community data. Dissolved oxygen is used as a surrogate for biological data in coastal waters because biological data are not available.

5.1.1 Aquatic Life Designated Use Assessment Method for Lakes

Data Sources for Aquatic Life Designated Use Assessment for Lakes

Fish populations are sampled using methods such as electrofishing, shoreline seining and/or gillnetting. Population assessments are then performed by experienced fishery biologists for the purpose of determining the lake's actual or potential recreational value as a fishery. These assessments are based upon the diversity of a wide range of fish species and not just of species possessing recreational value. Species stocked by the Department are also identified and addressed in these assessments. Results of published DFW fisheries assessments are used to assess aquatic life designated use attainment in lakes as shown in Table 5.2.

Data Requirements Specific to Aquatic Life Designated Use Assessments in Lakes

In addition to the requirements provided in Section 3 (General Data Requirements) the following are specific data requirements for the assessment of aquatic life designated uses in lakes.

Table 5.1: Data Requirements Specific to Aquatic Life Designated Use Assessments for Lakes

Data Considerations	Data Requirements for Aquatic Life Designated Uses Assessment Method for Lakes
Sampling frequency	Sufficient to establish recruitment capability
Field QC	Field identification should be carried out by qualified fishery biologists
Assessment references	Nielsen, L. and Johnson, D. 1983, Fisheries Technique. American Fisheries Society. Murphy, B. and Willis, D. 1996. Fisheries Technique, 2nd ed. American Fisheries Society.
Spatial extent	Assessment should be lake-wide.

Table 5.2: Aquatic Life Designated Uses Assessment Method for Lakes

Aquatic Life Designated Uses Assessment Method for Lakes	Result
Fishery is well balanced, exhibiting good diversity. Consistent recruitment.* No one species dominates the community. No observable factors limiting the fishery.	Full Attainment
Threatened Waters**: Fully supported fishery, however, anticipated changes in surrounding land use, lake water levels or in-lake water quality have the potential to cause future declines in fishery quality.	Non Attainment
Fisheries present, however, fish diversity not at potential expected for the type of lake in question. Predators to prey populations are not in balance, inconsistent recruitment*.	Non attainment
Fishery exhibits poor diversity. Fishery dominated by a few tolerant species (carp, goldfish, mudminnows, killifish, etc) and/or general overall number of individuals is low. Poor recruitment* and growth of individuals.	Non attainment
*_Recruitment_ refers to the number of young fish, which survive to ultimately become large enough to reproduce and/or become harvestable. For example: reproduction of a number species of fish in a lake may be good but there may be insufficient habitat cover resulting in many of these fish being eaten by their larger counterparts before they grow to sufficient size to either reproduce or be sought after by anglers. In such a scenario, recruitment is regarded as poor. **Note that because of the nature of the information that form the basis of the *"Threatened"* category as it applies to lake aquatic life assessments, the strict 2-year window applied to conventional parameters is not applied here. "Threatened" status here operates within a broader time window, which could encompass a period of, for example, 5 years.	

5.1.2 Aquatic Life Designated Use Assessment in Rivers

Benthic Macroinvertebrate Data Assessment: Biological assessment provides a direct measurement of aquatic life beneficial uses. The occurrence of bottom dwelling organisms, such as insects, crustaceans, snails and worms (i.e., benthic macroinvertebrates) is monitored in free-flowing streams. This assessment method is supported by findings that the occurrence of different aquatic species and communities is limited by environmental conditions and tolerances to pollution and/or habitat degradation. The occurrence of these tolerant and intolerant organisms is in turn used to screen streams for potential impairments for aquatic life designated uses. All macroinvertebrate sampling is conducted in accordance with USEPA guidance (USEPA 1989) and NJDEP field sampling procedures (NJDEPE 1992). Quality control measures must be consistent with USEPA procedures (USEPA 1999) and all specimen identifications must be performed by a qualified biologist.

An Interagency 303d Technical Workgroup including representatives from NJDEP, USEPA Region II and USGS were tasked with developing a water quality assessment procedure for application of the macro-invertebrate network in New Jersey and developed a series of recommendations as to how the individual sites should be assessed with respect to the Integrated List. A summary of this effort is delineated in Appendix IV. This procedure will be applied in assessing the results from the previous NJ Impaired Waterbodies List and current AMNET results.

In general the protocol directs that an AMNET result indicating a waterway as non-impaired or severely impaired (Non-Pinelands waters) which does not conform to items 1, 2 and 3 below will be placed in Categories 1, 2, or 5 of the Integrated Report as appropriate (see Table 5.3, below). However, assessment of AMNET Sites of moderately impaired status, not conforming to items 1, 2 and 3 below, will be placed in Category 3 of the Integrated Report which will require a reassessment when appropriate protocols are developed:

1. Monitoring sites must be located at points that represent the downstream terminus of a catchment area of 6 sq. mi. or greater;
2. Sites should not be located within 500 feet of a lake or impoundment outlet; and
3. Sites should be sampled between April through November, inclusive.

Note: These protocols will not apply to waters contained within the NJ Pinelands Area because of the unique nature of the low pH adapted organisms within these waters (i.e., PL designated surface waters as per N.J.A.C. 7:9B). These waters include both "Preservation" and "Protection" areas within the Pinelands, the Mullica and Great Egg Harbor River watersheds as well as the eastern portions of some Delaware tributaries, which also possess low pH characteristics.

Table 5.3: Macroinvertebrate Assessment Method

Data Assessment	**Result**
Assessments from locations in Pinelands waters (PL designations)	Further Assessment required
The following applies only to non-PL waters:	
Non-PL waters assessed as Non-Impaired	Attainment
Non-PL waters assessed as Severely Impaired	Non Attainment
Non-PL waters assessed as Moderately Impaired but falling under categories 1 – 5 below:	
1) Sites at points that drain a catchment area of less than 6-sq. mi.	Further Assessment required
2) Sites at points that drain a catchments area of 6 sq. mi. or greater:	Non Attainment
3) Sites located within 450 feet of a dam (impoundment outlet)	Further Assessment required
4) Sites assessed based upon April to November (inclusive) samples	Non Attainment
5) Sites assessed based upon December to March samples	Further Assessment required

Flow Effects: Research by the USGS has indicated that insufficient base flow can have detrimental effects on aquatic macroinvertebrate populations. The Department is currently investigating this issue more closely through several research projects being performed in cooperation with the USGS. The Department realizes that in some cases, non attainment of use may be due to extended drought conditions and this, in turn, may influence how the individual AMNET sites are (or will) be assessed with regards to use support.

5.1.3 Aquatic Life Designated Use Assessment Method for Tidal Waters

Dissolved oxygen (DO) is necessary for most aquatic life forms and monitoring data for DO in tidal waters is readily available through existing monitoring networks. Therefore DO status is used as an indicator for tidal water aquatic life designated use assessment. However, because many open water

aquatic species are mobile and/or naturally tolerant of transient low DO occurrences DO is an indirect indicator of aquatic life designated uses. Additional data and assessments are needed to develop a direct indicator of aquatic life designated use attainment in tidal waters.

Data Requirements Specific to Aquatic Life Designated Use Assessment in Tidal Waters
In addition to the requirements provided in Section 3 (General Data Requirements) data requirements for assessments of aquatic life designated uses in tidal waters are described below:

- **Estuarine Waters -** The aquatic life assessment method is based upon quarterly subsurface dissolved oxygen (DO) levels recorded within a recent five-year time span. Water column DO levels are based upon criteria contained within New Jersey's Surface Water Quality Standards (N.J.A.C. 7:9B). Assessment and listing methodology are summarized in Table 4.2 .
- **Ocean Waters** -Aquatic life assessment for New Jersey territorial ocean waters is based on water column DO levels (Sampled June to September) collected by the USEPA Region II helicopter survey and by monitoring conducted by the NJDEP's Bureau of Marine Water Monitoring. Although EPA monitors transects that extend nine miles off the New Jersey coast; for the purposes of this NJ Integrated Report the assessment of data will be confined to only the innermost 1 and 3 mile transect points (Fig. A5.1). Assessments are based on dissolved oxygen values recorded one meter above the ocean bottom. Water column DO levels are based on criteria contained within New Jersey's Surface Water Quality Standards (N.J.A.C. 7:9B). Assessment and listing methodology are summarized on Table 4.2. USEPA Region 2 has found, over many years of monitoring, that surface DO levels are consistently acceptable (DO is at or above 5mg/l) within the waters they survey. Based on Region 2's findings regarding surface DO levels, the EPA has discontinued monitoring of DO in surface waters, and NJDEP assumes that surface DO is at or above 5mg/l. In contrast, nearshore DO monitoring by NJDEP has found frequent contravention of the subsurface DO standard within the southerly portions of the coast. These have been factored into the Department's use support assessment of Ocean Waters.

Table 5.4: Sampling Characteristics for Assessment of Aquatic Life Designated Uses in Tidal Waters

Data Considerations	Data Collection for Assessment Aquatic Life Designated Uses in Tidal Waters
Minimum Sampling Frequency	Quarterly sampling in tidal rivers, back bays and inlets; Weekly sampling in the ocean during the summer
Data Age	The most recent 5 years of readily available data.
Tidal Considerations	None
Spatial Extent	See Section 6.

Aquatic Life Designated Use Assessment Method
Dissolved oxygen measurements were compared to applicable criteria as described in Section 4. For ocean stations, surfaced measurements were used and for estuarine stations, mid-water column measurements were used.

Note: In contrast to surface DO levels, the EPA monitoring has found benthic low DO conditions off the New Jersey coast for most of its length during the quiescent periods of the summer and early fall. These are brought about by the thermal a stratification that establishes in this period. Storms and the

onset of autumn bring about surface to bottom mixing resulting in a breakup of these low DO conditions until the onset of warmer temperatures again in June. The impacts to benthic aquatic life and the possible anthropogenic contributions to these benthic conditions are currently unknown. Therefore, the benthic coastal waters will be assigned to Category 3 to under go further assessments as to these unanswered questions.

Table 5.5: Aquatic Life Designated Use Assessment Method for Tidal Waters*

Aquatic Life Designated Use Assessment Method for Tidal Waters	Result
10% or less of samples exceed applicable SWQS criterion for dissolved oxygen or excursions were due to natural conditions	Full Attainment
Threatened Waters: Less than 10% of samples exceed applicable SWQS criterion for dissolved oxygen, but declining WQ trends indicate SWQS are likely to be exceeded in more than 10% of samples within 2 years	Non Attainment
More than 11% of samples and at least 2 samples exceeded applicable SWQS criterion for dissolved oxygen or the waterbody was included on 1998 Impaired Waterbodies List and no new data were available.	Non Attainment

* Surface Waters only.

5.2 Recreational Designated Use Attainment

Recreational designated use is applied to streams, ocean, bay and lake bathing beaches and to tidal open waters. Recreational designated uses include primary and secondary contact recreation which are defined as follows:

- Primary Contact Recreation: Recreational activities that may involve significant ingestion risks and includes, but is not limited to, wading, swimming, diving, surfing, and water skiing.
- Secondary Contact Recreation: Recreational activities where the probability of water ingestion is minimal and includes, but is not limited to, boating and fishing.

Data Requirements Specific to Recreational Designated Use Assessment

In addition to the requirements provided in Section 3 (General Data Requirements) specific data requirements for assessments recreational designated uses are described below.

Table 5.6: Data Requirements for Assessment of Recreational Designated Uses

Data Considerations	Data Requirements for Assessment of Recreational Designated Uses
Minimum Sampling Frequency	Streams*:* Five samples collected within 30 days at least once per year preferred, samples may be collected 4 or more times within 1 year; Lake Beaches: At least 10 samples collected during the summer; beach closure data not available, fecal coliform data used for assessment Ocean and Bay Beaches: at least weekly during summer, additional sampling as needed for closures; beach closure data used for assessment Tidal open water: Quarterly sampling in tidal rivers, back bays and inlets
Data Age	Streams*:* Data collected within the last 5 years Lake Beaches: Data collected within the last 5 years Ocean and bay beaches: Data collected within the last 5 years Tidal open water: Data collected within the last 5 years.
Tidal Considerations	Open water samples collected under low or outgoing tide in tidal rivers, back bays and inlets
Spatial Extent of Assessment	Streams*:* See section 6 Lake Beaches*:* See section 6 Ocean and bay beaches: 138 back bay beaches estimated to be 150 feet long (beachfront) x 100 feet wide (3.9 square statute miles); 127 miles of ocean beaches estimated to be 150 feet wide; Ocean open waters: shoreline to 3 miles off shore; Other tidal open waters from head of tide in rivers to ocean inlets.

Recreational Designated Use Assessment Method

Fecal coliform levels in water are used as the primary indicator of sanitary quality. Assessments are conducted at lakes, ocean and bay bathing beaches and in open tidal waters because recreational contact through water sports is likely. Some of New Jersey's rivers and streams, particularly those in the Pinelands, are used for swimming and secondary contact recreational activities, such as canoeing. Other rivers are not accessible or safe for these activities (e.g., steep banks, rapids, and private property). Water quality data on fecal coliform levels are collected at monitoring network stations, which are typically not located where swimming, or secondary contact recreation occurs. In addition, this assessment considers sanitary quality of rivers, but does not consider recreational beach amenities or access to the stream. Thus, these data are not appropriate for assessing risks to human health associated with swimming in rivers.

Table 5.7: Recreational Designated Use Assessment Method

Recreational Designated Use Assessment Method	Result
1. Primary Contact Assessment for Non-tidal Rivers (FW2) and Open Tidal Waters (SE1 and SC between 1500 feet and 3 miles from Shore)	
The FC geometric average was less than 200 MPN/100ml and less than 10 percent of individual samples exceeded 400 MPN/100 ml or excursions were due to natural conditions	Full Attainment
Threatened Waters: Less than 10% of samples exceed applicable SWQS, but declining WQ trends indicate SWQS are likely to be exceeded in more than 10% of samples within 2 years	Non Attainment
The FC geometric average was greater than 200 MPN/100ml or greater than 10 percent of individual samples exceeded 400 MPN/100 ml If sample size is less than 10, must have at least 2 violations.	Non Attainment
2. Primary Contact Assessment for Open Tidal Waters (SC within 1500 feet of Shore)	
The FC geometric average was less than 50 MPN/ 100 ml	Full Attainment
Threatened Waters: The FC geometric average was less than 50 MPN/ 100 ml but declining WQ trends indicate SWQS are likely to be exceeded within 2 years	Non Attainment
The FC geometric average was greater than 50 MPN/ 100 ml or included on 1998 Impaired Waterbodies List and no new data available.	Non Attainment
3. Secondary Contact Assessment for Open Tidal Waters (SE2)	
The FC geometric average was less than 770 MPN/ 100 ml	Full Attainment
Threatened Waters: The FC geometric average was less than 770 MPN/ 100 ml but declining WQ trends indicate SWQS are likely to be exceeded within 2 years	Non Attainment
The FC geometric average was greater than 770 MPN/ 100 ml	Non-attainment
4. Secondary Contact Assessment for Open Tidal Waters (SE3)	
The FC geometric average was less than 1500 MPN/ 100 ml	Full Attainment
Threatened Waters: The FC geometric average was less than 1500 MPN/ 100 ml but declining WQ trends indicate SWQS are likely to be exceeded within 2 years	Non Attainment
The FC geometric average was greater than 1500 MPN/ 100 ml	Non-attainment
Ocean and Bay Bathing Beach Assessment Method	
Less than or equal to 10% of 100 beach days are closed per year	Full Attainment
Greater than 10% of 100 beach days are closed per year	Non Attainment
Lake Bathing Beach Assessment Method	
Less than or equal to 10% of summer samples exceed NJDHSS bathing beach standards	Full Attainment
At least 2 samples and greater than 10% of samples exceed NJDHSS bathing beach standards	Non Attainment

5.3 Lake Aesthetic Quality Assessment Method

The aesthetic quality of lakes is an important aspect in the maintenance of recreational uses since swimming and boating uses may be impaired by nuisance algal growth and sedimentation due to eutrophication. Recreational use support is also assessed from a sanitary perspective in Sect. 5.2. Many of the lakes in New Jersey are constructed impoundments and highly prone to eutrophication. Eutrophication occurs naturally as lakes age, however, this process can accelerate from excessive inputs of nutrients and suspended sediments from surrounding watersheds. Eutrophic lakes are

characterized by excessive growth of aquatic weeds and algae, shallow depths as sediments fill the lake. Severely eutrophic lakes may experience elevated temperatures and low dissolved oxygen. Information for data sources is provided in Appendix 2.

5.3.1 Data Requirements Specific to Lake Aesthetic Quality Assessment

In the past, lake impairment issues have been brought to the attention of NJDEP principally through three programs:

1. New Jersey Lake Management Program Reports (NJLMP);
2. Clean Lakes Program Phase I diagnostic studies (CLP); and
3. Lake Water Quality Assessment Reports (LWQA).

Lake Reports through Programs 1 and 2 above occurred in response to perceived impairments by local authorities for lake recreational uses brought about by eutrophication. LWQA reports (No 3) represent lake investigations performed by NJDEP for assessing general water quality in New Jersey lakes and were not always in response to reported impaired recreational uses. In order to insure that the TMDL process is appropriately applied to eutrophic lakes with known recreational impairment, the department will assign eutrophic lakes to the following categories within the Integrated Assessment:

Table 5.8 Recreational Use Support Assessment Methodology for Eutrophic Lakes

Lake Assessment Category	Recreational use support status	Integrated Assessment
• New Jersey Lake Management Program Report	Non Attainment*	Category 5
• Clean Lakes Program Phase I and II diagnostic Studies	Non Attainment*	Category 5
• Lake Water Quality Assessment Report	Status not determined	Category 3
• All lakes assessed as mesotrophic, regardless of assessment method or lakes, which have been successfully remediated and have had their recreational use restored.	Attainment	Category 1

*Unless information indicates that the use impairment has been subsequently remediated in which case the use may be regarded as fully supporting.

The department will review all information sources which document restoration efforts for use impaired lakes. If it is shown that the recreational uses have been restored, the lake will be categorized as fully meeting its recreational use and placed into the corresponding Category of the Integrated List.

Although many of the lake assessments discussed here may be twenty years old the condition of the lake (with regards to recreational use support) is considered the same as that delineated in the original assessment. This rationale is based on the observation that unless a remedial action has taken place on an impaired lake, its condition (in regards to use impairment) through natural lake succession, is not expected to improve through time.

In addition to the requirements provided in Section 3 (General Data Requirements) specific data requirements for assessments of lake aesthetic quality are described below.

Table 5.9: Data Requirements for Assessment of Lake Aesthetic Quality

Data Considerations	Data Requirements
Minimum Sampling Frequency	The minimum sampling frequency was determined on a site-specific basis for each lake and ranged from limited studies to very thorough studies to document known eutrophication issues. Lakes were also monitored after any remediation strategies were implemented.
Data Age	Collected within the most recent 5 years*
Seasonal Considerations	Data collection includes summer sampling
Lake Selection	**NJLMP and CLP:** Public lakes with recreational uses affected by eutrophication were selected by municipalities, lake management entities and NJDEP for investigation and remediation. **LWQA:** Lakes selected to represent a cross section of lakes in NJ. Recreational use support not always considered. Selections tended towards better quality lakes.
Spatial Extent	Assessments apply to the entire lake.

* The department reserves the right to regard lakes as use impaired if assessments are as much as twenty years old if no remedial action has been taken in response to lakes impaired status.

5.3.2 Lake Aesthetic Quality Assessment Method

Use support status is based upon narrative standards in addition to the numerical water quality criteria for total phosphorus (N.J.A.C. 7:9B-1.5(g), which applies to all freshwaters of the state. The narrative nutrient policies preclude nutrient concentrations that cause objectionable algal densities, nuisance aquatic vegetation or render waters unsuitable for designated uses. Lake trophic status assessments were conducted using USEPA's Clean Lakes Program Guidance Manual (USEPA, 1980). Consideration may also have been given to documented impairments caused by other factors, such as excessive macrophyte growth, sedimentation or bacterial contamination affecting lake beaches. In the future, trophic status of lakes will be assessed based upon the department's developing policies regarding nutrients (See Section 4.1.3). In addition, USEPA's Clean Lakes Program Guidance Manual provides target levels (Table 5.10) for some in-lake parameters for the purpose of guiding lake remediation

Table 5.10 Lake Target Levels For Selected Parameters As Per USEPA's Clean Lakes Program Guidance Manual.

Data Assessment	Trophic Status Classification
If all of the following exist: • Total phosphorus less than 0.02 ppm TP (winter mean) • Chlorophyll *a* less than or equal to 5 – 10 ppb Chl*a* (summer) • Transparency greater than or equal to 1.5 meters (summer)	Mesotrophic
If one or more of the following exist: • Total phosphorus greater than or equal to 0.02 ppm TP (winter mean) • Chlorophyll *a* greater than 5 – 10 ppb Chl*a* (summer) • Transparency less than 1.5 meters (summer) • Excessive macrophyte populations or sedimentation impairing use • Included on 1998 Impaired Waterbodies List and no new data available.	Eutrophic

As stated earlier, the recreational use support status of lakes and their corresponding listings within the Integrated List are based on assumptions regarding the "actual use support determination" which itself is based upon professional judgment. This in turn leads to a detailed in-lake data collection effort. For lakes in which recreational use status is assessed as "status not determined" the Department will review all readily available information in order to determine its recreational use support and to revise the Integrated List accordingly.

5.4 Fish Consumption Designated Use Assessment Method

Fish consumption designated use assessments are based on the presence of fish consumption advisories or bans. The data collection, risk assessment and the issuance of fish consumption advisories and bans is overseen by the New Jersey Interagency Toxics in Biota Committee (See APPENDIX II). Through the Interagency Toxics in Biota Committee, research projects are coordinated to monitor levels of contaminants in commercially and recreationally harvested fish, shellfish and crustacean species. Edible portions of individual animals are tested for one or more bioaccumulative chemicals (e.g., PCB's, chlorinated pesticides, dioxins, and mercury). These data are evaluated for development of consumption advisories and bans as appropriate to protect human health. Fishing advisories are measured against USFDA Tolerances for contaminated food as well as NJ risk assessments performed by Toxic in Biota Committee, a joint effort between the NJDEP and the NJ Department of Health and Senior Services.

Data collection for fish tissue is currently accomplished through research projects. A stable funding source to establish a monitoring network is being sought.

Data Requirements Specific to Fish Consumption Designated Use

In addition to the requirements provided in Section 3 (General Data Requirements) the following specific data requirements for fish consumption designated uses are described below. Currently, PCB/dioxin/pesticide advisories are based on US Food and Drug Administration (FDA) tolerance levels (which are not human health risk-based) which reflect cost-benefit analyses. For mercury consumption advisories, the TIBC used health risk-based mercury guidelines established by the National Research Council report - *Toxicological Effects of Methylmercury*.

Advisories based on PCB/dioxin/pesticide data, which were collected in the mid-1980s are viewed as *evaluated data* (Category 3) and new data will be necessary for further evaluation. Fish consumption advisories based on *monitored data* (< 5 yrs.) is limited to mercury contamination.

Table 5.11: Fish Consumption Designated Use Assessment Method

Fish Consumption Designated Use Assessment Method	Result
No fish restrictions or bans in effect	Full Attainment
"Restricted Consumption" of fish in effect (restricted consumption defined as limits on the number of meals or size of meals consumed per unit time for one or more fish species); or a fishing ban is in effect for a sub-population that could be at potentially greater risk for one or more fish species or included on 1998 Impaired Waterbodies List and no new data available.	Non Attainment
"No consumption", or fishing ban in effect for general population for one or more fish species; or commercial fishing ban in effect.	Non Attainment
Statewide advisory based on extrapolated data OR fish tissue data not available	Insufficient Data

Data Assessment	Result
No fish restrictions or bans in effect (1) OR monitoring of fish tissue may show contaminants present but not exceeding levels of concern.	Attainment
Monitoring of fish tissue reveals contaminant levels with trends towards or away from levels of concern OR data more than five years old (2).	Attainment
"Restricted Consumption" of fish in effect (restricted consumption defined as limits on the number of meals or size of meals consumed per unit time for one or more fish species); or a fishing ban is in effect for a sub-population that could be at potentially greater risk for one or more fish species.	Non Attainment
"No consumption", or fishing ban in effect for general population for one or more fish species; or commercial fishing ban in effect.	Non Attainment

In New Jersey, it is generally[1] lakes that are impaired due to high concentrations of mercury in fish. Rather than placing these waterbodies in Category 5 and developing individual TMDLs for lakes impaired by mercury in fish, the Department is pursuing an aggressive mercury phase-out strategy Category 4b). Specifically, the Department is taking the necessary steps to implement the Recommendations of the NJ Mercury Task Force (December, 2001), the goal of which is the virtual

[1] The NY/NJ Harbor is an exception, being impaired due to water column concentrations of mercury in excess of the criteria. TMDLs for toxics, including mercury, in the Harbor are being developed through the bi-state efforts of the Toxics Work Group in the Harbor Estuary Program. A multi-media dynamic model of the entire Harbor waters is being developed to assist with this effort.

elimination of anthropogenic uses and releases of mercury. This policy is in keeping with USEPA's Quicksilver Council and the Environmental Council of States (ECOS) recommended approaches.

The Task Force gathered available information on the behavior of mercury in the environment and its impacts, its sources and control strategies, and developed both interim and final Recommendations. Implementation of the Recommendations from the first Task Force Report (1993) resulted in 94% reduction in emissions from municipal solid waste incinerators and 98% reduction in emissions from medical waste incinerators. Given the successful track record of the Mercury Task Force as well as the rigorous scientific and quantitative basis for the current Recommendations, lakes impaired due to mercury in fish will be placed on Part 4B of the Integrated List; these lakes do not require TMDLs because other pollution control requirements (implementation of Task Force Recommendations) are reasonably expected to result in attainment of water quality standards. This assumption will bet tracked. The New Jersey Mercury Task Force Report consists of three volumes: I. Executive Summary and Recommendations; II. Exposure and Impacts; and III. Sources of Mercury to New Jersey's Environment. These may be found at the NJDEP Web Site: http://www.state.nj.us/dep/dsr/mercury_task_force.htm

5.5 Shellfish Harvesting Designated Use Assessment Method

Shellfish harvesting designated use is applicable in all waters classified as SC in the SWQS. Shellfish harvesting classifications are based on the National Shellfish Sanitation Program (NSSP) requirements **(**NOAA, 1997**).** This program is overseen by the federal Food and Drug Administration to ensure the safe harvest and sale of shellfish. Information for data sources is provided in Appendix II.

Data Requirements for Shellfish Harvesting Designated Use Assessment

In addition to the general data requirements provided in the Quality Assurance section, the following are specific data requirements for assessment of shellfish harvesting designated use attainment:

Table 5.12: Data Requirements for Assessment of Shellfish Harvesting Designated Use Attainment

Data Considerations	Data Requirements for Assessment of Shellfish Harvesting Designated Use Attainment
Sampling Methods	All sampling methods and harvesting classifications are conducted in accordance with the NSSP Manual (NOAA, 1997)
Data Age	Most recent 5 years of readily available data.
Sampling frequency	At least 15 samples collected, as specified by NSSP Manual
Spatial Extent	Shellfish harvesting classifications are available for all SC waters

Shellfish Harvesting Designated Use Assessment Method

The adopted shellfish harvesting classifications are included in the NJ SWQS by reference in N.J.A.C. 7:9B-1.12(g). Based on sampling data and assessment procedures in the NSSP manual, waters are classified for unrestricted harvest, special restricted, seasonal or prohibited. Prohibited areas are further classified into waters where shellfish harvest is prohibited due to poor water quality and administrative closures.

Administrative closures are established in areas around potential pollution sources, such as sewage outfalls and marinas. These areas are closed as a preventive measure to protect shellfish from

contamination in areas immediately adjacent to the 15 sewage outfalls in the ocean and from an emergency such as a sewage bypass or break in an outfall pipe. In marinas, prohibited areas are established to protect human health from contamination from boat wastes and runoff. Where closings are based on land use (i.e. marinas, STP outfalls etc.) and there is insufficient water quality data to assess attainment, these areas are identified as not assessed. Where closings are based on land use but there is sufficient data to assess attainment, these areas will be assessed. This assessment methodology is consistent with USEPA's guidance on the use of shellfish classifications in 303(d) decisions which states that waters classified "Prohibited" due to administrative closures should not be classified as impaired if data are not available to document an impairment. (USEPA, 2000).

Table 5.13: Shellfish Harvesting Designated Use Assessment Method

Shellfish Harvesting Designated Use Assessment	**NSSP Classification**	**Result**
Geometric mean of total coliform was less than or equal to 70 MPN per 100 milliliters (ml) and the estimated 90th percentile was less than 330 MPN per 100 ml	Approved	Full Attainment
Administrative Closure with sufficient data and geometric mean of total coliform was less than or equal to 70 MPN per 100 ml and the estimated 90th percentile was less than 330 MPN per 100 ml	Prohibited	Full Attainment
Geometric mean of total coliform was greater than 70 MPN per 100 ml but less than or equal to 700 MPN per 100 ml and the estimated 90th percentile was less than 3,300 MPN per 100 ml	Special Restricted or Seasonal	Non Attainment
Geometric mean of total coliform exceeded 700 MPN per 100 ml and the estimated 90th percentile was greater than 3,300 MPN per 100 ml	Prohibited	Non Attainment
Administrative Closure with insufficient data for assessment	Prohibited	Insufficient Data
Notes: MPN: most probable number (of total coliform bacteria) *Approved* waters are harvestable without restriction. *Seasonal* waters that are open seasonally typically opened in the winter. *Specially Restricted* shellfish require additional treatment (relay or depuration) prior to harvest. *Prohibited* waters that are closed to the harvesting of shellfish.		

5.6 Drinking Water Supply Designated Use Assessment Method

Drinking water designated use means the waters are potable after conventional filtration treatment and disinfection and do not have consistent removal issues for chemical constituents. Drinking water designated uses apply to surface waters classified as Pinelands (PL), Freshwater Category 2 (FW2) and DRBC Zones 2 and 3.

Nitrate in surface waters was chosen as an indicator of drinking water designated use attainment because it a primary health concern in finished drinking water and is difficult to remove from source

waters. In addition, information regarding additional treatment to remove chemicals in surface water supplies will be used. Information for data sources is provided in Appendix II.

Data Requirements for Drinking Water Supply Designated Use Assessment
Data requirements provided previously in Section 3: General Data Requirements and data requirements for assessment of conventionals were used for this assessment.

Drinking Water Designated Use Assessment Method
Water quality data is compared to 10-ppm nitrate, the maximum contaminant level (MCL) allowable in finished drinking water. Surface waters with PL classifications are compared to 2-ppm nitrate criterion applicable to PL waters in the conventional water quality assessment (see Section 4.1). NJDEP's Safe Drinking Water and Site Remediation Programs provide information regarding additional treatment of surface water supplies to remove chemical constituents. It is important to note that some waterbodies may not have drinking water intakes due to stream size and other considerations. Waterbodies affected by either nitrate or intakes with treatment to remove chemical contaminants were assessed as "non attainment".

Table 5.14: Drinking Water Designated Use Assessment Method

Water Quality Assessment for 10 or More Samples in 5 Years	**Assessment**
10% or less of samples exceed 10 ppm nitrate and additional chemical removal treatments are not required on surface water intakes	Full Attainment
Threatened Waters: Less than 10% of samples exceed 10 ppm nitrate, but declining WQ trends indicate that more than 10% of samples are likely to exceed this concentration within 2 years and/or additional chemical removal treatments are expected to be required on surface water intakes within 2 years	Non Attainment
More than 10% of samples exceed 10 ppm nitrate and /or additional chemical removal treatments are not required on surface water intakes or included on 1998 Impaired Waterbodies List and no new data available.	Non Attainment
Water Quality Assessment for 4-9 Samples in 5 Years	**Assessment**
All samples had less than 10 ppm nitrate and additional chemical removal treatments are not required on surface water intakes	Full Attainment
Two (2) or more samples exceeded 10 ppm nitrate and /or additional chemical removal treatments are not required on surface water intakes or included on 1998 Impaired Waterbodies List and no new data available	Non Attainment
One (1) sample exceeded 10 ppm nitrate and additional chemical removal treatments are not required on surface water intakes or fewer than 4 samples	Insufficient Data

5.7 Industrial Water Supply Designated Use Assessment Method

Industrial water supply designated use assessment was piloted in the 2000 New Jersey Water Quality Inventory Report to waters used for processing or cooling. The Department has selected total suspended solids (TSS) and pH, a measure of acidity, as indicators for industrial water supply use. Information for data sources is provided in Appendix II.

Data Requirements for Industrial Water Supply Designated Use Assessment
The specific data requirements for assessment of industrial water designated use are described in Section 3: General Data Requirements and assessment of conventionals in surface waters in Section 4.1.

Industrial Water Supply Designated Use Assessment Method
Industrial designated uses were met if 10% or less of samples exceeded applicable criteria for pH or TSS.

Table 5.15: Industrial Water Supply Designated Use Assessment Method

Industrial Water Supply Designated Use Assessment	**Assessment**
Water Quality Assessment for 10 or More Samples in 5 Years	
10% or less of samples exceeded applicable criteria for pH or TSS	Full Attainment
Threatened Waters: Less than 10% of samples exceeded applicable criteria for pH or TSS, but declining WQ trends indicate that more than 10% of samples are likely to the criteria within 2 years.	Non Attainment
More than 10% of samples exceeded applicable criteria for pH or TSS or termination of an industrial water supply or included on 1998 Impaired Waterbodies List and no new data available	Non Attainment
Water Quality Assessment for 4-9 Samples in 5 Years	**Assessment**
All samples met applicable criteria for pH or TSS	Full Attainment
Two (2) or more samples exceeded applicable criteria for pH or TSS or termination of an industrial water supply or included on 1998 Impaired Waterbodies List and no new data available	Non Attainment
One (1) sample exceeded applicable criteria for pH or TSS or fewer than 4 samples	Insufficient Data

5.8 Agricultural Water Supply Designated Use Assessment Method
Agricultural uses of surface water include irrigation and livestock farming. Agricultural designated uses are referenced in the SWQS policies. Information for data sources is provided in Appendix II.

Data Requirements for Agricultural Water Supply Designated Use Assessment
The specific data requirements for assessment of agricultural water supply designated use are described in Section 3: General Data Requirements and assessment of conventionals in surface waters in Section 4.1.

Agricultural Water Supply Designated Use Assessment Method
This assessment applies to waters classified as FW2 and PL in the NJ SWQS. Waters classified as FW1, tidal (saline) and DRBC waters are not included. Although the SWQS are applicable to agriculture, numeric criteria specific to agricultural designated use are not included. The water quality suitable for agriculture is normally less stringent than needed to protect aquatic life and human health. In order to evaluate water supplies that support agriculture in New Jersey, guidelines are referenced from the U.S. Department of Interior Natural Resources Conservation and other states (Follet, 1999 and Bauder, 1998). These guidelines will be used to evaluate whether water supplies support common agricultural uses such as irrigation and livestock.

For this assessment, total dissolved solids (TDS) and salinity were selected as indicators of agricultural use. Salinity was chosen due to its adverse and immediate detrimental effects on all agricultural practices. TDS has similar negative effects and also indicates possible contamination from runoff. The lower of the recommended standards for irrigation and livestock will be applied in the assessment as the acceptable level to fully support agricultural use. Acceptable levels for total dissolved solids and salinity were established as at or below 2,000 mg/l (Follet, 1999). If TDS or salinity data are not available, specific conductance will be used as a surrogate with a specific conductance of 3,000 us/cm approximately equivalent to TDS and salinity levels of 2,000 mg/l (United Nations, 1985).

Note: Crops and livestock may be negatively affected by numerous non-water factors such as type of livestock, crop tolerance, soil type, drainage, irrigation methods and management. Therefore exceedences of these guidelines does not necessarily impair uses for agriculture. On the other hand, concentrations below these limits may restrict agricultural use in certain circumstances. Therefore, the designated use category of "non attainment" is applied only when a water supply no longer supports existing agricultural uses.

Table 5.16: Agricultural Designated Use Assessment Method for Rivers and Streams

Assessment	Result
Water Quality Assessment for 10 or More Samples in 5 Years	
TDS greater than 2000 mg/l or Salinity greater than 2000 mg/l in 10 % or less of samples.	Full Attainment
Threatened Waters: Meets full support but declining water quality trends indicate full support will not be attained in 2 years.	Non Attainment
TDS greater than 2000 mg/l or Salinity greater than 2000 mg/l in more than 10% of samples.	Non Attainment
Termination of use as an agricultural supply.	Non Attainment
Water Quality Assessment for 4-9 Samples in 5 Years	
TDS less than 2000 mg/l or Salinity less than 2000 mg/l in all samples	Full Attainment
TDS greater than 2000 mg/l or Salinity greater than 2000 mg/l in two (2) or more samples	Non Attainment
TDS greater than 2000 mg/l or Salinity greater than 2000 mg/l in one (1) sample or fewer than 4 samples.	Insufficient Data

6.0 Spatial Extent for Assessments

EPA guidance (USEPA 2002) recommends that each assessment be applied to a waterbody with a specific spatial extent (e.g., stream miles, lake, estuary and ocean acres). Furthermore the results should be coded to waterbody segments using either Reach File 3 (RF3), the new National Hydrography Database (NHD), or polygon coverages depicting large waterbodies such as lakes and estuary waters. RF3 and NHD contain segment codes that provide a waterbody address and segment length for streams, lakeshores and coastlines. Lakes, estuary, and ocean waters are depicted as polygon areas using coverages created by NJDEP and also provide waterbody names and area sizes. NJDEP will use RF3 in the 2002 Integrated Report to represent rivers and streams because corrections to this coverage were already underway. However future Integrated Report spatial assessments will use NHD coverages.

6.1 Spatial Extent Method for Streams

NJDEP and USGS developed this spatial extent method for benthic macroinvertebrate assessments and conventional water quality parameters for all streams in the state. The goal of this spatial extent method is to maximize the use of monitoring data without overestimating spatial extent.

Estimation of spatial extent is largely based on hydrology using the widely accepted Strahler stream order system. Strahler defines headwaters with no tributaries as a "1st order stream". A "2^{nd} order stream" is formed when two 1st order streams converge. Stream order changes when two or more streams with the same stream order converge. Two 2^{nd} order streams converge to create a 3^{rd} order stream. Stream order does not change if a lower order stream converges with a higher order stream. If 2^{nd} or 3^{rd} order streams converge with a 4^{th} order stream, the 4^{th} order stream continues until it converges with a 4^{th} order or higher stream. Strahler stream order is depicted on Figure 1.

Generally, Strahler stream order increases with flow and watershed size and indicates when flow from incoming tributaries is likely to be significant enough to change water quality. Strahler stream order, size of the watershed draining to the monitoring site, land use/land cover, impoundments, and station type in the redesigned ASMN were used to determine the upstream and downstream extent of monitoring.

- Monitored Waters: are reaches immediately adjacent to the monitoring site and will be used in assessment for Categories 1 through 5 given the higher degree of confidence in the assessment results.
- Estimated waters*:* are extrapolated from monitored waters based on land use and will be used for Categories 2 and 3 only, given the lower degree of confidence.
- Unassessed waters: are waters that can not be evaluated with available data.

6.1.1 Spatial Extent of Ambient Biological Monitoring Network Stations

The Ambient Biological Monitoring Network (AMNET) is described in Appendix II. Since local factors are likely to have a significant influence on aquatic biology the spatial extent for each of these monitoring sites is limited in range. However the 800(+) stations in this network provide for excellent overall spatial coverage.

Spatial extent of AMNET monitoring-site results considers the stream order of the reach on which the monitoring site is located; the presence of lakes greater than 25 acres; and if needed, land use/land cover information. Given the significance of local influences tributaries are not assessed except in small watersheds (e.g., watersheds of 2nd order or smaller streams). The close proximity of AMNET stations (typically 3 to 5 miles apart) provide an opportunity to assess stream segments between monitoring sites that have the same assessment result. The method for estimating spatial extent of AMNET stations is described below:

- Monitoring Site on a 2nd Order Stream or Smaller: *Upstream* of the monitoring site, all streams are monitored (i.e. mainstem and tributaries in the watershed). *Downstream*, the spatial extent continues along the mainstem to the next 2nd order stream.

- Monitoring Site on 3rd Order River: *Upstream and downstream* of the monitoring site, the spatial extent continues along the mainstem until there is a confluence with a 2nd order or higher stream or an impoundment at least 25 acres (tributaries are not assessed).

- Monitoring Site on 4th Order River: *Upstream and downstream* of the monitoring site, the spatial extent continues along the mainstem until there is a confluence with a 3rd order or higher stream or an impoundment at least 25 acres (tributaries are not assessed).

- Monitoring Site on 5th Order or Larger River: *Upstream and downstream* of the monitoring site, the spatial extent continues along the mainstem until there is a confluence with a tributary that is at least two stream orders smaller than the mainstem stream or an impoundment at least 25 acres. This mainstem is classified as monitored; the tributaries to this reach are not assessed. Thus, if the monitoring site is located on a 5th order stream, the spatial extent continues upstream and downstream to the confluences with 3rd order or higher streams.

- Estimated River Assessments: Assessments for estimated rivers were used for the following two scenarios which are shown on Figure 5. If two adjacent monitored reaches had the same assessment result and similar land uses, then the assessment was extended to close small gaps. If two or more monitored reaches with the same assessment result joined at a confluence and had similar land uses, then the assessment was extended below the confluence to the next tributary.

6.1.2 Spatial Extent of Ambient Stream Monitoring Network Stations

The following method was developed to estimate spatial extent of the Ambient Chemical Monitoring Network (ASMN), which is described in detail in Appendix II. The redesigned ASMN includes 4 monitoring station types selected for a specific purpose: 1.) background, 2.) land use indicator, 3.) watershed integrator, and 4.) Statewide status. This spatial assessment is tailored to each type of monitoring station type.

This method is used to estimate the spatial extent of conventional water quality parameters. There is a significant database for conventionals: typically 4-5 monitoring events per year for about 30 years. In addition, fate and transport of these parameters has been characterized. However, metals were typically monitored 1-2 times per year every other year. Organics in water were only added to the redesigned ASMN in 1997. Therefore, the spatial extent for these assessments is limited to the RF3 segment in which the monitoring site is located. The spatial extent of monitoring sites considers: 1.)

the stream order of the reach on which the monitoring site is located; 2.) the presence of impoundments greater than 50 acres; and 3.) surrounding land use/land cover. The maximum length of assessed river reaches is 25 miles based on USEPA guidance.

The Strahler stream order of the tributaries to the monitored reach and the size of the tributary watersheds are considered to estimate the upstream and downstream spatial extent. In general, the spatial extent is terminated at the confluence of a tributary with one stream order lower than the monitoring site. Lakes greater than 50 acres may have significantly different water quality above and below the lake. If the river reach is "monitored" the assessment continues as "estimated" above the lake. If the river reach is "estimated" the assessment ends at the lake.

The water quality in streams within a dominant land use watershed is considered to be similar to the monitoring station, providing an opportunity to assess larger stream reaches per monitoring station. If one land use in a watershed above a monitoring site is present in 50% or more of the watershed then that land use is considered dominant. If no single land use accounts for 50% of the watershed the land use is considered mixed. Land use/land cover (LU/LC) is estimated using 1995-97 data grouped into urban, agricultural and undeveloped (forest plus wetlands). Because changes in water quality may be associated with changes in land use, LU/LC is used (as necessary) to shorten long reaches. For example, the spatial extent of assessment for the Musconetcong River is shortened because land use changes from undeveloped land in the lower portion of the watershed to agricultural in the middle portion.

The general method to estimate spatial extent of assessment for conventional water quality parameters in the redesigned ASMN is described below. The spatial extent of conventional water quality data from other monitoring networks are estimated using the same method for statewide status sites.

All Stations on a 3rd Order or Smaller River: *Upstream* of the monitoring site, all streams are classified as monitored i.e. mainstem and tributaries in the watershed. *Downstream*, the spatial extent continues along the mainstem to the next 2nd order stream.

Land Use Indicator Station on a 4th Order or Larger River:
A. Dominant Land Use: If the watershed draining to Land Use Indicator (LUI) station has 1 dominant land use: *Upstream* of the monitoring site, the spatial extent of the assessment continues along the entire mainstem. The mainstem is classified as monitored and tributaries are estimated. *Downstream,* the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is at least one stream order smaller than the mainstem stream.
B. Mixed Land Use: If the watershed draining to the LUI station has mixed land use: *Upstream* of the monitoring site, the entire mainstem is monitored but tributaries are not assessed. *Downstream,* the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is at least one stream order smaller than the mainstem stream.

Watershed Integrator Station on a 4th Order or Larger River: These stations are located at the outlets of large watersheds and have mixed land use. *Upstream* of the monitoring site, the mainstem is classified as monitored until there is a confluence with a tributary that is at least one stream order smaller than the mainstem stream. The spatial extent is classified as estimated from this point until there is a confluence with a tributary that is at least two stream order smaller than the mainstem

stream. *Downstream* of the monitoring site, the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is at least one stream order smaller than the mainstem stream. Tributaries to the monitored and estimated reach are not assessed.

Statewide Status Stations on a 4th Order or Larger River: If the watershed draining to the Statewide Status station has 1 dominant land use: *Upstream* of the monitoring site, the entire mainstem is classified as monitored. *Downstream* the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is at least one stream order smaller than the mainstem stream. Tributaries are not assessed.

If the watershed draining to the monitoring site has mixed land use: *Upstream* of the monitoring site, the mainstem is classified as monitored until there is a confluence with a tributary that is at least one stream order smaller than the mainstem. *Downstream* of the monitoring site, the monitored spatial extent continues along the mainstem until there is a confluence with a tributary that is at least one stream order smaller than the mainstem stream. Tributaries are not assessed.

6.2 Spatial Extent Method for Lakes

Lakes are assessed as one waterbody and are not subdivided. Each waterbody is identified by a unique name and assigned one assessment result. If several sites are sampled in a lake with individual evaluation results, the assessment result for the lake is the aggregation of all of the sampled site results. For example, there may be several lake beaches with some assessment results being 'Full Attainment' and others "Non Attainment." The final assessment for the lake would be partially supporting recreational lake beaches which is a "Non Attainment" result.

6.3 Spatial Extent Method for Estuary Waters

In the determination of spatial extent for estuary waters (all tidal waters except for ocean areas) tidal rivers are not included. Instead their spatial extents will be developed using the same spatial extent method used for streams (Section 6.1). The spatial extent for estuarine waters will be based largely on identifying waterbodies and patterns of sample site results. First, the estuaries are identified by unique names to identify separate waterbodies (e.g., Great Bay, Barnegat Bay, Raritan Bay, Little Egg Harbor, etc.). These waterbodies will then be subdivided into smaller areas by patterns of sample site results. NJDEP's extensive Estuary Monitoring Network monitors all estuarine waters. For biological, recreational, and conventional spatial extents, the monitored estuarine waters will be delineated by identifying regional patterns through clusters of sites that are either in full attainment or non-attainment. Open waterbodies with isolated sites in violation will not be assigned spatial extents instead the cluster of sites that most accurately represents the water quality pattern will be assigned the spatial extent of the waterbody. The assessment and delineation of shellfish water by water quality is performed by NJDEP's Bureau of Marine Water Monitoring.

6.4 Spatial Extent Method for Ocean Waters

New Jersey jurisdictional waters extend from the shoreline to 3 nautical miles off the coast and from the tip of Sandy Hook to Cape May Point. Spatial extent of assessment is developed in 2 phases. First the USEPA helicopter transects delineate by subdividing the ocean waters so that each USEPA monitoring site is assigned a quadrant with each site centrally located. These quadrants cover all the near ocean waters.

The second phase overlies the monitoring sites maintained by NJDEP which are usually located around ocean outfall pipes and large bay inlets. Portions of the original quadrants, explained above, closest to the coast are then subdivided into near-shore regions characterized by NJDEP sites and far-shore regions characterized by USEPA sites. If the EPA site indicates non-attainment then the entire quadrant is assigned non-attainment. If the EPA site indicates full attainment but the NJDEP data indicates non-attainment then the miles for non-attainment should be assigned to the polygon characterized by the NJDEP site only. The reason for this lies in that the EPA network focuses on benthic anoxia which is very extensive along the NJ coast at certain times of the year. The DEP sites in contrast, characterize surface anoxia, which appears to be much less extensive spatially.

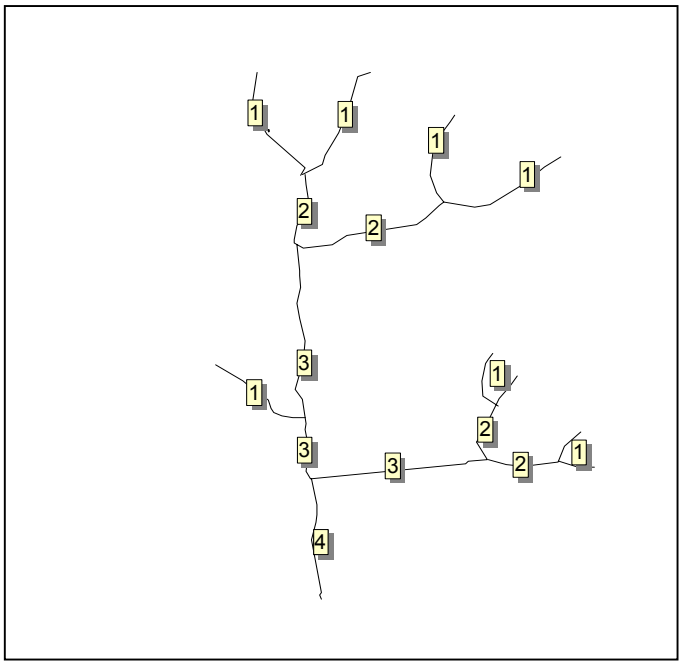

Figure 1. Strahler Stream Order

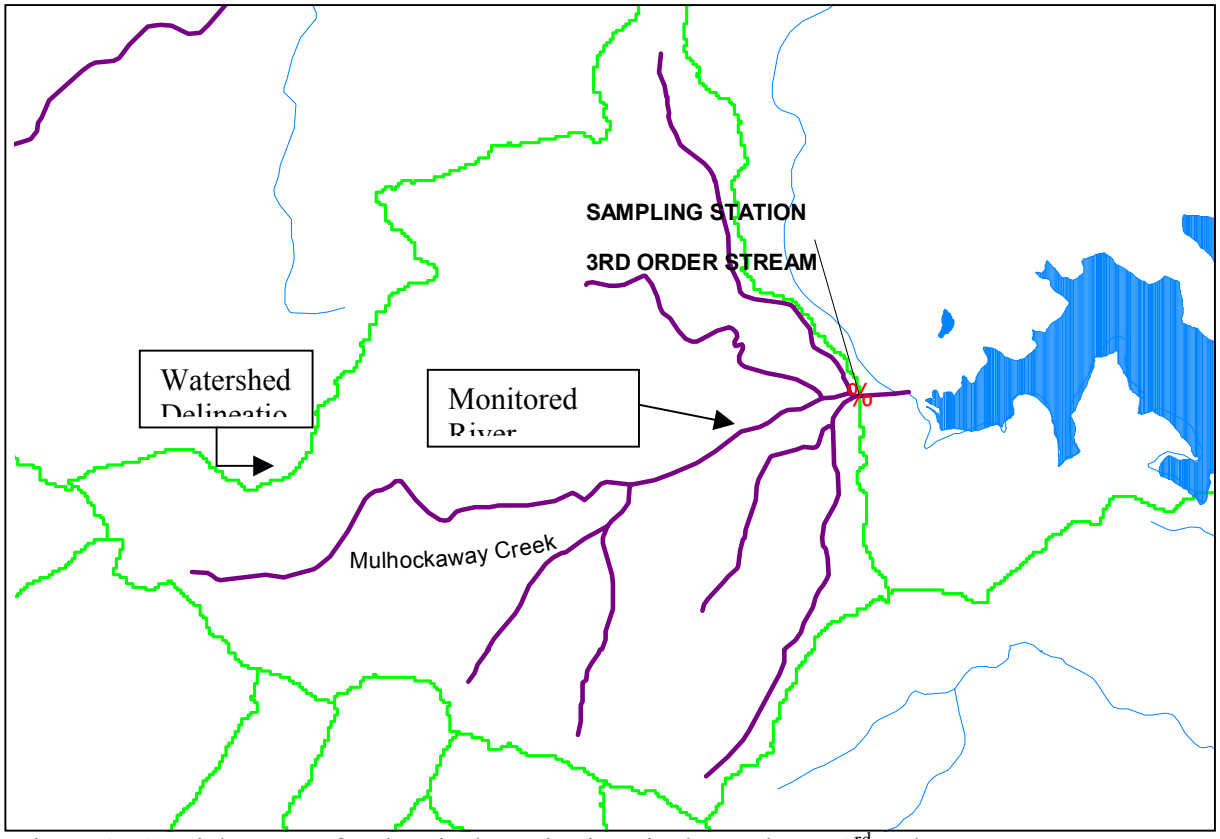

Figure 2. Spatial extent of a chemical monitoring site located on a 3rd order stream.

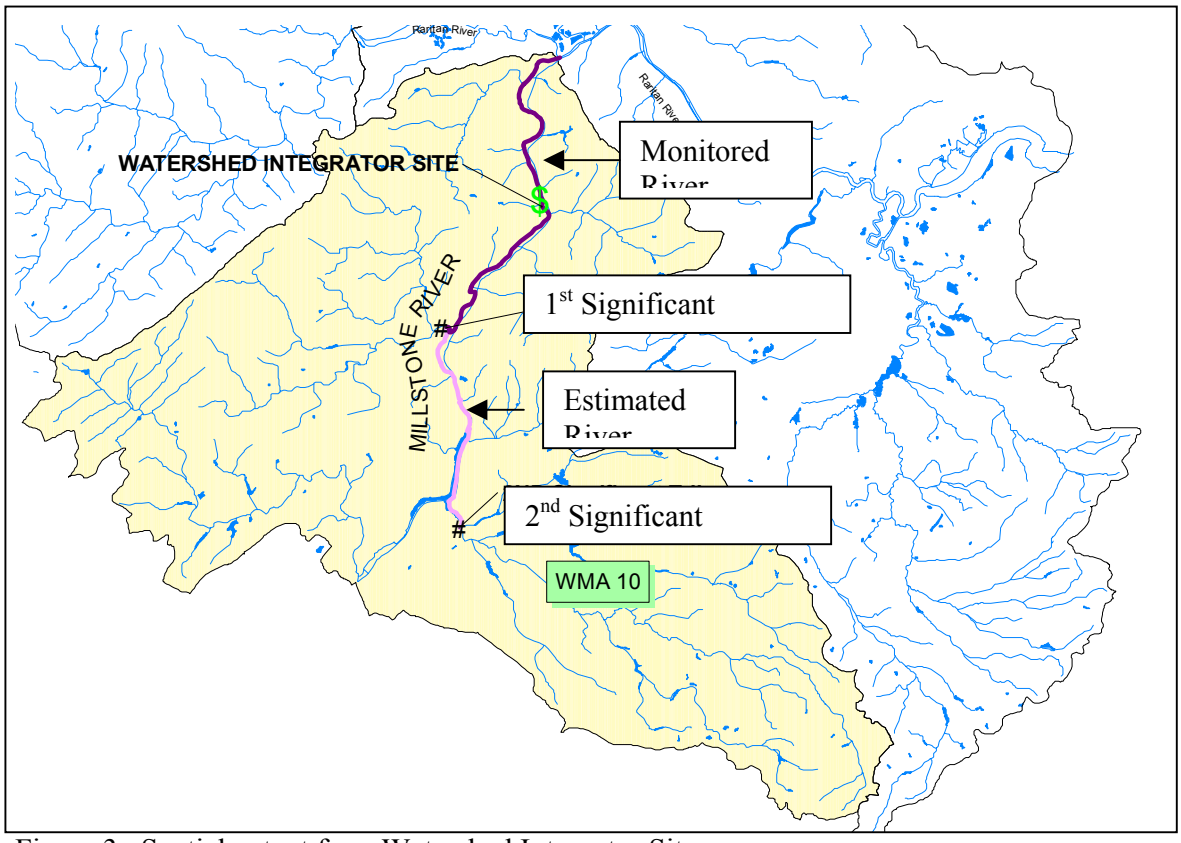

Figure 3. Spatial extent for a Watershed Integrator Site.

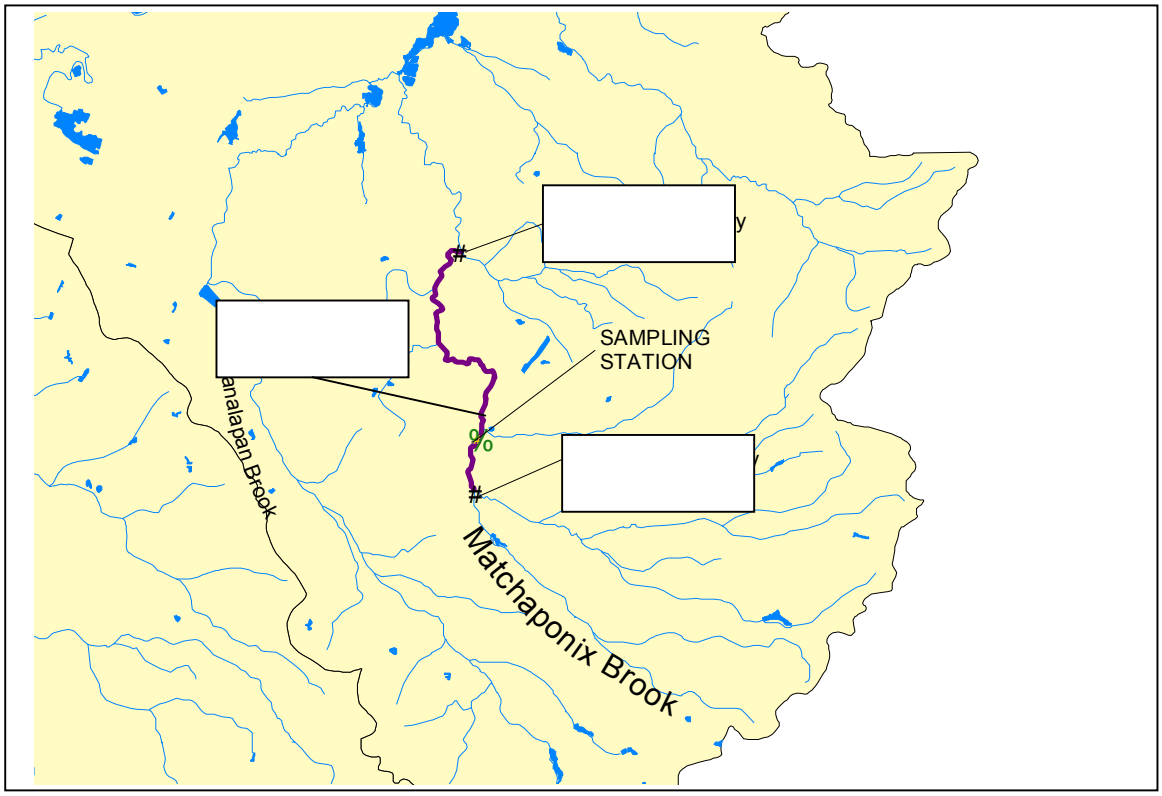

Figure 4. Statewide Status Station with a mixed land use watershed. Note: monitored river reaches extend to the next significant confluence and no estimated river reaches were assessed.

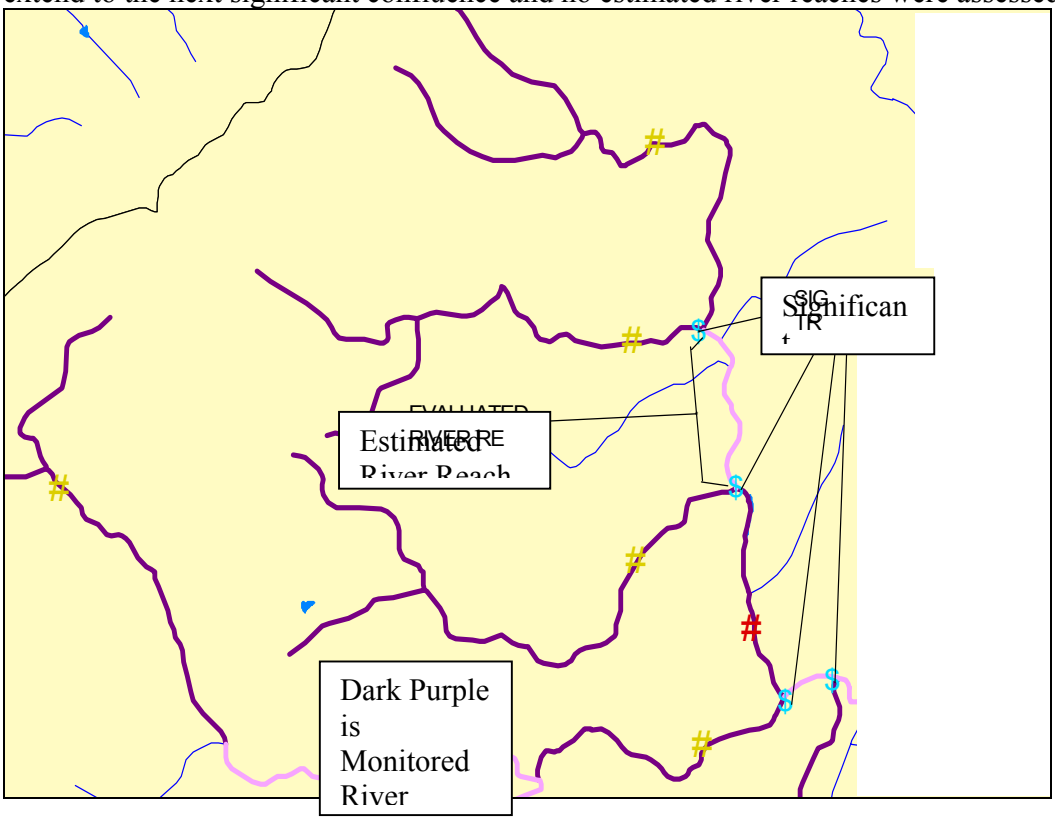

Figure 5. Example of estimated river reach based on biological monitoring sites.

7.0 Integrated Listing Guidance Method

The USEPA Guidance for developing Integrated Reports (USEPA 2002) of water quality and listings of impaired water segments recommends placing the assessment results into five specific categories (USEPA 2002); These include:

CATEGORY 1: Attaining a water quality standard and no use is threatened. Waterbodies will be placed in this category if there are data and information that meet the requirements of this assessment and listing methodology and support a determination that the water quality standard is attained and no use is threatened.

CATEGORY 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. Waterbodies will be placed in this category if there are data and information, which meet the requirements of this 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.

CATEGORY 3: Insufficient or no data and information to determine if any designated use is attained. Waterbodies will be placed in this category where the data or information to support an attainment determination for any use are not sufficient, consistent with the requirements of this assessment and listing methodology.

CATEGORY 4: Impaired or threatened for one or more designated uses but does not require the development of a TMDL. **(Three subcategories)**

A. TMDL has been completed. Waterbodies will be placed 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 a waterbody, the waterbody will remain in Category 5 until all TMDLs for each pollutant have been completed and approved by EPA.

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), waterbodies will be placed 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. These requirements must be specifically applicable to the particular water quality problem.

C. Impairment is not caused by a pollutant. Waterbodies will be placed in this subcategory if pollution rather than a pollutant causes the impairment.

CATEGORY 5: The water quality standard is not attained. The waterbody 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. Waterbodies will be placed in this category if it is determined, in accordance with this 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 waterbody, the waterbody will remain in Category 5 until TMDLs for all pollutants have been completed and approved by EPA.

The flow chart in Figure 7.1 provides an overview of the listing methodology process.

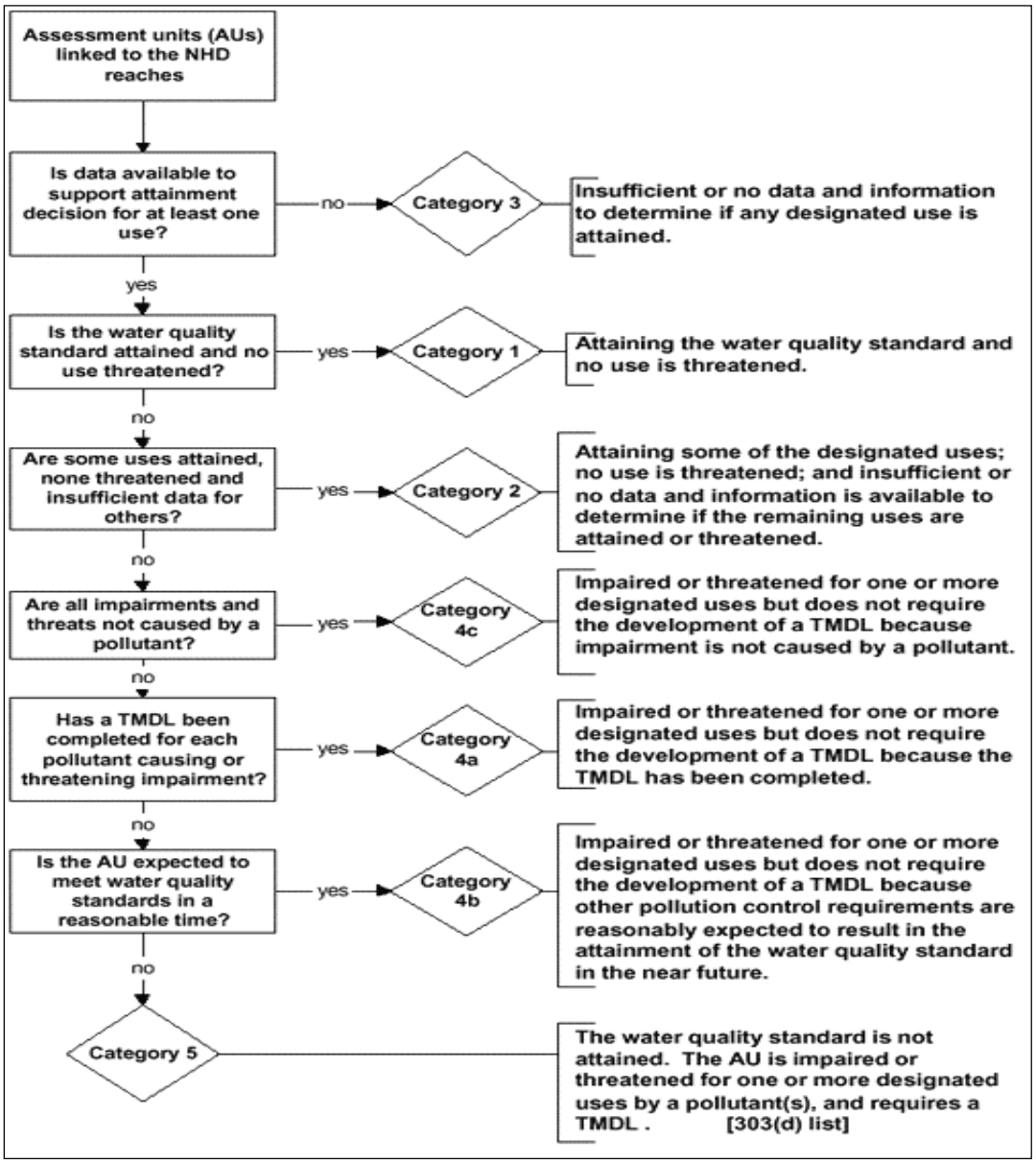

Figure 7.1: Summary of Logic Used to Place Waterbodies into 5 Categories in the 2002 Integrated Report

7.1 Integrated Listing Methodology

The Integrated Listing Method provided in Table 7.1 describes how the results of the individual assessments described in Sections 4 and 5 will be integrated to determine the listing category for each waterbody. For waterbodies classified as Non Attainment for one or more uses, the additional assessments described in the table will be conducted to assign each waterbody to the appropriate category. The following are important considerations associated with the Integrated Listing Method:

- Each waterbody will be assigned to only one category. Therefore, waterbodies that attain numerical criteria and designated uses in all assessments except one will be placed in Category 5.
- Waterbodies classified as Non Attainment due to impairment or threat of impairment by one or more pollutants may be reclassified to another category without completing a TMDL if additional data and information indicating this classification was inappropriate becomes available by the next listing cycle.
- Results of studies conducted to further evaluate relationships between designated use attainment, policies and applicable criteria may be used to develop site-specific or watershed-specific criteria, clarify designated uses or reclassify waterbodies to another category without completing a TMDL. For example, studies to evaluate relationships between designated uses, nutrient policies and total phosphorus criteria are anticipated in some waterbodies that do not meet the numerical criterion.

Table 7.1: Integrated Listing Method

Assessment	**Integrated Assessment**	**Listing Category**
Full Attainment	SWQS numerical criteria and designated use assessments were complete and results for each assessment indicated Full Attainment.	**Category 1:** Attaining SWQS and no use is threatened
Full Attainment and Insufficient Data	Results of SWQS numerical criteria and designated use assessments for 1 or more assessments indicated Full Attainment; Results for remaining assessments indicated "Insufficient Data"	**Category 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.
Insufficient Data	Results of SWQS numerical criteria and designated use assessments for all assessments indicated "Insufficient Data"	**Category 3:** Insufficient or no data and information to determine if any designated use is attained.
Additional Evaluation of Waterbodies Classified in Non Attainment for 1 or more Assessments:		
Non Attainment	Waterbody was impaired or threatened due to 1 or more pollutants and a TMDL is required (1)	**Category 4a**: TMDL adopted in New Jersey Register and approved by USEPA **Category 5:** The water quality standard is not attained. The AU is impaired or threatened for one or more designated uses by a pollutant(s),

Assessment	Integrated Assessment	Listing Category
		and requires a TMDL
Non Attainment	Non Attainment was due to pollutants, other strategies being used to restore the waterbody to attainment status including but not limited to: watershed management, non-point source controls, lake restoration plan, permitting, enforcement, finance, site remediation and any other relevant water quality improvement projects	**Category 4b:** Document water quality improvement strategies and expected time frame of SWQS attainment **Category 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
Non Attainment	Non Attainment due to pollution, including impoundments, flow alterations, habitat degradation or the cause is unknown (2)	**Category 4c**: The cause of impairment could reasonably be determined and was attributed solely to pollution. **Category 5c**: The cause of impairment could not reasonably be determined. Additional studies will be done to determine the cause of impairment.
Notes: 1. The waterbody may be reclassified to Category 4 without completing a TMDL if additional documentation attributing the impairment solely to pollutants becomes available by the next listing cycle.		

7.2 Determining Causes and Sources of Impairment

In making 305(b) water quality/use support assessments, the primary focus is the evaluation of existing data and information. Some of that information may include knowledge of conditions known or likely to cause impairment. Many times, however, ambient data, especially biological data, may indicate an impairment but the cause and source are unknown. In other cases, monitoring staff may have knowledge of particular discharges or land use conditions that could potentially cause impairment, but do not have the specific information or resources to conduct a thorough investigative study to verify causes and sources. Therefore, for the vast majority of impaired waters listed in the Integrated Report, the causes and sources indicated are the best estimations of staff based on a weight of evidence approach. Once a waterbody or segment is designated for TMDL development, however, a more thorough investigative study will be conducted to determine possible causes and sources of impairment. These investigations may include more intensive ambient water quality sampling, aquatic toxicity studies, sediment or fish tissue analysis and/or dilution calculations of known discharges. In some cases the determination of causes and sources may not be possible

7.3 Delisting

For waters listed on previous 303(d) Lists, there are several possible scenarios that may result in a waterbody being removed from a 303(d) list (Category 5). In previous years, when a waterbody was removed from the 303(d) list it was no longer tracked. Under the new methodology, a waterbody, which is, removed from Category 5 remains on the Integrated List in one of the other 4 categories. Some scenarios which could result in the removal of a waterbody from Category 5 follow:

7.3.1 A determination is made that the waterbody is meeting water quality standards (i.e., no TMDL is required). For example:

A. An error was made in the initial listing causing an erroneous listing;

B. New Information: More recent and/or more accurate data which meets the QA/QC requirements identified in this Methods Document demonstrates that a designated uses or SWQ criteria are being met for the waterbody (with or without a TMDL);

C. Revisions to the SWQSs may cause a waterbody to come into compliance with standards.

7.3.2 Reassessment of available information or data: Waterbody listed on previous 303d list is based on data, which is insufficient to meet current data quality requirements. These waterbodies would be moved to Category 3 for further monitoring or protocol development. Some examples:

A. New Macro-Invertebrate Protocol: Macroinvertebrate data had been collected under conditions not calibrated to reference conditions specified in the sampling protocol. See Section 5.1.3 and Table5.3 for detailed information

B. Metals Methodology: Many old listings for metals were based on data that preceded the "clean technique" sampling and analysis methods and did not reflect actual metal concentrations. See Section 4.2.4 for a detailed description of assessment methodology.

C. Fish Tissue Data: Consumption Advisories based on old PCB/dioxin/pesticide data, which were collected in the mid-1980s and are viewed as *evaluated data*. These waterbodies will be placed in Category 3 pending the collection of new data. Listings based on Mercury contamination will be placed in Category 4B as outlined in concordance with USEPA's Region 5 'Mercury Reduction Plan' and New Jersey 'Mercury Task Force' initiatives (See Section 5.4).

D. Other insufficient data. Rational will be identified on a case by case basis.

7.3.3 TMDL has been completed. Where more than one pollutant is associated with the impairment of a waterbody, the waterbody will remain in Category 5 until TMDLs for each pollutant have been completed and approved by EPA. Waterbodies will be removed from Category 5 and placed in Category 4A once all TMDL(s), which are expected to result in full attainment of the SWQSs, have been developed and approved by EPA.

7.3.4. 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), waterbodies will be placed in Category 4B 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. These requirements must be specifically applicable to the particular water quality problem. This includes the installation of new control equipment or elimination of discharges.

7.3.5. Impairment is not caused by a pollutant. Waterbodies will be placed in Category 4C if the impairment is caused by pollution and not a pollutant.

7.3.6 New spatial extent – When sufficient data warrants, waterbodies previously listed on a large scale may be broken down into smaller assessment units and placed in other categories, if appropriate.

7.3.7 Natural causes - Waters that exceed standards but drain wilderness or similar areas and it can be documented that there are no contributing human contributions that could contribute to the standard exceedence.

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8.0 Method to Rank and Prioritize Impaired Waterbodies

Section 303(d) of the Federal Clean Water Act requires states to rank and prioritize impaired waterbodies (i.e., waterbodies in Category 5). The goal of priority ranking is to focus available resources on the right waterbodies at the right time, in the most effective and efficient manner, while taking into account environmental, social and political factors.

The Department will prioritize those waterbodies in Category 5, taking into account, at a minimum, the following factors:

- TMDL complexity
- Pollutants of concern and identification of legacy pollutants of concern
- Additional data and information collection needs
- Sources of the pollutants, e.g. atmospheric deposition and acid rain
- Severity of the impairment or threatened impairment
- Spatial extent of impairment
- Designated uses of the waterbodies
- Efficiencies of grouping TMDLs for waterbodies located in the same watershed or for the same parameter of concern
- Timing of downstream TMDLs developed by other agencies, e.g. New York / New Jersey Harbor Estuary Program
- Status of TMDL project development at the time of ranking priorities (TMDL development already underway)
- Timing of TMDLs for shared waterbodies with the State of New York
- General watershed management activities, e.g. 319 grant activities and watershed management planning
- Other ongoing control actions that will result in the attainment of SWQS, e.g. site remediation activities
- Existence of endangered and sensitive aquatic species
- Recreational, economic, cultural, historic and aesthetic importance
- Degree of public interest and support for particular waterbodies"

9.0 Method for Developing the Monitoring and Assessment Plan

The Integrated Report guidance (USEPA 2002) states that the States should include: 1.) a description of additional monitoring that may be needed to determine water quality standard attainment status and, if necessary, to support development of TMDLs for each pollutant/waterbody combination; and 2.) a schedule for additional monitoring planned for waterbodies.

Consistent with Section 106(e)(1) of the CWA, the 2002 Integrated Report will include a comprehensive Monitoring and Assessment Plan that describes the state's approach to obtaining data and information necessary to characterize the attainment status of all assessment units. Elements of this strategy include: a description of the sampling approach (i.e. rotating basin, fixed and probabilistic station array), a list of the parameters to be collected (i.e. physical, chemical, and biological), an approach to assess the data with respect to SWQS and spatial extent. The 2002 Integrated Report will include a schedule (both long term and annually) for collecting data and information for basic assessments and for TMDLs.

It is neither necessary nor practical to conduct site-specific monitoring of all waters to support comprehensive assessments. Various approaches will be employed to prioritize and target collection of new water quality data, assess extant data from available sources and use advanced assessment tools such as spatial statistics, probabilistic monitoring and modeling to estimate water quality. Assessment of data is an important component of the Monitoring and Assessment Plan. Assessments may include the following:

- Comparing site-specific data to applicable SWQS;
- Estimating the spatial extent of monitoring;
- Conducting trends analyses or other statistical methods to evaluate changes in water quality over time and predict future water quality changes (i.e., threats to water quality);
- Identifying causes of impairment, particularly biological impairment; and
- Estimating the effectiveness of water quality improvement strategies (i.e., pollutant load reductions, flow alterations, TMDL implementation).

The schedule associated with the monitoring and assessment plan will consider the following priorities:

- TMDL planning and development;
- Identifying causes of impairment for waterbodies on Category 5;
- Identifying waterbodies that may be impaired by pollutants and require TMDLs;
- Monitoring and assessments for waterbodies that currently have no data or insufficient data. Monitoring and assessments may be prioritized based on existing uses (potable supply, recreational contact, aquatic life); and
- Continuing routine monitoring for waterbodies that are currently assessed.

It is important to recognize that monitoring and assessing each waterbody will require significant effort and can only be accomplished over the long term. Several strategies will be key to accomplishing this goal including:

- Using of advanced statistical techniques to evaluate water quality in waterbodies that are not sampled based on probabilistic sampling;

- Exchanging and using data and assessments from other programs within NJDEP and watershed partners;
- Expanding ongoing and planned monitoring and assessments to address data limitations identified for waterbodies on Categories 2 and 3.

10.0 Public Participation

The Integrated Report will combine the non-regulatory Water Quality Inventory Report (305b) aspects with the more regulation-driven aspects of the Impaired Waterbodies (303d) listing procedures (i.e., only the latter triggers TMDL development). The public participation requirements of these programs are different. In general, Category 5 of the Integrated List is considered reporting under Section 303d for Impaired Waterbodies and the remaining Categories (1 through 4) are considered reporting under Section 305b for Water Quality Inventory and therefore, regulatory requirements identified in this section (regarding public participation, EPA approval and adoption of the Impaired Waterbodies List) apply only to Category 5 waters. The Department is required under 40 CFR 130.7(b)(6) to provide a description of the methodology used to develop the list as part of the 303(d) List. This Methods Document lays out the framework for assessing data and determining which of the 5 Categories the waterbody will be assigned to in fulfillment of that requirement (and will be included with the Integrated List). By doing so, it will follow the same public process as the 303(d) Listing. The entire Integrated List (Categories 1 through 5) will be provided during the public process for informational purposes only.

10.1 Request for Data

The Department will invite the submittal of data and information for use in developing the Integrated Report. The public notice of the request for data will be published in the New Jersey Register, the DEP Bulletin, and the NJDEP Website. The period of time for submitting data will be specified in the public notice and will be a minimum of six months. Data submitted after the specified period will be considered in the development of subsequent Integrated Reports.

10.2 Public Notice

The Department will publish notice of the availability of the Integrated Water Quality Monitoring and Assessment Methods and Draft Integrated Report in the New Jersey Register, the DEP Bulletin, on the NJDEP Website, and in newspapers of general circulation throughout the State. Adjacent states. and Federal and interstate agencies shall also be notified, as necessary.
The public notice shall include the following:

- A summary of listed waterbody segments and relative parameters;
- A description of the procedures for comment on the draft Methods Document and proposed Category 5 List; and
- The name, address and website of the office in the Department from which the Draft Methods Document and Integrated Report may be obtained and to which comments may be submitted.

10.3 Comment Period

The comment period on a proposed Category 5 (303(d)) List shall be a minimum of 30 days.

10.4 Public Hearings

Within 30 days of the publication of the notice, interested persons may submit a written request to extend the comment period for up to 30 days. If the Department determines that there is a significant environmental issue or that there is a significant degree of public interest, the comment period shall be extended. If granted, notice of an extension of the comment period shall be published promptly in the DEP Bulletin and on the NJDEP Website.

Within 30 days of the publication of the notice, interested persons may submit a written request that the Department hold a non-adversarial public hearing. If the Department determines there is significant public interest or that issues raised by the request warrant a non-adversarial public hearing, notice of the public hearing shall be provided in the DEP Bulletin and on the NJDEP Website at least 30 days in advance of the hearing. The comment period on the proposed 303 (d) List will automatically be extended to 15 days after the hearing, unless a later date is specified in the notice of the public hearing.

10.5 Final Action

After the close of the public comment period, the Commissioner shall render a decision on the Category 5 (303(d)) List, which will be the final agency action. The Commissioner may:

1. Adopt the Category 5 List as proposed;
2. Adopt the Category 5 List with changes which do not effectively destroy the value of the public notice regarding the proposed List; or:
3. Re-propose all or portions of List.

When the commissioner has adopted the Category 5 List the Department will public notice the adopted List in the New Jersey Register and submit the adopted List to USEPA for approval in accordance with 40 CFR 130.7.

10.6 Availability of Final Documents

The Integrated Report, which will include the integrated list, monitoring needs and schedules, TMDL needs and schedules, as well as any other information usually included in the 305(b) Report, will be submitted to EPA as required by Section 305(b) of the Clean Water Act. The Department will post the availability of the Integrated Report on its web page at that time.

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APPENDICES

I. 2002 Integrated Water Quality Monitoring and Assessment Report Guidance

II. Data Sources for the 2002 New Jersey Integrated Report

III. Nutrient Criteria Plan (PLACEHOLDER)

IV. USEPA–USGS–NJDEP Interagency Workgroup Assessment and Listing Methodology for Aquatic Life in Freshwater Streams

V. List of Acronyms and Abbreviations

Appendix I.
2002 Integrated Water Quality Monitoring and Assessment Report
EPA Guidance

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 <u>all</u> 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:

Assessment and Listing Methodologies,
Integrated Lists of Waters and Monitoring Schedules,

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:

The Section 305(b) report, including the Section 314 lakes assessment;

The most recent Section 303(d) list;
The most recent Section 319(a) nonpoint assessment;
Reports of water quality problems provided by local, state, territorial or federal agencies, volunteer monitoring networks, members of the public or academic institutions;
Reports of dilution calculations or predictive models;
Fish and shellfish advisories, restrictions on water sports or recreational contact;
Reports of fish kills or abnormalities (cancers, lesions, tumors);
Water quality management plans;
Safe Drinking Water Act Section 1453 source water assessments;
Superfund and Resource Conservation and Recovery Act reports; and
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.

If a state or territory determines that an AU does not meet a use based on biological information and the cause of the impairment is unknown, the AU may be listed in Category 3. If a state or territory lists the AU in Category 3, EPA strongly recommends that the state or territory schedule additional monitoring to expeditiously determine the cause of the impairment.

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.

Table 7.1: Integrated Listing Method

Assessment	Integrated Assessment	Listing Category
Full Attainment	SWQS numerical criteria and designated use assessments were complete and results for each assessment indicated Full Attainment.	**Category 1:** Attaining SWQS and no use is threatened
Full Attainment and Insufficient Data	Results of SWQS numerical criteria and designated use assessments for 1 or more assessments indicated Full Attainment; Results for remaining assessments indicated "Insufficient Data"	**Category 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.
Insufficient Data	Results of SWQS numerical criteria and designated use assessments for all assessments indicated "Insufficient Data"	**Category 3:** Insufficient or no data and information to determine if any designated use is attained.
Additional Evaluation of Waterbodies Classified in Non Attainment for 1 or more Assessments:		
Non Attainment	Waterbody was impaired or threatened due to 1 or more pollutants and a TMDL is required (1)	**Category 4a**: TMDL adopted in New Jersey Register and approved by USEPA **Category 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
Non Attainment	Non Attainment was due to pollutants, other strategies being used to restore the waterbody to attainment status including but not limited to: watershed management, non-point source controls, lake restoration plan, permitting, enforcement, finance, site remediation and any other relevant water quality improvement projects	**Category 4b:** Document water quality improvement strategies and expected time frame of SWQS attainment **Category 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
Non Attainment	Non Attainment due to pollution, including impoundments, flow alterations, habitat degradation or the cause is unknown (2)	**Category 4c**: The cause of impairment could reasonably be determined and was attributed solely to pollution. **Category 5c**: The cause of impairment could not reasonably be determined. Additional studies will be done to determine the cause of impairment.
Notes: 2. The waterbody may be reclassified to Category 4 without completing a TMDL if additional documentation attributing the impairment solely to pollutants becomes available by the next listing cycle.		

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 II.
Data Sources for the 2002 New Jersey Integrated Report

All data sources that were recommended to be evaluated in the 2002 Integrated Report Guidance are discussed below. Data and information useful for assessing water quality was available from many of these sources. This appendix focuses on routine monitoring data, assessments and information sources available through state programs. The 2002 New Jersey Integrated Report, and subsequent integrated reports, will include additional data sources obtained through the public solicitation of data. Monitoring data sources are summarized on Table A1: Summary of State Monitoring Data used for the 2002 New Jersey Integrated Report.

NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN): The New Jersey Department of Environmental Protection (NJDEP) and the United States Geological Survey (USGS) have cooperatively operated the Ambient Stream Monitoring Network since the 1970's. The data from this network have been used to status and trends for conventional water quality parameters, metals and recreational designated uses (fecal coliform) in freshwater, non-tidal streams as well as sediment quality.

A Quality Assurance Project Plan was developed and approved each year for the NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN). In 1996 and 1997, the ASMN included 81 stations located outside of regulatory mixing zone in well mixed, non-tidal areas. Sites were located using GPS.

Conventional water quality samples were collected 5 times per year; metals were collected 2 times per year at about 2/3 of the stations on a rotating basis. Samples were collected using cross-sectional, depth-integrated sample collection techniques. Beginning in 1995, modified Clean Methods sampling techniques were implemented to improve metals data quality. Concurrent measurement of stream discharge was also collected. USGS report on water quality trends was used to assess threats to water quality (USGS, 1999).

Redesigned Ambient Stream Monitoring Network: Although the previous network was sufficient to assess general status and trends, changes were needed to provide data for water quality indicators and watershed management. The new network, which was designed by a NJDEP and USGS interagency committee, has been operating since October 1997. By using several different types of monitoring stations, the Redesigned Ambient Stream Monitoring Network is designed to answer several important questions about surface water quality.

Reference Stations: To characterize water quality in undeveloped areas, 6 reference stations have been established in the 4 physiographic regions of the state. Data from these stations will be used to evaluate degradation in developed areas and to provide additional data to support surface water quality standards.

Land Use Indicator Stations: To characterize the effects of the 2 dominant land uses in each of 20 watershed management areas (WMA), 40 land use indicator stations were selected. Drainage area, and percent of urban, agricultural, and forest from the most recent Land Use/ Land Cover data were used to select these stations. Many Land Use Indicator stations are also monitored in the Benthic Macroinvertebrate (AMNET) Monitoring Network. These data will provide insight into the biological effects of chemical pollutants, and the effects of nonpoint sources from dominant land uses on chemical and biological water quality.

Statewide Status Stations: Two statewide status stations per WMA were randomly selected each year from the set of ~800 Benthic Macroinvertebrate Network stations to provide a probabilistic monitoring component. These stations provide site-specific data at an increasing number of locations and can identify emerging issues.

Watershed Integrator Stations: Watershed integrator stations were located at the outlet of each WMA and at the outlets of larger watersheds within WMAs. The 23 watershed integrator stations will be used to characterize downstream water quality and will be assessed together with data from Coastal and Estuarine Water Quality Monitoring Network to evaluate pollutant transport to back bays.

Watershed Reconnaissance: **Resources** to conduct watershed reconnaissance sampling are available each year to address data needs. Watershed reconnaissance sampling has recently been used to monitor diurnal DO at a subset of ASMN stations.

Parameters: Bacteria were monitored 5 times within 30-days as recommended in the NJSWQS. Conventional water quality parameters (i.e., dissolved oxygen, nutrients, solids, and pH) were monitored at all stations seasonally, 4 times per year. Diurnal DO data were collected at a subset of ASMN stations. Flow is continuously monitored or instantaneous discharge measurements were collected during seasonal monitoring at all stations except Statewide Status stations. Monitoring at the 6 reference stations and 40 statewide status stations included one sample event per year for total recoverable metals, pesticides and volatile organic chemicals.

For both the ASMN and Redesigned ASMN, conventional water quality samples were sent to the New Jersey Department of Health and Senior Services (NJDHSS) NJ state certified laboratory; metals samples were analyzed for total recoverable (TR) metals at the USGS National Laboratory in Denver. Samples were analyzed using USEPA approved methods or equivalent USGS methods.

Data were managed in USGS's National Water Information System (NWIS) and USEPA's Storage and Retrieval (STORET) database. Raw data collected between 1/96 and 12/2000 were reported by USGS in Water Year Reports. (USGS, 1997, 1998, 1999, 2000, 2001). Electronic data are available to be downloaded from NWIS at www.usgs.gov\nwis or USEPA's STORET database at www.epa.gov/owow/STORET.

303d Evaluation Monitoring: The 303d Evaluation Monitoring, also called 303d Reconnaissance Monitoring was initiated in 1998 to provide high quality, current data

regarding concentrations of total recoverable and dissolved metals in waterbodies included on the 1998 303d List for metals.

A Quality Assurance Project Plan was developed and approved. Locational data were obtained using Global Positioning System (GPS). Sites were sampled three times during stable baseflow, often for 3 consecutive days; all sites in a WMA were sampled on the same day. Total recoverable (TR) and dissolved fraction (DF) metals samples were collected using modified Clean Methods techniques. Bottom sediment samples were also collected. USGS determined when stable baseflow conditions existed and collected flow measurements on day 2 of sampling. Samples were analyzed at the New Jersey Department of Health and Senior Services (NJDHSS) NJ State certified laboratory using EPA approved methods.

Data were reviewed by NJDEP and are being entered into USEPA's Storage and Retrieval System (STORET) available at www.epa.gov/owow/STORET and are published in Preliminary Data Reports on 303d Reconnaissance Monitoring for each Watershed Management Area.

USGS National Ambient Water Quality Assessment: The final report from the Long Island New Jersey National Ambient Water Quality Assessment (NAWQA) program was used to evaluate organics in freshwater non-tidal streams (USGS, 2000).

Marine and Estuarine Monitoring Program: NJDEP's Marine and Estuarine Monitoring Program was used to assess SWQS attainment, aquatic life and recreational designated uses. This monitoring network included 200 stations in tidal rivers, back bays, estuaries and inlets that were monitored quarterly for dissolved oxygen, ammonia-nitrogen, nitrate-nitrite, organic nitrogen, ortho-phosphate, chlorophyll a, Secchi depth, salinity, temperature, pH, suspended solids, fecal and enterococcus bacteria. The stations were a subset of the National Shellfish Sanitation Program stations.

Ambient Biological Monitoring Network (AMNET): Aquatic life designated uses in rivers were assessed using NJDEP's Ambient Biological Monitoring Network (AMNET). This network monitored benthic macroinvertebrate organisms, including crustacean, larval insects, snails and worms, which are ubiquitous throughout the state's streams and an important component of the aquatic food web. Over 800 AMNET stations located in freshwater, non-tidal streams were sampled on a 5-year rotating schedule. Round 1 sampling was completed in the mid-1990s. Round 2 sampling conducted between 1997 and 2001 was used for this 2002 New Jersey Integrated Report.

Benthic macroinvertebrate communities were examined using USEPA's Rapid Bioassessment Protocols - Level II (see Plaftkin, et. al, 1989; NJDEP, 1992). Communities were examined for pollution tolerant and intolerant forms and the results were used to compute the New Jersey Impairment Score (NJIS). NJIS scores were used to assess aquatic life designated uses as follows: **full attainment** (non-impaired; NJIS: 24-30), **non-attainment** (moderately impaired; NJIS: 9-21 and severely impaired; NJIS: 0-6). Round 2 sampling included a qualitative assessment of stream habitat quality, which was used to compute a Habitat Assessment Score. The habitat condition can provide insight into factors that contribute to biological impairment.

AMNET monitoring results are being entered into USEPA's Storage and Retrieval System (STORET) available at www.epa.gov/owow/STORET; reports are published by NJDEP's Water Monitoring Management Program (www.state.nj.us/dep/watershedmgt/bfbm)

Warmwater Fisheries Populations: Aquatic life designated use assessment in lakes was based on assessments of lake fisheries performed by the Division of Fish and Wildlife. Lakes were selected for assessment based on the Warmwater Fisheries Management Plan, which provides primary guidance for Warmwater fisheries management in New Jersey (NJDEP, 1998b).

Fish populations were sampled using electrofishing (spring or fall), shoreline seining (summer to assess fish reproduction), and/or gillnetting (fall). Conventional water quality parameters such as dissolved oxygen; pH and nutrients are recorded during the summer months when the water columns are most stratified. Fish population data were assessed by experienced fishery biologists to determine the actual or potential recreational value as a fishery and used to recommend strategies to maintain or enhance the resource.

Although the Bureau of Freshwater Fisheries is principally concerned with the recreational value of the fisheries, the assessments were based on the diversity of fish species, not only species of recreational value. Many sport fish are carnivores that depend upon an abundant and diverse forage base to support their populations. Hence, although many of these lakes are stocked, assessment results are not affected by the stocking.
Individual lake assessment reports are available from the Bureau of Freshwater Fisheries by calling (908) 236-2118.

Clean Lakes Program: The Clean Lakes Program was used to assess aesthetic quality of public lakes. This program was designed by USEPA to facilitate identification and remediation of eutrophic public lakes. Between 1977 and 1992, public lakes with water quality issues were identified by lake associations, municipalities or other entities; studies were conducted to characterize water quality and as funding was available, remediation projects were conducted. Also during the 1980's and early 1990's, NJDEP collected water quality data on a number of public lakes. The trophic status of lakes was assessed using USEPA Clean Lakes Program Guidance Manual based on total phosphorus, Secchi disk transparency and chlorophyll *a* levels (reference). Placeholder- any Lakes Bond Act studies and / or reference database and reports

USEPA Helicopter Monitoring Program: The USEPA Helicopter Monitoring Program was used to assess aquatic life and recreational designated use attainment in ocean waters. USEPA- Region 2 monitors water quality in the ocean at a series of 10 transects that extend eastward from Sandy Hook to Cape May with samples taken at 1, 3, 5, 7, and 9 mile points along each transect. This assessment was based on data collected at the 1 and 3 mile stations, which were located within New Jersey's 3-mile jurisdiction. Samples collected eight to ten times during the summer between 1996 and 2001 were used for this Integrated Report. Parameters included dissolved oxygen and fecal coliform.

The aquatic life assessment for ocean waters was based on dissolved oxygen (DO) data collected in the USEPA Helicopter Monitoring Program. USEPA-Region 2 has found over many years of monitoring that surface DO levels are consistently acceptable (DO is at or above 5mg/l). Therefore, DO monitoring at the surface was discontinued and NJDEP assumed that surface DO is at or above 5mg/l. The DO assessment was based on DO recorded one meter above the ocean bottom.

Fish Consumption Advisories: The presence of fish consumption advisories and bans was used to evaluate fish consumption designated use. In 1976, monitoring of fish and shellfish tissue for contaminants of concern to human health was initiated. Sampling locations were chosen to include areas where known or suspected sources of persistent bioaccumulative toxics (PBTs) might be found (e.g., PCBs, dioxin, pesticides, and mercury). These included freshwater, estuarine and marine areas important to both recreational and commercial fisheries. Data were collected primarily through research projects targeted at species and drainages where contamination was found. The Interagency Toxics in Biota Committee, with representatives from NJDEP and NJDHSS, oversees the issuance of fish consumption advisories and bans as needed to protect human health. Sampling locations and advisories are routinely listed at the NJDEP Website (i.e., www.state.nj.us/dep/fgw) and in the New Jersey Fish and Wildlife Digests (NJDEP 2000a and NJDEP 2000b).

National Shellfish Sanitation Program: National Shellfish Sanitation Program was used to assess shellfish consumption designated use. Shellfish harvesting areas are classified in accordance with the National Shellfish Sanitation Program (NSSP) through monitoring total and fecal coliform bacteria in water and shellfish at over 2,500 sites between 5 and 12 times per year and conducting sanitary surveys to identify potential pollution sources. www.state.nj.us/dep/watershedmgt/bmw/reports.htm

Cooperative Coastal Monitoring Program: The Cooperative Coastal Monitoring Program (CCMP) was used to assess recreational designated use attainment at ocean and bay bathing beaches. A Quality Assurance Project Plan is developed and approved each year prior to the start of sampling. This monitoring program is cooperatively operated by NJDEP, the New Jersey Department of Health and Senior Services (NJDHSS) and local health agencies. Ocean and bay bathing beaches are monitored weekly, with over 6000 samples collected each summer between Memorial Day and Labor Day at 179 ocean beaches and 139 bay beaches. Results are used to open and close bathing beaches to protect public health.

Lake Bathing Beach Data: The Lake Bathing Beach monitoring program was used to assess recreational designated use attainment at lake bathing beaches. The NJDHSS oversees monitoring by local health agencies at about 360 lake beaches in New Jersey. Fecal coliform data (not closure records) were provided to NJDEP for use in Lake Beach assessments. Approximately 180 of 360 beaches have been located on GIS. Lack of GIS locations precluded assessments of the remaining lakes; efforts are underway to locate these lake beaches.

1998 Impaired Waterbodies List (303d): Data sources for the 1998 Impaired Waterbodies List included: Ambient Stream Monitoring Network, Ambient Biological Monitoring Network, Clean Lakes Program, National Shellfish Sanitation Program, Fish Consumption Advisories, National Estuary Programs, previous Impaired Waterbodies Lists, Waterbodies Impaired by Toxics (304(l)) Lists. Waterbodies on the 1998 Impaired Waterbodies List were placed on one of 5 categories based on new data and assessments; or were retained on Category 5 in the 2002 Integrated Report if no new data were available to update the previous assessments.

Nonpoint Source Assessment (319): The most recent Nonpoint Source Assessment was completed in 2001 (placeholder: add reference). This report was based on the 2000 New Jersey Water Quality Inventory Report. Placeholder: check with 319 program for any updated assessments or project results that should be considered for the integrated report.

Predictive Models. NJDEP has listed waters as impaired due predictive modeling (e.g., Delaware River VOCs) and will continue to do so (e.g., Whippany River TMDL results). EPA used predictive models and data to delist metals for New Jersey in the NYNJ harbor.

Local water quality data and information: NJDEP solicited local water quality data and information through a notice published in the New Jersey Register on May 21, 2001, NJDEP Bulletin and NJDEP Website. In addition, letters were mailed to local entities requesting data for the Integrated Report. Data were accepted by NJDEP for a period of 6 months and were required to be accompanied by an approved or "approvable" Quality Assurance Project Plan, accurate monitoring sites locations, electronic data format, citeable report and contact information. Data that met these conditions were received from

Monmouth County Health Department;
Pequannock River Coalition;
Hudson County
Interstate Environmental Commission –
Delaware River Basin Commission
Barnegat Bay Estuary Program – State of the Estuary Report
HMDC

Review of data from these programs is ongoing. These monitoring programs and how the results were used will be described in more detail in the 2002 Integrated Report.

Water quality management plans Water *Quality Management Plans* were used to identify waters where TMDLs have been completed.

Superfund and RCRA – The Department considered data from contaminated sites in several specific instances. Five (5) waterbodies were added to the 1998 Impaired Waterbodies List as remanded by USEPA due to pollutants from contaminated sites (add Fed. Reg. Reference). The 303d Evaluation Monitoring identified lead contamination in the Rancocas River due to activities at Fort Dix; remediation is underway. The 2000 New Jersey Water Quality Inventory Report included an assessment of TCE contamination in the Rahway River due to an unidentified contamination source.

Superfund and RCRA data are not computerized and thus are generally not readily available. However, the Department is developing EQUIS database for chemical contaminants at over 8000 contaminated sites in New Jersey. Contaminated sites will be considered in more detail as the EQUIS database is populated.

Table A1: Summary of State Monitoring Data used for the 2002 New Jersey Integrated Report

Waterbody Type	Data Source for Assessment	Time Period	# of Stations	Parameters (1)	Notes
Data Sources for Conventional Water Quality Parameters Assessments					
Rivers- freshwater, non-tidal	NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN)	1/96-9/97	81	Conventionals	Trends assessment available (1986-95)
Rivers- freshwater, non-tidal	NJDEP-USGS Redesigned ASMN	10/97-9/00	115	Conventionals	Diurnal DO at subset of stations
Rivers – tidal, Estuaries & Inlets	NJDEP Marine and Estuarine Water Quality	1996-01	200	Conventionals	
Data Sources for Toxics Water Quality Assessments					
Rivers- freshwater, non-tidal	NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN)	1/96-9/97	81	Un-ionized Ammonia, Metals	Ammonia -Trends assessment available (1986-95)
Rivers- freshwater, non-tidal	NJDEP-USGS Redesigned ASMN	10/97-9/00	115	Un-ionized Ammonia, Metals	
Rivers- freshwater, non-tidal	NJDEP 303d Evaluation (Reconnaissance) Monitoring	1998-01	TBD	Metals	
Rivers- freshwater, non-tidal	NJDEP-USGS Redesigned ASMN	10/97-9/00	TBD	Volatile organics & pesticides	Supplement with USGS LI-NJ NAWQA
Data Sources for Aquatic Life Designated Use Assessments					
Rivers- freshwater, non-tidal	NJDEP Ambient Biological Monitoring Network (AMNET)	1997-01	~800	Benthic macro-invertebrates	
Lakes	NJDEP Warmwater Fisheries Monitoring	1990-00		Fish Populations	
Rivers – tidal Estuaries & Inlets	NJDEP Marine and Estuarine Water Quality	1997-01	200	Dissolved Oxygen	Mid-water column samples
Ocean	USEPA Helicopter Monitoring			Dissolved Oxygen	Bottom samples
Data Sources for Recreational Designated Use Assessments					
Rivers- freshwater, non-tidal	NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN)	1/96-9/97	81	Fecal Coliform	Trends assessment available (1986-95)
Rivers- freshwater, non-tidal	NJDEP-USGS Redesigned ASMN	10/97-9/00	115	Fecal Coliform	

Waterbody Type	Data Source for Assessment	Time Period	# of Stations	Parameters (1)	Notes
Lakes	NJDHSS & Local Health Dept lake bathing beach monitoring	1999-00	~360	Fecal Coliform	Locational data gaps preclude use of data for some lakes
Rivers – tidal Estuaries & Inlets	NJDEP Marine and Estuarine Water Quality	1996-01	200	Fecal Coliform	Open water monitoring
Ocean	USEPA Helicopter Monitoring	1997-01	~44	Fecal Coliform	Open water monitoring
Coastal Beaches	NJDEP, NJDHSS and Local Health Dept Cooperative Coastal Monitoring	2001	179 ocean 138 Bay	Fecal Coliform	~6000 samples each summer; Trends assessment available (1990-01)
Data Sources for Lake Aesthetics Designated Use Assessment					
Lake Aesthetics	NJDEP Clean Lakes Program, Lake Water Quality Assessments, Lakes Bond Act Studies	1977-94	~116	Total Phosphorus, Secchi Depth, Chlorophyll a	1 or more stations in each of 116 public lakes
Data Sources for Fish Consumption Designated Use Assessment					
All waterbodies	Interagency Toxics in Biota Committee published fish consumption advisories	1982-00	NA	Mercury, PCBs, chlordane, DDTs, Dioxin in fish	Based on results of research studies
Data Sources for Shellfish Consumption Designated Use Assessment					
All SC waters	NJDEP National Shellfish Sanitation Program	1996-01	2,500	Total Coliform, sanitary surveys	Trends assessment available (1976-01)
Data Sources for Drinking Water, Industrial and Agricultural Water Supply Designated Use Assessment					
Rivers- freshwater, non-tidal	NJDEP-USGS Cooperative Ambient Stream Monitoring Network (ASMN), Redesigned ASMN	10/96-9/00	81 115	DW- Nitrate Ind-pH, TSS Ag-TDS, salinity	Trends assessment available (1986-95)

Notes:
Conventionals: dissolved oxygen, pH, total phosphorus, total suspended solids, total dissolved solids, sulfate, temperature, chloride, nitrate
Metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc; beryllium in Delaware River only
Organics: placeholder: crosswalk being developed to determine which monitored organics have SWQS criteria

Appendix III.

NUTRIENT CRITERIA PLAN (PLACEHOLDER)

Appendix IV.

USEPA – USGS – NJDEP Interagency Workgroup Assessment and Listing Methodology for Aquatic Life in Freshwater Streams

Background:
New Jersey's current Rapid Bioassessment Protocol (RBP) for freshwater streams (NJIS scoring system) was calibrated by EPA Region 2. In doing so, EPA sampled between June and September, at sites having drainage areas greater than approximately 5 square miles. In selecting locations, EPA avoided locations under the direct influence of lakes and impoundments and also avoided sites located within the "core" Pinelands region of New Jersey.

NJDEP current 800 site AMNET monitoring program (based on EPA's calibration) operates by sampling sites once every 5 years; typically 2 sample events per station are now available. Results are used for NJDEP's 305b Aquatic Life assessments and moderately and severely impaired sites were included on 1994, 1996 and 1998 303d Lists.

Some of the 800 sites in the AMNET program are not consistent with the calibration done by EPA Region 2. The Workgroup concluded that there is a lower degree of confidence in aquatic life assessment results from sites that are different from the EPA calibration.

Goal of Workgroup: to apply the NJIS scoring to locations where it is best suited and to develop either refinements in the NJIS or alternative assessment methods for those sites for which the current scoring is not best suited.

Workgroup Guidelines:
- Ensure that sites on Category 5 on the Integrated List have the greatest likelihood of needing a TMDL.
- Ensure that sites having a high probability of not needing a TMDL are not inappropriately listed on Category 5, but can be moved to 5 if and when it is decided that a TMDL is appropriate.
- Ensure that unique sites are assessed using appropriate methods, thereby ensuring accurate biological assessments regardless of stream type or location.

Aquatic Life Assessment and Listing Method:
For this protocol, the most recent AMNET assessments are divided into two categories;
- higher level of confidence: conclude that either use is supported or use is not supported (Categories 1, 2, 4, or 5 as appropriate)
- lower level of confidence: insufficient information to determine use support status (Category 3).

1. **Place Pinelands assessments on Category 3.** The low pH waters of the NJ Pinelands favor unique biological communities. The "core" Pinelands was not included in the EPA calibration. Therefore, there is a lower degree of confidence in AMNET assessments for Pinelands sites. Pinelands sites, regardless of assessment results, would be regarded as representing insufficient information (Category 3).

2. Sites outside the Pinelands that are non-impaired are assessed as representing full support in the Integrated List (Categories 1 or 2). There is a higher level of confidence that non-impaired AMNET sites reflect attainment of aquatic life designated uses.

3. Sites outside the Pinelands that are severely impaired are assessed as representing no support status (Category 5). There is a higher level of confidence that severely impaired AMNET sites reflect non-attainment of aquatic life designated uses.

4. Moderately impaired sites that are outside the Pinelands and are <u>not unique sites</u> are assessed as representing no support (Category 5). There is a higher level of confidence that moderately impaired AMNET assessments reflect non-attainment of aquatic life designated uses for sites outside the Pinelands that are not unique sites**.**

5. Moderately impaired sites that are outside the Pinelands that are <u>unique sites</u> represent locations where there is currently insufficient data to make an informed assessment of use support (Category 3). Unique sites include headwaters, sites under the influence of lake outlets and sites sampled outside the season used by EPA to calibrate the RBP II protocol for NJ. There is a lower level of confidence that these sites reflect non-attainment of aquatic life designated uses. Additional analyses are needed to ensure that these sites are accurately assessed. If a site is considered unique for any reason it will be placed on Category 3.

<u>Unique sites</u>:

Small Stream Size: AMNET assessments derived from sites located on small headwater streams are likely to be affected by the naturally lower community diversity that can occur at these locations. The EPA calibration used drainage areas of approximately 5 square miles or greater and the Interagency 303d Technical Committee evaluation indicated changes in community structure in sites with drainage areas less than <u>6 square miles</u>.

Downstream of Impoundment: AMNET sites immediately downstream of impoundments are likely to be affected by natural nutrient and temperature changes that occur below the impoundment. The EPA calibration avoided sites immediately downstream of impoundments. Currently sites within a 450 foot buffer below impoundments are categorized in this group for our purposes here; however, lake effects may occur farther downstream as a function of lake size, stream hydrology and impoundment type, but a conservative approach was taken for this assessment.

Seasonality: AMNET sites sampled between December and March may have artificially lower scores because the invertebrates are smaller and harder to sample in the winter. The EPA calibration was based on data collected between June and September. USGS has evaluated seasonality effects for the workgroup and as a result the workgroup has established the sampling season to be April through November (inclusive). Sites sampled between December and March will be regarded as unique.

Appendix V.

List of Acronyms and Abbreviations

AGWQN: Ambient Ground Water Quality Monitoring Network
AMNET: Ambient Biological Network
AQLa Aquatic Life Acute
AQLc Aquatic Life Chronic
BMP(s) Best Management Practice(s)
ASMN Ambient Stream Monitoring Network
BIOS Biological System, a component of STORET (see STORET)
C1 Category 1
CALM: Comprehensive Assessment and Listing Methods
CCMP: Cooperative Coastal Monitoring Program
CEHA: County Environmental Health Act
CLP Clean Lakes Program Phase I diagnostic studies
DF Dissolved fraction
DFW Division of Fish and Wildlife
DO: Dissolved Oxygen
DRBC: Delaware River Basin Commission
DSRT Division of Science, Research and Technology
DWQS: Drinking Water Quality Standards
EQUIS Earthsoft's EQUIS
EWQ Existing Water Quality (network)
FC: Fecal Coliform (bacteria)
FW Fresh Water
FW Fresh Water Category 2
GIS: Geographic Information System
GW: Groundwater
GWIA: Groundwater Impact Areas
HEP: Harbor Estuary Program
HH Human Health
HUC: Hydrologic Unit Code
IBI: Index of Biotic Integrity
IEC Interstate Environmental Commission (formerly Interstate Sanitation Commission)
LWQA Lake Water Quality Assessment Reports
CWA Federal Clean Water Act
MA1CD10 minimum average 1 day flow with a statistical recurrence interval of 10 years
MA7CD10 minimum average 7 day flow with a statistical recurrence interval of 10 years
MA30CD5 minimum average 30 consecutive day flow with a statistical recurrence interval of 5 years
MCL: Maximum Contaminant Level
MDL Maximum Detection Limit
MPN: Most Probable Number (of Fecal Coliform bacteria)
NAWQA: National Ambient Water Quality Assessment
NJ: New Jersey
N.J.A.C.: New Jersey Administrative Code

NJADN: New Jersey Air Deposition Network
NJDEP: New Jersey Department of Environmental Protection
NJDHSS: New Jersey Department of Health and Senior Services
NJIS: New Jersey Impairment Score
NJPDES New Jersey Permit Discharge Elimination System
NJLMP New Jersey Lake Management Program Reports
N.J.S.A.: New Jersey Statutes Annotated
NO_3: Nitrate
NRCS: National Resource Conservation Service
NSSP: National Shellfish Sanitation Program
NY: New York
ODES: Ocean Data Evaluation System
PAH: polycyclic aromatic hydrocarbon
PCB: polychlorinated biphenyl
P.L.: Public Law (federal)
PPM: parts per million
PPB: parts per billion
QUAPP Quality Assurance Project Plan
RF3: River Reach File 3
RPB: Rapid Bioassessment Protocol
SC Saline coastal
SE Saline Estuary
SIIA: Sewage Infrastructure Improvement Act
SRP: Site Remediation Program
STORET: Storage and Retrieval, USEPA's water quality database
STP: Sewage Treatment Plant
SWAP: Source Water Assessment Program
SWQS: Surface Water Quality Standards
TCE: tetrachloroethlylene
TIBC: (Interagency) Toxics in Biota Committee
TMDL: total maximum daily load
TP Total Phosphorus or Trout Maintenance
TR Total Recoverable
TSS Total Suspended Solids
USEPA: United States Environmental Protection Agency
USGS: United States Geological Survey
WATSTORE: Water Data Storage and Retrieval System, USGS water quality database
WCE: Water Compliance and Enforcement
WLA: Waste Load Allocation
WMA: Watershed Management Area
WQ Water Quality
VOC: volatile organic compound
305b Report: Water Quality Inventory Report
303d List: Impaired Waterbodies List