

Presented below are water quality standards that are in effect for Clean Water Act purposes.

EPA is posting these standards as a convenience to users and has made a reasonable effort to assure their accuracy. Additionally, EPA has made a reasonable effort to identify parts of the standards that are not approved, disapproved, or are otherwise not in effect for Clean Water Act purposes.

**IMPLEMENTATION GUIDELINES
for the
NARRATIVE NUTRIENT STANDARD**

**By
THE WATER QUALITY ASSESSMENT UNIT
of the
ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY**

January 16, 1996

NARRATIVE NUTRIENT IMPLEMENTATION GUIDANCE

Summary

The Arizona Department of Environmental Quality (ADEQ) developed this guidance document to resolve the EPA's disapproval of the State lacking guidance for determining when a violation of the narrative nutrient standard has occurred. This standard states:

"Navigable waters shall be free from pollutants in amounts or combinations that...cause the growth of algae or aquatic plants that inhibit or prohibit the habitation, growth or propagation of other aquatic life or that impair recreational uses" (Arizona Administrative Code Title 18, Chapter 11, Article 1, Section 108, Part A(6) (A.A.C. R18-11-108.A.6)).

The EPA notified the State of its disapproval on September 9, 1993. Specifically, the EPA stated:

"Since the State has not provided an implementation process for narrative nutrient standards, there is insufficient support for the position that the State's narrative standard provides protection substantially equivalent to that provided by the federally promulgated numeric standards...We recommend that the State adopt...implementation procedures...in order to satisfy the federal requirement. In addition to adopting an implementation procedure, the State has the option of adopting numeric nutrient standards for specific water bodies."

In its July 6, 1994 letter ADEQ responded to the EPA:

"ADEQ will clarify how the narrative nutrient standard will be implemented through the development of a guidance document. ADEQ does not believe that implementation procedures for the narrative nutrients standard should be prescribed in water quality rules. Instead, the narrative nutrient standard implementation guidance should be developed as part of the Continuing Planning Process."

Following the development of a draft guidance document, ADEQ initiated the public review process for this document at a meeting of the Water Quality Advisory Council on September 9, 1994. During 1995 additional requests for public comment were solicited at meetings held by the Councils of Government and public meetings held for the triennial review of water quality standards.

As of January 1, 1996 the Department had received two written comments. The EPA provided comments that primarily focused on the need for the guidance to more clearly identify when a violation of the narrative standard had occurred and what specific steps were to be taken in such an event. The City of Phoenix made several recommendations to improve the document to better reflect the unique nutrient conditions that are found in effluent dependent waters. ADEQ modified the draft to address as many of the concerns raised by the comments as possible.

This document represents ADEQ's final implementation procedure for addressing potential violations of the narrative nutrient standard. The focus of the guidance is on the field methods that should be utilized

for verifying where nutrient problems are occurring and the steps that will be followed to resolve a confirmed narrative nutrient standard violation.

Introduction

The narrative nutrient standard serves to preserve and protect waters by limiting pollutants which may be discharged at concentrations that are not directly toxic but may cause a highly productive, but nuisance, growth of aquatic plants. These changes may modify aquatic community structure, diversity and abundance, affect the ability of a community to resist or recover from a disturbance, cause extirpation of sensitive species or cause a change in the functions and values associated with the aquatic ecosystem. In addition, these changes may impair recreational uses of the State's waters, especially swimming and boating. The narrative standards play a vital role in protecting the designated uses of surface waters in Arizona. By being qualitative rather than quantitative, narrative standards provide blanket protection for all waterbodies regardless of whether or not a particular water quality standard applies to that waterbody.

Arizona's diverse environment presents many challenges for determining the cause or causes of increased productivity and biomass that lead to a violation of the narrative standard. To a great extent, the presence or absence of bioavailable nitrogen determines rates of productivity in Arizona's waters. Special attention must be paid to the determination of natural inputs as there are many natural sources of nitrogen. Nitrate and ammonia occur in precipitation and nitrate can be found in elevated quantities in spring water and in upwelling areas due to natural nitrification.

In Arizona's low to middle altitude streams, long growing seasons, high water temperatures and open canopies combine to cause high rates of productivity, often resulting in high biomass. This circumstance results from the tight cycling of available nutrients caused by increased primary productivity, community metabolism and biologically-mediated nutrient transformations. The resultant increase in productivity and biomass may give the false impression of a narrative nutrient violation and should be carefully investigated. For further information about the role of nutrients in Arizona streams, please see Fisher, 1986; Fisher and Grimm, 1985; Grimm, 1992; Grimm and Fisher, 1986a; Grimm and Fisher, 1986b; Holmes et.al., 1994; Holmes et.al., in press.

When attempting to make a determination of a narrative standard violation carefully consider hydrologic factors. Many streams in Arizona have hydrologic regimes which are prone to destructive floods. What appears to be a narrative standard violation one day may be swept completely away the next day. Care must be taken to note the probable last flood date and revisit the site at a later date if it is suspected that a violation has been "cleaned up" by nature.

The type of waterbody is also relevant. For example, effluent-dependent waters (EDWs) do not function in the same way as naturally flowing waters. Because EDWs acquire most of their flow from wastewater treatment plant discharges, the typical aquatic community (plant and animal) found in these waterbodies and the net ecological benefits that result from the wastewater discharge are factors to consider. If the discharger meets the requirements of the NPDES permit, then a benefit exists in having the discharge as it provides important habitat for wildlife that utilize the riparian vegetation that naturally develops in these systems.

Arizona has adopted numeric nutrient standards for ten waterbodies (see Appendix A). Additional federally-promulgated standards apply to other State waterbodies (see Appendix A). This information

must be determined before initiating the procedures outlined in this guidance document.

Arizona also has an agricultural general permit system (R18-9-201 through 203) in place which requires compliance with performance-based Best Management Practices (BMPs) for the application of nitrogen fertilizer and the operation of concentrated animal feeding facilities. If best professional judgement indicates that a discharge from an agricultural facility causes a narrative nutrient violation the Nonpoint Source Agricultural Program should be consulted.

For waters with a numeric nutrient standard, a narrative nutrient standard violation may be caused by violation of that nutrient standard. However, for waters without numeric nutrient standards a narrative nutrient standard violation may cause a violation of another numeric standard. For example, increased aquatic plant biomass associated with a narrative nutrient standard violation may cause an oxygen standard exceedance as a result of increased night-time respiration.

The pursuit of numeric standard, unpermitted discharge and permit violations that are associated with a probable narrative standard violation are generally preferred prior to pursuing a narrative standard violation. Voluntary compliance should be sought prior to initiating formal compliance procedures (see ADEQ Compliance and Enforcement Policy, Appendix D).

The following implementation guidelines are designed to provide guidance for separating waterbodies which truly have a nutrient problem to the degree that a standard violation has occurred from those waterbodies that are experiencing nothing more than conditions that are considered typical of the Arizona environment. For those situations where a violation has occurred, this guidance provides recommended outcomes for handling different types of situations.

Synopsis of Investigation Steps

The steps for resolving a possible narrative nutrient standard violation are divided into two parts. Staff use Part 1 to gather background information on the site, determine if in fact a violation has occurred and determine if obvious causes exist for the violation. Part 2 describes the follow-up investigation that occurs if the findings of the preliminary investigation warrant further study of the problem.

Part 1 - Identification of Sources and Preliminary Investigation

Step 1 - Initiation of investigation of possible violation

Gather preliminary information from reports and/or data that indicate that a narrative nutrient standard violation may have occurred.

Step 2 - Preliminary site investigation

Inspect the site, sample baseline parameters, discover readily visible discharges that may be causing the violation, identify numeric standard violations that may be linked to a narrative standard violation and survey the site for possible additional sampling.

Step 3 - Evaluate preliminary findings and assess need for further action

Evaluate findings from the previous steps and determine a course of action including, where necessary, initiating compliance procedures or undertaking an intensive field investigation to determine possible sources of pollutant loadings.

Part 2 - Intensive Site and Source Investigation

Step 4 - Intensive site investigation

Gather information on:

- ▶ Baseline conditions;
- ▶ Sources and amounts of nutrient loadings;
- ▶ Inputs not readily visible upon first inspection;
- ▶ Possible standards violations linked to natural increases in productivity;
- ▶ Other data that will contribute to the resolution of the problem.

Upon completion of the intensive site investigation, staff will prepare a report detailing the findings of the investigation.

Step 5 - Final Recommendations

Provide recommendations for resolving nutrient problems in the waterbody of concern. After review of all data and consultation with affected parties, a decision is made on what follow-up actions are needed to resolve identified water quality problems. Examples of follow-up actions include the initiation of a Total Maximum Daily Load (TMDL) analysis, occasional monitoring to establish trends, and establishment of additional or modified Best Management Practices.

Detailed Explanation of Steps 1-5

Part 1 - Identification of Sources and Preliminary Investigation

Step 1 - Initiation of investigation of possible violation

ADEQ becomes informed of possible standards violations from a variety of sources. The primary sources include:

- ▶ Citizen complaints - Preliminary information is compiled on the ADEQ Water Quality Division's Complaint/Incident Report Form.
- ▶ Report from ADEQ field personnel - Staff may submit memos to the appropriate program to identify possible water quality violations observed while in the field.
- ▶ Reports and data from cooperating agencies, including:
 - Arizona Game and Fish Department
 - US Geological Survey (USGS)
 - US Forest Service
 - Bureau of Land Management
 - US Fish and Wildlife Service
 - US Corps of Engineers
- ▶ ADEQ water quality data collected by the following programs:
 - Fixed station network (ADEQ and USGS)
 - Intensive field investigations
 - Biological criteria development
 - Clean lakes program
 - Priority pollutant sampling

In addition to obvious indicators such as low dissolved oxygen or high pH values that may indicate a narrative nutrient standard violation, anecdotal information from memos, field reports or citizen's complaints may be indicators that a narrative nutrient standard violation has occurred. These indicators include:

- ▶ Excessive growth of algae or macrophytes (Note: In an effluent-dependent water (EDW) this growth may be a natural result of the created ecosystem).
- ▶ High organic or inorganic nitrogen levels as compared to similar waterbodies in the same region.
- ▶ Low dissolved oxygen (DO) readings that are possibly linked to plant growth and decay (Note: These DO readings should be compared to the waterbody's DO standard).
- ▶ A biological community with a dominance of blackflies, snails, leeches and bloodworms (Note: In an EDW this condition may be normal, especially near the outfall of the discharge).
- ▶ Fish kills.
- ▶ Other indicators of low DO, e.g., hydrogen sulfide odor (rotten eggs) correlated with excessive plant growth and decay (Note: In an EDW this odor may be a natural result of the created ecosystem).
- ▶ Low abundance or diversity of invertebrates (Note: Low invertebrate abundance has causes other than a narrative violation, e.g., recent flood event).
- ▶ Unusual or excessive pH readings correlated with a nuisance plant growth.

Prior to initiating Step 2, the investigator should review any available historical water quality data for the waterbody of concern. State Water Quality Assessment or 305(b) Reports can provide waterbody-specific information as to whether historical water quality data exist for the waterbody of concern. This review should include an analysis of significant trends for chemical constituents that can be linked to nutrient problems including nitrogen, phosphorus, dissolved oxygen, pH and turbidity. Primary sources of historical data include:

- ▶ ADEQ Fixed Station records
- ▶ USGS water quality database
- ▶ Federal water quality database (STORET)
- ▶ Complaint investigation files
- ▶ ADEQ groundwater database
- ▶ Published reports

Step 2 - Preliminary site investigation

ADEQ will conduct a site investigation according to information in Appendix B. If possible, schedule this field investigation after a period of hydrologic stability and during the warmer months. For efficiency, plan the visit so that the pH readings and the major portion of the work can be done in the middle to late afternoon of one day and the dissolved oxygen reading can be taken at or before dawn the next day. This investigation is specifically designed to identify unpermitted discharges, numeric standards violations, permit violations, or if the possible narrative violation is a result of a natural nutrient source or event.

Step 3 - Evaluate preliminary findings and assess need for further action

From the results of the first two steps, one of the following outcomes results:

- ▶ No violation - The weight of evidence results in a finding of no violation. Evidence that leads to this conclusion includes:
 - No unpermitted discharges are located.
 - Vegetation biomass is of a reasonable quantity for the type of waterbody.
 - Invertebrate diversity is as expected for the region, a similar type of waterbody or an upstream site.
 - Nitrogen and phosphorus levels are well below the standard (if there is an applicable nutrient standard), typical of nutrient levels found in the region or in similar types of waterbodies, or similar to an upstream site.
 - No evidence of extreme or unusual pH or dissolved oxygen concentrations are found.
 - Nutrient inputs are natural, resulting from springs or upwelling zones. However, caution should be taken to make sure these sources of nutrient inputs do not result from underground runoff from an adjacent land use activity.
- ▶ Finding of an unpermitted discharge - If after the site investigation an unpermitted discharge is evident, follow the compliance procedures according to the ADEQ compliance and enforcement policy (Appendix D). If the discharge does not appear to be the only source of nutrient inputs

that cause the violation, then conduct additional investigation as needed.

- ▶ Violation of a numeric standard - A nutrient standard violation has occurred if the nitrogen or phosphorus levels are above published standards for that waterbody or the increased productivity has caused a violation of the pH standard, oxygen standard or possibly both standards. Follow the ADEQ compliance and enforcement policy (Appendix D) if an anthropogenic source is clearly demonstrated. However, if no clear anthropogenic source is apparent, then initiate Steps 4 and 5 of these guidelines.
- ▶ Violation of antidegradation standard (A.A.C. R18-11-107) - If a discharge that is exempt from the permit process causes a significant increase in the pollutant loading to a surface water, a violation of the state antidegradation standard has occurred. Typically, this violation occurs because of a nonpoint source activity. Follow ADEQ's compliance and enforcement policy (Appendix D) to bring the activity into compliance with this standard.
- ▶ Permit violation - A finding of a violation of any narrative standard that is a direct result of a permitted activity is a permit violation. Follow ADEQ's compliance and enforcement policy (Appendix D) to bring the permittee into compliance with the narrative standard.
- ▶ Unattributed narrative nutrient standard violation - If best professional judgement indicates that the narrative nutrient standard has been violated, i.e. the weight of evidence indicates that for that waterbody type aquatic plant growth is accelerated due to enriched conditions (see Nutrient Enrichment Form in Appendix B) and no apparent anthropogenic source exists, initiate Steps 4 and 5 of these guidelines.
- ▶ No violation found, but trend analyses indicate cause for concern - Although the site investigation may not have conclusively indicated a violation of the narrative nutrient standard, significant trends in water quality data may indicate that the waterbody is at risk. Initiate Steps 4 and 5 of these guidelines.

Part 2 - Intensive Site and Source Investigation

Part 1 should address the majority of investigations of a possible narrative nutrient standard violation. Those remaining cases that recommend initiation of Part 2 steps require resources that are above and beyond the resources utilized by ADEQ to investigate routine complaints. Consequently, waterbodies that are in need of a Part 2 investigation are prioritized according to the severity of the water quality problem. To determine which waterbody receives attention first, ADEQ will consider the following:

- ▶ Whether or not the waterbody is on the Water Quality Limited list, or 303(d) list.
- ▶ ADEQ's schedule for implementation of the watershed framework for the basin in which the waterbody is located.
- ▶ The effect of additional violations on human health, aquatic organisms and wildlife.
- ▶ Established schedules for conducting intensive monitoring within the watershed that the waterbody is located.

Step 4 - Intensive site investigation

Initiate intensive site investigations during periods when the hydrologic regime is relatively stable and the likely impacts of excessive nutrients are the greatest. For much of Arizona, the ideal sampling periods are May-June and October. The choice of constituents to sample, the sampling frequency and the sampling locations should be selected according to the requirements for calculating a TMDL for the waterbody as a TMDL is a potential tool for resolving water quality problems. Review the minimum data requirements for a TMDL before developing the sample plan.

At a minimum the sample plan developed for the intensive site investigation should include the following components:

- ▶ A complete site characterization of the affected waterbody. Prior to initiating the sampling, investigate the perimeter and uplands of the site and locate the following features:
 - Tributaries or springs;
 - Facilities or land use activities within or adjacent to the floodplain;
 - Patterns of algal/macrophyte distribution which may indicate groundwater sources, i.e., potential upwelling or downwelling sources;
 - Waterbodies that are near but not connected to the affected waterbody, e.g, farm or process ponds;
 - Landscape characteristics - on-site and directly upstream;
 - Areal extent of current possible violation.

- ▶ Based on the findings of the site characterization and considering the data needs for calculating a TMDL, at a minimum conduct the following sampling:
 - Critical water quality chemical constituents of the waterbody coupled with stream flow or lake depth taken at appropriate times;
 - Tributary/spring water chemistry and rate of flow to calculate potential loadings;
 - Vertical hydraulic gradient at upstream end of site;
 - Algal community upstream and downstream or phytoplankton for lake;
 - Microbiological data, especially for *Escherichia coli* (*E. coli*);
 - Where necessary, effluent specific parameters, e.g. laundry brighteners.

Upon completion of the intensive site investigation prepare a written report that documents the findings of the sampling effort. Appendix C provides background information for interpreting the results of the data collected. This report should also include, if necessary, the calculation of a preliminary TMDL.

Step 5 - Final Outcomes

Upon completion of the intensive site investigation report, implement one of the following outcomes as a result of the report's findings:

- ▶ If the investigation identifies a previously unseen or intermittent unpermitted discharge, follow ADEQ's compliance and enforcement policy (Appendix D).

- ▶ If a previously unseen activity that is exempt from the permit process causes a significant increase in the pollutant loading to the waterbody, a violation of the state antidegradation standard has occurred, and follow ADEQ's compliance and enforcement policy (Appendix D). For nonpoint source activities with established Best Management Practices (BMPs), the BMPs should be reviewed and/or modified to reduce the pollutant loading to the waterbody.
- ▶ If after the intensive study it is apparent that no violation is occurring, monitor the site periodically for one to two years to verify findings and determine if any change has occurred.
- ▶ If the investigation finds that the waterbody is at risk, use the results of the preliminary TMDL to initiate a watershed-based management approach to minimize nutrient loadings to the waterbody. In these instances the decision-making process for resolving the water quality problem will include stakeholders as outlined in ADEQ's watershed framework. Additional monitoring may be necessary to finalize the TMDL and address local concerns.

References

- Fisher, S.G. 1986. Structure and dynamics of desert streams. Pages 119-139 in W.G. Whitford (editor). *Pattern and Process in Desert Ecosystems*. University of New Mexico Press, Albuquerque.
- Fisher, S.G. and N.B. Grimm. 1985. Hydrologic and material budgets for a small Sonoran Desert watershed during three consecutive cloudburst floods. *Journal of Arid Environments* 9: 105-118.
- Grimm, N.B. 1992. Biogeochemistry of nitrogen in Sonoran Desert streams. *Limnology and Aquatic Biology of the Southwest*, Issue 2: pp. 139-155.
- Grimm, N.B. and S.G. Fisher. 1986a. Nitrogen limitation potential of Arizona streams and rivers. *Journal of the Arizona-Nevada Academy of Science* 21: 31-43.
- Grimm, N.B. and S.G. Fisher. 1986b. Nitrogen limitation in a Sonoran Desert stream. *Journal of the North American Benthological Society* 5: 2-15.
- Holmes, R.M., S.G. Fisher, and N.B. Grimm. 1994. Parafluvial nitrogen dynamics in a desert stream ecosystem. *Journal of the North American Benthological Society* 13: 468-478.
- Holmes, R.M., J.B. Jones, Jr., S.G. Fisher, and N.B. Grimm. In press. Denitrification in a nitrogen-limited stream ecosystem. *Biogeochemistry*.

APPENDIX A

State and Federal Numeric Nutrient Standards for Arizona

A. State adopted numeric nutrient water quality standards (from A.A.C. R-18-11-109.G). The following water quality standards for total phosphorus and total nitrogen, expressed in milligrams per liter (mg/L), shall not be exceeded:

Waterbody	Nutrient	Annual Mean ¹	90th %-tile ²	Single Sample Maximum
Verde River and its tributaries from headwaters to Bartlett Lake	Total Phosphorus ³	0.10	0.30	1.00
	Total Nitrogen ⁴	1.00	1.50	3.00
White River, Black River, Tonto Creek and their tributaries that are not located on tribal lands	Total Phosphorus	0.10	0.20	0.80
	Total Nitrogen	0.50	1.00	2.00
Salt River and its tributaries, except Pinal Creek, from the confluence of the White and Black Rivers to above Theodore Roosevelt Lake that are not located on tribal lands	Total Phosphorus	0.12	0.30	1.00
	Total Nitrogen	0.60	1.20	2.00
Theodore Roosevelt, Apache, Canyon and Saguaro Lakes	Total Phosphorus	0.03 ⁵	NNS	0.60 ⁶
	Total Nitrogen	0.30 ⁵	NNS	1.00 ⁶
Salt River below Stewart Mountain Dam to confluence with the Verde River	Total Phosphorus	0.05	NNS	0.20
	Total Nitrogen	0.60	NNS	3.00
Little Colorado River and its tributaries above River Reservoir in Greer; South Fork of Little Colorado River above South Fork Campground; Water Canyon Creek above Apache-Sitgreaves National Forest boundary	Total Phosphorus	0.08	0.10	0.75
	Total Nitrogen	0.60	0.75	1.10
Little Colorado River at crossing of Apache County Road No. 124	Total Phosphorus	NNS	NNS	0.75
	Total Nitrogen	NNS	NNS	1.80

Waterbody	Nutrient	Annual Mean ¹	90th %-tile ²	Single Sample Maximum
Little Colorado River above Lyman Lake to above Amity Ditch diversion near crossing of Arizona Highway 273 (applies only when in-stream turbidity is less than 50 NTU)	Total Phosphorus	0.20	0.30	0.75
	Total Nitrogen	0.70	1.20	1.50
Colorado River, at Northern International Boundary near Morelos Dam	Total Phosphorus	NNS	0.33	NNS
	Total Nitrogen	NNS	2.50	NNS
San Pedro River, from Curtiss to Benson	Total Phosphorus	NNS	NNS	NNS
	Total Nitrogen	NNS	NNS	10.0

¹ - Annual mean means the arithmetic mean of monthly values determined over a consecutive 12 month period, provided that monthly values are determined for at least three months. The monthly value shall be the arithmetic mean of all values determined in a calendar month (A.A.C. R18-11-101).

² - Ninetieth percentile means the value which may not be exceeded by more than ten percent of the observations in a consecutive 12 month period. A minimum of ten samples, each taken at least ten days apart, are required to determine a 90th percentile (A.A.C. R18-11-101).

³ - Total phosphorus means all phosphorus present in the sample, regardless of form, as measured by a persulfate digestion procedure (A.A.C. R18-11-101).

⁴ - Total nitrogen means the sum of the concentrations of ammonia (NH₃), ammonium ion (NH₄⁺), nitrite (NO₂⁻), nitrate (NO₃⁻) and dissolved and particulate organic nitrogen expressed as elemental nitrogen (A.A.C. R18-11-101).

⁵ - Annual mean of representative composite samples taken from the surface and at 2 and 5 meter depths (A.A.C. R18-11-109).

⁶ - Maximum for any set of representative composite samples taken from the surface and at 2 and 5 meter depths (A.A.C. R18-11-109).

NNS - No numeric standard adopted.

B. Federally-adopted nutrient numeric water quality standards (Federal Register, Vol. 41, No. 121, Part 120.104(c), June 22, 1976).

River or River Segment	Total Phosphates as PO ₄ mg/L		Total Nitrates as NO ₃ mg/L	
	Mean Annual ¹	90th Percentile ²	Mean Annual ¹	90th Percentile ²
Colorado River from Utah border to Willow Beach (mainstem)	0.04	0.06	4	7
Colorado River from Willow Beach to Parker Dam (mainstem)	0.06	0.10	5	7
Colorado River from Parker Dam to Imperial Dam (mainstem)	0.08	0.12		7
Colorado River from Imperial Dam to Morelos Dam (mainstem)	0.10	0.15	5	7
Gila River from New Mexico border to San Carlos Reservoir (excluding San Carlos Reservoir)	0.50	0.80		
Gila River from San Carlos Reservoir to Ashurst Hayden Dam (including San Carlos Reservoir) ³	0.30	0.50		
San Pedro River	0.30	0.50		
Verde River (except Granite Creek)	0.20	0.30		
Salt River above Roosevelt Lake	0.20	0.30		
Santa Cruz River from international boundary near Nogales to Sahuarita	0.50	0.80		
Little Colorado River above Lyman Reservoir	0.30	0.50		

¹ - The mean annual total phosphate and mean annual total nitrate concentrations shall not exceed the values given in the table.

² - The total phosphate or total nitrate concentrations of more than 10 percent of the samples in any year shall not exceed the 90 percent values given in the table.

³ - State has no jurisdiction on portion located on tribal lands.

APPENDIX B

Site Investigation Form for Step 2

Field Investigation Protocol

- A. Document geographic location, preferably with GIS equipment.
- B. Select upstream site as reference for investigation area. Collect the following data for both the upstream and investigation sites.
1. Characterize physical parameters including water temperature, dissolved oxygen (preferably at sunrise), pH (preferably at mid-afternoon), turbidity, and discharge.
 2. Collect water samples for analysis of ammonia, nitrate, phosphate, and total nitrogen (samples should be analyzed by laboratory with lowest detection limits possible).
 3. Estimate the percent cover per square meter of macrophytes, attached algae and large filamentous algae in streams; chlorophyll a/m^3 in lakes or large pools.
 - Methods to estimate algal or macrophyte density should be chosen according to waterbody characteristics (depth, flow etc.) Use published methods or best professional judgement to estimate cover.
 - Chlorophyll a/m^3 (lake or large pools only): Take three random, unpreserved, 1 liter samples, composite, assay for chlorophyll a.
- C. Estimate the time since the last flood using the following resources:
1. USGS data
 2. Anecdotal evidence from local residents
 3. Best professional judgement using
 - Dampness of banks
 - Cohesiveness of dry soil
 - Wetness and general condition of suspended debris, e.g. are grasses still laid over?
 - Amount of regrowth of terrestrial and aquatic plants
 - Color of substrates (due to recolonization by diatoms)
 - Abundance/composition of biological community
- D. Compare invertebrate samples upstream/downstream of possible violation (see ADEQ Biological Criteria Guidance: Reference Site Selection and Sampling Methodology, 1994).
- E. Gather site photographs and provide general description of area noting any visible tributaries (wet or dry) riparian conditions, upland and channel characteristics.
- F. Document location of possible point and nonpoint source discharges that could be reasonably associated with increased productivity.
- G. Fill out nutrient enrichment rating sheet (see following page).

Nutrient Enrichment Rating Sheet

A. Please rate the following characteristics according to the following scale:

- 0 = Absent
3 = present in small quantities
5 = present in large quantities but not dominant
7 = present in large quantities approaching dominance
10 = dominant

- ___ Aquatic macrophytes/algae (dominant = > 90% cover)
___ Flocculent, dead organic matter in slow water areas (dominant = > 90% cover)
___ Anoxic sediments in slow water areas or under plants (dominant = > 60% cover)
___ Estimated number of snails in runs and pools (dominant = > 4 snails/10 cm² avg.)
___ Blackflies in riffles (dominant = > 90% cover on upper cobble surface)

B. ___ Are leeches present on underside of cobbles? (Yes = 5; No = 0)

C. ___ Are bloodworms common in a scoop of fine sediments in slow water? (Yes = 5; No = 0)

D. ___ Of the algae present, is *Cladophora* the dominant species? (Yes = 5; No = 0)

Cladophora can be identified by the following: (1) appears in dense, fibrous mats or long flowing "beards"; (2) coarse texture (not slimy); (3) highly branched structure; and (4) colored light green to yellow in mats, medium to medium dark green in "beards", never dark, forest green.

E. ___ Of the macrophytes present is watercress the dominant species? (Yes = 5; No = 0)

Watercress can be identified by the following: (1) it emerges from the waterbody sprawling and erect; (2) highly branched structure; (3) hollow stems; (4) small, whitish flowers, several arranged closely; and (5) roots from stem nodes.

F. ___ In comparison with an upstream site, does there appear to be an increased amount of downstream export of organic matter? (Yes = 5; No = 0)

Indicators of downstream export of organic matter include: (1) *Cladophora* mats wrapped around protruding rocks and stems; (2) flocculent matter in downstream flow.

G. ___ Dissolved oxygen saturation score (Range = 0-10, where 0% = 10; 100% = 0)

H. ___ pH score (Range = 0 - 10, point for every .25 above median pH for waters within the region).

I. ___ Provide a subjective score to summarize overall impression of the sites based upon the following characteristics (10 = nutrient-enriched conditions suggested; 0 = normal conditions):

- ▶ Odor - Does it smell like rotten eggs, feces (cattle or human), ammonia, other?
- ▶ Health of fish - Are fish lethargic, swimming erratically, odd-colored or blotchy?

- ▶ Landscape patterns - Is there an alluvium to bedrock transition, open basin to canyon transition? What is the general shape of the immediate basin?
- ▶ Tributaries - Are there any tributaries (wet or dry), or are there any "perched channels" entering onto the terrace?
- ▶ Riparian conditions - Appearance, health, grazing, understory, species, if known.
- ▶ Channel characteristics - Gradient, substrate, riffle, run, pool, structure.
- ▶ Possible point/nonpoint discharges - Are there any agricultural, industrial, sewage, or other facilities? Are there any homes in the area?
- ▶ Bottom deposits, surface sheen, temperature changes, color, different colored or textured sediments, etc.
- ▶ Natural springs or seeps - Are there areas of perched water, *fissidens* moss, "butterscotch pudding" bacteria, wet canyon walls, red monkey flowers, changes in temperature, pH, conductivity, etc.?

Total Nutrient Enrichment Score = _____

If more than six of the above criteria are rated at the highest score possible and/or the total score is > 75, then a narrative nutrient standard violation is likely to have occurred.

APPENDIX C

Data Interpretation for Step 4

Interpreting data from Intensive Site Investigation

From data collected during the intensive site investigation address the following issues in the investigation report:

- A. The location of any anthropogenic discharges not apparent during preliminary site investigation. This is accomplished by walking the perimeter of the affected waterbody and noting tributaries and algal patterns and densities (Be sure to follow any tributaries that show signs of anthropogenic discharges). Indicators of discharge (natural or anthropogenic) include:
- Marshy areas extending up the bank
 - Abrupt increase in algal density
 - Tributary channels showing signs of excavation
 - Signs of vehicle or heavy equipment movement
 - Abrupt change in water color or turbidity
 - Abrupt changes in flow volume
 - Abrupt changes in water temperature
 - Odors, foam, sheens, escaping gas bubbles
 - Bottom deposits
 - Abrupt changes in chemistry (evidenced by changes in conductivity, pH etc.)
 - Pipes, hoses, culverts etc.
- B. Determine if the oxygen standard for the waterbody is being exceeded by recording pre-dawn and mid-afternoon oxygen levels. An oxygen standard violation may be linked to plant respiration if oxygen levels follow an exaggerated pattern of low pre-dawn and high mid-afternoon values. Other indicators of low oxygen levels or unnaturally increased productivity that should be noted include (Note: Remember that the oxygen standard for EDWs is significantly less than for other types of water bodies):
- Hydrogen sulfide odor (rotten egg smell)
 - Black, organic rich sediments
 - A dominance of blackflies, snails, leeches and red bloodworms
 - Large amounts of dead organic matter, e.g., snail feces
 - Dead or stressed organisms
 - Unnaturally dense aquatic and riparian plants
- C. Determine if the pH standard for the waterbody is being exceeded by following the procedures outlined above for oxygen (See B). A pH violation may be linked to excess productivity as a result of excess CO₂ evolution. Other indicators of high pH should be noted including:
- Grainy buildup of CaCO₃ on plants and other surfaces
 - A "whiting" or abrupt lightening in color of a waterbody
 - Dead or stressed organisms
 - A predominance of blue green algae
 - The presence of a "bathtub ring" of CaCO₃ on plants and rocks
- D. Determine where possible natural nutrient sources exist by locating and sampling springs, recording landscape characteristics and determining the vertical hydraulic gradient (VHG) at the upstream end

of an affected area. Locate possible natural inputs of nutrients resulting from precipitation, ammonification and/or nitrification.

1. Indicators of the presence of springs include:

- Bedrock in close proximity to the surface
- Igneous intrusions
- Open valley/canyon transitions
- Change in rock type in canyon
- Increased percentage of waterbody comprised of riffle habitat
- Increase in gradient
- Marshy areas above water line
- Areas of iron-reducing bacteria , looks like "butterscotch pudding"
- Monkey flowers and seeps on canyon walls
- Mosses
- CaCO₃ and salts deposited on rocks
- Abrupt changes in chemistry evidenced by changes in conductivity, pH etc.
- Abrupt increase in algal density
- Abrupt changes in flow volume
- Abrupt changes in water temperature
- Strongly positive VHG

2. Indicators of possible natural ammonification/nitrification inputs include:

- The appearance of algae on the downstream end of sandbars
- Positive VHG
- Abrupt increase in algal density
- Change in algal community type from blue green to green algae
- Presence of alder thickets

3. Other indicators of sources of natural inputs of nutrients include:

- Presence of "dry" tributaries
- Linear depressions that may indicate old stream channels

E. Determine if potential anthropogenic nutrient sources are located near the affected waterbody by locating facilities, waterbodies and/or activities that may contribute nutrients to the affected waterbody. Facilities or activities that may contribute nutrients include:

1. Concentrated animal feeding operations
2. Sewage treatment plants
3. Septic systems
4. Nitrogen fertilizer applications
5. Urban runoff
6. Industry and manufacturing
7. Landfills
8. Ordinance disposal
9. Sewage sludge or wastewater applications

APPENDIX D

ADEQ Compliance and Enforcement Policy

Compliance and Enforcement Policy

The Arizona Department of Environmental Quality (ADEQ) is charged with the implementation of the environmental laws of this state. To accomplish this mission, ADEQ must have a credible education program to assist facilities to voluntarily comply with environmental laws, and a strong enforcement policy where voluntary compliance is not achieved. Therefore, ADEQ's compliance and enforcement programs will consist of educational and technical assistance to promote voluntary compliance with the law, and strong, swift enforcement actions to deter and penalize violations. For ADEQ to fulfill its commitment, all employees shall be responsible for ensuring that the Department's responsibilities are carried out in an equitable, consistent and timely manner.

The Department shall carry out its responsibilities consistent with the following:

1. ADEQ SHALL promote voluntary compliance by writing clear and consistent rules, permit conditions and guidance and by providing educational and technical assistance to the regulated community.
2. ADEQ SHALL provide accurate, complete and prompt notification of all violations to facility management and shall proactively manage all cases in a manner that encourages expeditious compliance.
3. ADEQ SHALL manage the compliance and enforcement process to ensure efficient and swift formal enforcement actions in instances where expeditious, voluntary compliance has not been achieved or where circumstances warrant immediate actions.
4. ADEQ SHALL choose the type of formal enforcement action to pursue by considering such factors as comparative risk, indifference to the law, and the compliance and enforcement history of the facility.
5. ADEQ SHALL manage compliance and enforcement actions with a unified, cross-media approach by addressing all violations occurring at a specific facility, whenever feasible.

RESPONSIBILITY

All ADEQ compliance and enforcement staff are responsible for the implementation of this policy.

APPLICABILITY

This policy is applicable agency-wide.

PROCEDURES

Compliance Education and Technical Assistance

1. Establish technical assistance programs for regulated facilities.

2. Promote the dissemination of all applicable current rules, policies and guidelines to affected and interested parties.
3. Provide regular compliance education opportunities, for the regulated community, on a statewide basis.
4. Establish educational alternatives to enforcement, for first time violators, as appropriate.
5. When appropriate, enforcement shall be taken regardless of whether compliance education has occurred.

Compliance Tracking and Notification of Violations

1. Maintain an accurate, readily accessible database that shows the current compliance status of each facility.
2. Maintain an up-to-date compliance file on each facility that contains all compliance related information. Any compliance related documents shall be placed in the file within 10 days of receipt or generation by ADEQ.
3. When ADEQ identifies a violation either through an inspection or records submitted to ADEQ, a decision will be made whether to issue a compliance status letter, a notice of violation, an administrative order, or to seek injunctive relief, and/or seek civil penalties. This decision will be made based upon the following considerations:
 - A. Risk to human health and environment;
 - B. The violator's indifference to the law;
 - C. The violator's previous compliance history.
4. Nothing in this policy requires a compliance status letter or a notice of violation to be issued before issuing an administrative order, or seeking injunctive relief and civil penalties in Superior Court. The decision to send a Notice of Violation or take other enforcement action shall be made based upon the considerations identified in Paragraph 3 at the time the violation is identified.
5. When ADEQ records indicate existing violations older than 180 days and no ADEQ action has been initiated, and no human health or environmental endangerment exists, a compliance status letter may be sent to a facility prior to the issuance of a notice of violation. The status letter shall state the compliance status of the facility based upon ADEQ records and that within 30 days of receipt of the letter, the facility shall submit evidence that (1) a previously identified violation has been corrected or (2) the violation does not exist.

The status letter shall further state that if there is no response, or the facility's response does not, to ADEQ's satisfaction, establish that the violation has been corrected or does not exist, a notice of violation will be issued at the end of the 30 day period. The status letter may offer the facility the opportunity to enter into a consent order or judgment if it wishes to avoid the issuance of a notice of violation.

6. Review all self-monitoring and other compliance-related reports submitted by regulated parties within

30 days of receipt by ADEQ. If such reports reveal any violation, ADEQ shall within 30 days of receipt send written notice of violation to the facility.

7. Establish a reporting tracking system that automatically triggers a finding of non-submittal from any facility within 15 days of the required submittal date. A finding of non-submittal shall immediately result in the sending of a written notice of violation to the facility.
8. Where an ADEQ inspector discovers a violation in the course of an inspection, the inspector shall provide written notice of the violation to a facility representative at the end of the inspection. The inspector shall provide written notice within 45 days of the inspection, for violations identified after the inspection.
9. With respect to violations other than those addressed above, send written notice of violation within 15 days of the date that ADEQ becomes aware of the violation.
10. Notwithstanding any of the above, provide immediate oral and written notice of any violation that presents an imminent and substantial endangerment to human health or the environment. Such notice shall demand immediate action by the facility to abate the endangerment.
11. Face to face compliance meetings are encouraged. Conclude each meeting with a written statement which sets forth what occurred during the meeting and any agreements reached. The parties should initial the statement prior to the conclusion of the meeting.
12. Every written notification of violation shall include the following elements:
 - A. The factual nature of the violation.
 - B. The legal authority regarding compliance.
 - C. A description of what constitutes compliance and how it is to be documented.
 - D. A timeframe in which ADEQ expects compliance to be achieved. Timeframes shall require compliance at the earliest possible date. Staff shall set timeframes based upon their estimate of the time realistically required to comply. Any timeframe greater than 120 days from the receipt of the Notice of Violation shall require either a consent order or an executed agreement for a consent decree and a compliance schedule. The notice shall further direct the facility to provide ADEQ with written notice of its compliance status at the end of the allowed timeframe.
 - E. An offer to meet.
 - F. A statement of consequences.
13. The stated compliance timeframe in the notification of violation is a firm limit. Any failure to meet the timeframe will be permitted only in a compliance schedule negotiated in the context of a consent order, consent decree, or a plea agreement.
14. After ADEQ determines that the facility has achieved compliance, a written notice of case closure shall be sent to the facility.

Manage Formal Enforcement Actions

1. Document all cases from the outset to meet the most stringent requirements of the legal system at any

subsequent time in the compliance and enforcement process.

2. Conduct internal review of enforcement cases to advance cases through the compliance and enforcement continuum in a consistent and timely manner. Establish mechanisms that assure consistent and timely treatment, such as regular staff meetings on enforcement cases.
3. ADEQ and the Attorney General shall maintain standardized wording to be included in consent orders and compliance orders.
4. Where appropriate, utilize Attorney General assistance if facilities are represented by legal counsel negotiating consent orders.
5. In no event shall ADEQ staff grant oral waivers or modifications of legal requirements. Waivers and modifications may only be granted in writing and only under such circumstances as authorized by law. All waivers must be approved by the division director, deputy director or director.
6. Issue a unilateral administrative order or pursue judicially imposed injunctive relief and civil penalties if a facility fails to either comply with a notification letter or enter into a consent order.
7. Seek injunctive relief and civil penalties with the Attorney General assistance.
8. Issuance of a unilateral administrative order or referral of enforcement actions to the Attorney General shall be made in a timely manner and, absent compelling circumstances, within 60 days after a facility has failed to either comply with a notification letter or enter into a consent order.
9. Diligently and expeditiously prosecute all enforcement actions.
10. Maintain an enforcement docket showing the status of every enforcement action, including date filed, nature or relief sought, date set for hearing or trial, and any disposition. This docket shall be kept current and shall be open for public inspection.

Enforcement Case Priorities

Each program shall monthly review its enforcement cases and establish the cases in priority order considering the risk to human health and environment posed by the violations, the violator's indifference to the law, extent of deviation and the violator's previous enforcement history. This priority listing shall be communicated to the Attorney General's office.

Cross-Media Approach

1. Develop and maintain a uniform facility tracking approach for all programs.
2. Develop and maintain cross-media data tracking system that will provide all units with all current compliance information about a facility. Such system shall be reasonably accessible to the public in such manner that does not unduly interfere with normal ADEQ operations. If a request for documents is made by the public, documents collected in anticipation of an enforcement action may be kept confidential. Staff should consult the Identification and Protection of Confidential Records Policy if

there is a question as to the confidentiality of a particular document.

3. Create a cross-media compliance and enforcement team (CMET) with representation from each division to share information, problems and ideas and to coordinate cross-media cases through the enforcement process.

Publication of Enforcement Information

1. Issue a press release whenever a court enforcement action is filed. A press release may be issued when an administrative order is issued.
2. When a press release concerning a consent order is to be released, the parties should be notified that a press release is being issued. The parties are not entitled to amend or modify the press release.