

**COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER DIVISION**

P.O. Box 1105

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Subject: **Water Guidance Memo No. 13-2003, Amendment No. 1**
Guidance for Calibration Verification of On-Line Analyzers Used to Monitor Reclaimed Water

To: Regional Directors

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Date: February 10, 2014

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Summary:

The purpose of this guidance is to provide DEQ regional water compliance staff information on (i) standards and requirements of the Water Reclamation and Reuse Regulation that provide the basis for reclaimed water monitoring and documentation of operational procedures, and (ii) appropriate methods and procedures for the calibration verification of on-line analyzers that are used to monitor specific reclaimed water quality parameters. This guidance replaces Interim Water Guidance Memo No. 13-2003.

Electronic Copy:

An electronic copy of this guidance in PDF format is available for staff internally on DEQNET, and for the general public on DEQ's website at: <http://www.deq.virginia.gov/>.

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Disclaimer:

This document is provided as guidance and, as such, sets forth standard operating procedures for the agency. However, it does not mandate any particular method nor does it prohibit any alternative method. If alternative proposals are made, such proposals should be reviewed and accepted or denied based on their technical adequacy and compliance with appropriate laws and regulations.

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List of Acronyms

CAT	Corrective Action Threshold
DEQ	Department of Environmental Quality
NTU	Nephelometric Turbidity Units
OLAP	DEQ Office of Land Application Programs
O&M	Operations and Maintenance
OWC	DEQ Office of Water Compliance
POC	Point of Compliance
RO	Regional Office
SRS	Satellite Reclamation System
TRC	Total Residual Chlorine
VELAP	Virginia Environmental Laboratory Accreditation Program
VPDES Permit	Virginia Pollutant Discharge Elimination System Permit
VPA Permit	Virginia Pollution Abatement Permit

I. Introduction

According to [9VAC25-740-80.A](#) of the Water Reclamation and Reuse Regulation, turbidity and total residual chlorine (TRC) in Level 1 reclaimed water must be monitored continuously with on-line meters or analyzers. The following guidance provides information on (i) standards and requirements of the Water Reclamation and Reuse Regulation that provide the basis for reclaimed water monitoring and documentation of operational procedures, and (ii) appropriate methods and procedures for the calibration verification of turbidity and TRC on-line analyzers used to monitor Level 1 reclaimed water at a reclamation system or satellite reclamation system (SRS). This guidance replaces Interim Water Guidance Memo No. 13-2003. The interim guidance was to remain in effect until amendments to the Water Reclamation and Reuse Regulation went into effect, which occurred on January 29, 2014.

II. Authority

This document provides guidance to implement monitoring requirements and achieve compliance with specific reclaimed water standards contained in the Water Reclamation and Reuse Regulation (9VAC25-740). Authority for promulgation of the regulation and development of this guidance is contained in the Code of Virginia, specifically §§ [62.1-44.15\(15\)](#) and [62.1-44.15\(6\)](#), respectively.

III. Guidance

A. Regulatory requirements

1. Reclaimed water standards

The Water Reclamation and Reuse Regulation ([9VAC25-740](#)) contains standards and monitoring requirements for water that is reclaimed from municipal wastewater. For the reclamation of municipal wastewater, there are two sets of reclaimed water standards referred to as Level 1 and Level 2 ([9VAC25-740-70.A](#)). Typically, reclaimed municipal wastewater meeting Level 1 standards (or Level 1 reclaimed water) will be suitable for reuses where there is potential for public contact with the reclaimed water, while Level 2 reclaimed water will be suitable for reuses where there is little or no potential for public contact.

Specific standards and monitoring requirements for water that is reclaimed from industrial wastewater are developed on a case-by-case basis relative to the intended reuse of a particular reclaimed industrial wastewater. Industrial wastewater may also be subject to disinfection requirements of Level 1 or Level 2 if the industrial wastewater contains sewage or is expected to contain organisms pathogenic to humans, such as, but not limited to, wastewater from the production or processing of livestock and poultry.

Continuous on-line monitoring is only required for TRC and turbidity standards of Level 1 reclaimed water. For the purposes of this guidance, therefore, only these standards will be discussed. The TRC standard for Level 1 reclaimed water consists of only a corrective action

threshold and applies only where chlorination is used for disinfection. A corrective action threshold (CAT) is defined in the regulation as a bacterial, turbidity or TRC standard for reclaimed water at which measures shall be implemented to correct operational problems of the reclamation system within a specified period, or divert substandard water away from continued reclamation. CATs do not apply to reclaimed water in storage or reclaimed water distribution systems. The CAT for TRC is at less than 1.0 mg/L after a minimum contact time of 30 minutes at average flow or 20 minutes at peak flow. A TRC CAT at less than 1.0 mg/L may be authorized by DEQ if demonstrated to provide comparable disinfection through a chlorine reduction program in accordance with the Sewage Collection and Treatment Regulations ([9VAC25-790-750.H.3](#)). Therefore, the TRC CAT specified in the permit or administrative authorization for a reclamation system or SRS should be used in the calibration verification of continuous online meters that monitor TRC in reclaimed water produced by that system.

Level 1 reclaimed water also has turbidity standards that include a daily average of discrete measurements recorded over a 24-hour period that is less than or equal to 2 Nephelometric Turbidity Units (NTU), and a CAT at greater than 5 NTU.

2. Reclaimed water points of compliance and monitoring

Per [9VAC25-740-70.B](#), points of compliance for reclaimed water must be established at a reclamation system or SRS. A point of compliance (POC) is defined in the regulation as a point at which compliance with the standards of the regulation is required ([9VAC25-740-10](#)). For turbidity, which applies to only Level 1 reclaimed water, the POC must be just upstream of disinfection. For TRC in Level 1 reclaimed water, the POC must be at the end of the contact tank or contact period ([9VAC25-740-80.A.2](#)). The POCs for standards of water reclaimed from industrial wastewater must be determined on a case-by-case basis.

When monitoring at POCs indicates that a Level 1 reclaimed water is failing to meet the CAT standards for turbidity, TRC or both, [9VAC25-740-70.C](#) requires that the operator of the reclamation system or SRS immediately initiate a review of treatment operations and data to identify the cause of the CAT monitoring results in order to bring the reclaimed water back into compliance with the standards. Resampling or diversion must occur within one hour of first reaching the CAT. Note that resampling includes on-line monitoring or other 40 CFR Part 136 approved methods, including associated Quality Assurance and Quality Control for sampling and analysis. If monitoring results of the resamples for turbidity or TRC continue to reach the CAT, the reclaimed water is considered substandard or reject water. This reject water must be:

- 1) Diverted to storage for subsequent additional treatment or retreatment; or
- 2) Discharged to another permitted reuse system requiring a lower level of treatment not less than Level 2; or
- 3) Discharged to a VPDES permitted effluent disposal system provided the reject water meets the effluent limits of the permit.

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After diversion of substandard or reject water, the regulation prohibits automatic distribution restart to avoid the potential of sending substandard or reject water to reuses prior to correcting the treatment problem. Upon resuming discharge of reclaimed water to the reclaimed water distribution system following an event where the CAT was reached for turbidity, TRC or both, resampling must occur within one hour to verify proper treatment.

Related to CAT excursions, failure to perform the following is a violation of the regulation:

- i. Resampling within one hour of reaching a CAT standard,
- ii. Resampling within one hour upon resuming discharge of reclaimed water to the distribution system following a diversion of substandard or reject water,
- ii. Making adjustments to the treatment process in order to bring the reclaimed water back into compliance with the standards, or
- iii. Diverting substandard or reject water after one hour of CAT monitoring results.

Sampling and monitoring requirements for reclaimed water are described in [9VAC25-740-80](#) of the regulation. Calibration verification of reclaimed water monitoring equipment is only necessary when monitoring by a reclamation system or SRS is required. For a reclamation system or SRS that produces reclaimed water intermittently or seasonally, monitoring is only required when the system discharges to a reclaimed water distribution system, a non-system storage facility, or directly to a reuse ([9VAC25-740-80.C](#)). Where a reclamation system or SRS has system storage that retains reclaimed water for greater than 24 hours, monitoring and POCs for certain reclaimed water standards may be required between system storage and a discharge of the reclaimed water as described above.

For turbidity and TRC standards of Level 1 reclaimed water, continuous on-line monitoring is required. The on-line meters or analyzers for both parameters must be equipped with an automated data logging or recording device and an alarm to notify the operator when the CAT for turbidity or TRC has been reached. Compliance with the daily average standard for turbidity is based on the arithmetic mean of hourly or more frequent discrete measurements recorded during a 24-hour period and calculated daily.

Should the on-line meter or analyzer for either turbidity or TRC go out of service for either planned or unplanned repair, the permittee is allowed to manually collect samples for turbidity or TRC analysis at four-hour intervals, although more frequent hourly intervals are recommended, up to a maximum of five days. Analyses must comply with 40 CFR 136 approved methods, including associated Quality Assurance and Quality Control (e.g., initial demonstration of capability). Manual collection of samples for turbidity or TRC analysis should be as close to the sample withdrawal point as the on-line meter or analyzer. Following the five-day period of repair, continuous on-line monitoring with a turbidity or TRC meter or analyzer must resume. Although not stated in the regulation, any continuous on-line monitoring of turbidity or TRC must be performed by a properly functioning and calibration verified instrument.

The regulation does not exclude the use of chemicals other than TRC for disinfection of reclaimed water, and for Level 1 reclaimed water, [9VAC25-740-80.A.2](#) requires continuous on-

line monitoring for residual concentrations of these chemicals. Unlike TRC, other chemical disinfectants do not have reclaimed water standards specified in the regulation. Consequently, reclaimed water standards, as well as calibration verification requirements, may be developed for other chemicals disinfectants on a case-by-case basis and as needed.

3. Operations and maintenance manual requirements

In accordance with [9VAC25-740-140.A](#), the permittee must develop and submit to DEQ an operations and maintenance (O&M) manual for each reclamation, SRS, or both where covered by the same permit. The minimum content of the O&M manual for these facilities is specified in [9VAC25-740-140.D.1](#) and includes, among other items the following:

- “c. The criteria used to make continuous determinations of the acceptability of the reclaimed water being produced and shall include set points for parameters measured by continuous on-line monitoring equipment;
- d. Descriptions of sampling and monitoring procedures and record keeping that comply with the requirements of this chapter and any applicable permit conditions;”

On the basis of these regulatory requirements, the permittee must include procedures for the calibration verification of continuous on-line analyzers or meters for turbidity and TRC in the O&M manual for the reclamation system or SRS where the continuous on-line monitoring equipment will be located.

B. Methods and procedures for calibration verification of continuous on-line analyzers

1. General

DEQ and the Department of General Services, Division of Consolidated Laboratory Services consider the continuous monitoring of TRC and turbidity to be “field testing” and, therefore, exempt from accreditation requirements of the Virginia Environmental Laboratory Accreditation Program (VELAP).

Based on the experience of DEQ with variance requests for alternate test procedures approved in accordance with [40 CFR Section 136.5](#) for the calibration and calibration verification of on-line meters of treated effluent, and in the absence of comparable federal regulations specifically for reclaimed water analysis, the following methods and procedures are recommended, unless noted as required in accordance with other regulations, for the calibration verification of continuous on-line analyzers or meters of TRC and turbidity in reclaimed water:

- a. Daily calibration verification of on-line analyzers or meters used to monitor reclaimed water in accordance with the Water Reclamation and Reuse Regulation and per conditions of the permit, should be performed by comparing instantaneously displayed monitoring results of the on-line analyzer equipment with results of a method approved in

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40 CFR Part 136, including associated Quality Assurance and Quality Control, for the same parameter. This comparison should be based on a grab sample collected and analyzed within 15 minutes of the on-line meter observation.

- b. The acceptable range of tolerance between the calibration verification measurements and results of the approved method is ± 10 percent of the calibration verification method results with the following exceptions:
 - 1) When the approved method results for TRC are below 1.0 mg/L, the acceptable range of tolerance is ± 0.1 mg/L, and
 - 2) When the approved method results for turbidity are below 1.0 NTU, the acceptable range of tolerance is ± 0.1 NTU. This range of tolerance is well within the approved method sensitivity for turbidity analyzers or meters (e.g., 0.02 NTU or less).
- c. On-line analyzer equipment results outside acceptable ranges of tolerance must be flagged as suspect at the time of actual verification or observation and reported to DEQ. All flagged data must include:
 - 1) The date(s) and associated simultaneous reading(s),
 - 2) Calibration verification value(s),
 - 3) The percent tolerance value(s),
 - 4) NTU tolerance values for turbidity monitoring results below 1.0 NTU, and
 - 5) A description of corrective measures implemented to bring measurements of the on-line analyzer equipment within acceptable ranges of tolerance. Corrective measures must begin immediately after a failed calibration verification event.
- d. Records of monitoring information required by record keeping conditions applicable to all VPDES and VPA permits must include, among other things, details regarding all daily calibration verification adjustments and maintenance to on-line analyzers or meters performed by the permittee. A daily calibration verification log must be maintained summarizing the calibration verification readings or results of on-line analyzers, and the calculated difference between daily calibration verification measurements and approved method results. An instrumentation maintenance and corrective action log should also be maintained.
- e. Calibration verification of continuous on-line analyzers or meters for TRC and turbidity should be performed in addition to initial and routine calibrations specified by the manufacturer's instructions for the analyzers or meters.

2. Calibration verification sampling locations for TRC and turbidity

The POC for TRC in Level 1 reclaimed water is at the end of the chlorine contact tank or contact

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period after a minimum contact time of 30 minutes at average flow or 20 minutes at peak flow. The sampling or collection location for calibration verification of the TRC continuous on-line analyzer or meter must be at the POC. Given a situation where a facility has multiple chlorine contact tanks and two or more tanks are operated simultaneously to meet the required minimum chlorine contact time of 30 minutes at average flow or 20 minutes at peak flow, the permittee may need to demonstrate and document that the sampling or collection location for calibration verification of the TRC continuous on-line monitoring equipment is appropriate and representative.

The POC for turbidity in Level 1 reclaimed water is just upstream of disinfection. The sampling or collection location for calibration verification of the turbidity continuous on-line analyzer or meter must be at the POC.