NORTH CAROLINA WASTEWATER/GROUNDWATER LABORATORY CERTIFICATION APPROVED PROCEDURE FOR THE ANALYSIS OF TEMPERATURE

This document provides an Approved Procedure for the analysis of Temperature for compliance monitoring per 15A NCAC 2H .0805 (a) (6) (F) and (g) (3).

HOLDING TIME:

- Analyze within 15 minutes (40 CFR Part 136 Table II). It is recommended samples be analyzed immediately or *in situ*, if possible.

GENERAL INFORMATION:

- All National Institute of Standards and Technology (NIST) traceable temperature-measuring devices must have a stated accuracy of at least ± 0.5 °C and be within their expiration date.

- All compliance temperature measurements must be made with an NIST traceable liquid-in-glass or electronic thermometer, or another temperature-measuring device that has been verified to read within 0.5 °C of an NIST traceable temperature-measuring device. Other acceptable devices include a Conductivity, Dissolved Oxygen, pH or multi-parameter meter. The device must be able to distinguish temperature changes of 0.1°C, or less, and equilibrate rapidly. Infrared (IR) devices are not acceptable for compliance monitoring. Liquid-in-glass thermometers must be inspected to ensure there is no separation in the liquid column. It is recommended that all liquid-in-glass thermometers have a metal case to prevent breakage.

- All compliance temperature-measuring devices without a valid NIST certificate must be checked **initially and every 12 months** against an NIST traceable temperature-measuring device and the process documented. Documentation must include the serial number of the device being checked. The serial number, stated accuracy and expiration date of the NIST traceable temperature-measuring device used in the comparison must also be documented. Verification data must be kept on file and be available for inspection for 5 years. (NOTE: Vendors or other Certified laboratories may provide assistance in meeting this requirement. When a vendor or other Certified laboratory provides this assistance, they must provide a copy of their NIST Certificate or the serial number, accuracy and calibration expiration date.)

- To check a compliance temperature-measuring device, compare readings at two temperatures that bracket the range of compliance samples routinely analyzed against an NIST traceable temperature-measuring device and record all four readings. The readings from both devices **must agree within 0.5ºC**. If they do not, the device may not be used for temperature compliance monitoring.

- If a compliance temperature-measuring device with its own valid NIST traceable certificate is used to measure reported temperatures, initial verification against another NIST traceable temperature-measuring device is not required. The device may be used beyond its stated expiration date provided it is verified prior to its next use and at least every 12 months thereafter against another NIST traceable temperature-measuring device.

- All temperature-measuring devices must be immersed in the sample to the proper depth as specified by the manufacturer. Partial immersion thermometers are designed with scales calibrated to indicate the true temperature when the thermometers are immersed to specified depths. Total immersion thermometers are designed with the scales calibrated to indicate the true temperature when the bulb and the portion of liquid column, to just above the temperature being read, is exposed to the sample being measured. If a total immersion thermometer is used as a partial immersion thermometer, an emergent stem correction must be performed. NOTE: Probe type thermometers will also have a specified immersion depth. Refer to the manufacturer's manual for the proper immersion depth.

- Unless greater precision is required by the permit or data receiving agency, it is recommended that all temperatures reported for compliance monitoring, be reported in whole numbers as recommended by the *Precision in Discharge Monitoring Reports* document found here:

  http://portal.ncdenr.org/c/document_library/get_file?uuid=1407b370-e848-4550-9f4b-21a2f05b95e4&groupId=38364.

- Sample duplicates are not a required quality control element for Field parameters.

DOCUMENTATION:

The following must be documented in indelible ink whenever sample analysis is performed:

1. Date and time of sample collection
2. Date and time of sample analysis - Alternatively, one time may be documented for collection and analysis with the notation that samples are measured *in situ* or immediately at the sampling site (i.e., immediately following collection at a location as near to the collection point as possible). When this 'one time' option is used, state that the documented time is both collection and analysis time.
3. Facility name, sample site (ID or location), and permit number
4. Collector's/analyst's name or initials
5. Sample temperature measurement in permit specified units
   °C = (°F - 32) / 1.8
   °F = (°C × 1.8) + 32
6. Thermometer/instrument identification (serial number preferred)
7. Parameter analyzed
8. Method reference
9. Data qualifiers, when necessary
10. Equipment maintenance (recommended)

Refer to *Quality Assurance Policies for Field Laboratories* (at http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/technical-assistance-policies) for additional quality assurance and quality control requirements.

Ref: Standard Methods 2550 B - 2010.