Low-Flow Purging and Sampling Parameters

New Jersey Department of Environmental Protection
Office of Quality Assurance
Laboratory Audit Checklist

Disclaimer: This checklist is considered to be in draft form, and the information in this checklist does not supplant the requirements noted in the Regulations Governing the Certification of Laboratories and Environmental Measurements, N.J.A.C. 7:18-1 et seq, or the requirements noted within the applicable analytical reference methods for which the laboratory is certified or seeking to become certified. This document is a tool to assist staff when performing laboratory evaluations for compliance with N.J.A.C. 7:18-1 et seq and the applicable reference methods and is not to be considered inclusive of all requirements. It shall not be considered as final documentation that a deficiency or violation does or does not exist. If there is any disagreement between the contents of this document and N.J.A.C. 7:18-1 et seq or the analytical method reference, the regulations and/or method shall prevail (whichever requirement is more stringent).

General

	Reference	Y, N, N/A
1. If the laboratory performs low-flow testing, does it hold certification for all five parameters?	N.J.A.C. 7:18-1.4 (b) & (c)	
2. What type of tubing does the laboratory use for sampling? *Note: Teflon© or Teflon© lined is required unless sampling only for metals, inorganics or PFAS.*	NJDEP Low-Flow Purging and Sampling Guidance Section B4	
3. What type of tubing is used when sampling for PFAS? *Note: High density polyethylene should be used.*		

What make/model multimeter does the laboratory use most often? _____

Temperature [SM 2550 B-10]

	Reference	Y, N, N/A
4. Are all temperature monitoring devices graduated in at least 0.50°C increments?	N.J.A.C. 7:18-3.3(a)5i	
5. Does the laboratory have access to a NIST certified/traceable thermometer? NIST Serial #: _____	N.J.A.C. 7:18-3.3(a)5iv	
a. Is the NIST accompanied by a certificate with a matching identification number?		
b. Is the certificate current? NIST Cal Due Date: _____		
c. Is the NIST graduated in ≤ 0.5°C increments (*OQA allowance for non-microbiological testing*)? NIST Graduations: _____		
d. If using a glass NIST thermometer, is no separation observed in the liquid column?	N.J.A.C. 7:18-3.3(a)5iii	
6. Is the calibration of all meters checked against a NIST certified/traceable thermometer quarterly (every 3 months)?	N.J.A.C. 7:18-3.3(a)5v	
a. Is this verification in the range of use?		

	Reference	Y, N, N/A
7. Does the laboratory maintain a temperature verification log for all temperature monitoring devices which includes: • date of check; • identification of the analyst; • the serial number of the NIST; • ID # for each thermometer verified; • temperatures displayed on each thermometer; and • any correction factors (CFs) determined?	N.J.A.C. 7:18-3.3(a)5v	
8. Are the current CFs applied? *Note: Any CFs ± 0.5°C or larger must be applied. Laboratories can either set the meter to match the reading displayed on the NIST or apply the current CF to each reading.*	N.J.A.C. 7:18-3.3(a)5v	

pH [SM 4500-H B-11]

	Reference	Y, N, N/A
9. Is the pH meter capable of temperature compensation?	N.J.A.C. 7:18-3.3(a)3vi SM 4500-H B 2.a	
10. Is the meter calibrated each day before use?	N.J.A.C. 7:18-3.3(a)3vii	
11. Is at least a 2-point calibration performed using buffers bracketing the expected range of measurement and at least 3 pH units apart (e.g., pH 4 and 10 or pH 4, 7, and 10)?	N.J.A.C. 7:18-3.3(a)3vii [bracketing] SM 4500-H B 4.a [3 pH units apart]	
12. If the laboratory is using a meter that requires users to manually enter calibration values, are the correct values entered (based on the calibration temperature, e.g., 10.06 at 20°C)? *Note: Laboratories must check either the certificate of analysis (C of A) or the buffer bottle for the buffer value at the calibration temp, as the true pH value varies with temperature.*	SM 4500-H B 4.a [manufacturer's instruction]	
13. Are buffer calibration values recorded to 2 decimal places?	N.J.A.C. 7:18-3.3(a)3i	
14. Are buffer calibration values within ± 0.05 pH units of the true buffer value **at the calibration temperature**? If not, is the meter recalibrated?		

	Reference	Y, N, N/A
15. Is the buffer temperature recorded during calibration? *Note: Laboratories can assume all buffers are at the same temperature if they are stored together. Only one "buffer temperature" must be recorded.*	SM 4500-H B 4.a	
16. Immediately after calibrating the pH meter, is a mid-range calibration check (e.g., pH 7 for a pH 4 and 10 calibration) standard analyzed **using the instrument in measurement mode**?	N.J.A.C. 7:18-3.3(a)3vii	
a. Does the calibration check standard read within ± 0.1 of the true value at the measurement temperature? If not, is the meter recalibrated and re-checked?	SM 4500 H-B 4.a	
17. Is a mid-range calibration check standard analyzed once every 3 hours when the meter is in use > 3 hours? *Note: The OQA considers the meter "in use" starting at the time of the calibration check that follows initial calibration.*	N.J.A.C. 7:18-3.3(a)3vii	
a. Are the 3-hour check results within ± 0.2 pH units of the true value at the measurement temperature? If not, is the meter recalibrated and re-checked?		
18. Is calibration and check data recorded in a logbook, signed, and dated by the analyst?		
19. Are buffer calibration aliquots discarded after each use?	N.J.A.C. 7:18-3.3(a)3viii	

Conductivity [EPA 120.1 or SM 2510 B-11]

	Reference	Y, N, N/A
20. Is the conductivity meter capable of temperature compensation?	N.J.A.C. 7:18-3.3(a)6ii	
21. Does the laboratory have potassium chloride (KCl) standards available?	SM 2510 B 3.b EPA 120.1 6.1	
a. If standards are purchased, are certificates of analysis (C of As) available? *Note: If standards are prepared, verify they are prepared in accordance with laboratory's certified method.*	N.J.A.C. 7:18-5.4(a)9	
22. Is a KCl check standard analyzed each day that samples are measured and **after any calibration**?	N.J.A.C. 7:18-3.3(a)6iii	

	Reference	Y, N, N/A
a. Is the standard result within ± 1% of the true value? *Note: If the standard fails to meet the 1% criteria, the laboratory must take corrective action such as recalibration of the meter, following manufacturer instructions. The laboratory cannot begin analysis until a check standard meeting the 1% criteria is achieved and documented.*	N.J.A.C. 7:18-3.3(a)6	
b. Is the % recovery of the standard calculated and recorded? *Note: In lieu of calculating and recording the % recovery each day, the laboratory can list the acceptance range (i.e., 1399-1427 µS/cm for a 1413 µS/cm standard) on each page of the worksheet/logbook.*	N.J.A.C. 7:18-5.6(a)	

Turbidity [EPA 180.1 or SM 2130 B-11]

23. Does the laboratory use a **flow through** or a **stand-alone** turbidity meter or **both**? (circle)		
24. Does the laboratory have primary (AMCO-AEPA-1 styrene divinylbenzene polymer or Formazin) turbidity standards available?	EPA 180.1 2.1 SM 2130B 3.b, 3.d	
a. If standards are purchased, are C of As available?	N.J.A.C. 7:18-5.4(a)9	
25. Are the manufacturer's operating instructions followed to calibrate the instrument? (Primary standards must be used for the calibration, unless otherwise specified by the manufacturer.) *Note: Pre-calibrated/factory-set calibrations are acceptable.*	EPA 180.1 10.1 SM 2130B 4.b	
26. Is at least one <u>non-zero</u> check standard analyzed in each instrument range used for sample analysis, each day of measurement, and **after any calibration?** *Note: Primary or secondary standards may be used.*	N.J.A.C. 7:18-5.5(c)4ii [daily] EPA 180.1 10.1, SM 2130B 4.b [range of use]	
a. Are the standard results within ± 10% of the true value? *Note: If the standard fails to meet the 10% criteria, the laboratory must troubleshoot or recalibrate. The laboratory cannot begin analysis until a check standard meeting the 10% criteria is achieved and documented.*	N.J.A.C. 7:18-5.5(c)4ii	
b. Is the % recovery of the standard calculated and recorded? *Note: In lieu of calculating and recording the % recovery each day, the laboratory can list the acceptance range e.g., 90-110 NTU for a 100 NTU standard) on each page of the worksheet/logbook.*	N.J.A.C. 7:18-5.6(a)	

	Reference	Y, N, N/A
27. For a stand-alone turbidity meter, are sample cells: • clear, colorless glass or plastic; • discarded if scratched or etched; and • kept scrupulously clean?	EPA 180.1 6.4 SM 2130 B 2.b	
28. For a stand-alone turbidity meter, if secondary standards are used as check standards, are they compared to primary standards periodically? *Note: Commercially prepared and certified, stabilized sealed liquid or gel turbidity standards are designated as "secondary standards."*	EPA 180.1 7.6	
a. Are the secondary standards either adjusted to match the primary standard value or discarded if the check against a primary standard yields poor results? (SM only - 180.1 does not have the allowance to make adjustments)	SM 2130B 3.d	

Dissolved Oxygen (DO) [SM 4500-O G-16]

29. Is a membrane electrode used? *Note: The OQA also offers certification for optical/luminescence DO analysis. This checklist incorporates the requirements for only the SM 4500-O G-16 membrane method. Laboratories must maintain certification and adhere to the requirements for the method/technique used. Laboratories cannot perform the method cited in this checklist using an optical/luminescence probe - separate certification is required.*	N.J.A.C. 7:18-1.4(b) & (c) SM 4500-O G 2	
30. Is the DO membrane free from any air bubbles that may interfere with analysis?	SM 4500-O G 3.b	
31. Is the DO meter calibrated against air or air-saturated water (ASW) at least weekly? *Note: Daily calibration must be performed if required by manufacturer instructions. If there is any doubt as to the frequency of the calibration, a good practice is to perform the calibration daily.*	N.J.A.C. 7:18-5.5(c)1 [air or ASW weekly] SM 4500-O G 3.a & meter instructions [daily]	
a. Are the results of this calibration recorded? *Note: Laboratories may record calibration values in either mg/L or percent.*	N.J.A.C. 7:18-8.5(a)	
32. Is zero check[1] sample present? *Note1: Cobalt chloride is only required if sodium sulfite is not sufficient to bring the DO to zero.* *Note2: The laboratory can use alternate zero check solutions.*	SM 4500-O G 3.a	

[1] Add excess sodium sulfite, Na_2SO_3, and a trace of cobalt chloride, $CoCl_2$, to water [SM 4500-O G 3.a]

	Reference	Y, N, N/A
a. Is **zero check** sample analyzed after each calibration?	SM 4020B Table 4020:I Footnote 6	
b. Is the **zero check** result ≤ 0.3 mg/L? *Note: If the zero check fails to meet the criteria, the laboratory must troubleshoot or recalibrate. The laboratory cannot begin analysis until a check meeting the ≤ 0.3 mg/L criteria is achieved and documented.*	N.J.A.C. 7:18-5.2(a)17.i	
33. Is a **Winkler** titration carried out (in accordance with a method promulgated by the USEPA) as a **check** of the meter on a weekly basis? *Note1: This is done by comparing the Winkler titration results against the results obtained using the meter.* *Note2: If rented equipment is kept for more than one week after the Winkler titration was performed, the laboratory will be required to perform the next Winkler titration if that equipment is still in use (or obtain another calibrated meter from the rental company).*	N.J.A.C. 7:18-5.5(c)1	

Winkler Titration

Reagents

- Manganous sulfate (reagent solution or powder pillow)
- Alkali-iodide-azide reagent (A-I-A) (reagent solution or powder pillow)
- Sodium thiosulfate titrant
  - C of A maintained for purchased lots [*N.J.A.C. 7:18-5.4(a)9*]
  - Restandardized or new bottle opened quarterly [every 3 months]) [*N.J.A.C. 7:18-5.4(a)8*]
- Sulfuric or sulfamic acid powder pillow
- Starch solution

Equipment

- Graduated burette or titrator/titration cartridge

Procedure

- 1 mL $MnSO_4$ (or one powder pillow) and 1 mL A-I-A (or one powder pillow) added to sample and mixed
- Wait for precipitate to form
- Precipitate allowed to settle halfway then 1 mL conc. H_2SO_4 (or one sulfamic acid powder pillow) added and mixed
- Measure out portion of sample and titrate to pale straw
- Add starch solution and titrate until the disappearance of blue color
- 1 mL titrant = 1 mg DO/L

a. If the laboratory uses a purchased titration kit, does the kit contain a titrator/titration cartridge with graduations or digits? *Note: Drop counting, using eye-dropper type equipment, is not allowed.*	N.J.A.C. 7:18-5.2(a)17.i	

	Reference	Y, N, N/A
b. Do the meter and Winkler results agree within 0.3 mg/L? If not, is corrective action taken and the comparison repeated until acceptable agreement is achieved? *Note: Corrective action such as cleaning electrode and repeating both measurements is encouraged.*	N.J.A.C. 7:18-5.2(a)17.i	

Additional Questions – Reagents, Standards, and Records

	Reference	Y, N, N/A
34. Does the laboratory have SOPs for all 5 low-flow parameters and are the SOPs current?	N.J.A.C. 7:18-5.5(b)1 & 8.4(b)1	
35. Are the date and time of calibration and the initials of the analyst recorded?	N.J.A.C. 7:18-8.5(c)2 [date/time] N.J.A.C. 7:18-8.5(c)4 [initials]	
36. Do laboratory records identify the Department Sanctioned Analytical Method (DSAM) used?	N.J.A.C. 7:18-5.6(d)4 & 8.5(c)5	
37. If standards are prepared, is the preparation documented?	N.J.A.C. 7:18-5.5(c)13i-iv	
38. If standards are prepared, are they labeled with the preparation date, concentration, and expiration date?	N.J.A.C. 7:18-5.4(a)3	
39. If standards are purchased, are they labeled with the date received and date first opened?	N.J.A.C. 7:18-5.4(a)6	
40. Are expired reagents and solutions immediately discarded?	N.J.A.C. 7:18-5.4(a)4	
41. For rental meters, does the laboratory have documentation for the calibrations performed by the rental company traceable by serial #?	N.J.A.C. 7:18-5.6(a) & 8.5(a)	
42. For rental meters, does the laboratory have documentation (i.e., C of As) for the reagents and solutions used by the rental company to perform calibrations?	N.J.A.C. 7:18-5.4(a)9	
43. Is the meter referenced through some form of unique identification on the daily calibration log and on the low-flow sampling form? (serial number/calibration packet number/etc.)	N.J.A.C. 7:18-5.6(a) & 8.5(a)	
44. Is calibration and sample analysis data maintained for at least 5 years?		

	Reference	Y, N, N/A
45. Is at least 1 year of data available on-site?	N.J.A.C. 7:18-5.6(b) & 8.5(b)	
46. For laboratories using their own equipment, is a maintenance log kept?	N.J.A.C. 7:18-5.5(c)12	

Additional Questions – Quality Control

	Reference	Y, N, N/A
47. Were PTs analyzed in the same manner as routine samples? *Note: Laboratories must not perform extra QC or take extra measurements.*	N.J.A.C. 7:18-2.13(h)1	
48. Does the laboratory have documentation of the investigation into the cause of PT failures and associated corrective actions?	N.J.A.C. 7:18-2.13(i)3viii	
49. Does the laboratory perform any testing other than low-flow sampling? If yes, answer the subsequent questions. If no, the audit is complete.		
50. Are duplicates analyzed daily or per batch of 20 samples, whichever is more frequent? *Note: This only applies to SM methods and is not applicable for turbidity or temperature.*	SM 2020B 2.f, SM Table 2020: II [cond.] SM 4020B 8 SM Table 4020:I Footnote 2 [pH & DO]	
a. Does the laboratory monitor the relative percent difference (RPD) of duplicate samples? Are the RPD results verified to be ≤20%? *Note: The laboratory can use the following acceptance criteria in lieu of monitoring RPD:* *pH: ± 0.1 pH units* *DO: ± 0.15mg/L*	SM 2020B 2.f [cond.] SM 4020B 8 [pH & DO]	