



Environmental Analysis Program

Pomona College
Biogeochemistry Laboratory

SOP-L312

Total Suspended Solids (TSS) and Total Dissolved Solids (TDS)

Standard Operating Procedure

SOP Number	SOP-L312
Revision	1.1
Author(s)	
Date	2026-06-26
Organization	EA Program, Pomona College

FOR INTERNAL USE ONLY

This document is the property of the Environmental Analysis Program at Pomona College.
Unauthorized distribution is not permitted.

Table of contents

1 Purpose	1
2 Scope	2
3 Responsibilities	2
4 Definitions	2
5 Safety and Hazards	3
5.1 Required PPE	3
5.2 Emergency Procedures	3
6 Equipment and Materials	3
6.1 Equipment	3
6.2 Consumables	3
7 Procedure	4
7.1 Filter and Dish Preparation	4
7.2 Filtration and Sample Analysis	4
7.3 Shutdown and Cleanup	4
8 Calculations	5
9 Quality Control and Acceptance Criteria	5
10 Waste Disposal	5
11 References	5
12 Related SOPs	6
13 Training Record	6

1. Purpose

This SOP describes the gravimetric determination of Total Suspended Solids (TSS) and Total Dissolved Solids (TDS) in environmental water samples (e.g., surface water, groundwater, runoff). TSS represents the portion of solids retained by a glass fiber filter, while TDS represents the portion that passes through the filter and is dried to constant weight in a vessel (APHA et al., 2012).

2. Scope

- **Applies to:** Environmental water samples analyzed for TSS and TDS by gravimetric methods.
- **Does not apply to:** Settleable solids, volatile suspended solids, or non-aqueous matrices.
- **Location:** Environmental analysis laboratories.

3. Responsibilities

Role	Responsibility
Lab PI	Approve SOP, ensure training compliance
Trained Personnel	Follow this SOP, report deviations
New Students	Complete training before independent use

4. Definitions

- **Constant mass:** Successive weighings (after additional drying cycles of at least 1 hour) agree within ± 0.5 mg; the criterion confirming complete desiccation.
- **Detection limit (MDL):** The minimum concentration that can be reliably distinguished from a blank; for gravimetric TSS/TDS, the practical lower limit is approximately 5 mg/L, set by the precision of the analytical balance and filter tare variability (APHA et al., 2012).
- **Fixed residue:** The fraction of total solids remaining after ignition at 550 °C; equivalent to inorganic (mineral) solids.
- **Relative percent difference (RPD):** A measure of duplicate precision: $RPD (\%) = |A - B| / ((A + B) / 2) \times 100$; acceptance criterion for TSS/TDS duplicates is 10%.
- **Total dissolved solids (TDS):** The mass of material passing through a 0.45 μm filter per unit volume of sample, determined gravimetrically after evaporation at 180 °C; expressed in mg/L (APHA et al., 2012, Method 2540 C).
- **Total solids (TS):** The residue remaining after evaporation of a sample at 103–105 °C; $TS = TSS + TDS$.
- **Total suspended solids (TSS):** The mass of material retained on a pre-weighed glass fiber filter per unit volume of sample; expressed in mg/L (APHA et al., 2012, Method 2540 D).
- **Volatile suspended solids (VSS):** The fraction of TSS lost on ignition at 550 °C; approximates the organic content of suspended solids (APHA et al., 2012).

5. Safety and Hazards

Hazards

- **Thermal:** Drying ovens (103–180 °C) and muffle furnaces can cause severe thermal burns. Always use heat-resistant crucible tongs and thermal gloves when handling hot apparatus.
- **Vacuum/Implosion:** Vacuum filtration assemblies operate under reduced pressure. Ensure filtration flasks are borosilicate glass and free of visible cracks to eliminate implosion risks.

5.1. Required PPE

- ☐ Safety glasses
- ☐ Laboratory coat
- ☐ Nitrile gloves
- ☐ Heat-resistant thermal gloves (when handling hot dishes, filters, or oven contents)

5.2. Emergency Procedures

In case of burn or equipment failure, refer to [SOP-L002 Laboratory Safety](#) or call campus safety.

6. Equipment and Materials

6.1. Equipment

Item	Notes
Vacuum filtration apparatus	Buchner funnel, flask, and vacuum pump
Analytical balance	Capable of weighing to ± 0.1 mg
Drying oven	Regulated at 103–105 °C (TSS) and 180 ± 2 °C (TDS)
Desiccator	With active color-indicating silica gel
Blunt forceps	For filter handling
Graduated cylinder	For measuring sample volume

6.2. Consumables

Item	Notes
Glass microfiber filter disks	e.g., Whatman 934-AH, 1.5 μm nominal pore size (APHA et al., 2012)
Evaporating dishes	Porcelain or high-silica glass
Aluminum weigh pans	For filter drying

Item	Notes
Deionized (DI) water	For filter washing and volume adjustment

7. Procedure

7.1. Filter and Dish Preparation

1. **TSS filter prep:** Place a glass fiber filter on the filtration apparatus. Apply vacuum and wash with three successive 20 mL volumes of DI water. Continue vacuum until all trace water is removed. Transfer the filter to an aluminum weigh pan and dry in an oven at 103–105 °C for 1 hour. Cool in a desiccator to room temperature and weigh to determine the tare mass (B_{TSS}) (APHA et al., 2012).
2. **TDS dish prep:** Clean an evaporating dish and heat in an oven at 180 ± 2 °C for 1 hour. Cool completely in a desiccator and record the stable tare mass (B_{TDS}).

7.2. Filtration and Sample Analysis

1. Assemble the pre-weighed filter pad into the filtration funnel and wet with a small volume of DI water to seal it against the porous plate. Turn on the vacuum.
2. Shake the sample bottle vigorously to achieve homogeneous particle distribution. Measure a known sample volume (V , typically 100 mL to 500 mL depending on turbidity) using a graduated cylinder.
3. Pour the measured sample into the filter funnel. Wash the cylinder and funnel walls with three successive 10 mL aliquots of DI water, allowing total drainage between washings.
4. **For TSS:** Carefully remove the filter pad from the funnel using blunt forceps. Place it back in its aluminum pan and dry in the oven at 103–105 °C for at least 1 hour. Cool in the desiccator and weigh to constant mass (A_{TSS}).
5. **For TDS:** Transfer the entire filtrate volume from the filter flask quantitatively into the pre-weighed evaporating dish. Place the dish into the drying oven at 180 ± 2 °C until all liquid evaporates completely. Dry for at least an additional hour, cool inside the desiccator, and weigh to find the final mass (A_{TDS}).



Constant Mass

“Constant mass” means that successive weighings (after additional drying cycles of at least 1 hour) agree within ± 0.5 mg (APHA et al., 2012).

7.3. Shutdown and Cleanup

1. Discard used filters in solid waste.

2. Rinse filtration apparatus thoroughly with DI water.
3. Return evaporating dishes and tongs to storage after cooling.
4. Turn off the vacuum pump and drying oven if no other users need them.

8. Calculations

$$\text{TSS (mg/L)} = \frac{(A_{\text{TSS}} - B_{\text{TSS}}) \times 1,000,000}{V \text{ (mL)}}$$

$$\text{TDS (mg/L)} = \frac{(A_{\text{TDS}} - B_{\text{TDS}}) \times 1,000,000}{V \text{ (mL)}}$$

Where:

- A = weight of dry filter or dish plus residue (g)
- B = tare weight of clean filter or dish (g)
- V = sample volume (mL)

If the calculated TSS residue mass is less than 2.5 mg, increase the sample volume and repeat (APHA et al., 2012).

9. Quality Control and Acceptance Criteria

- Run a method blank (DI water through the full procedure) with each batch. The blank result must be less than the method detection limit (APHA et al., 2012).
- Duplicate samples should agree within $\pm 10\%$ RPD.
- If the measured residue mass is less than 2.5 mg, use a larger sample volume.

10. Waste Disposal

Waste Type	Container	Disposal Method
Used glass fiber filters	Solid waste bin	Standard solid waste
Filtered water samples	Drain	If no hazardous analytes

11. References

- APHA et al. (2012)
- [SOP-L002 Laboratory Safety](#)
- [SOP-L114 Vacuum Filtration](#)

APHA, AWWA, & WEF. (2012). *Standard methods for the examination of water and wastewater* (22nd ed., p. 1360). American Public Health Association.

12. Related SOPs

SOP	Title	Relationship
L002	Laboratory Safety	Emergency procedures
L114	Vacuum Filtration	Filtration system operation

13. Training Record

Training is documented in the lab training log. Before working independently, personnel must:

1. Read this SOP in full
2. Observe a trained operator perform the procedure
3. Perform the procedure under supervision
4. Be signed off by the PI or designated trainer