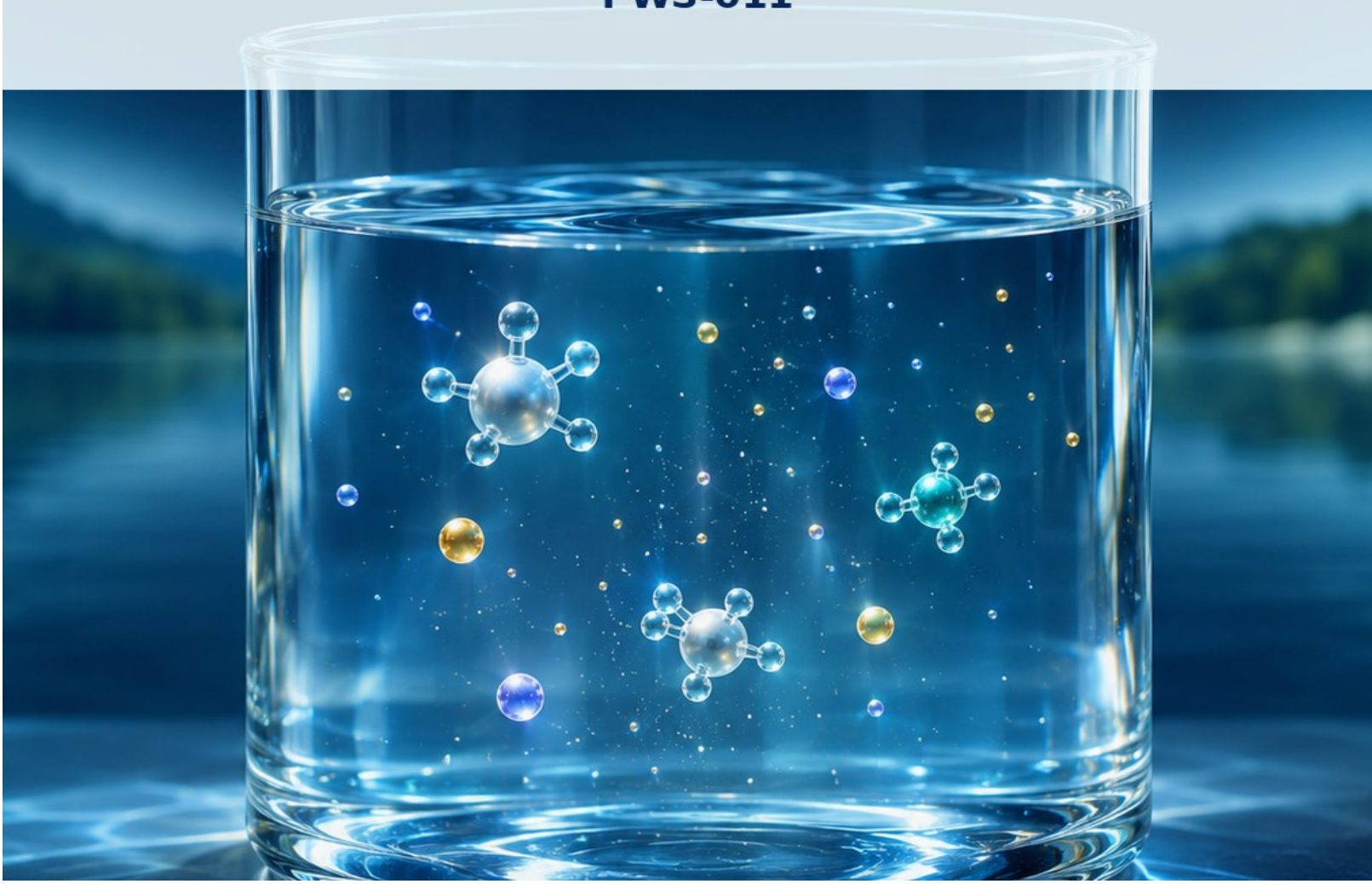
PUROXI WATER SERIES

UNDERSTANDING TOTAL DISSOLVED SOLIDS

What TDS Reveals—and What It Cannot Tell Us

PWS-011



CHAPTER 1

TDS Describes Dissolved Material

Total dissolved solids, commonly called TDS, describes the combined amount of dissolved inorganic and organic material in water. Major contributors often include calcium, magnesium, sodium, potassium, bicarbonate, chloride, sulfate, nitrate and silica.

TDS is usually reported in milligrams per litre, or mg/L. In dilute water, mg/L is approximately equivalent to parts per million. The number represents quantity; it does not identify every substance or establish whether the water is safe, suitable or properly treated.

- Clear water can contain substantial dissolved material that cannot be seen.
- Two waters with the same TDS can contain very different ions and behave differently.
- The intended use determines whether a particular concentration and composition are acceptable.

PUROXI INSIGHT **TDS tells us how much dissolved material may be present—not what that material is.**

CHAPTER 2

Dissolved Solids Are Not Suspended Solids

Dissolved material passes through the filter specified by the analytical method and remains in solution. Suspended solids are particles retained by a filter or otherwise present as discrete material in the water.

Turbidity measures how material scatters light. A sample may look clear and show low turbidity while containing high TDS, because dissolved ions are too small to create visible cloudiness.

Measurement	What it primarily describes
TDS	Combined dissolved material, measured gravimetrically or estimated from conductivity.
TSS	Mass of suspended material retained by a specified filter.
Turbidity	Light scattering by particles, colour and sometimes bubbles.
Colour	Optical appearance from dissolved and suspended substances, depending on method.

PUROXI INSIGHT Invisible dissolved ions and visible suspended particles require different measurements and treatment methods.

CHAPTER 3

Where Dissolved Solids Come From

Water dissolves minerals as it moves through soil and rock. Longer contact time, evaporation and local geology can increase concentrations. Seawater intrusion, road salt, fertilizers, irrigation return flow, wastewater, industrial discharge and treatment chemicals can also contribute.

Season, drought, rainfall, pumping pattern and blending may change TDS even when the source name remains the same.

- Natural sources include mineral weathering, groundwater contact and saltwater influence.
- Human sources include de-icing salt, agriculture, sewage, mining and industrial activity.
- Recirculating systems can concentrate dissolved solids as water evaporates or is reused.

PUROXI INSIGHT A TDS trend becomes more useful when the source and water balance are understood.

CHAPTER 4

How TDS Is Measured

A laboratory can measure TDS gravimetrically by filtering a sample, evaporating a measured volume and weighing the residue under a defined method. Laboratories may also estimate dissolved solids by summing measured ions.

Portable instruments normally do not weigh residue. They measure electrical conductivity and apply a conversion factor to display an estimated TDS value.

- Record whether the result was measured in a laboratory or estimated by a meter.
- Use clean containers and follow the laboratory’s sampling instructions.
- Compare results only when methods, units and sampling locations are consistent.

PUROXI INSIGHT A meter reading labelled ppm is often a conductivity-based estimate, not a direct gravimetric measurement.

CHAPTER 5

Conductivity and TDS Are Related but Not Identical

Electrical conductivity responds mainly to dissolved ions that carry charge. TDS includes the broader dissolved residue, including substances that may conduct weakly. The relationship between conductivity and TDS depends on the ionic composition and temperature.

Meters commonly multiply conductivity by a factor such as 0.5, 0.64, 0.7 or another programmed value. A factor suitable for one water may be inaccurate for another.

- Use temperature-compensated conductivity for consistent process monitoring.
- Confirm the meter's conversion factor and calibration standard.
- Develop a site-specific relationship using laboratory TDS and conductivity when accuracy matters.

PUROXI INSIGHT **There is no universal conversion factor that accurately describes every type of water.**

CHAPTER 6

TDS Salinity Hardness and Alkalinity

These measurements overlap chemically but answer different questions. Salinity describes the concentration of dissolved salts. Hardness measures primarily calcium and magnesium. Alkalinity measures acid-neutralizing capacity, often from bicarbonate and carbonate.

Sodium chloride can raise TDS and salinity while contributing little hardness. Calcium bicarbonate can contribute to TDS, hardness and alkalinity at the same time.

Measurement	Primary interpretation
TDS	Total quantity of dissolved residue or an estimate of it.
Salinity	Concentration of dissolved salts.
Hardness	Primarily calcium and magnesium on a stated reporting basis.
Alkalinity	Capacity to neutralize acid.
Conductivity	Ability of water to carry electrical current through ions.

PUROXI INSIGHT Related measurements should be interpreted together without treating them as interchangeable.

CHAPTER 7

TDS Does Not Identify Risk

A moderate TDS value could be dominated by familiar minerals, while a low TDS sample could still contain a small concentration of a substance that matters for health, biology or process performance. TDS cannot identify microorganisms, many organic chemicals or individual ions.

When the result is unexpected or the application is sensitive, a laboratory ion panel and contaminant-specific testing are needed.

- Do not use TDS as proof that drinking water is safe.
- Do not use TDS alone to approve irrigation, aquaculture or industrial water.
- Investigate composition, source and change over time.

PUROXI INSIGHT **A total can conceal the identity and significance of its individual parts.**

CHAPTER 8

Drinking Water Taste and Operations

Health Canada treats TDS as an operational and aesthetic parameter. The U.S. Environmental Protection Agency lists 500 mg/L as a non-enforceable federal secondary standard related mainly to aesthetic effects; local requirements may differ.

High dissolved solids may affect taste, deposits, corrosion, treatment performance and distribution-system operation. The specific ions and water stability determine the actual effect.

- Confirm applicable provincial, territorial, state and local requirements.
- Test individual ions when taste, corrosion or health concerns exist.
- Do not present a general TDS guideline as a universal safety threshold.

PUROXI INSIGHT Drinking-water decisions require the complete analysis and the rules that apply where the water is used.

CHAPTER 9

Agriculture and Irrigation

Dissolved salts reduce the ability of plant roots to extract water from soil. With repeated irrigation and evaporation, salts can accumulate in the root zone unless rainfall, drainage and leaching remove them.

Crop tolerance, soil texture, climate, drainage, irrigation method, sodium adsorption ratio and individual ions such as sodium, chloride and boron influence suitability. TDS alone cannot predict crop response.

- Use electrical conductivity and laboratory chemistry to assess salinity.
- Evaluate sodium hazard with SAR and soil conditions, not TDS alone.
- Monitor source water, drainage water and root-zone salinity where accumulation is possible.

PUROXI INSIGHT The same irrigation water may be manageable for one crop and soil but unsuitable for another.

CHAPTER 10

Livestock and Aquaculture

Livestock response depends on species, age, diet, climate, water intake and the specific dissolved constituents. Sulfate, nitrate and salinity may require separate attention even when the total appears acceptable.

In aquaculture, salinity and ionic balance influence osmoregulation and species performance. Recirculating systems can accumulate salts from feed, treatment chemicals, source water and evaporation.

- Use species- and life-stage-specific guidance.
- Test sulfate, nitrate, sodium, chloride and other relevant ions separately.
- Trend water intake, behaviour and system chemistry alongside TDS or conductivity.

PUROXI INSIGHT **Biological suitability depends on composition and exposure—not one total-solids number.**

CHAPTER 11

Wastewater Natural Waters and Groundwater

TDS can reveal mixing, concentration, intrusion or discharge effects when a stable baseline exists. Conductivity sensors are useful for continuous trend monitoring, while laboratory analysis helps identify the ions responsible.

Discharge limits and ecological effects depend on the receiving water, background chemistry, flow, sensitive organisms and jurisdiction. A rise may result from chloride, sulfate, nutrients or another ionic mixture.

- Compare upstream and downstream or influent and effluent locations.
- Record flow, rainfall, season and operating conditions.
- Use ion-specific analysis to investigate unexplained changes.

PUROXI INSIGHT TDS can show that dissolved loading changed; source identification requires additional evidence.

CHAPTER 12

Industrial Systems Scaling and Corrosion

Boilers, cooling towers, membranes, food plants and manufacturing processes often concentrate dissolved solids. TDS or conductivity may support blowdown and recovery control, but acceptable values are process-specific.

Scaling and corrosion cannot be predicted from TDS alone. Calcium, magnesium, alkalinity, silica, chloride, sulfate, pH, temperature and concentration cycles all matter.

- Track feed, treated, recirculating and reject streams separately.
- Use the process manufacturer’s water-quality requirements.
- Identify deposit composition and corrosion mechanism before changing treatment.

PUROXI INSIGHT A high total may signal concentration, but the chemistry determines what the dissolved material will do.

CHAPTER 13

Treatment Must Match the Dissolved Constituents

Conventional sediment filters do not remove truly dissolved ions. Treatment must be selected for the substances present, the required finished-water quality, flow, recovery, energy, waste handling and operating skill.

Approach	Primary role and limitation
Reverse osmosis	Removes many dissolved ions; requires pressure, pretreatment and concentrate management.
Nanofiltration	Often removes hardness and multivalent ions; rejection varies by membrane and chemistry.
Ion exchange	Targets selected ions; requires regeneration and waste handling.
Distillation	Separates water by evaporation and condensation; energy and scaling must be managed.
Electrodialysis	Moves ions through selective membranes; suitability depends on water and scale.
Blending	Adjusts final concentration but does not destroy or remove the dissolved load overall.

PUROXI INSIGHT **Treatment selection begins with composition, not merely the TDS display.**

CHAPTER 14

Aeration Nano Bubbles and Dissolved Solids

Aeration and Puroxi Nano Bubble Nozzles can improve gas transfer, circulation and dissolved-oxygen distribution when correctly designed. They do not directly remove sodium, chloride, calcium or other dissolved ions and should not be described as TDS-reduction equipment.

Gas transfer can change carbon dioxide, oxygen and pH, which may influence mineral equilibrium or precipitation. Any resulting solids still require suitable separation and management.

- Use membrane, ion-exchange or other ion-specific treatment when removal is required.
- Monitor pH, alkalinity and scaling conditions when gas transfer changes.
- Distinguish improved oxygenation from dissolved-solids removal.

PUROXI INSIGHT **Improving gas transfer is a different function from removing dissolved salts.**

CHAPTER 15

Common TDS Myths

TDS is easy to measure, which makes it useful for screening and trends. It also makes the number easy to overinterpret.

Myth	More accurate interpretation
Low TDS means safe water	Pathogens and important contaminants may be present at low total concentrations.
High TDS means toxic water	Suitability depends on composition, concentration and application.
A TDS meter measures every solid	Most handheld meters estimate TDS from conductivity.
One conversion factor fits all water	The conductivity-to-TDS relationship changes with ionic composition.
A sediment filter lowers TDS	Dissolved ions normally pass through ordinary particle filters.
Aeration removes TDS	Gas transfer does not directly remove dissolved salts.

PUROXI INSIGHT **TDS is a screening and trend tool—not a complete water-quality verdict.**

CHAPTER 16

A Practical TDS Decision Framework

Begin with the intended use and the reason for testing. Then connect the number with composition, source, operating conditions and a defined outcome.

- Confirm whether the result is laboratory-measured TDS or a conductivity-based estimate.
- Record the units, temperature compensation, meter factor and sampling location.
- Compare the value with an established baseline for the same source and method.
- Measure major ions and application-specific contaminants when the result matters.
- Evaluate health, crop, livestock, aquatic or process requirements separately.
- Select treatment for the actual constituents and verify performance after treatment.
- Manage concentrate, brine or residuals created by the treatment process.

PUROXI INSIGHT **Understanding Always Comes Before Recommendation.**

KEY LESSONS

- TDS describes the combined amount of dissolved material, not its identity.
- Clear water and low turbidity do not mean low TDS.
- Most handheld TDS meters estimate TDS from conductivity using a conversion factor.
- TDS is related to salinity, hardness, alkalinity and conductivity but is not interchangeable with them.
- Suitability depends on composition, application and exposure.
- Sediment filtration, aeration and nano bubbles do not directly remove dissolved salts.
- Ion-specific testing and consistent trends provide the context needed for treatment decisions.

A total becomes meaningful only when we understand what makes up that total.

TECHNICAL REFERENCES

- Health Canada. Guidelines for Canadian Drinking Water Quality Operational Parameters Total Dissolved Solids. https://www.canada.ca/en/health-canada/programs/guidelines-canadian-drinking-water-quality-operational-parameters.html
- U.S. Geological Survey. Chloride Salinity and Dissolved Solids. https://www.usgs.gov/mission-areas/water-resources/science/chloride-salinity-and-dissolved-solids
- U.S. Environmental Protection Agency. National Secondary Drinking Water Regulations. https://www.epa.gov/sdwa/drinking-water-regulations-and-contaminants
- U.S. Environmental Protection Agency. Indicators Conductivity. https://www.epa.gov/national-aquatic-resource-surveys/indicators-conductivity
- Food and Agriculture Organization of the United Nations. Water Quality for Agriculture. https://www.fao.org/4/t0234e/t0234e00.htm
- APHA AWWA WEF. Standard Methods for the Examination of Water and Wastewater Methods 2510 and 2540.

Guidelines, classifications and compliance requirements differ by jurisdiction and application. Current local requirements and method documentation should be confirmed before setting targets.

ABOUT THE PUROXI WATER SERIES

The Puroxi Water Series is an educational publication created to improve understanding of water through science, practical experience and thoughtful discussion. Each edition focuses on one important measurement or process and explains what it means, what it does not mean and how it should be interpreted in real applications.

PWS-011 Understanding Total Dissolved Solids continues the series by connecting dissolved minerals and salts with conductivity, salinity, agriculture, biological systems, process water and responsible treatment selection.

UNDERSTANDING ALWAYS COMES BEFORE RECOMMENDATION.

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