

Lab Interpretation Summary – Metals Mobilization and Stabilization

This document provides guidance on how to correctly interpret laboratory metal results (e.g., iron, calcium, magnesium) in treated and untreated produced-water systems. It is interpretive only and does not make mechanism, formulation, or product claims.

PAGE 1 — Why Metals Appear to “Spike”

Understanding What Is Being Measured

Total metals

- Measures all metal present after digestion
- Includes dissolved, suspended, colloidal, and surface-associated material
- Represents the maximum metal inventory in the sample

Dissolved metals

- Typically measured after filtration (commonly 0.45 µm)
- Represents metals passing through the filter at sampling time
- Does not include particle-bound or surface-associated metals

Bound or surface-associated metals

- Metals attached to solids, biofilms, corrosion products, or mineral scale
- Often invisible to dissolved-metal analyses
- Can appear or disappear depending on sampling and stabilization state

Why Conventional Filtered CWAs Can Misrepresent System Behavior

- Filtration removes information about surface-bound metals
- Acidized samples convert bound metals into measurable form
- Single time-point samples do not capture dynamic behavior
- Results vary with sampling location, disturbance, and handling

Key point: A short-term increase in measured metals does not automatically indicate corrosion, scale formation, or system failure. Interpretation requires context and trend analysis.

Metal Mobilization

Mobilization refers to the release of previously bound or surface-associated metals into the water phase where they become measurable. These metals may originate from scale, corrosion products, biofilms, or contact surfaces.

Mobilization alone does not imply new corrosion, increased metal generation, or loss of system integrity.

Why Mobilization Appears Transient

- The reservoir of releasable metal is finite
- Once released, metals may re-stabilize or be removed downstream
- Systems commonly show increase → plateau → stabilization

Metal Stabilization

Stabilization is identified when metal concentrations stop increasing, sample-to-sample variability decreases, and the system reaches a new steady operating condition.

Stabilization does not require metals to return to baseline values.

Common Misinterpretations and Clarifications

Misinterpretation: “Higher iron means treatment failure.”

Clarification: An increase in measured iron concentration, by itself, is not sufficient evidence of treatment failure. In the absence of corroborating indicators (e.g., corrosion rate data, wall loss, persistent upward trends, or operational anomalies), higher iron may reflect a change in iron partitioning or transport rather than increased iron generation.

Misinterpretation: “Increased calcium means new scale formation.”

Clarification: Calcium may appear in solution due to mobilization from existing deposits and does not, on its own, indicate active precipitation.

Misinterpretation: “Filtered results represent total system metals.”

Clarification: Filtered results represent only the dissolved fraction at the time of sampling and do not capture particle-bound or surface-associated metals.

What Laboratory Data Can and Cannot Conclude

Laboratory data can quantify concentrations, identify relative changes, and support trend analysis when collected sequentially and interpreted in context.

Laboratory data alone cannot assign causality, prove corrosion rates, or predict long-term system behavior from a single sample.

Important Notes

- Results are system-specific
- Data must be interpreted in operational and temporal context
- No mechanism, formulation, or causality is claimed
- Provided to support correct evaluation under NDA