This summary was generated by ChatGPT and reviewed by our staff on Oct. 21, 2025:

Here's a clear and thorough **summary of the groundwater quality data** in your uploaded *US Magnesium Hydrogeologic Report (Dec. 15, 2017)* — along with an interpretation of **how badly the groundwater is contaminated**:

🔍 **Overview**
The report describes groundwater beneath the **Current Waste Pond (CWP)** and **Old Waste Pond (OWP)** areas at the **US Magnesium facility** near Great Salt Lake.
It distinguishes three main subsurface zones:

1. **Upper Aquifer Zone** (to ~35 ft deep)
2. **Deeper Silty Clay Unit** (~35–55 ft deep, acts as a confining layer)
3. **Lower Aquifer Zone** (below ~55 ft)

The **Upper Aquifer** is directly impacted by wastewater from the ponds. The **Lower Aquifer** remains relatively isolated and cleaner due to the low permeability of the silty clay.

💧 **Groundwater Quality Summary**
1. Total Dissolved Solids (TDS)

- **Upper Aquifer Zone:** 29,000–300,000 mg/L (extremely saline)
- **Lower Aquifer Zone:** 56,000–160,000 mg/L
- Utah's drinking water standard = **500 mg/L**.
- Water is therefore **Class IV (Saline)** — *unusable for drinking, irrigation, or livestock*.

2. pH

- **Impacted wells** downgradient of the CWP: **as low as 5.1**
- **Upgradient wells: 6.8–7.8** (neutral)
- Indicates **acidic seepage** from low-pH wastewater (pond pH < 2).
- Some buffering occurs due to carbonate-rich soils.

3. Anions / Cations (Major Ions)

- **Impacted groundwater:** Dominated by **Ca^{2+} / Mg^{2+} / Cl^-** → matches wastewater chemistry.
- **Unimpacted groundwater:** Dominated by **Na^+ / K^+ / Cl^- / SO_4^{2-}** → natural saline signature.
- This ion pattern clearly shows **wastewater mixing into the shallow aquifer**.

4. Metals

- **Elevated** concentrations of:
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  - **Iron (Fe)**
  - **Manganese (Mn)**
  - **Nickel (Ni)**
  - **Molybdenum (Mo)**
  - **Cobalt (Co)**
  - **Zinc (Zn)**

- These are characteristic of acidic, industrially impacted water.
- Deeper wells (e.g., MW-22A, below the silty clay) show **low metals**, confirming the confining layer limits vertical migration.

5. Organic Compounds

- **Detected:** Dioxins/furans, PCBs, SVOCs (e.g., phthalates, naphthalene), VOCs (e.g., chloroform, acetone).
- Many compounds found in multiple wells and surface-water seeps.
- Indicates **industrial organic contamination**, especially in and near the CWP area.
- Lower aquifer samples mostly **non-detect or trace levels**, confirming limited vertical migration.

📈 Hydrogeologic Findings

- The **Upper Aquifer** is **unconfined** and receives direct recharge from unlined wastewater ditches and ponds.
- The **Deeper Silty Clay Unit** is **continuous and low-permeability**, providing some hydraulic isolation.
- **Flow direction:** generally southwest → northeast, toward Great Salt Lake.
- **Surface water and groundwater interact** — wastewater seeps emerge as standing water near the OWP.

⚠️ Contamination Assessment

Indicator	Impact	Interpretation
TDS	Up to 300,000 mg/L	Severely degraded (hypersaline)
pH	As low as 5.1	Acidic seepage from waste pond
Major ions	$Ca^{2+}/Mg^{2+}/Cl^{-}$ dominated	Industrial wastewater signature
Metals	Elevated Fe, Mn, Ni, Mo	Clear wastewater contamination
Organics (PCBs, dioxins, SVOCs)	Detected	Industrial pollutant presence
Extent	Limited to Upper Aquifer	Lower aquifer relatively protected

Overall:
🔴 **Severe contamination in the shallow groundwater** immediately beneath and downgradient of the CWP.
🟡 **Moderate impact** within a mile, depending on flow direction.
🟢 **Lower aquifer remains largely unimpacted** due to the confining silty clay.

🧭 Conclusion

The **groundwater near US Magnesium's waste ponds is heavily contaminated** with saline, acidic, and metal-rich wastewater typical of magnesium production effluent. The contamination:

- Is **localized to the shallow aquifer**,
- **Does not (yet)** significantly affect deeper aquifers,
- But poses **high environmental risk** to surface water and the **Great Salt Lake ecosystem** due to upward discharge zones and hydraulic connectivity.