Every Mine Has a Water Problem

Too Much

Too Little

Too Dirty

The “E” in ESG Really Means Stewardship

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A Quick Introduction to Larry Cope

- 40 years experience with mine water. Now somewhat retired. Experience spans:
  - mine water supply and mine dewatering,
  - environmental characterization and compliance, and
  - mine water management.
- Focus has been on mine water management over the last 20 years. Mostly in underground mines.

Definition of Stewardship

- A formal generic definition: *Taking responsibility for overseeing and protecting something considered worth caring for and preserving.*

- In the context of mine water management, stewardship can be considered:
  - Viewing water resources as worthy of protecting, and
  - Taking actions that reduce impacts to the resource.

The Logic in Practice

- Environmental compliance needs data to quantify impacts.
- Baseline conditions and compliance programs are defined early in project development.
- But early detailed environmental data can provide more than a monitoring plan.
- Planning those early studies carefully can yield the benefits of:
  - Reduction in water treatment costs,
  - Quantify the impacts of a mine on the groundwater resource,
  - Minimize additional studies needed for closure planning, and
  - Early knowledge of the variables that drive decisions on risk tolerance.
- An attitude of being a steward of the water resource allows one to see the opportunities in the data.

Key Water Variables that Informs Risk Analysis

- Supply needs, make up water, segregation of affected and unaffected waters, and treatment discharge
- Seasonal Variations
  - Wet and dry seasons
  - Winter freeze up and the freshet
- Surplus Supply
  - Flooding (pits, UG workings, TSFs)
  - Comingling of contact water with large volume of non-contact water
- Context of the mine site within the larger hydrologic basin for impacts assessments.
- Other water users in the basin.

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Examples of data collection and analysis driven by an attitude of stewardship

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Characterization Leads to Stewardship

Data gathering can be simple and practical. Here drips from the back are measured over time to calculate very low inflow rates (< 0.005 gpm) to characterize groundwater in a tight rockmass.

These simple data minimized the scale of the subsequent packer injection test program.

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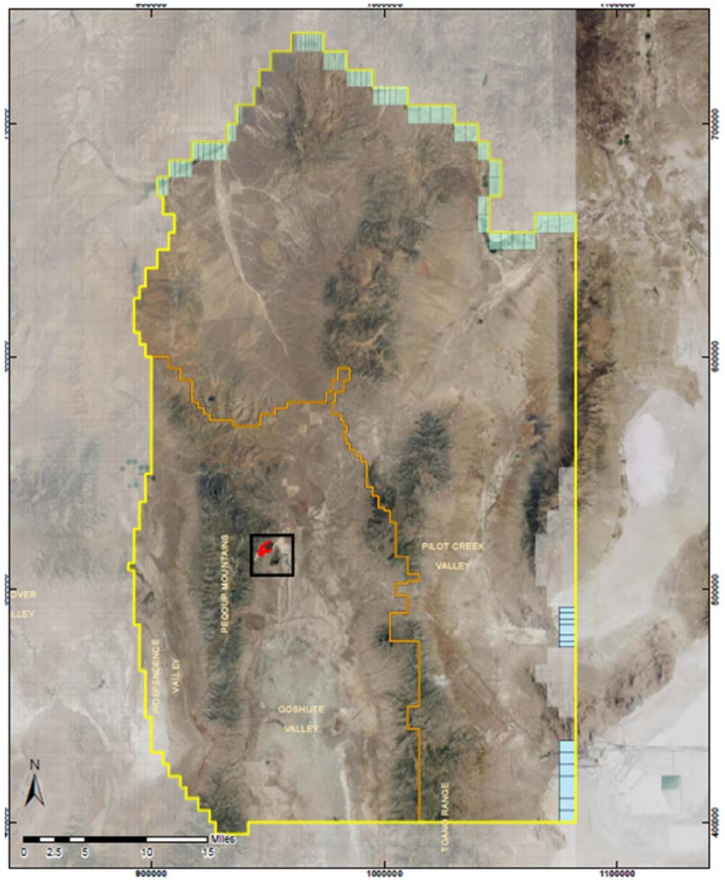
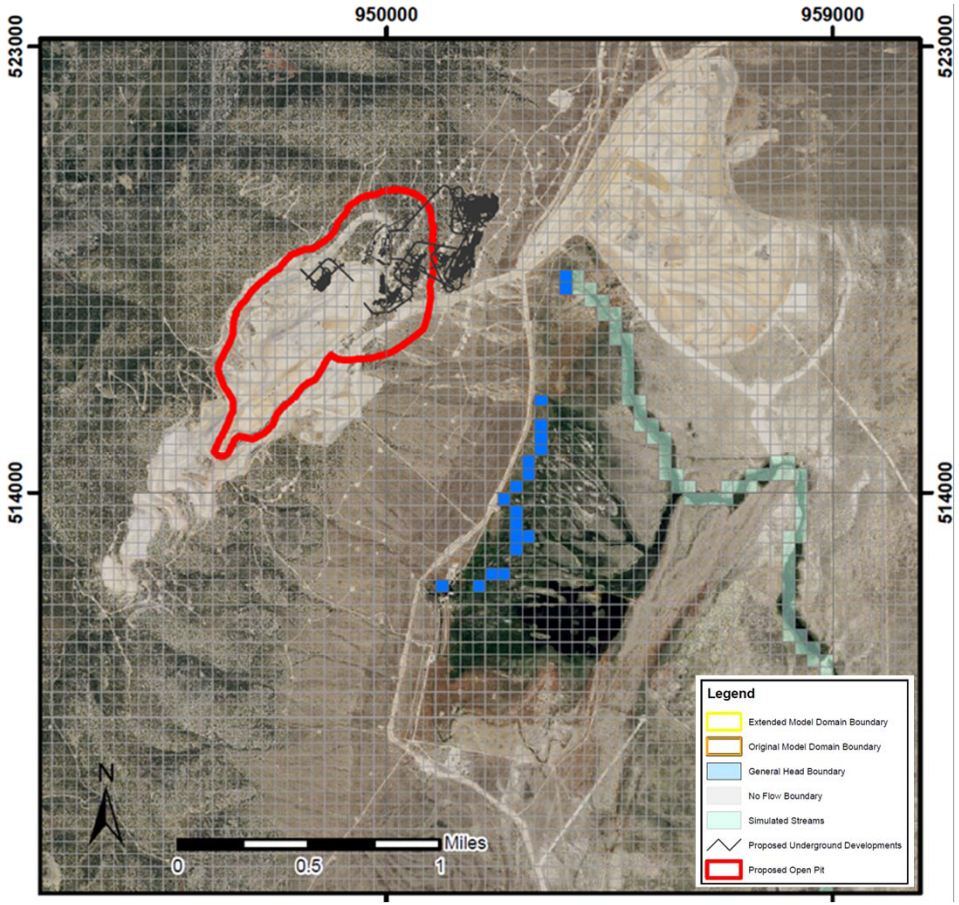
Characterization Leads to Stewardship





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Characterization Leads to Stewardship

Taking the opportunity to collect hydrogeological data in an exploration corehole.

Borehole receiving a piezometer installation.

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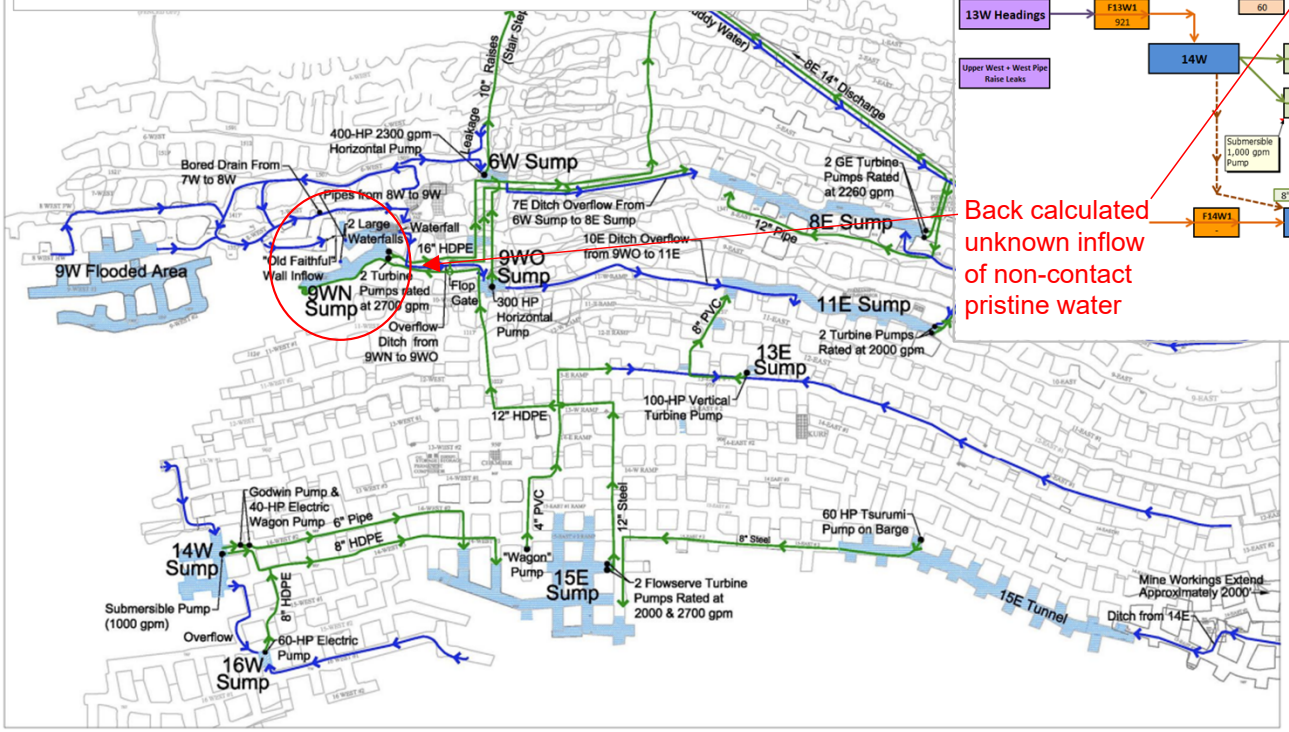
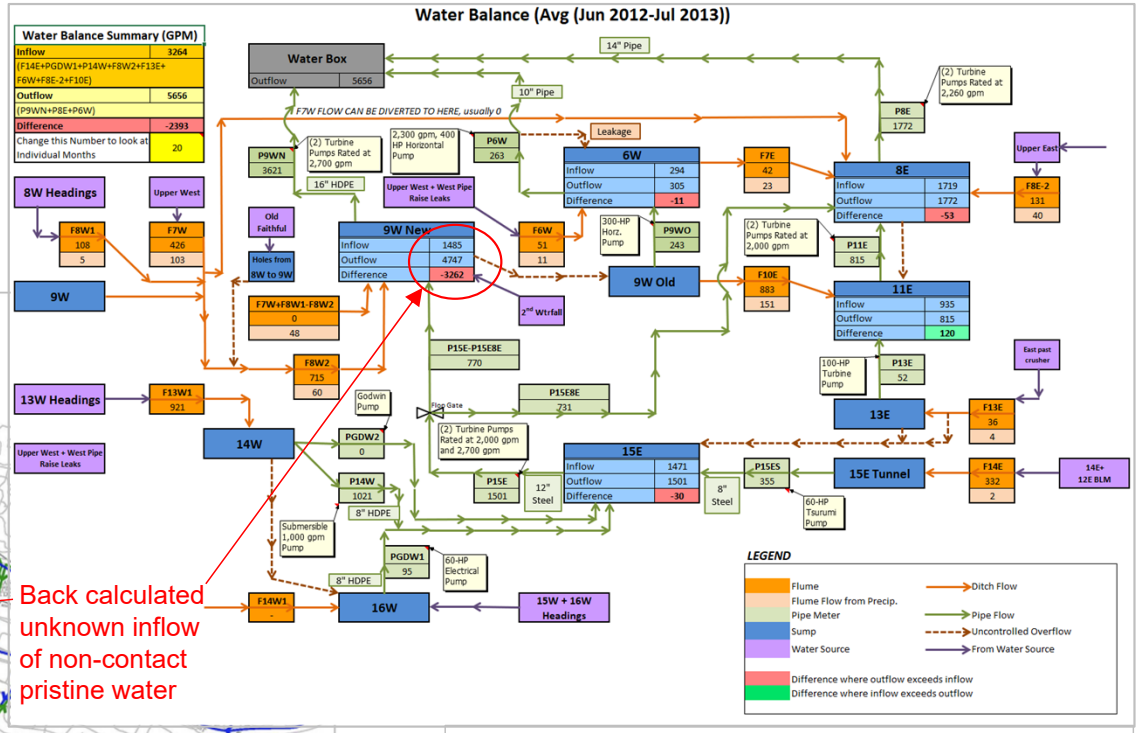
Characterization Can Lead to Stewardship

Efficient water management requires that sumps, pumps, ditches, and pipes are mapped and monitored.





Back calculated unknown inflow of non-contact pristine water

Effective stewardship of the water resource closely tied to the analysis of characterization data.

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Characterization Leads to Stewardship

Segregation of mining-affected water from unaffected water.

Pictured here is a sump from pristine drippings down a development raise.

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Characterization Leads to Stewardship

Segregating mining-affected from unaffected waters requires mapping inflow locations and quantifying inflow and chemistry.

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Summary

Keys to Effective Stewardship of a Water Resource

- Appreciate the resource as one needing care and preservation.
- Know your surface and groundwater flow system via characterization and monitoring data.
- Focus on the details that can lead to opportunities for risk and cost reduction directly related to protection of the resource.
- Design data collection programs to leverage long-term needs
    - characterization data from exploration programs,
    - water treatment plan design, and
    - closure planning.

Thank you.

Questions?

srk consulting