Cost Effective Tier 2 Remediation Guidelines for a Salt Contaminated Site in an Urban Development

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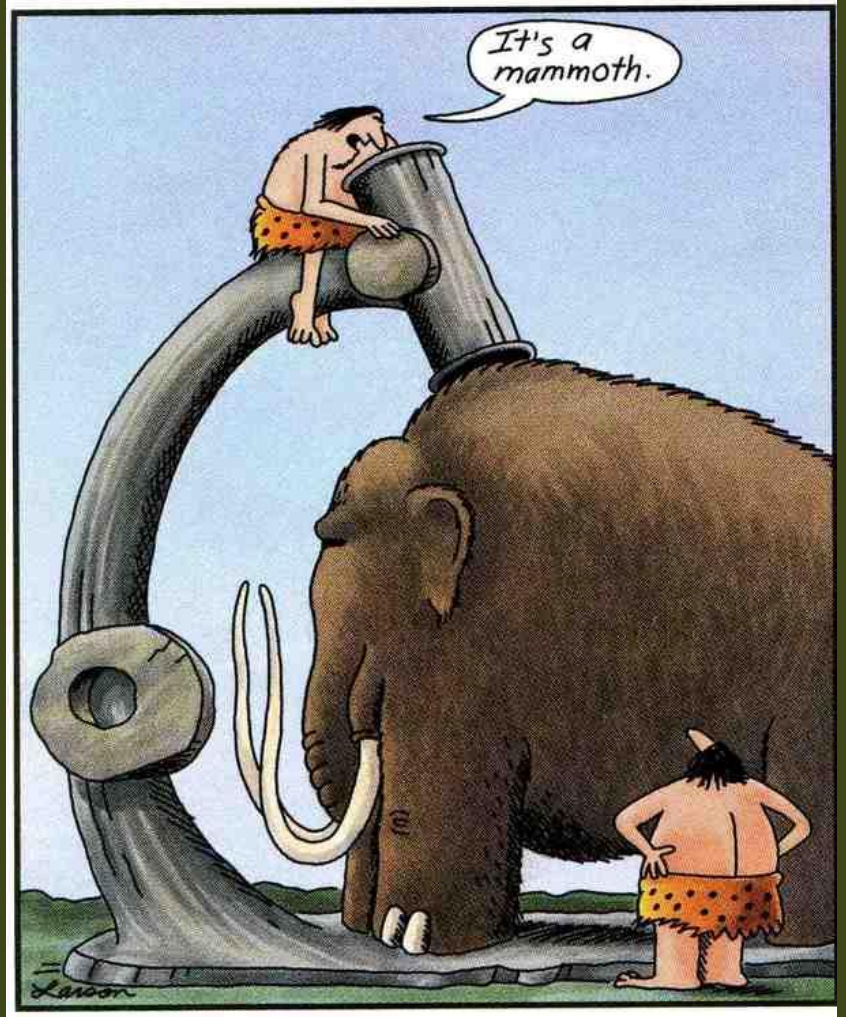


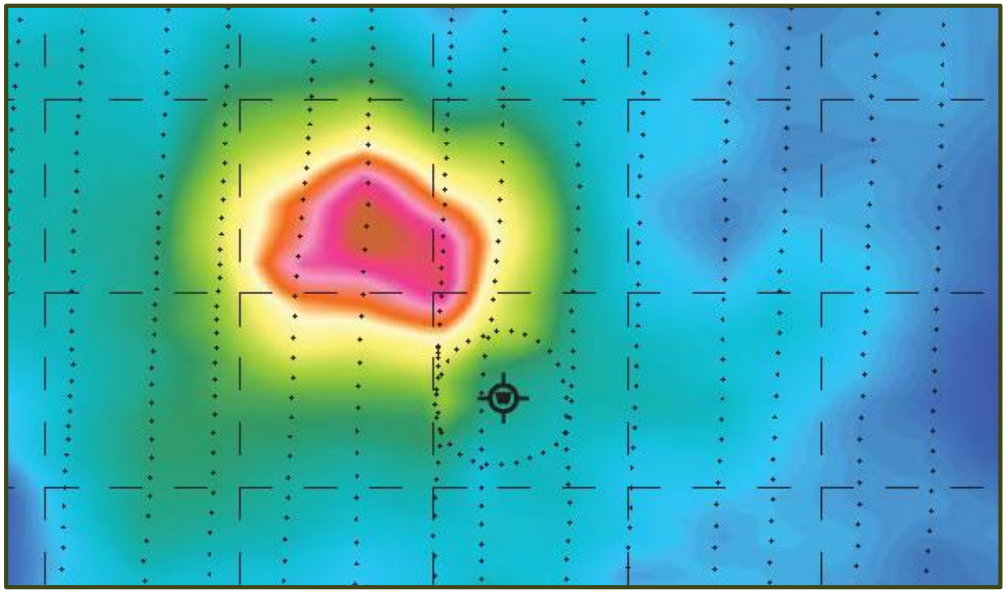
Early microscope

The Challenge

Assessing salt impacted sites

- Thoughtful Planning
- Excellent Communication
- Effective use of Tools

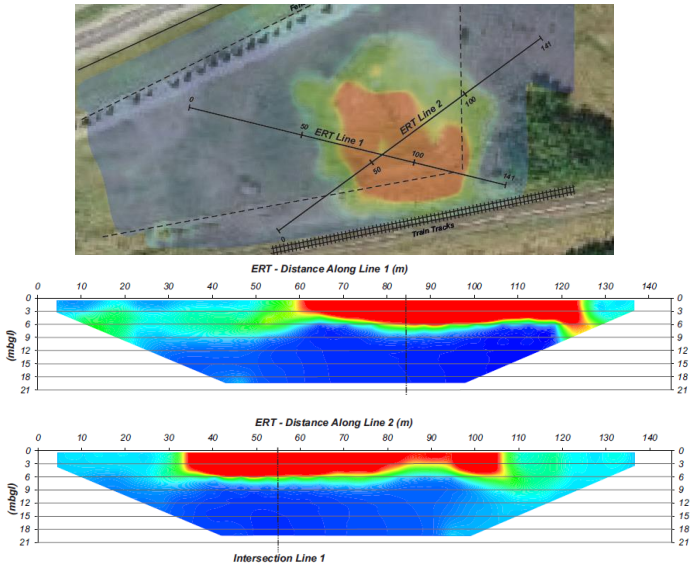
Case Study A: Urban Development



Future urban development

- End land use = residential
- Drilling waste disposal area
- Exceedances ~ 50 m x 50 m x 9 m = 22,500 m^3
- Estimated remediation costs (to Tier 1) = $2,250,000

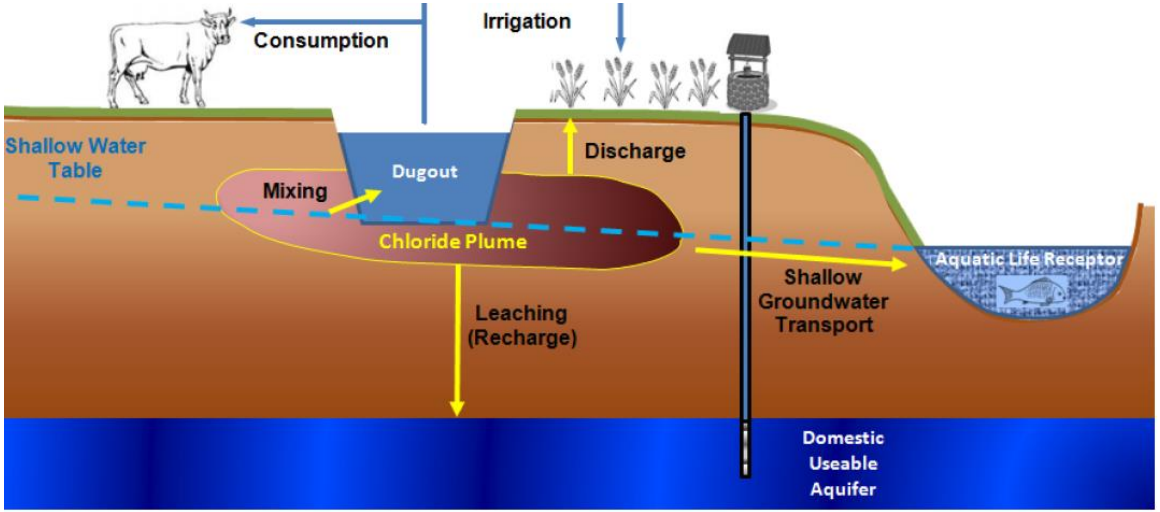
Case Study B: Municipal Annex



Possible former road salt storage area

- Public Sector Accounting Standard PS3260
- Unknown fill source
- Exceedances ~ 65 m x 60 m x 10 m
- Estimated remediation costs (to Tier 1) = $3,900,000

Planning: CSM Gaps



Pathways/receptors

- Residential: seldom IW / LW
- Up to ~35 parameters
- Which are most influential and least certain?
- Prioritize field efforts = $ savings

Uncertainty rating x degree of influence rating = priority level

Graphic credit: SST EQM Help File, AEP, 2013

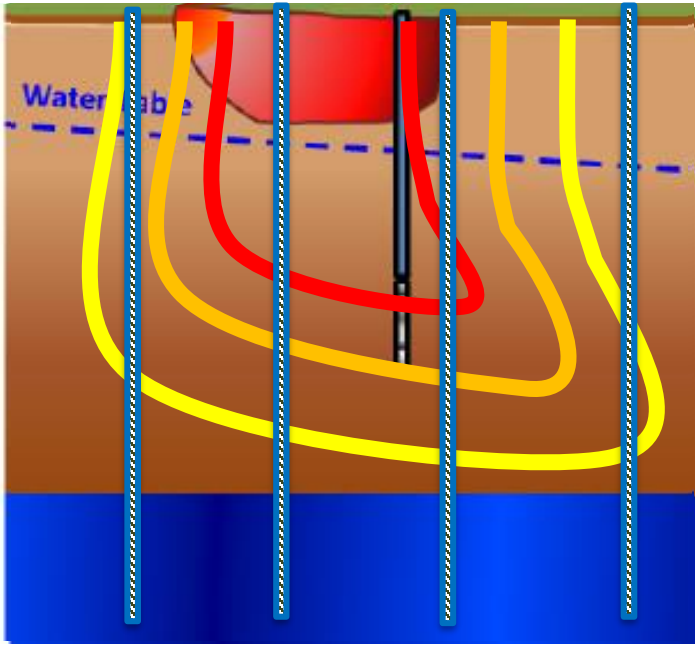
Case A: Planning FAL pathway

Limitations/Opportunities

- Class?
- Groundwater connected?
- Groundwater flowing toward?
- Groundwater velocity?
- Plume shape/sub-areas?
- Potential guideline range?
- <3 events?

Image credit: Abadata, 2017

Case A: Planning DUA pathway

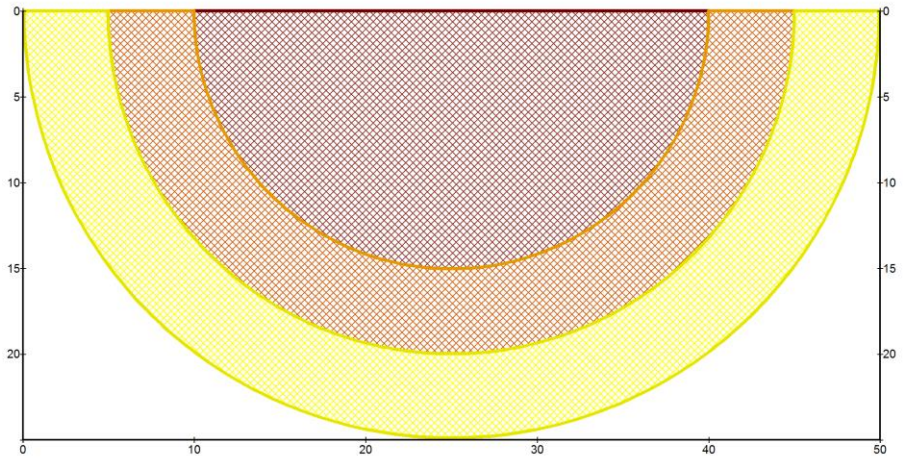


Limitations/Opportunities

- Bottom of impact to DUA?
- Plume shape/sub-areas?
- Vertical gradient?
- Vertical ksat?
- Horizontal dilution?
- Potential guideline range?

Background graphic credit: SST EQM Help File, AEP, 2013

Case A: Volume reduction

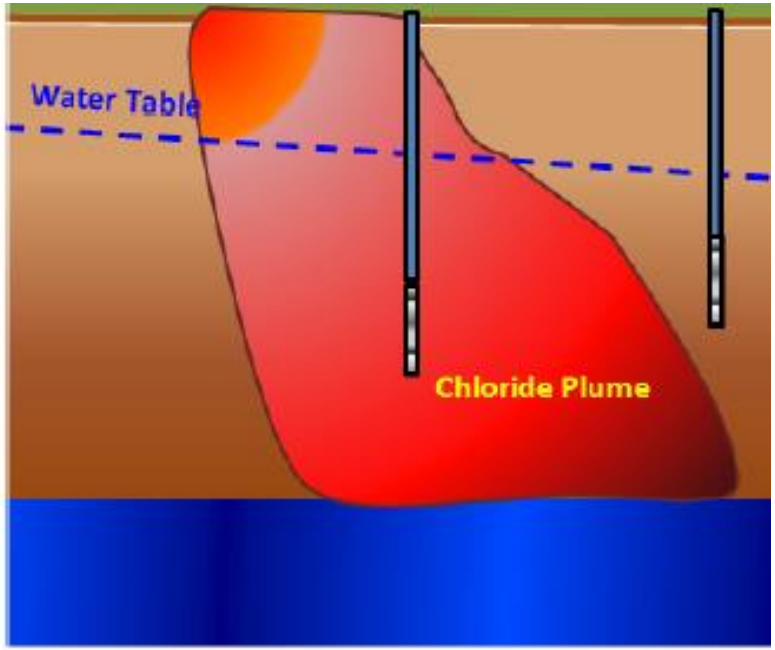


Sub-areas Salvage Plan

- Volume/liability estimation
- Only remove worst case, if required
- Cost/benefit of sub-area characterization?
- Balance guidelines
- Every 100 m³ salvaged $5k-10k

Cross sectional profile of chloride concentration contours and soil mgt areas

Case B: RMP options



Limitations/Opportunities

- DUA?
- Chem, ksat, pump test?
- SST potential for other pathways
- Groundwater delineation
- Goals: short or longer term?
- Partial or full RMP

Background graphic credit: SST EQM Help File, AEP, 2013

Field Considerations

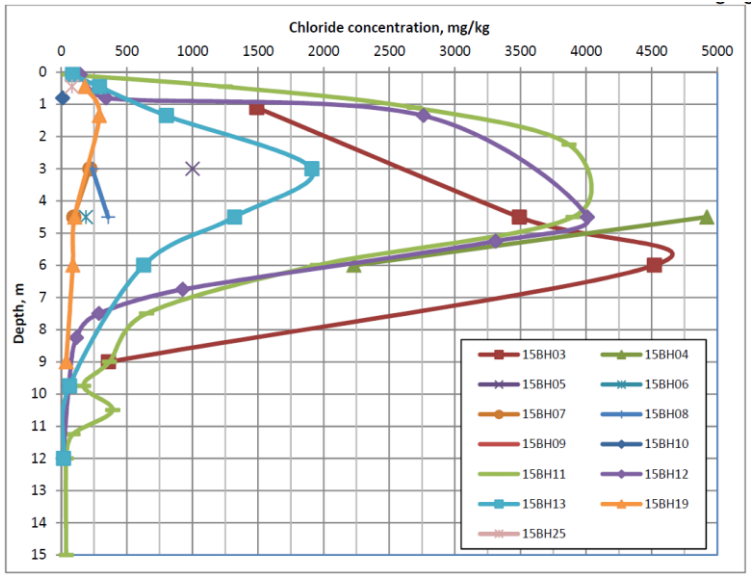
Coarse grained material

Possible evidence of salinity impacts

Target key data

- Real time discussions
- Adapt to deviations
- Model checks
- Correlate data

Field Considerations – Case Study A



Smooth sailing

- Low saturated hydraulic conductivity
- Clear bottom of impact
- Domestic use aquifer
- Site progression

Field Considerations – Case Study B

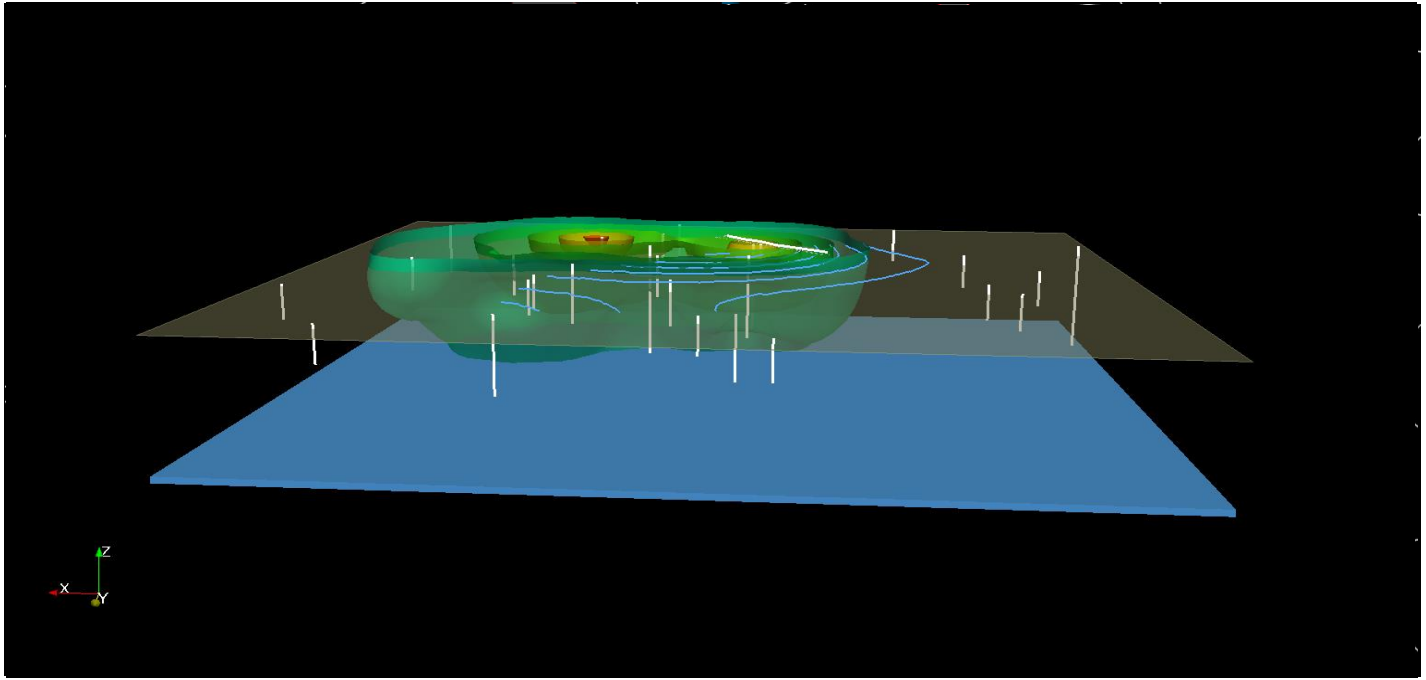
Saturated sandy loam material

Unexpected conditions

- Saturated material
- Coarse-grained?
- Bottom of impact unclear
- Correlate field data

Case B: RMP

CSM visualization



Cost Savings – Case Study A

Item	Lesser Planned	Well Planned	Savings
Planning and correspondence	Not completed	$10,000	-$10,000
Supplemental Phase 2 ESA	$25,000	$50,000	-$25,000
Groundwater monitoring	$5,000	$10,000	-$5,000
Second supplemental Phase 2 ESA	$40,000	Not required	**$40,000**
Three groundwater monitoring events	$15,000	Not required	**$15,000**
Additional planning and correspondence	Not completed	$10,000	-$10,000
Remediation/risk management	$2,250,000	$525,000	**$1,725,000**
Total	**$2,330,000**	**$605,000**	**$1,730,000**

Cost Savings – Case Study B

Item	Lesser Planned / Rem focused	Well Planned / RMP focused	Savings
Planning and correspondence	Not completed	$10,000	-$10,000
Supplemental Phase 2 ESA	$20,000	$50,000	-$30,000
Groundwater monitoring	$5,000	$15,000	-$10,000
Second supplemental Phase 2 ESA	$30,000	Not required	**$30,000**
Second groundwater monitoring event	$10,000	Not required	**$10,000**
Additional planning and correspondence	Not completed	$10,000	-$10,000
Remediation/risk management	$4,000,000	$1,200,000	**$2,800,000**
Total	**$4,065,000**	**$1,285,000**	**$2,780,000**

Conclusions

Plan and prepare

- Step back
- Focus assessment
- Communicate and Prepare for “what-ifs”
- Effectively use resources/tools

Thank You

Questions?