Site-Specific Risk Assessment as a Cost-Effective Step to achieve Regulatory Closure at a Former Gas Plant in Southern Alberta

Amy Gainer, Ph.D., P.Ag.

Team:

Tiona Todoruk, Advisian | Masten Brolsma, Advisian

Marissa Hayward, Advisian | Tim Kulka, ATCO

ATCO

Advisian
Worley Group

advisian.com

I want to acknowledge

I work, live, and play on the traditional gathering place, travelling route and home for many Indigenous Peoples.

Progressive Aboriginal RELATIONS COMMITTED

Canadian Council for Aboriginal Business

Project Background

- Natural Gas Liquids Processing Plant
  - Extracted natural gas liquids from gas
  - Produced ethane, propane and natural gas

- Timeline
  - 1983: plant constructed
  - 2005: evaporation pond decommissioning
  - 2011: compressor building remediation
  - 2015: facility shut down
  - 2017: infrastructure removed; confirmatory sampling occurring
  - 2018 / 2019: environmental site assessments

Project Objective

Develop	Site-specific guidelines
Assess	Risks to human and ecological health
Progress	Towards risk-based closure Regulatory approval of approach

Background

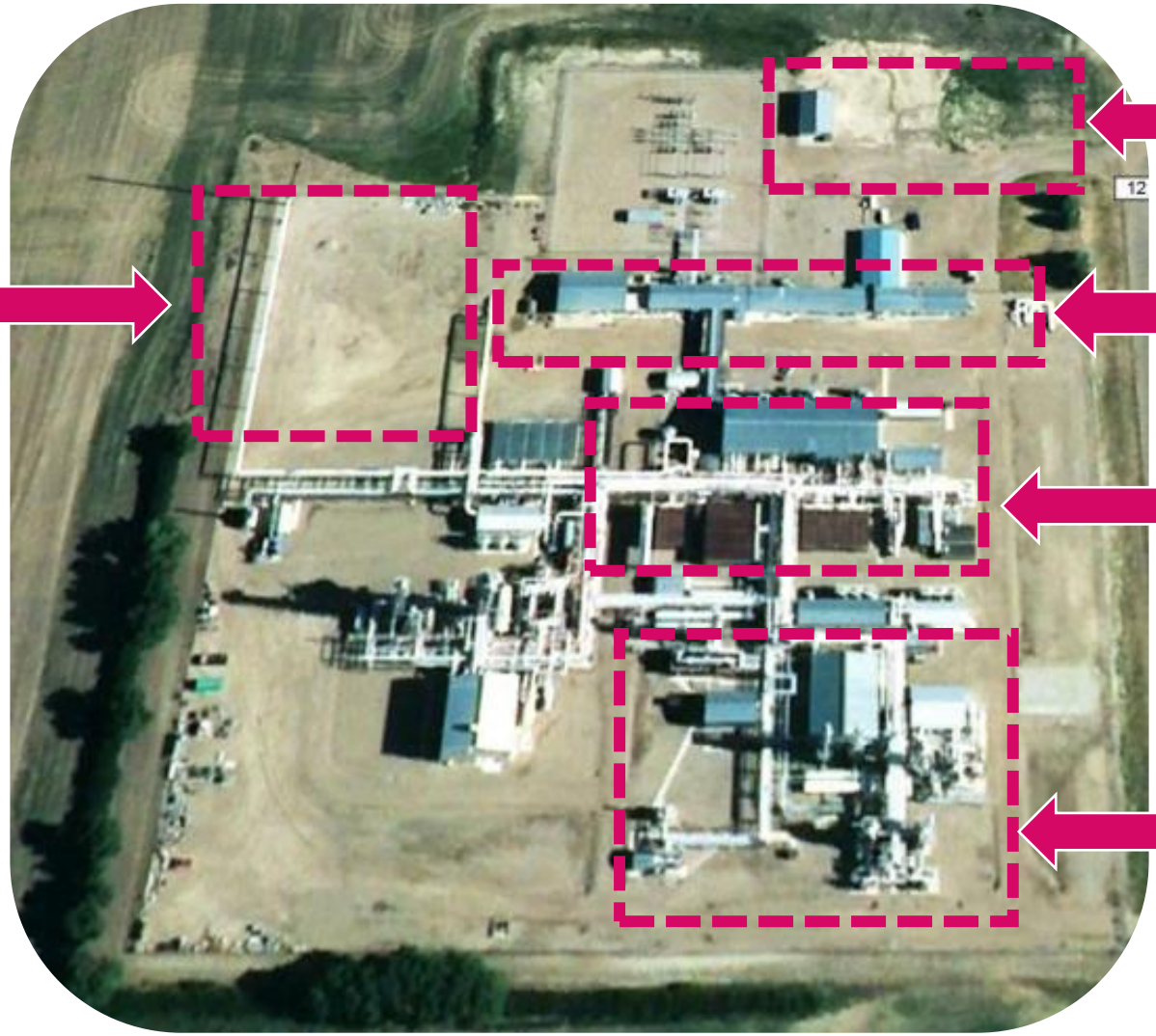
Conceptual Site Model Summary	
End land use	Agricultural
Surficial Deposits	• Sand and silt overlying clay till to 16.5 mbgs • Solonetzic soils
Hydrogeology	• Depth to groundwater between 2 to 3 m bgs • Groundwater flow direction to northwest
Water Wells	Approximately 820 m south of the Site • depth = 15 m bgs
Surface Water	Ephemeral 1. 100 m southwest 2. 340 m northwest

APEC and associated Historical COPCs

Flare Area and Former Evaporation Pond

Soil – chromium

GW- ethylbenzene, bromacil, tebuthiuron, iron, manganese, arsenic



Northern Area
Soil + GW - salinity

Administration Area
Soil - pH

Compressor Area
Soil - PHC F3, chromium, molybdenum, nickel

Process Area
Soil – PHC F3, pH, zinc, chromium, nickel

Background conditions

Soil maxima

- EC=14 dS/m
- SAR = 14.1

Background Groundwater Quality above Tier 1

- Sulphate, sodium, EC, TDS, Nitrate-N, Nitrite-N
- Iron, Manganese
- Cadmium, selenium, uranium

No elevated chloride in soil or groundwater at the Site

Tier 2 GW Guidelines - DUA

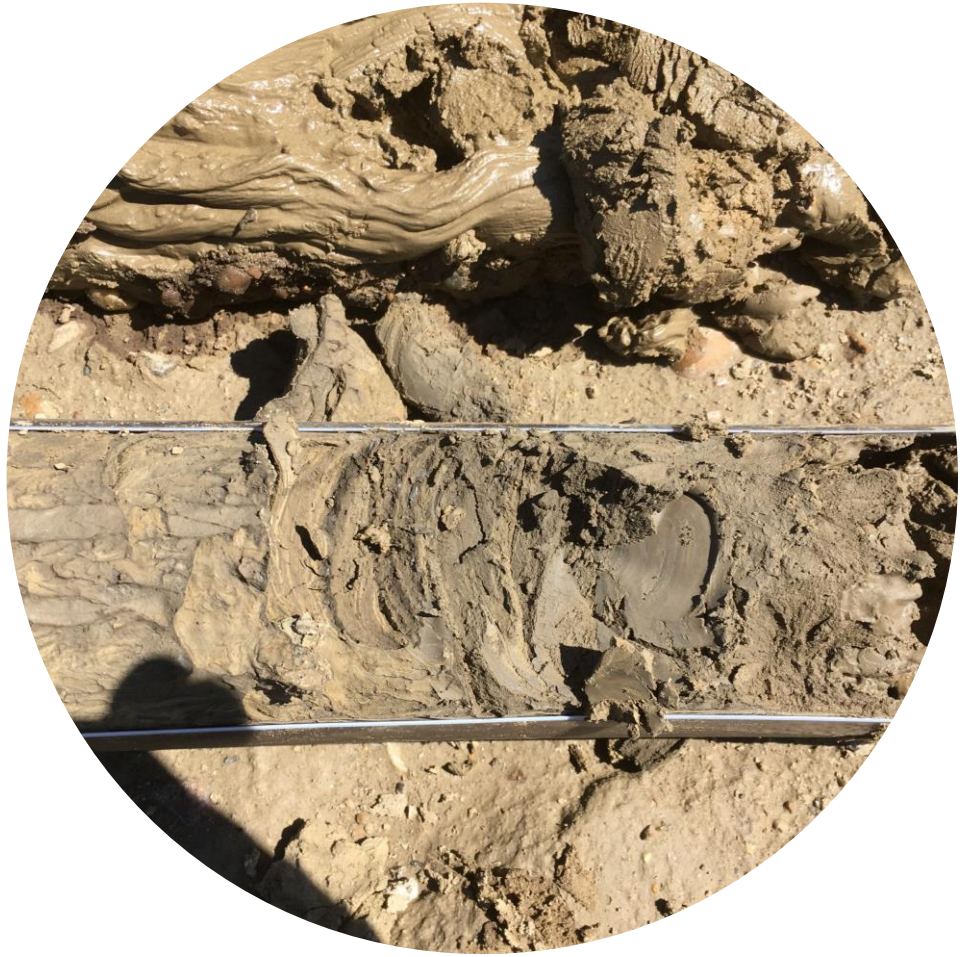
- Ethylbenzene in groundwater
- Clay till sufficient barrier to protect potential underlying DUA past 16 mbgs
- A large diameter (30 inch) domestic/stock water well is located approximately 820 m south of the Site at a total depth of 15.2 mbgs, associated with a residence
  - AEP Tier 1 and 2 guidelines indicates that when large diameter wells are completed in geologic units that do not meet the hydraulic conductivity or yield criteria defining a DUA, the water well is considered a point of compliance for drinking water guidelines
- Lateral separation (DF4) included in Dominico and Robbins model
- All Tier 1 parameters except site-specific hydraulic conductivity

Tier 2 Guidelines - FWAL

- Bromacil (soil and groundwater) & Tebuthiuron (groundwater) were developed
  - Used maximum half lives from literature
- Used conservative approaches to distance down-gradient to water body
  - Assumed groundwater flow direct to closest water body
- **Results**
  - Bromacil soil – soil saturation limit
  - Bromacil groundwater – solubility limit
  - Tebuthiuron groundwater – solubility limit

COPC Screening

- Salinity – reflective of background conditions
  - EM survey
  - Absence of chloride
  - Solonetzic soils in region
  - Native Prairie Protocol
- Soil metals (molybdenum, nickel and hexavalent chromium)
  - High alloy stainless steel metals shavings associated with historical construction/recent decommissioning
  - Non-toxic metal forms
- Remaining exclusions based on:
  - Isolated exceedances
  - Not reproducible
  - Not related to Site activities
  - Associated with biogeochemistry of monitored natural attenuation



COPC Scr

- Soil Res
  - **pH – 12**
    - Elevat
      differ

- Groundv
  -no COPC

Problem Formulation COPCs:

pH

Receptor – Exposure Pathways

- Ecological soil contact
  - Plants (crops)
  - Soil Invertebrates

Exposure Assessment

- Outlier identified (12.1) in one APEC
- Remaining three APECs had no outliers

Toxicity Assessment

- Used upper limit of Tier 1 guidelines (8.5) as TRV

Risk Characterization

- **<u>Outlier (12.1) in process area presents unacceptable risk</u>**

Next Steps

- Supplementary sampling confirmed elevated pH =12 remains at outlier location
  - Lateral delineation achieved
- Meeting with AER to accept approach taken in SSRA
- Complete small excavation of area with elevated pH

Path to Closure…

How it Started?

How its Going?

To learn more, contact:

amy.gainer@advisian.com

Advisian

Worley Group

Pride@Worley

MIKISEW ADVISIAN
ENVIRONMENTAL

Nu Nenne Advisian
ENVIRONMENTAL

TRS Advisian