

Site-Specific Risk Assessment as a Cost-Effective Step in achieving Regulatory Closure at a Former Gas Plant in Northern Albertana, P.Eng. – Project Manager - Advisian Tim Kulka - Senior Advisor - ATCO Energy Solutions

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Outline

- Background
 - Site History
 - Site Setting
- Remedial Action Plan
 - New APECs
 - Changes to CSM / Design Basis
- Site-Specific Risk Assessment
 - Problem Formulation
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 - Toxicity/Effects Assessment
 - Risk Characterization
 - Conclusions / Path Forward
- Regulatory and Remediation Considerations
- Acknowledgements
- Questions







I want to acknowledge

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

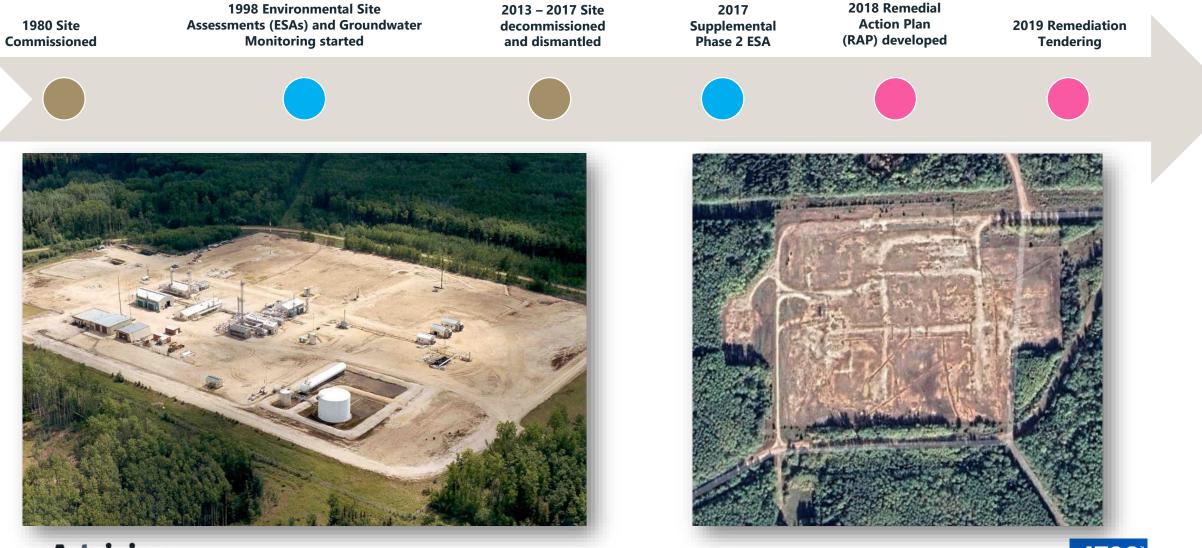
Progressive Aboriginal RELATIONS

COMMITTED

Canadian Council for Aboriginal Business











Site History





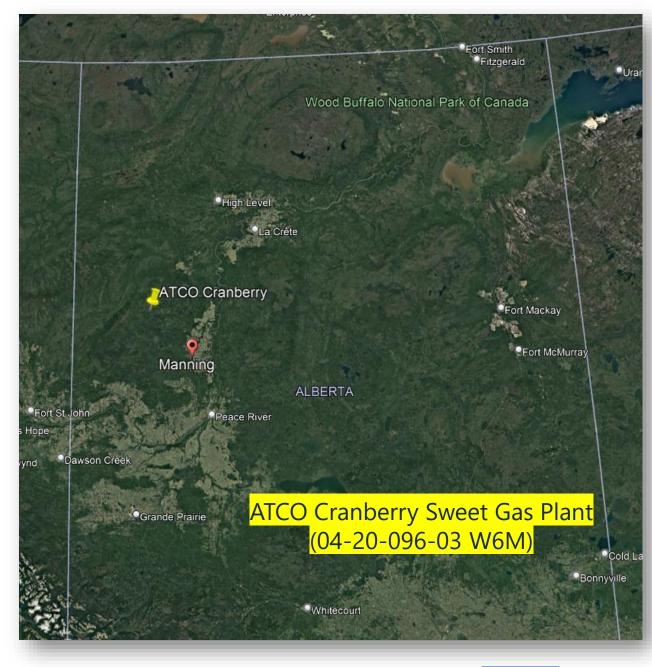






Site Setting

- Location
 - Approximately 70 km northwest of the Town of Manning, Alberta
 - Kilometre 80 Chinchaga Forestry Road
 - Nearest landfill ~2.5 hours (1 way)
 - Surrounded by natural area in the Green Zone on Crown Land
 - Future land use is assumed to be natural
- Water Usage
 - On-Site supply well was present but decommissioned in 2019
 - Nearest water well is located approximately 1650 m east
 - Tributary of the Meikle River is located approximately 300 m west







Site Setting

- Surficial deposits:
 - Fine-grained clayey silt and clay till (to approximately 5 mbgs) overlays a partially cemented silty fine sand unit.
 - Cemented sand layer is contiguous and sufficiently thick
 (> 5 m) except in APEC 1- Administration Area.
 - Cemented fine sand layer acts as a confining unit for certain areas of the Site.
 - This layer was compromised during the Administration Area excavation (former Fuel Tank).
- Groundwater:
 - Depth to groundwater is 11 mbgs.
 - Geometric mean hydraulic conductivity is 2.5 x 10⁻⁷ m/s.
 - Groundwater flows towards the southwest.

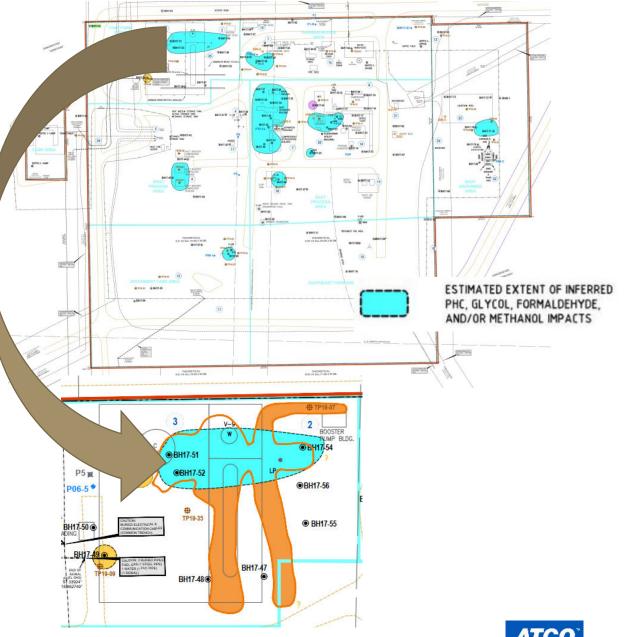






Remedial Action Plan

- RAP based on known APECs (24) and Conceptual Site Model from past ESAs
- Contaminants of Concern = PHCs, glycols, chlorides, metals, formaldehyde, phenols, bromacil and methanol
- On-Site treatment of PHCs & Glycols
- Landfill disposal for metals, chlorides and bromacil
- Drilling waste disposal area found during the excavation of Tank Farm (TF 1)
- Cemented sands observed during remediation of fuel tank APEC (AD1)











Problem Formulation

- Guidelines
 - Alberta Tier 1 and Site-specific Tier 2 Guidelines for natural land use and fine-grained soils
 - Remote Green Zone subsoil management limits
 - In areas of the Site used for drilling waste disposal, salinity parameters are assessed using the 1996 Directive 50 Equivalent Salinity Guidelines for Alberta
- Tier 2 Pathway Exclusion Considered potential fate and transport based on site-specific conditions
 - Freshwater aquatic life (FWAL) excluded based on distance.
 - DUA exclusion where the partially cemented fine-grained sand confining layer remains intact and sufficiently thick (> 5 m) / not applied to APEC 1
- Retained substances exceeding guidelines or without guidelines that were elevated as a result of site activities:
 - Surface Soil PHC F1, PHC F2, Ethylene glycol, Chromium (total), Nickel
 - Subsurface Soil Xylenes, PHC F1, Phenol
 - Groundwater none
- Receptors limited to plants/invertebrates plus management limits considered for free-phase formation.
- Exposure Pathways include ecological direct contact, nutrient and energy cycling check, management limit



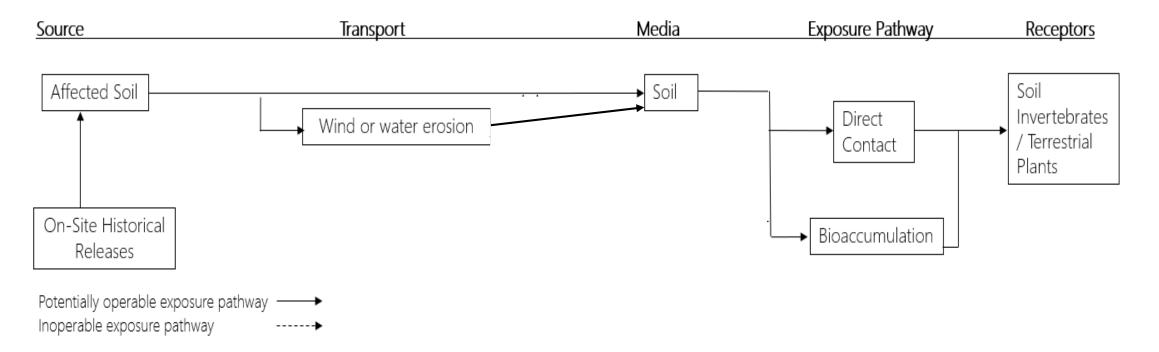




Problem Formulation – Conceptual Site Model

• CSM developed considering the natural land use scenario

ON-SITE & OFF-SITE ECOLOGICAL RECEPTORS







Exposure and Toxicity Assessment

- Exposure Assessment
 - Exposure point concentrations (EPCs) were estimated for COPCs exceeding the guideline in that APEC.
 - EPCs used 95UCL of the mean for soil quality data estimated using ProUCL when sufficient data were available.
 - Maximum soil concentration used if sufficient data were not available for statistical evaluation.



- Outlier sample locations evaluated separately / considered likely to require remediation.
- Toxicity Assessment
 - TRV selected was the Tier 1 or Tier 2 Guidelines for each COPC.
 - Guidelines are protective of the eco-direct contact pathway.
 - Guidelines typically based on current guidance and insufficient new data were available to justify recalculation/updates to ecological soil contact TRVs.





Risk Characterization

• Pre-Remediation SSRA: **Red Highlight** indicates unacceptable risk.

ΑΡΕС	Exposure Pathway	Media	СОРС	Value (type) (mg/kg)	TRV (mg/kg)	HQ
APEC 7- Glycol	Ecological soil contact	Surface Soil	Ethylene glycol	4781 (EPC)	1100	<mark>4.34</mark>
Regeneration, Aerial Coolers and Compression Building	Nutrient cycling energy check	Surface Soil	Ethylene glycol	4781 (EPC)	1700	<mark>2.81</mark>
APEC 22- Former Landfill	Ecological soil contact	Subsoil	Phenol	14.7 (EPC)	20	0.74
APEC 25- DWDA – South subarea	Ecological soil contact	Surface soil	PHC F1	2780 (outlier)	210	<mark>13.2</mark>
			Xylene	71.2 (EPC)	65	<mark>1.09</mark>
			PHC F1	457.1 (EPC)	210	<mark>2.18</mark>
			PHC F2	636.6 (EPC)	150	<mark>4.24</mark>
		Subsoil	Xylene	29.4 (EPC)	130	0.22
	Management limit	Subsoil	PHC F1	1310 (EPC)	800	<mark>1.6</mark>
APEC 25- DWDA – North subarea	Ecological soil contact	Surface soil	Xylene	25.7 (EPC)	65	0.40
			PHC F1	1780 (EPC)	210	<mark>8.48</mark>
			PHC F2	810 (EPC)	150	<mark>5.4</mark>
		Subsoil	Xylene	96 (EPC)	130	0.74
	Management limit	Subsoil	PHC F1	2555 (EPC)	800	<mark>3.19</mark>
APEC26- Off-Site Campsite Stockpile	Ecological soil contact	Surface soil	Total Chromium	49.6 (EPC)	64	0.78
		Surface soil	Nickel	34.5 (EPC)	45	0.77

Post-Remediation SSRA: HQ < 1





SSRA Conclusions and Path forward

- Submission of SSRA to AER + Meeting
- 2021 Remediation Planning based on AER acceptance of SSRA approach

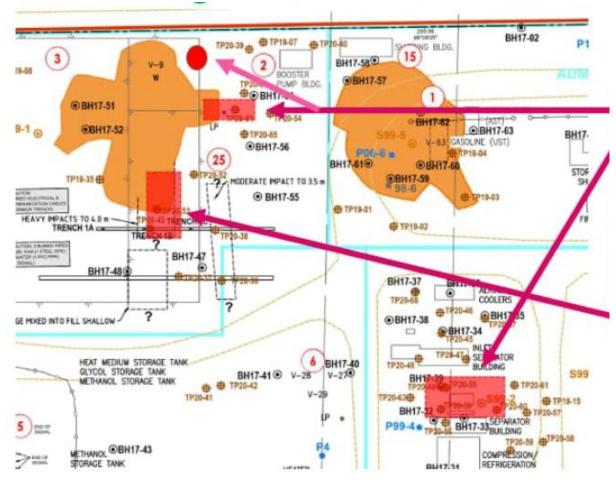


Table 8-1 Summary of Status of APECS at the Site

Retained APEC	Remediation Required?	Rationale	
APECs 1, 15, and 16 - Administration Area	No*	COPCs meet	
APECs 2 and 3 - Tank Farm Area	No	guidelines and/or screening identified	
APECs 4, 5, 6, and 17 - West Process Area	No	no risk	
APEC 7 - Glycol Regeneration, Aerial Coolers and Compression Building	Yes	Unacceptable risk	
APECs 8, 14, and 20 - Utility, Old Compressor and Process Buildings	No	COPCs meet	
APECs 9, 13, and 23 - Former Landfarm, Boneyard, and Septic Tank #4	No	guidelines and/or screening identified	
APEC 10 - Southeast Yard Area	No	no risk	
APECs 11 and 12 - Southwest Yard Area	No		
APECs 15 and 16 - Shipping Pump Building and Septic Tank #3	No		
APECs 18, 19, 20 and 21 – East Process Area - Slop tank, diesel tank, garbage incinerator, meter station, V306 and V16 UST excavation, heater building and dehydrator	No		
APEC 22 - Former Landfill	No	Acceptable risk	
APEC 25 - DWDA	Yes	Unacceptable risk	
APEC 26 – Campsite Stockpile	No	Acceptable risk	

*Tier 2 guidelines with exclusion of FWAL applicable; Bold indicates remediation required APEC=area of potential environmental concern; DWDA=drilling waste disposal area

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Regulatory and Remediation Considerations

Regulatory Engagement

- RAP submitted/approved in 2018
- SSRA submitted to AER in January 2021
- SSRA discussion with AER on April 8, 2021
- AER verbal acceptance of SSRA approach on May 28, 2021 \rightarrow Remediation (Year 2) started on July 6, 2021

Remediation Consideration

- SSRA Update based on Year 2 results
- Remediation Certificate Approval Expected Q4 2022
- Cost Benefit in completing:
 - Additional Phase II ESAs vs. Remediation stage
 - SSRA (not all parameters will be excluded and/or SSROs increased at all sites)
 - Use of subsoil guidelines for treatment objectives and selective backfilling





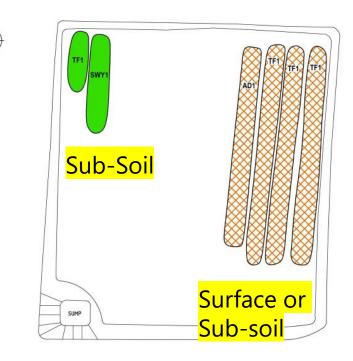


2020 Site Remediation

Cranberry – Treatment Cell (23-Sep-2020)

Treatment Cell at start of 2021

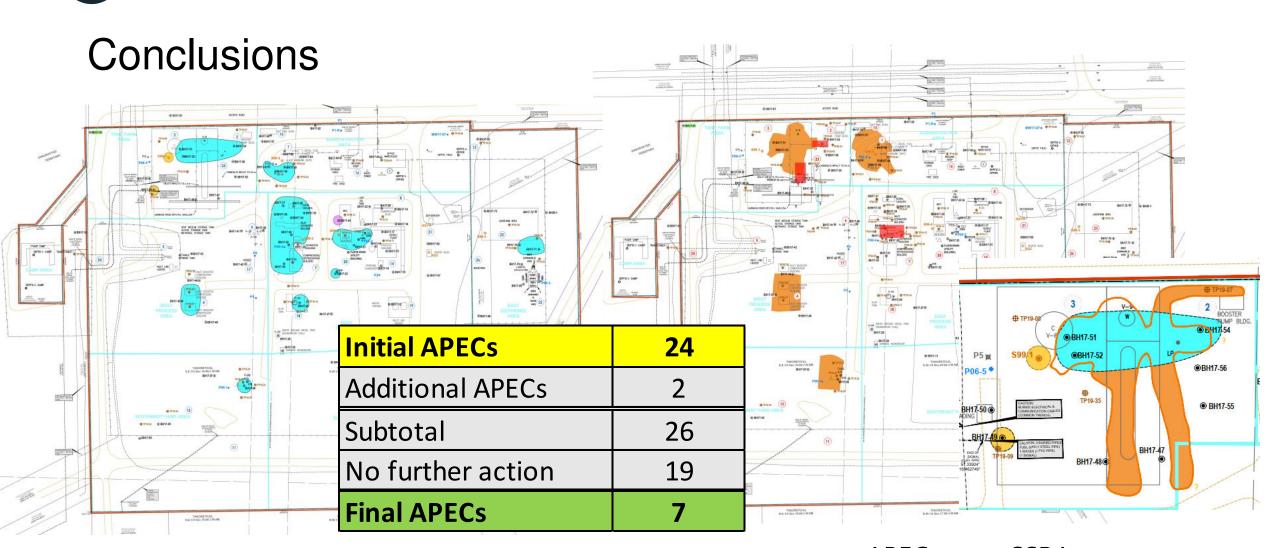




LEGEND MEETS SITE SPECIFIC TIER 2

NAD83 UTM ZONE 11N

2021 Post-Remediation



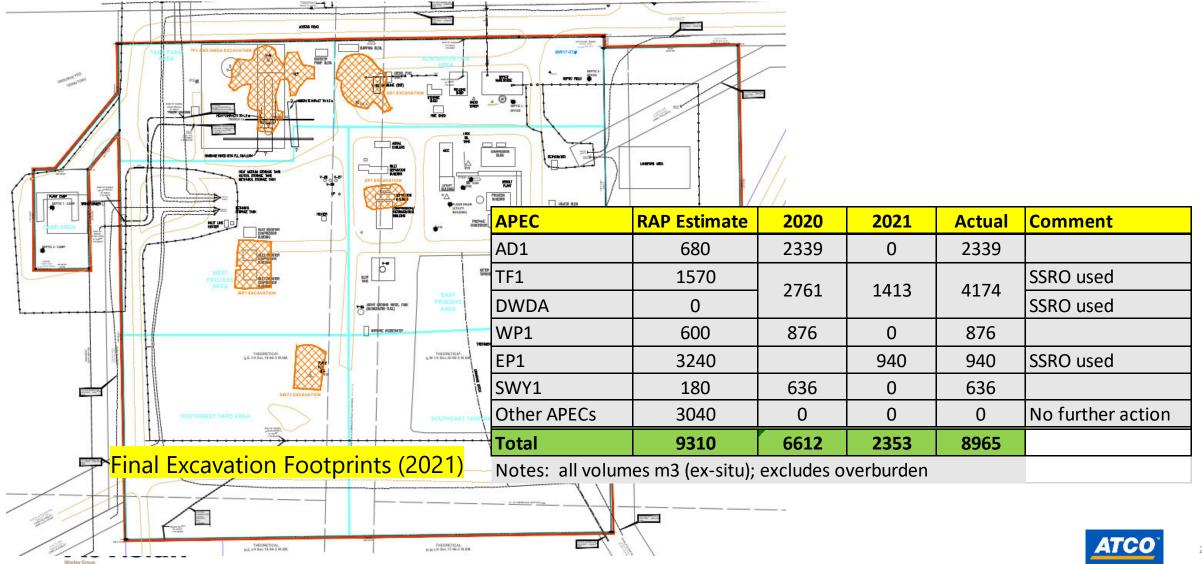
APECs prior to SSRA (excludes DWDA encountered during remediation)

APECs post-SSRA (includes DWDA and 2020 remediations)









Conclusions - 2022 Reclamation

Туре	APECs	Overburden	Disposal	Treatment	Comment
RAP Estimate	24	3340	100	9310	Tier 1 / 2
No further action	19	1300	100	3040	SSRO used
Non-treatable (Landfilled)	n/a	0	227	0	F3, Glycols
Final Volume	7	2864	227	8587	

Notes: all volumes m3 (ex-situ); treatment volume based on minimum 3 aerations

Acknowledgements

- AGAT Laboratories
- Alberta Energy Regulator
- Resolve Earthworks and Environmental







Questions?





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