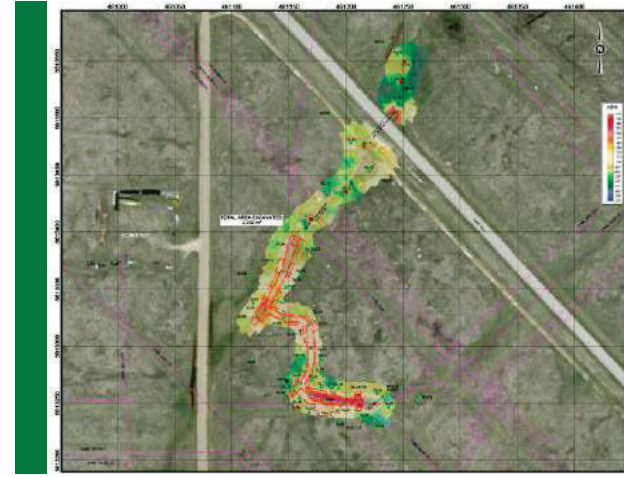


PRODUCED WATER PIPELINE RELEASE INTO A NATIVE PASTURE SETTING (20182985)



Location: 12-01-020-12 W4M – Southern Alberta

Industry: Upstream Oil and Gas

Product Released: Produced Water

Volume Released: 200 m³ (200,000 litres)

Ecosystem Affected:

- * Native prairie
- * Grassland
- * Low-lying riparian area

Media Affected:

- * Organic soil
- * Mineral soils
- * Vegetation

Services Ridgeline Provided

Emergency spill response management and field execution:

- » Hazard identification and safety management
- » Incident command system
- » Initial spill reconnaissance, GIS, and plume dispersion mapping
- » Development of the incident action plan(s): Sampling and Monitoring Plan, Wildlife Protection Plan, and Remediation Action Plan
- » Permitting, regulatory liaison, and stakeholder engagement
- » Access planning and waste tracking
- » Containment and recovery within the heavily impacted areas
- » Contractor management: heavy equipment, haul trucks, line locators, laboratory, and waste disposal facilities
- » Budget forecasting and financial tracking
- » Project communications and regulatory reporting

Environmental project management and field execution:

- » Initial environmental site assessment and delineation
- » Habitat assessment, ecosite classification, and receptor identification
- » Wildlife management and monitoring
- » Geophysical assessment – electromagnetic surveys
- » Vegetation health assessment
- » Delineation drilling program to achieve vertical delineation of subsurface impacts
- » Tier 2A Subsoil Salinity Tool (SST) modelling was completed for the Site using the soil analytical results obtained during the emergency response program and delineation drilling
- » Laboratory analytical interpretation – characterization of source contaminants, waste materials, and background conditions – delineation of contaminant plume – confirmatory samples indicating if the remediation endpoints have been achieved
- » Remediation of surficial impacts via excavation and waste disposal
- » Data management, laboratory QA/QC, GIS mapping and dispersion, modeling, analytical trending, waste tracking, and data visualization
- » SST modelling was conducted to establish site-specific chloride guidelines for depths below 2.0 mbg
- » Backfill, site restoration and revegetation
- » Environmental closure reporting





The exposed breakpoint is evident at the base of the pipeline excavation.



View of vegetation stress to the native pasture observed within the spill path.



Vegetation stress was monitored throughout the spill path. This bare area was observed during vegetation monitoring conducted in 2019.

Incident Details

The incident occurred on September 20, 2018 as a result of internal corrosion of a produced water pipeline. Approximately 200 m³ of produced water were released over an area measuring approximately 3,755 m² in a native pasture setting. The released fluids migrated approximately 283 m along an existing drainage channel through three culverts before terminating in a low-lying area.

The incident was reported to the Alberta Energy Regulator (AER) on September 20, 2018 and assigned incident number 20182985.

Project Objectives

Ridgeline Response was responsible for the Emergency Spill Response, Environmental Management and fieldwork at the site. Throughout the containment and recovery phase of the project, approximately 140 m³ of free fluids were recovered and disposed of at an approved waste management facility. A screening-level ecological risk assessment was conducted to evaluate the site conditions and determine an appropriate remediation action plan. The source characterization analytical results determined the parameters of concern associated with the release were electrical conductivity (EC), sodium adsorption ratio (SAR), and chloride.

The breakpoint was exposed to accommodate the pipeline repair activities. The breakpoint excavation was Y-shaped with the north section measuring approximately 30 m (east-west) by 5 m (north-south) and the south section measuring approximately 20 m (northwest-southeast) by 5 m (southwest-northeast) with a depth of 3.0 m. An expansion measuring 5 m (east-west) by 2 m (north-south) with a depth of 5.0 m was completed at the breakpoint. Soil samples collected from the breakpoint excavation indicated residual EC, SAR and chloride impacts remained in the walls and base. A total of 319.1 tonnes (255 m³) of soil was transported to an approved waste management facility for disposal in 2018. At the direction of AER, and in an effort to minimize the impact on the native pasture vegetation, additional excavation of the release area was not completed at the time.

Ridgeline conducted a vegetation assessment of the release area on September 5, 2019. A bare area was observed extending northwest from the surficial point of release for approximately 150 m. An area of sparse vegetation was observed extending from the bare area north towards the culvert for approximately 80 m.

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In 2020 the remaining surficial impacts were excavated and disposed of at an approved waste management facility during frozen ground condition to minimize damage to the native pasture.



Once the impacted soil was successfully excavated, the impacted area was backfilled and recontoured with a soil with similar physical and chemical properties to those found within the region.



After all the rig mats and temporary roads were dismantled, the impacted areas were harrowed and seeded with an approved seed mix.



Project Objectives (continued)

Ridgeline completed additional delineation soil sampling between December 16, 2019 and January 9, 2020. A total of 41 delineation boreholes and five background boreholes were advanced to a depth ranging from 4.5 mbg to 6.0 mbg. Vertical and lateral delineation of the sodium chloride impacts above 100 milligrams per kilogram (mg/kg) was achieved.

Tier 2A Subsoil Salinity Tool (SST) modelling was completed for the site using the soil analytical results obtained during the emergency response program and delineation drilling. The sections of the release area with observed vegetation stress in 2019 was subdivided into three sub-areas for the SST evaluation. For each sub-area, an excavation and backfill scenario was applied based on the depth of impact, and site-specific chloride guidelines were established under the SST protocol for impacts persisting at depths below 2.0 mbg.

Project Challenges

Taking a minimal disturbance risk-based remediation approach was prudent due to the relatively large surficial impact resulting from the produced water release to the sensitive native prairie ecosystem.

Native pasture in this geographic area takes a very long time to re-establish, therefore it was determined that a Tier 2A SST approach and monitoring of vegetation health was the best way to minimize the extent of the impacted area requiring mechanical excavation. Minimal disturbance measures were also taken to mitigate the damage created by accessing the native pasture with heavy equipment and trucks.

Project Outcome

Throughout the eventual release remediation program conducted in 2020, a total of 5,038.15 tonnes (4,030 m³) of heavily impacted surface soil from the release area excavation were transported to an approved waste management facility. The remaining residual contaminant levels met the site-specific remediation targets developed by means of the Tier 2A SST and approved by the AER.

Following the completion of backfilling, the former excavation was re-contoured to the surrounding topography and seeded with an approved EID reclamation seed mix.

Vegetation monitoring has been completed on the former excavation area and the sections of the release area that were not excavated to ensure there are no adverse effects to the vegetation as a result of the residual impacts.