REMEDIATION SOLUTIONS FOR REMOTE O&G LOCATIONS

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REMOTE SITES ARE COMMON
CHALLENGES CAN BE OVERCOME WITH INNOVATION

REMOTE SITE CHALLENGES

• Infrastructure Limitations (Power)
• High Personnel Mobilization Costs
• High Trucking Costs/Tipping Fees
CASE STUDY #1

DENVER-JULESBURG BASIN - COLORADO

CONDENSATE RELEASE IN THE DENVER-JULESBURG BASIN
CASE STUDY #1
DENVER-JULESBURG BASIN - COLORADO

BENZENE GROUNDWATER PLUME

• Excavation of release area
• Benzene impact 500 feet long by 100 feet wide
• High of 26.4 mg/L –with some detectable LNAPL
• Mix of sand, clays, underline by weathered claystone
CASE STUDY #1
DENVER-JULESBURG BASIN - COLORADO

AIR SPARGE/SOIL VAPOR EXTRACTION (AS/SVE)

- Good fit due to relative large extent and high benzene concentration
- Pilot tested technology due to geology. Recommended if geology is competent or fine-grained
- Good site assessment key to success
CASE STUDY #1
DENVER-JULESBURG BASIN - COLORADO

AS/SVE WELL LAYOUT

• 37 AS wells with 20’ radius of influence (ROI)
• 23 SVE wells with 30’ ROI
CASE STUDY #1
DENVER-JULESBURG BASIN - COLORADO

AS/SVE NATURAL GAS TRAILER

• Hook directly to onsite separator
• 14 trailers in use by DJ Basin producers
• Telemetry capabilities
• 1st trailer on 9th site since 2006 (with engine rebuild)
CASE STUDY #1
DENVER-JULESBURG BASIN - COLORADO

AFTER 1.5 YEARS OF OPERATION

- 95% reduction
- Polished remaining groundwater with carbon injection
CASE STUDY #2

ROCK SPRINGS, WYOMING

HISTORICAL SKIM PIT
ROCK SPRINGS, WYOMING
CASE STUDY #2
ROCK SPRINGS, WYOMING

HISTORICAL SKIM PIT

- 2,500 cubic yards impacted soil
- Total petroleum hydrocarbons (TPH) gasoline and diesel range organics
- 60 feet by 40 feet and up to 30 feet deep
- No power onsite but SVE best fit technology
CASE STUDY #2
ROCK SPRINGS, WYOMING

GEOLOGY AND WELL DESIGN

• 4 SVE wells installed and pilot tested to confirm influence

• Pilot test conducted due to soil heterogeneity. Clay versus sand influence
CASE STUDY #2
ROCK SPRINGS, WYOMING

GEOLOGY AND WELL DESIGN

- 2 additional wells required (6 total)
- Shallow impact and clay to ensure flow throughout impacted material
CASE STUDY #2
ROCK SPRINGS, WYOMING

SOLAR SVE SYSTEM

• 6 kW array (20 panels)
• 5 horsepower regenerative blower – 170 cfm @ 50” wc
• Direct drive from solar to blower via variable frequency drive (VFD)
• Telemetry capabilities
CASE STUDY #2
ROCK SPRINGS, WYOMING

SITE STATUS

• Startup July 2017
• 1.8 tons total volatile petroleum hydrocarbons (TVPH) removed in 3 months
• Anticipate shutdown spring 2018
• Adjustments on monthly basis
• Traditional dig and haul estimate - $200k. Total cost including system $125k
• 6 pits to be remediated
CASE STUDY #3
MORGAN COUNTY, COLORADO
CASE STUDY #3
MORGAN COUNTY, COLORADO

23 PRODUCED WATER SKIM PITS

• 30,000 cubic yards impacted soil
• Total petroleum hydrocarbons and benzene
• Eliminate landfill trip...Dig but no haul?
CASE STUDY #3
MORGAN COUNTY, COLORADO

SOIL SHREDDING

Mechanical system to increase oxidant contact. Dig and treat
CASE STUDY #3
MORGAN COUNTY, COLORADO

BENEFITS

• Cost – Traditional dig and haul $1.5M, soil shredding $1M. 33% cost savings.
• Reduce Landfill Waste
• Reduce Truck Traffic
• No Imported Fill Material
FINAL THOUGHTS AND QUESTIONS?