Remediation

- Removal of contaminants from the soil and groundwater at the site
- Contaminant concentrations compared to regulatory guidelines
- Technologies include in-situ methods (treat contamination without removing soils) and ex-situ methods (excavation and disposal to landfill, treatment onsite)
- Soil and groundwater samples collected after remediation to confirm contaminant concentrations meet regulatory guidelines
Removal of Underground Storage Tank
Legal Oil and Gas 00/11-31-049-26W4/0
Remedial Excavation
Produced Water Impacts
Big Valley Energy 00/02-07-048-20W4/0
Petroleum Hydrocarbon Impacts
Reclamation

- Returning disturbed land to equivalent land use,
- Contouring the land to match surrounding landscape and to restore drainage,
- Topsoil replacement,
- Promote growth of desired vegetation (seeding, natural regeneration, seedling planting),
- Monitoring vegetation growth (weed management, interseeding).
Big Valley Energy 00/03-19-048-20W4/0
Stripping Topsoil
Detailed Site Assessment

- For Alberta upstream oil and gas facilities/wellsites, the reclamation regulatory criteria requires a Detailed Site Assessment (DSA).
- This assesses the landscape, soil profile and vegetation growth at the well or facility site and access road.
- The reclaimed site is compared for similarities in landscape, soil, and vegetation with background locations.
- Once the specified criteria is met and documented, an application can be made for a reclamation certificate for the site.
Reclamation Certificate

• After an upstream oil and gas facility/wellsite has been decommissioned, assessed, remediated, and reclaimed, operators are to apply for a reclamation certificate.

• Landowner declaration of information disclosure required.

• Environmental reports (Phase 1 ESA, Phase 2 ESA, Remediation, DSA) are submitted to AER for review.

• If the specific requirements for assessment, remediation of contaminated land, and reclamation of soil disturbance and vegetation productivity are met, a Reclamation Certificate is issued for the upstream oil and gas facility/wellsite.
Environmental Consulting

What my friends think I do

What Society thinks I do

What Government thinks I do

What my Clients think I do

What I think I do

What I do
## Regulatory changes

<table>
<thead>
<tr>
<th>Year</th>
<th>Regulatory Change</th>
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<tbody>
<tr>
<td>1990</td>
<td>Alberta Tier 1 Criteria for Contaminated Soil Assessment and Remediation released for use as draft</td>
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<tr>
<td>1994</td>
<td>Reclamation criteria developed</td>
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<tr>
<td>1995</td>
<td>1995 update to 1994 reclamation criteria</td>
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<tr>
<td></td>
<td>Alberta Tier 1 Criteria for Contaminated Soil Assessment and Remediation finalized</td>
</tr>
<tr>
<td>1998</td>
<td>Review of 1994 reclamation criteria (not implemented)</td>
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<tr>
<td>2001</td>
<td>Draft pipeline reclamation criteria</td>
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<tr>
<td></td>
<td>Review of 1994 reclamation criteria (not implemented)</td>
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<td>Standardized DSA form</td>
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<td>Mandatory Phase I assessments</td>
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<td></td>
<td>Revised Tier I/II remediation criteria (CCME and SCARG)</td>
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<td></td>
<td>SCARG and Upstream Petroleum Hydrocarbon Guidelines released</td>
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<tr>
<td>2003</td>
<td>Change in reclamation process; dropping of site inquiry and reliance on audit process</td>
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<tr>
<td></td>
<td>Phase II environmental site assessment requirements</td>
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<tr>
<td>2004</td>
<td>Assessment of drilling waste area Information Letter</td>
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<td></td>
<td>Barite remediation guidelines</td>
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<tr>
<td>2005</td>
<td>Assessment of drilling waste area guidance (significant difference to 2004 IL)</td>
</tr>
<tr>
<td>Year</td>
<td>Changes</td>
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| 2007 | Revised Phase I and reclamation certificate application forms  
      | Increased reclamation certificate application fee (from $300 to $700)  
      | Forested reclamation guide  
      | Revised Tier I/II remediation criteria  
      | Revised assessment of drilling waste area  
| 2008 | Change in reclamation process; routine and non-routine applications  
      | Professional sign off requirement  
      | Revised assessment of drilling waste area  
| 2009 | Record of Site Condition reporting  
      | Revised barite remediation guidelines  
      | Remediation certificate development  
| 2010 | 2010 Reclamation Criteria for Wellsites and Associated Facilities  
      | Alberta Tier 1 Soil and Groundwater Remediation Guidelines  
      | Alberta Tier 2 Soil and Groundwater Remediation Guidelines  
      | Subsoil Salinity Tool, first release  
| 2011 | Subsoil Salinity Tool (SST) v. 2.5.2,  
| 2012 | Revised assessment of Drilling Waste Disposal Areas (AER Directive 050 revised) |

35 Regulatory changes since 1990.  
25 Regulatory changes since 2002.
Joffre Oils Ltd.
00/14-35-014-01W5/0

Reclamation Certificate
received July 4, 2011
after 14 Years and $1,302,095.19
Summary

Orphan Well Association Benefits

• Handle clean up of orphan wells and sites which otherwise would be left to Alberta taxpayer.

• Encourage government to be proactive in enforcement and the prevention of orphans.

• Encourage industry to be proactive in conducting well abandonments and site reclamations.
Orphan Well Association:
Dealing with the Legacy of Abandonment and Reclamation

Thank you

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