Priddis 3D seismic survey and development of a training centre

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Objectives

- 3D seismic surveys for shallow targets
- Evaluate Envirovibe for 3D surveys
- Map aquifers
- Field School training in 3D acquisition
- Training centre
- New technologies
Survey location at Rothney Astronomical Observatory
Priddis well driller’s report and well logs

Joe Wong
### 3D seismic survey parameters

<table>
<thead>
<tr>
<th>Shot-line interval:</th>
<th>50 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shot interval:</td>
<td>10 m</td>
</tr>
<tr>
<td>Source:</td>
<td>Envirovibe 17,200 lb</td>
</tr>
<tr>
<td>Sweep:</td>
<td>4 x 10 – 180 Hz over 12 seconds</td>
</tr>
</tbody>
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<table>
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<th>Receiver-line interval:</th>
<th>50 m</th>
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<tbody>
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<td>Receiver interval:</td>
<td>10 m</td>
</tr>
<tr>
<td>Receivers:</td>
<td>Single 10 Hz vertical component</td>
</tr>
<tr>
<td></td>
<td>Single 10 Hz 3C (one receiver line)</td>
</tr>
</tbody>
</table>

| Geometry:               | Orthogonal design |
| Shot-lines:             | East-west |
| Receiver-lines:         | North-south |
3D pre-survey geometry

shot & receiver line interval = 50 m; shot & receiver interval = 10 m
3D pre-survey near-offset distribution
3D pre-survey far-offset distribution
Pre-survey offset distribution quality
Pre-survey azimuth distribution quality
University of Calgary 17,200lb Envirovibe

Sweep: 10-180 Hz over 12 seconds, 4 sweeps per shotpoint
University of Calgary ARAM recording system

600 channels, upgrading to 1800 channels
Recording patch #1

shot & receiver line interval = 50 m; shot & receiver interval = 10 m
Recording patch #3

shot & receiver line interval = 50 m; shot & receiver interval = 10 m
Recording patch #6

shot & receiver line interval = 50 m; shot & receiver interval = 10 m
Post-acquisition fold
Shot gather (30-50-150-180 Hz filter)
Cross-line from the 3D migrated volume
In-line from the 3D migrated volume
Fence diagram from the 3D volume
Geophysical monitoring research & training centre

Research and training in

- 3D surface seismic data surveys
- 3D-3C seismic surveys
- 3D vertical seismic profile surveys
- Cross-well seismic data surveys
- Microseismic surveys and monitoring
- Full logging suites
- Rock mechanics
- Pressure/temperature monitoring
- Groundwater studies
- Environmental geophysics
- Tiltmeters & DGPS
- InSAR imaging and interpretation
Environmental geophysics site (existing)

Proposed geophysical monitoring and hydrology experiential learning and research station

Legend

- Buried geophones (permanent)
- Injector & instrumented observation wells (~500 m deep)
- Shallow borehole tiltmeters, GPS, microgravity and INSAR stations
- Shallow monitoring wells (hydro)
Drivers

• Field training needs in all seismic methods
• Exposure to new monitoring technologies
• Monitoring of subsurface fluid flow
• Measurement, monitoring and verification (MMV) for carbon capture and storage (CCS)
• Public site for new instrument testing
• Public outreach
Industry CCS in Alberta

Letters of intent to Alberta Energy moving to full proposals for $2b funding (November, 2008)

CNRL
ConocoPhillips
Enoch Cree Nation/Teedrum Inc.
Enhance Energy Inc
Hydrogen Energy
Petro-Canada
Shell Canada
Sherritt International
StatoilHydro
Suncor Energy Inc
Syncrude Canada Ltd
Total E&P

ATCO Power
Enbridge
EPCOR
Northwest Upgrading
Opti Canada
Swan Hills Synfuels
TransAlta
TransCanada
Conclusions

- Priddis is a good location for shallow 3D seismic surveys and VSPs
- 3D seismic survey imaged near surface structure & stratigraphy
- The site is being proposed for a comprehensive field research and training centre for 3D seismic methods, VSP, timelapse analysis, monitoring and verification of CO$_2$ injection
Acknowledgements

• Students from the 2007 Geophysics Field School
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• Gedco (Vista software)
Look up at night

Look down during the day