



GLOBAL
CCS
INSTITUTE



WELLBORE INTEGRITY AND CCS

California ARB Webinar on Wellbore Integrity

12 May 2016



The Global CCS Institute

Our Vision for CCS:

CCS is an integral part of a low-carbon future

OUR MISSION

To accelerate the development, demonstration and deployment of CCS globally.

1

Fact-based, influential advice and advocacy

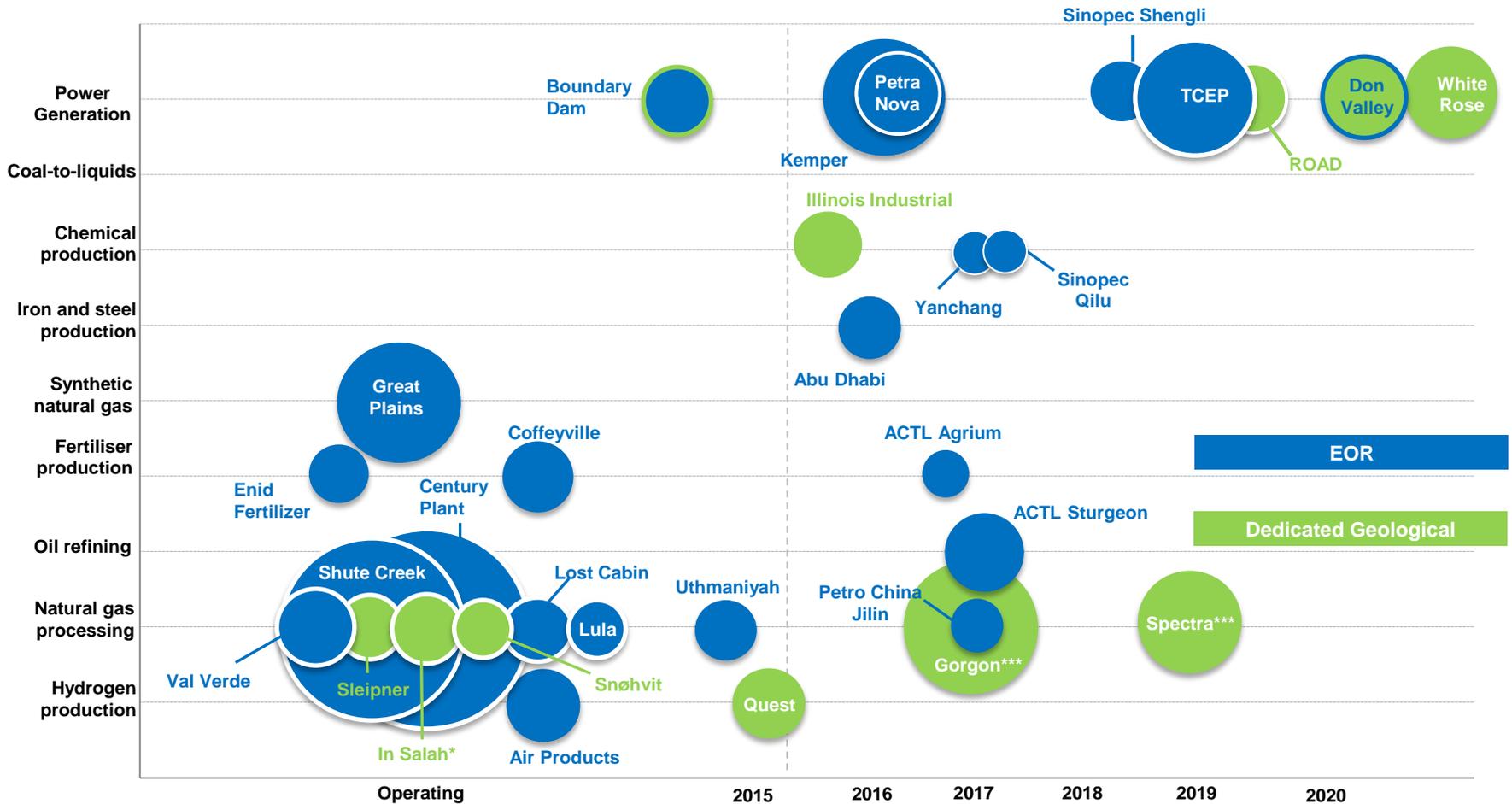
2

Authoritative knowledge sharing

- We are an international membership organisation.
- Offices in Washington DC, Brussels, Beijing and Tokyo. Headquarters in Melbourne.
- Our diverse international membership consists of:
 - governments,
 - global corporations,
 - small companies,
 - research bodies, and
 - non-government organisations.
- Specialist expertise covers the CCS/CCUS chain.



Actual and expected operation dates for projects in operation, construction and advanced planning



○ = 1Mtpa of CO₂ (areas of circle are proportional to capacity)

* Injection currently suspended ** Storage options under evaluation

*** Institute estimate



CRYSTAL GEYSER, UTAH





IEAGHG WELLBORE NETWORK

- Annual meetings from 2005 to 2011
- Reports and presentations online
- www.ieaghg.org, Report 2012/01
- Topic now rolled into risk assessment and other storage networks
- Follow up meeting in 2013 organized by PTRC, www.prc.ca



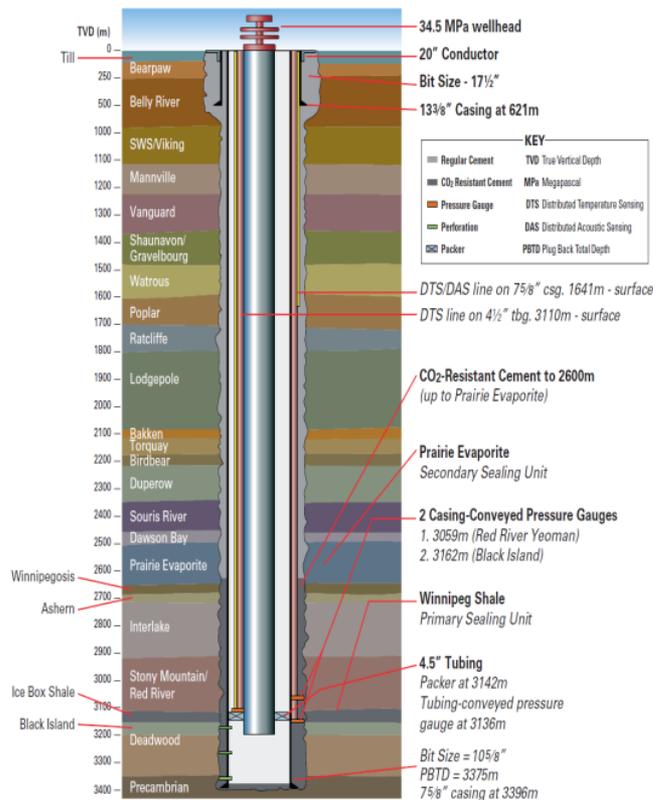
KEY FINDINGS FROM NETWORK

- Potential CO₂ effects on materials
- Discrepancy of lab versus field studies
- Importance of material interfaces
- Knowledge gaps/R&D priorities (2012!)
 - Mechanical properties of degraded materials
 - Standard definitions
 - Field testing/sampling
 - Monitoring strategies

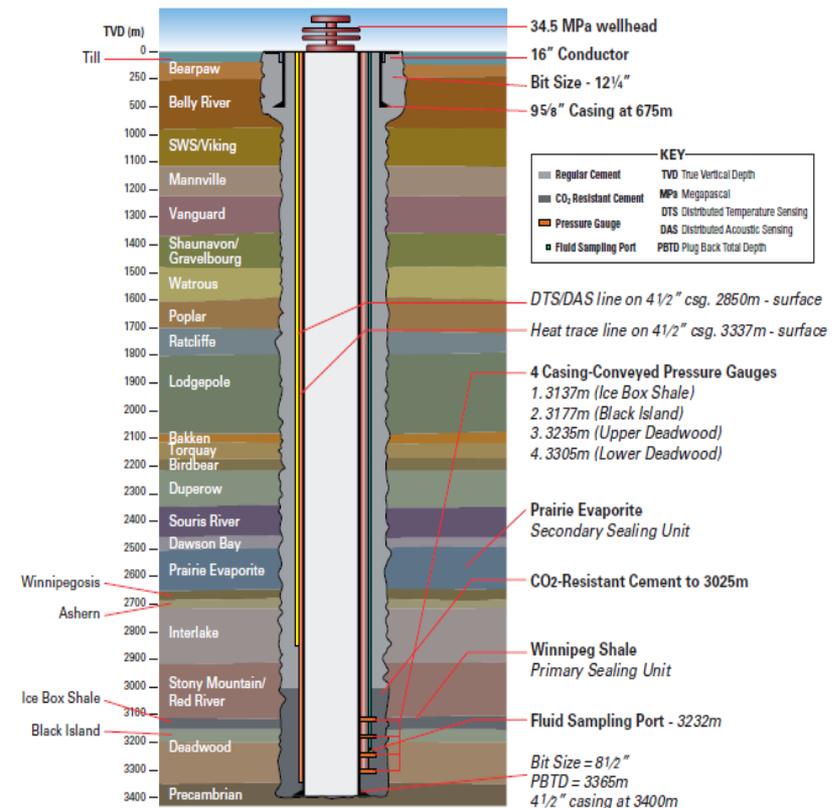
AQUISTORE: DEEPEST WELLS IN SASKATCHEWAN



Injection Well – 3396 m

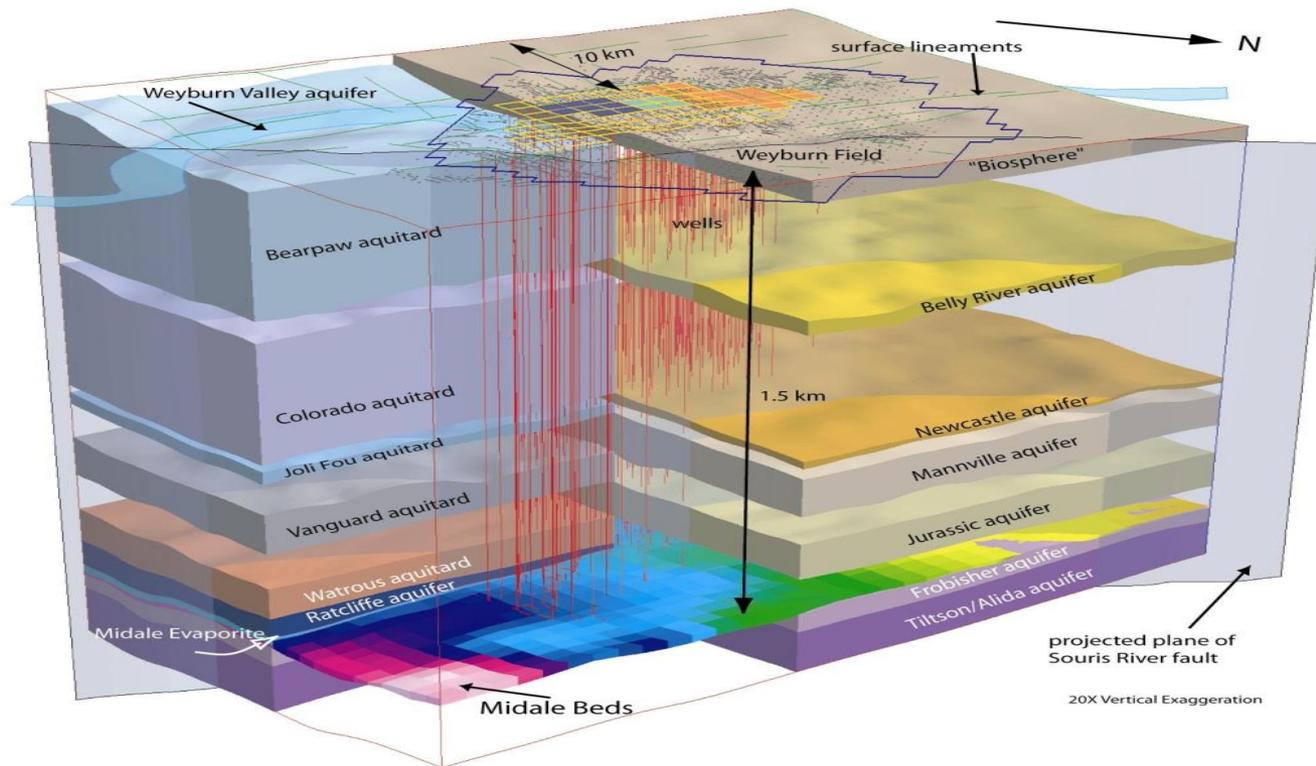


Observation Well – 3400 m





Weyburn site characterization



3D visualization of Weyburn, courtesy of PTRC

False Claims of Weyburn CO₂ Leakage

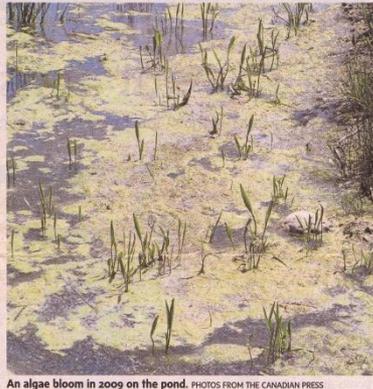
- source of problems according to local consultant...
- 'clearly anthropogenic CO₂ injected into Weyburn reservoir'

- CO₂ concentrations
 - δ¹³C isotopes
- Methane concentrations
- Ethane+ concentrations

- 'oil' sheen on dugout
- bubbles, foam, noises...
- dead animals



A silver blue film forms on water in September, 2009.



An algae bloom in 2009 on the pond. PHOTOS FROM THE CANADIAN PRESS



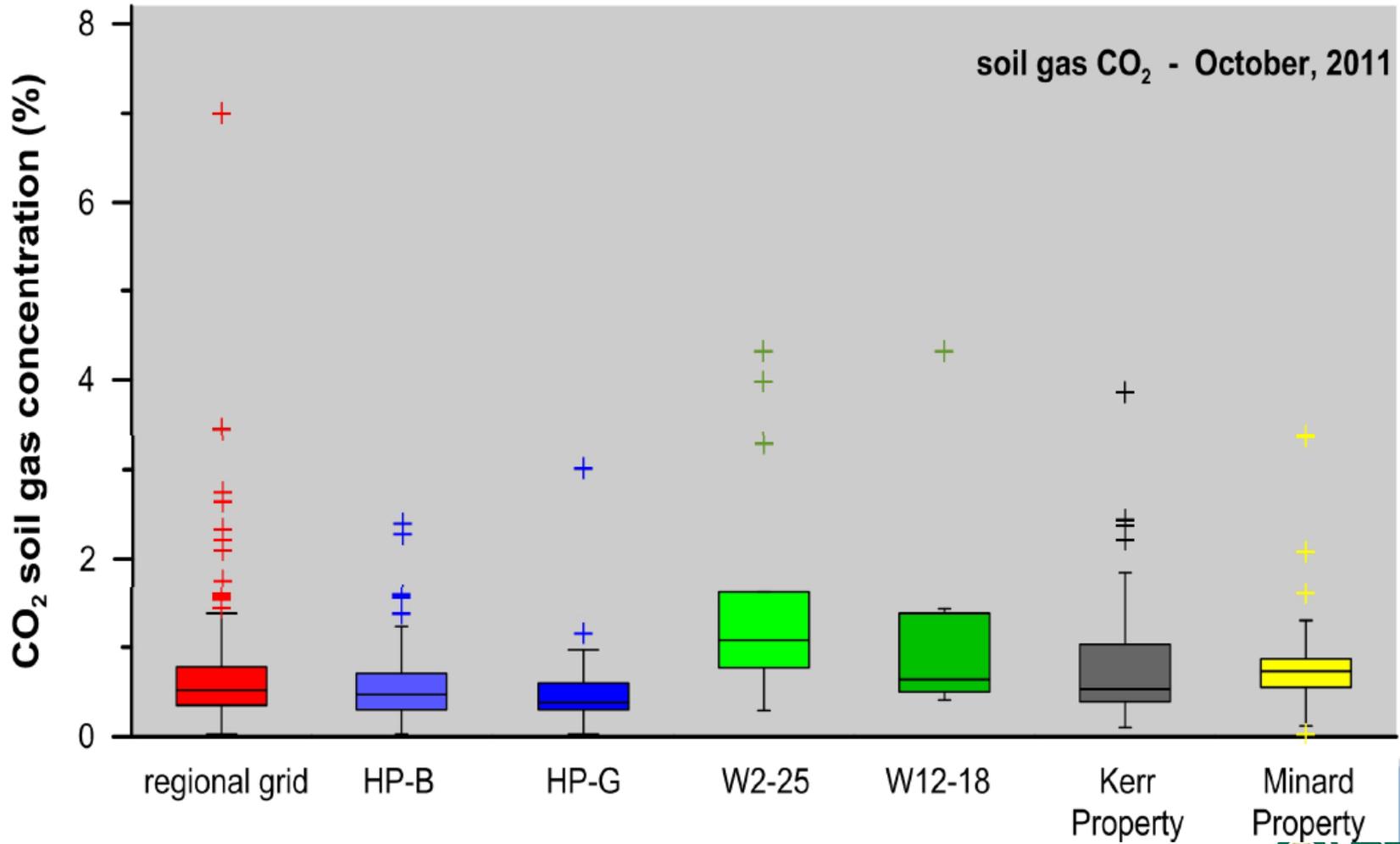
An algae bloom was photographed in April, 2005, on the farm pond.



Several dead birds have been found on the property near Weyburn.

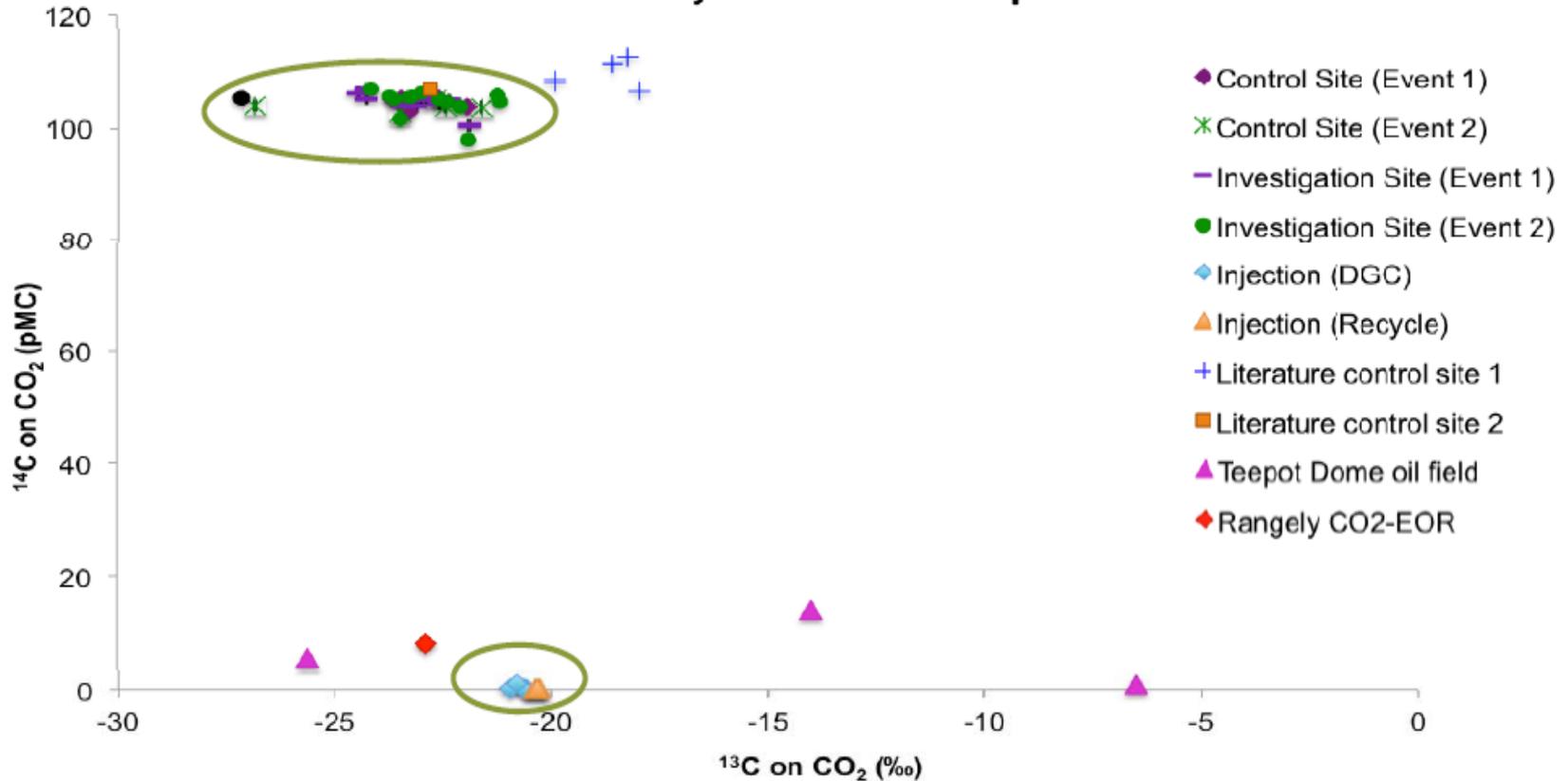
Pictures from Globe and Mail, Jan 12, 2011

Soil Gas Composition



Carbon 14 Isotope Data

Scatter plot of ^{13}C on CO_2 with ^{14}C on CO_2
- Control, Investigation (Event 1 and Event 2)
and Injection Gas samples



Top Slots

Degrees

0 30 60 90 120 150 180 210 240 270 300 330 360

1318

1319

1320

1321

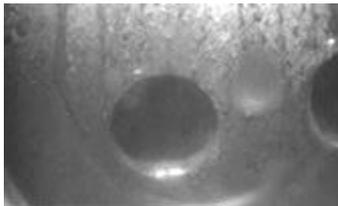
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Depth (m)



Pressure transient test confirms cement effectiveness

● Slot Holes

— WR Plug

Field Testing Program



Well Integrity: Field Testing Program

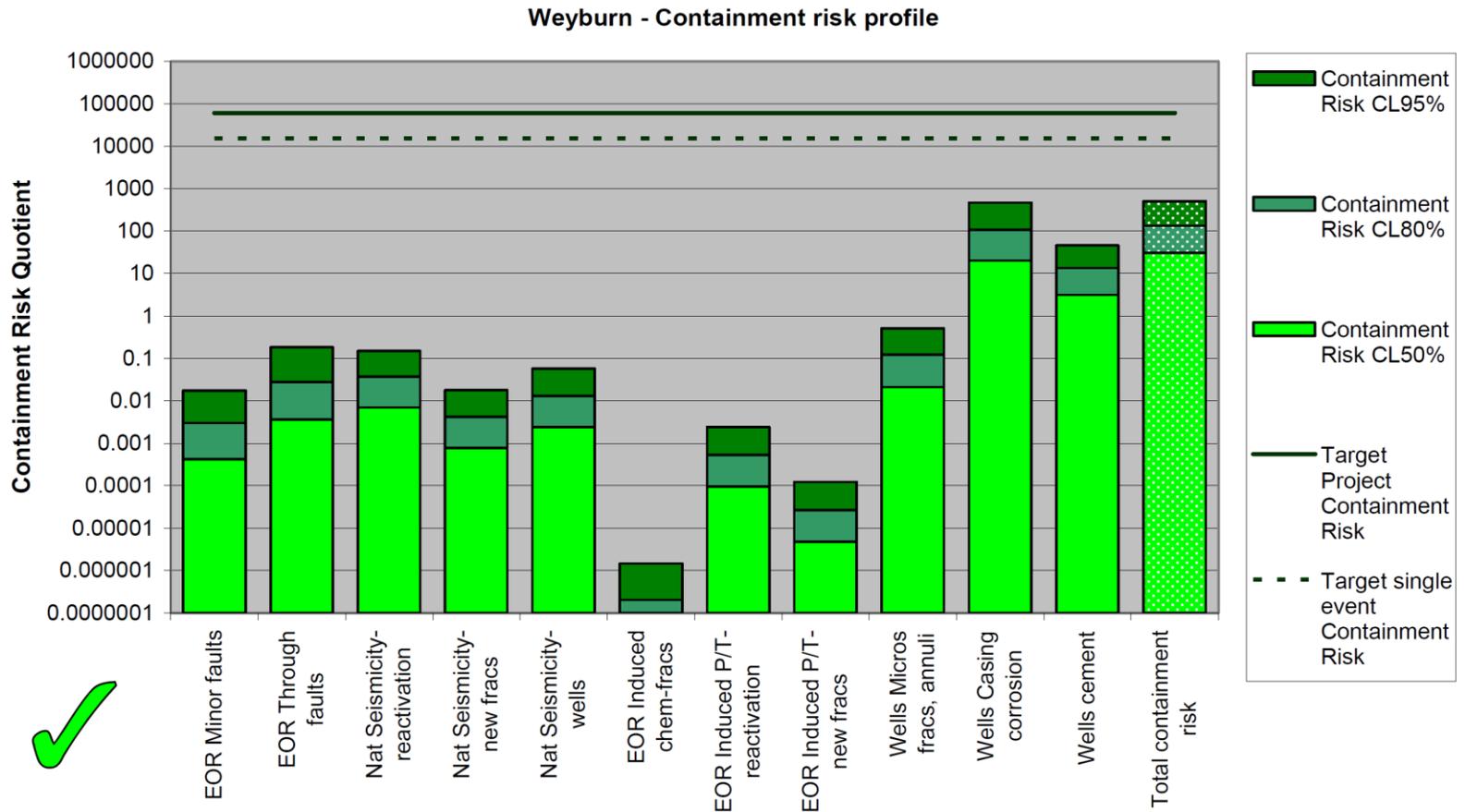
Modified coring tool:
→ **Direct confirmation of cement**



Containment Risk Profile

The storage will retain most of the CO₂ injected

Containment risk assessment



No further work would be required to demonstrate containment acceptability.

SaskCO₂USER: Extension of Weyburn Results Analyses

US DOE sponsored program – forthcoming special issue of IJGGC journal

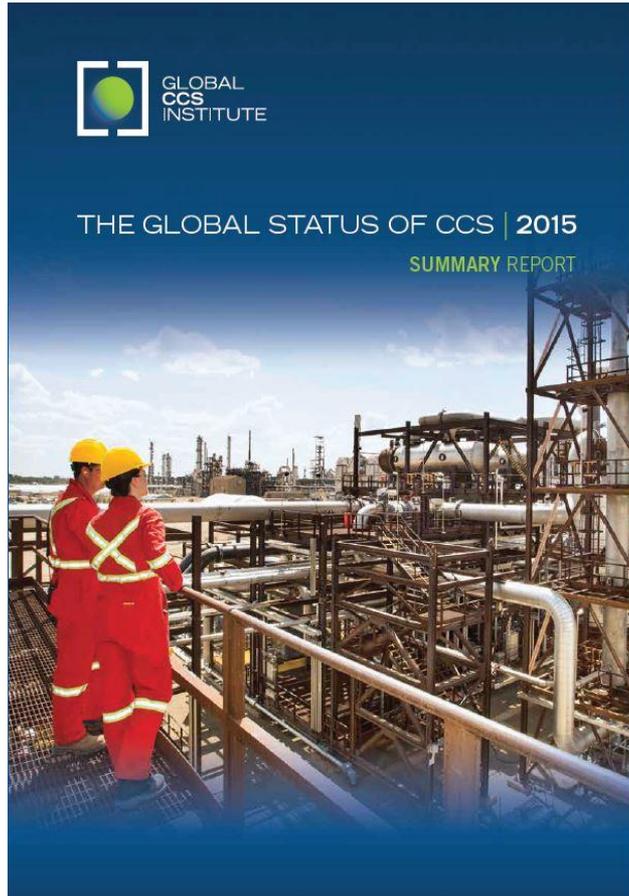


- Minimum dataset requirements
- Overburden monitoring
- Passive seismic monitoring
- History matching
- Wellbore design
- Casing corrosion
- Core assessment





The Global Status of CCS: 2015



The Institute's key publication

Summary Report, Key Findings and other advocacy materials can be found at:

<http://status.globalccsinstitute.com/>

Full report is available online at the Institute's Members Portal.

www.globalccsinstitute.com



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