

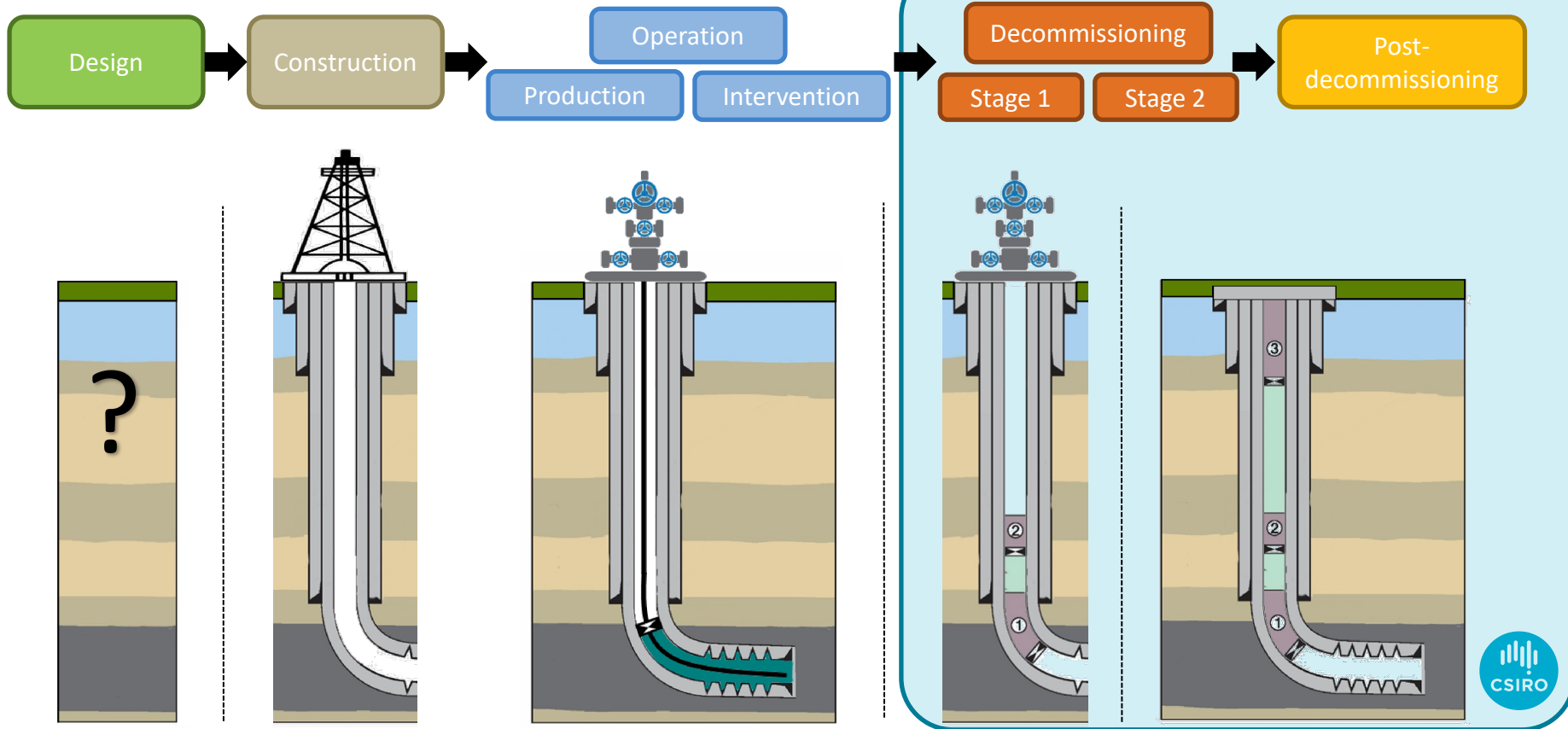


Improved approaches to long-term monitoring of decommissioned onshore gas wells

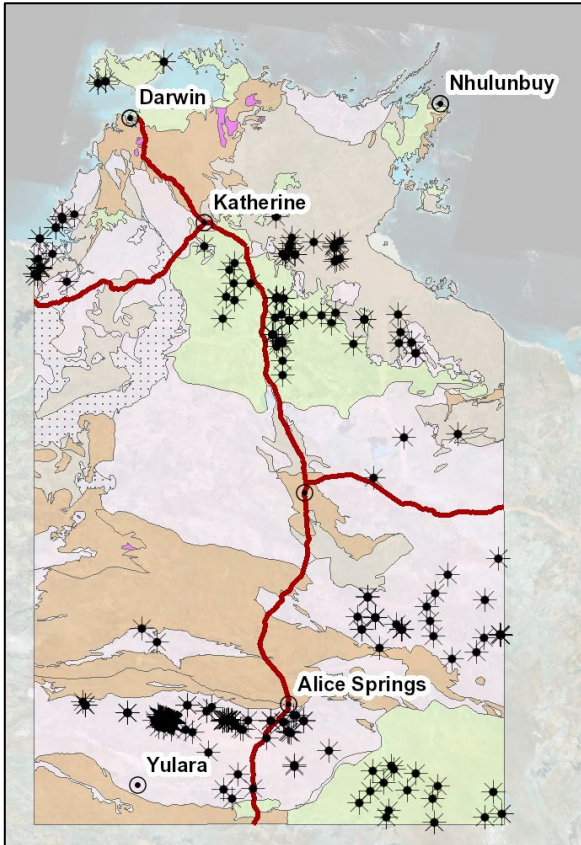
Knowledge Transfer Workshop - Research presentation 3

James Kear, Elaheh Arjomand, Cameron Huddleston-Holmes | 31st August 2021

Well 'life-cycle'



Why look at this in the NT?



The objective of this project is to investigate monitoring options for decommissioned onshore gas wells in the Northern Territory.

The project assessed monitoring techniques against the risks of well integrity failure.

Well decommissioning techniques and technology options that facilitate monitoring were also considered.

- There are about 260 (active and decommissioned) onshore petroleum wells in the NT.
- 162 have been decommissioned.

Why look at this in the NT?

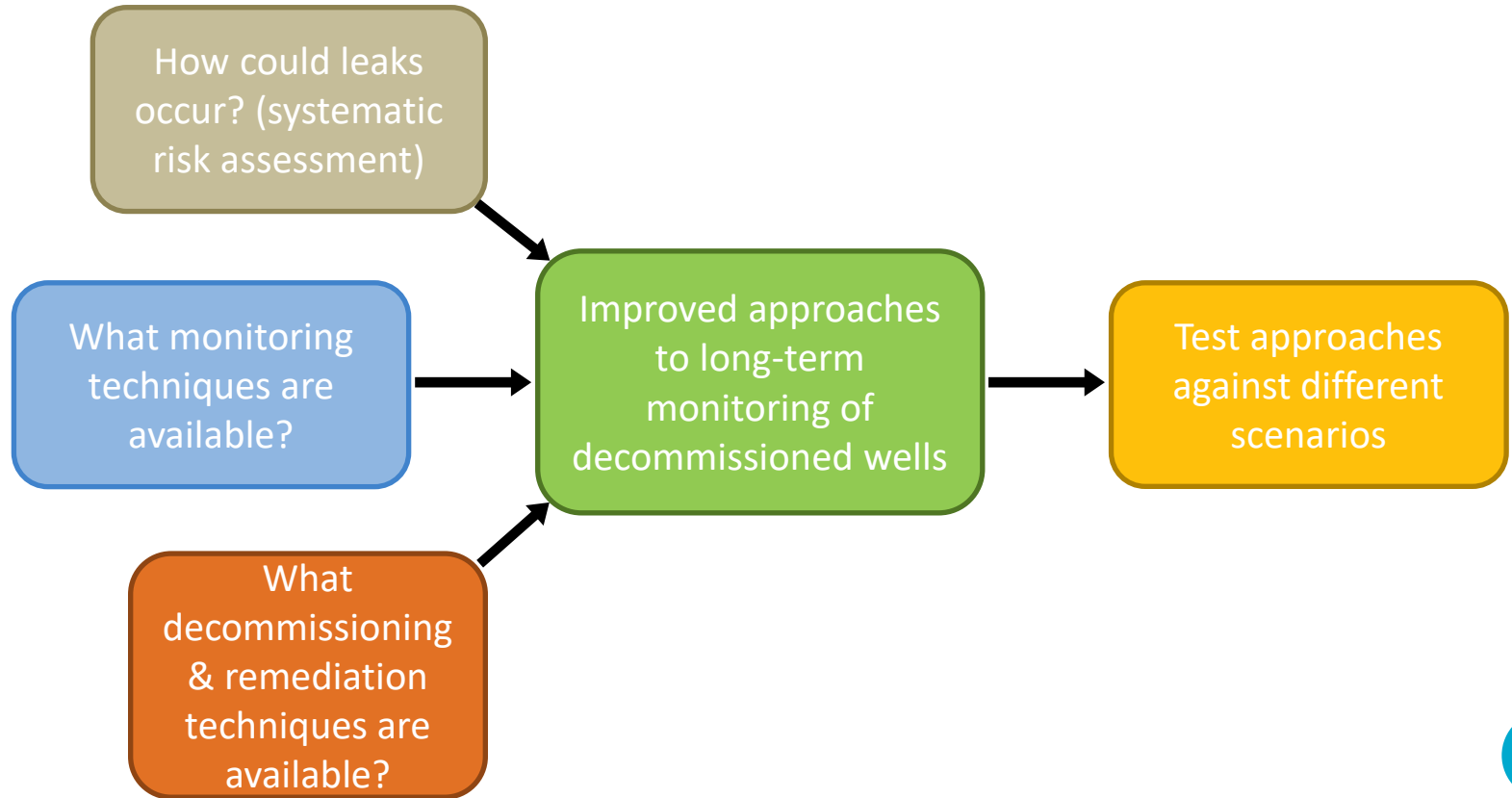
Uncertainty over the well integrity of decommissioned wells was raised by the NT Hydraulic Fracturing Inquiry (Pepper *et al.*, 2018):

Recommendation 5.2

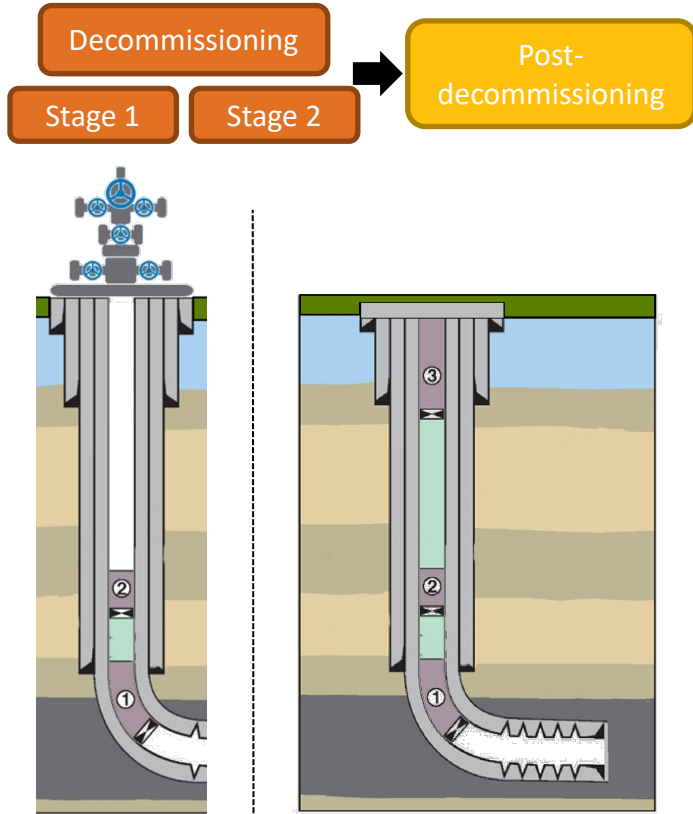
That the Government:

- *implements a mandatory program for **regular monitoring** by gas companies of **decommissioned onshore shale gas wells** (including exploration wells), with the results from the monitoring to be **publicly reported in real-time**. If the performance of a decommissioned well is determined to be acceptable to the regulator then the gas company may apply for relinquishment of the well to the Government,*

How has this project been undertaken?

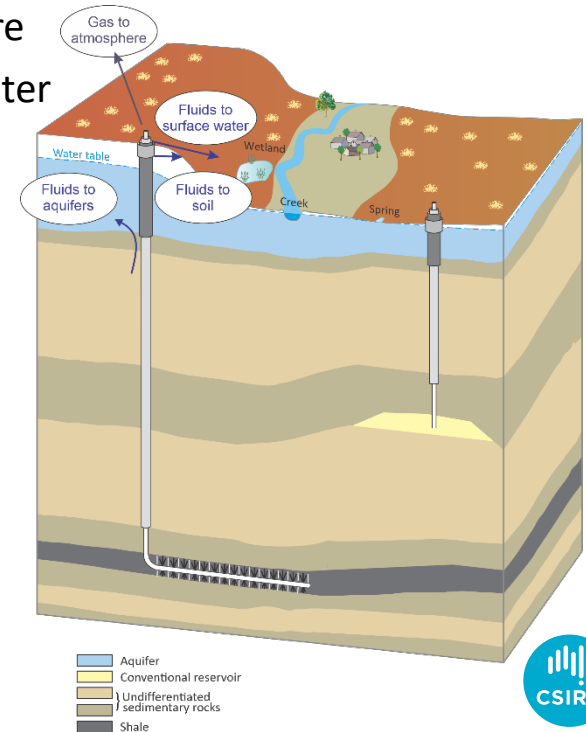


Why monitor decommissioned wells?

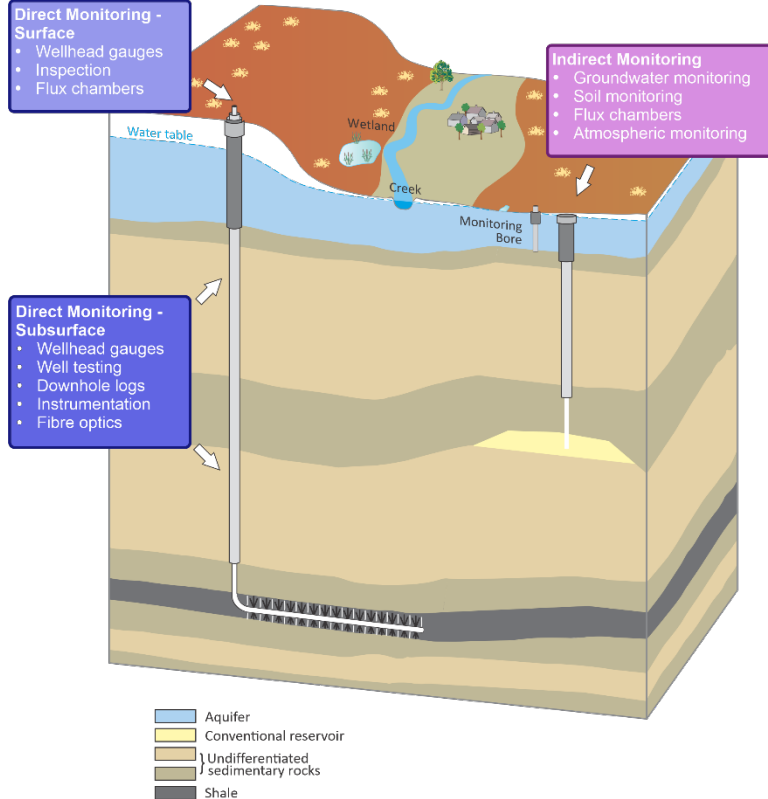


The goal is to prevent release of fluids and gas to the environment:

- Atmosphere
- Surface water
- Soil
- Aquifer



How and where can we monitor?



Direct Monitoring - Surface:

- Wellhead gauges
- Surface equipment inspection
- Surficial scanning
- Static chamber flux measurements

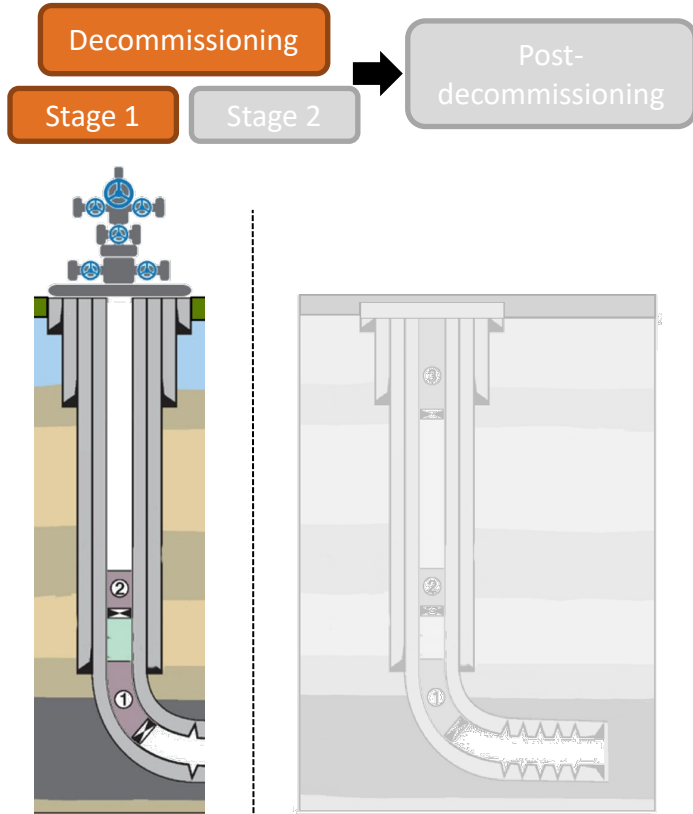
Direct Monitoring – Subsurface:

- Wellhead pressure gauges
- Well testing
- Downhole (wireline) logs
- Real-time Compaction Imager*
- Distributed Acoustic Sensing*
- Distributed Temperature and Strain Sensing*

Indirect monitoring:

- Groundwater monitoring
- Soil monitoring
- Static chamber flux measurements
- Atmospheric monitoring

What can be monitored?



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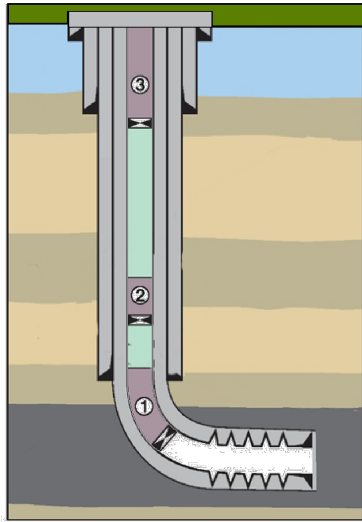
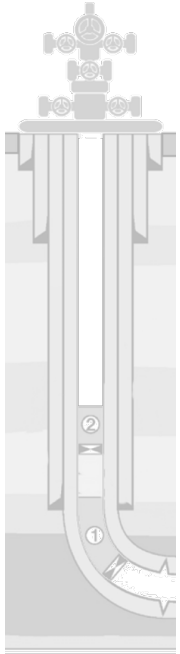
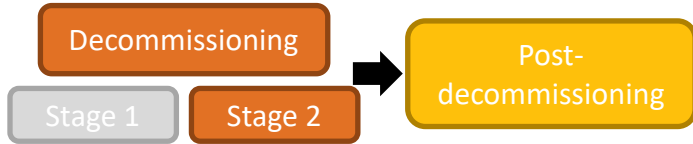
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Indirect monitoring:

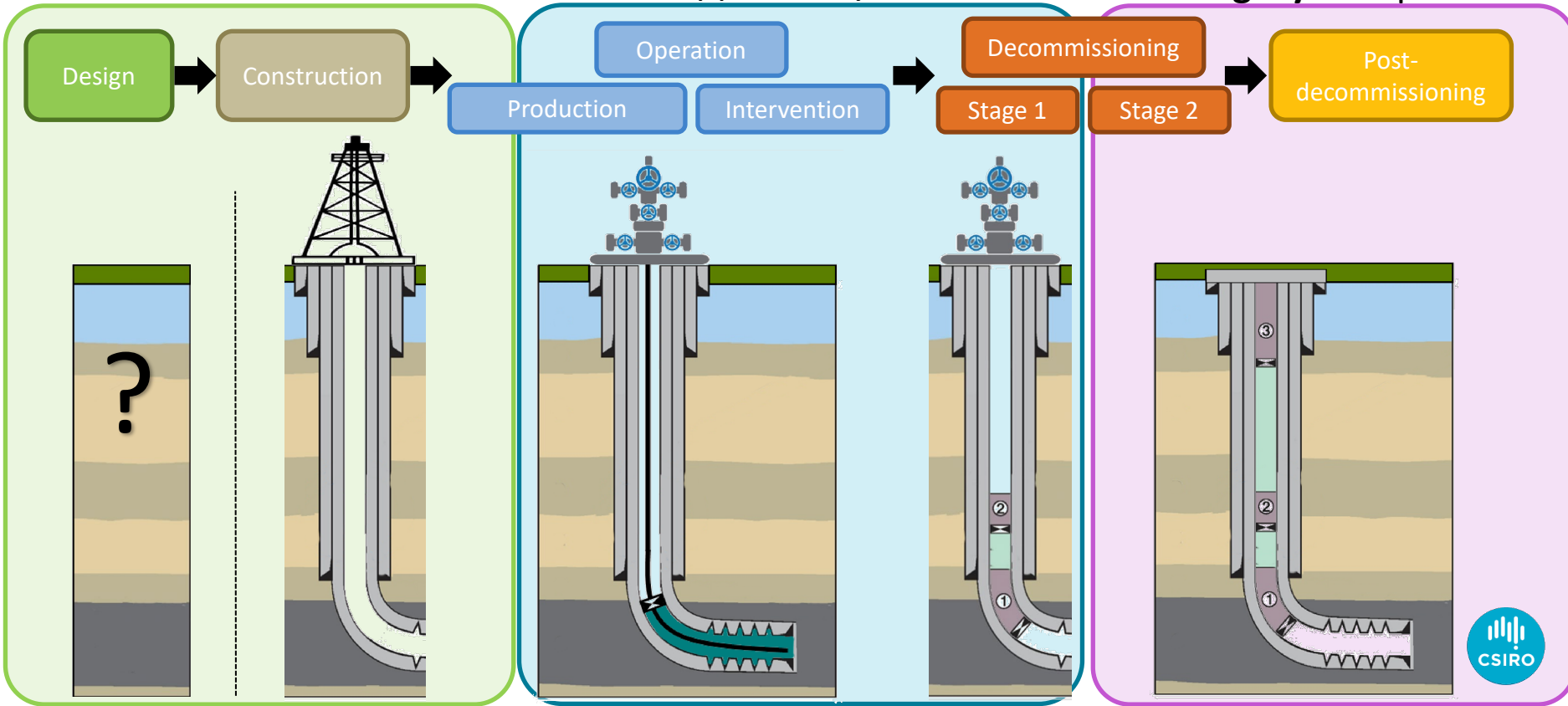
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Where and when to monitor?

Success / failure foundation

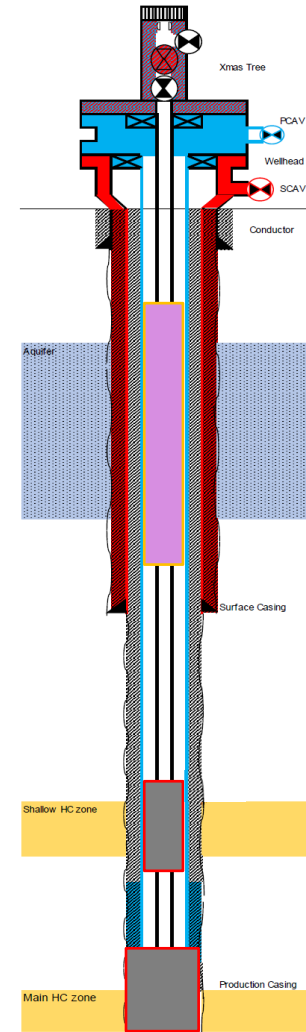
The best opportunity to **monitor**

Where **long-term integrity** is required



Example scenario

- Immediately prior to decommissioning:
 - Sustained casing pressure detected at wellhead indicates potential pathway
 - Well Integrity is categorised as **Orange**
- Remediate *before* setting plugs
- Validate through logging, monitoring of wellhead
- Plug across hydrocarbon bearing zones
- 6 month monitoring period
- Set final plugs, fully decommission



Could new technology used to improve outcomes?

**The goal is to prevent release of fluids
and gas to the environment**

New **monitoring** technologies?

New **well logging tools** (which scan the well from the inside) are of limited use for decommissioned wells.

Permanent installations of monitoring devices in the well prevent remediation of the surface and potentially introduce leak pathways in the well.

New **monitoring technologies** appear to provide a **lower potential** to improve outcomes

New **decommissioning** technologies?

New **remediation technologies** could provide options for well integrity repair prior to decommissioning which improve long-term performance.

New **methods of decommissioning** wells may perform better in preventing leaks in the long-term.

New **decommissioning technologies** appear to provide a **higher potential** to improve outcomes

Recommendation 5.2

Monitoring prior to relinquishment - 3 components

Lifecycle well integrity management

- Key focus of wellfield operations
- Well Operations Management Plans
- Well Integrity Management Systems

Code – 2 stage well decommissioning process

- 1st stage – plugs set, well head maintained
- Mandatory 6 month monitoring period
- 2nd stage – surface plug, wellhead removed
- Monitoring requirements based on risk profile of the well, documented in WOMP
- May need to consider the timing of stage 1/stage 2 pause

Monitoring methods

- Well integrity:
 - Well Barrier Integrity Validation reports
- Wellhead monitoring
 - Instrumentation of the well head to monitor pressures
- Indirect monitoring
 - Groundwater monitoring bores

Thank you

