

FRACTURE GRADIENT AND MAXIMUM INJECTION PRESSURE



Fracture Gradient

Within the project AoR there is no site specific fracture pressure or fracture gradient for the injection zones. However, several wells in the [REDACTED] have formation integrity tests (FIT) performed at similar depth ranges to the project injection and confining zones. Tests from nine wells average 0.76 psi/ft from tests in the depth range of [REDACTED] TVD. CTV will conduct a step rate test in the injection zone as part of the pre-operational testing plan to confirm this fracture pressure gradient.

At this time, no fracture gradient information has been found for the upper confining zone. CTV will conduct a step rate test for the upper confining zone as part of the pre-operational testing. For computational modeling, a frac gradient of 0.76 psi/ft was used.

Maximum Injection Pressure

CTV will ensure that the injection pressure is beneath 90% of the fracture gradient at the top of perforations in the injection wells. CTV expects to operate the wells with a planned bottom hole injection pressure well below the maximum allowable injection pressure calculated using the fracture gradient and safety factor.

Table 1 – Fracture gradient and maximum injection pressure for [REDACTED]

Injection Pressure Details	Injection Well 5 [REDACTED]
Fracture gradient (psi/ft)	0.76
Maximum allowable bottomhole injection pressure (90% of fracture pressure) (psi)	2,993
Elevation corresponding to maximum injection pressure (ft TVD)	4,376
Elevation at the top of the perforated interval (ft TVD)	4,376