FRACTURE GRADIENT AND MAXIMUM INJECTION PRESSURE

[redacted]

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 1** [redacted]
Fracture gradient (psi/ft)	0.76
Maximum allowable bottomhole injection pressure (90% of fracture pressure) (psi)	2,335
Elevation corresponding to maximum injection pressure (ft TVD)	3,414
Elevation at the top of the perforated interval (ft TVD)	3,414