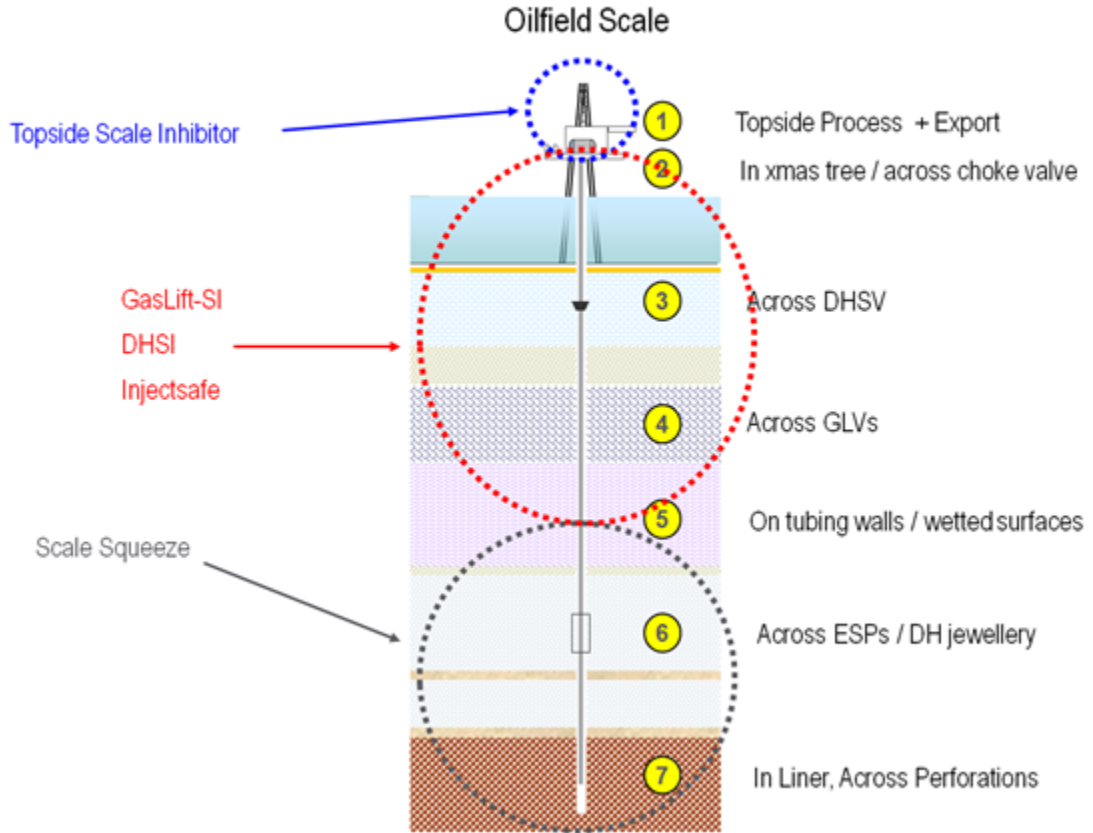


# Scale – Where is it located?



## Scale – What is it?

- $\text{BaSO}_4$  /  $\text{SrSO}_4$
- $\text{CaCO}_3$
- Injectors PWRI
  - Sulphur compounds
  - $\text{CaCO}_3$

- $\text{Fe}_x\text{S}_y$
- $\text{CaCO}_3$
- $\text{SrSO}_4$

### $\text{CaCO}_3$ Scale

- Temperature ↓
- Pressure ↓
  - Moving up well
  - Increase in water cut
  - Interaction oil, gas and water

### Sulphate Scale

- Mixing of Sea Water ( $\text{SO}_4^{2-}$ ) with Formation Water ( $\text{Ba}^{2+}$ )
- Temperature ( $T = 80^\circ\text{C}$ , BHT)
- Pressure ( $P = 3000$  psi, BHP)

# Downhole Mitigation Measures

## Gas Lift Application

- SI deployed downhole from surface pump
- Injected via 'C' annulus to upper Gas Lift Valve
- Trickles down 6 o'clock position of wetted surfaces to annular sump

## Downhole Chemical Injection Line

- SI deployment downhole via 3/8" line from surface pump
- SI injected via Chemical Injection Valve located below the GLV

## Scale Squeeze Treatments

- Treatment is bullheaded into the formation at highest possible injection rate
- Injection water mixture: Produced water + seawater
- 3- stages: Pre-flush, Main treatment and Over-flush
  - Chemical mixture: injection water, scale inhibitor, oxygen scavenger
- 6 hours soaking period following the over-flush

