AoR Delineation

2.3.1 Critical Pressure Calculations

Thornhill et al. (1982) defined the AoR as "the area around an injection well where, during injection, the [hydraulic] head of the formation fluid in the injection zone is equal to or greater than the hydraulic head of USDWs." In relation to the USDWs, the pressure increase threshold in the injection reservoir(ΔP_{if}) can be determined by:

$$\Delta P_{if} = P_u + \rho_i * g * (z_u - z_i) - P_i$$

where P_u is the initial fluid pressure in the USDW, ρ_i is the injection zone fluid density, g is the acceleration due to gravity, z_u is the representative elevation of the USDW, z_i is the representative elevation of the injection zone, and P_i is the initial pressure in the injection zone. Using the aforementioned equation and the input parameters in Table 2-1, the pressure increase threshold is calculated to be 110 psi. It is worth noting that the main assumption for this equation is the injection borehole is perforated only within the injection zone and the USDW.

Input Parameters	**Units**	**Value**
Initial fluid pressure in the USDW (P_u)	psi	433
Injection zone fluid density (p_i)	lb/ft^3	66
acceleration due to gravity (g)	ft/s^2	32
USDW depth (z_u)	ft	1,000
Injection zone depth (z_i)	ft	4,054.7
Initial pressure in the injection zone (P_i)	psi	1,885

Table 2-1: Input data used for critical pressure calculation.

2.3.2 AoR Delineation

Based on the threshold above, the AoR has been defined as the boundary of reservoir pressure buildup that is larger than 110 psi at the end of 12 years of injection. This has been selected due to the fact that there is more than one well injecting at the same time, thus it would be challenging to differentiate a single well pressure front and/or AoR. The total pressure front from which this AoR is derived is the result of the base case DRM and is used to help guide the corrective action for this site.