

4.4 Water Flooding and Groundwater Extraction

Pump-and-treat.

Will only move free product with continuous phase (high contamination).

Upconing will result from pumping (reduce overlying pressure)

Maximize recovery using low pumping rates (reduces viscous/interface effects).

Field Implementation

Connectional wells, trenches, horizontal wells.

Install at base of DNAPL pool → maximize recovery using "stratigraphic depressions".

Water recovery wells nested above DNAPL wells.

Pump water recovery wells continuously. Resume DNAPL recovery when DNAPL detected in water wells.

Control DNAPL pumping to prevent "pinch-off".

Level of Demonstration

East Stroudsburg.

Coal Tar pool 3-10' deep
35,000 gal pumped

Laramie, WY

Water-flood in 5000 gal pore space
cell recovered 1600 gal wood treating
wastes.

∴ most applicable for high NAPL conc.

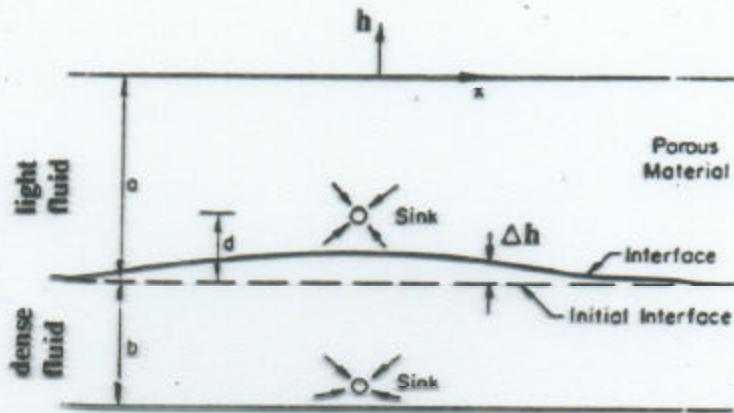


Figure 3.5.4.1 Schematic illustrating the upcoming phenomena of a dense fluid phase to pumping stress in the overlying fluid phase [Wisniewski et al., 1985].

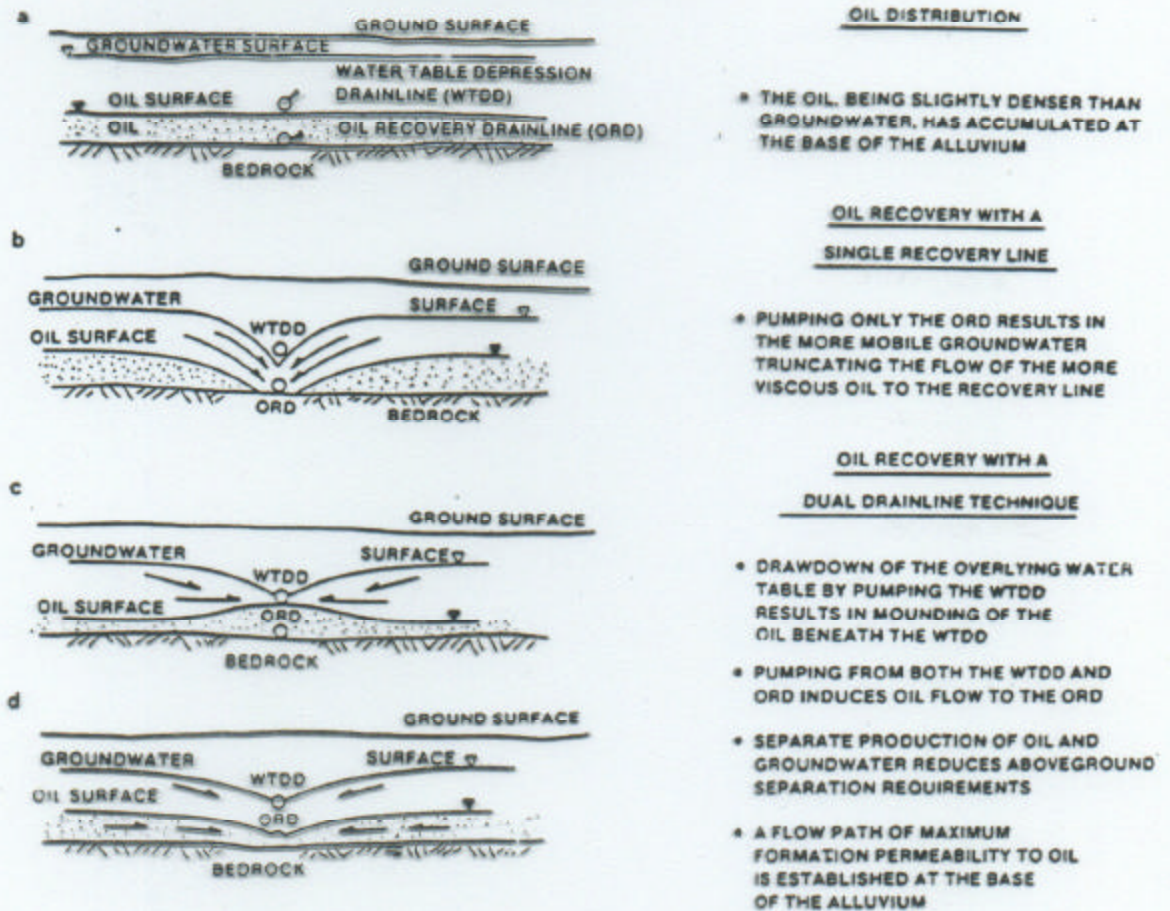


Figure 3.5.4.2 Schematic of dual drain line system for pumping of both light and dense fluid phase to enhance the recovery of the underlying, denser phase [Sale et al., 1988].

Applicability

Recovery from DNAPL pools - as initial treatment

- need secondary recovery to remove low residual conc. (5-20wt%)

Applied to low Specific Gravity DNAPLs (~ 1.15)

Simultaneous pumping of water and DNAPL may reduce potential ex situ processing \rightarrow volumes considerable
 \rightarrow water reinjected.

Cost and Availability

Coal tar recovery \$1000/month

Coal tar (17,500 BTU) sold as fuel supplement.