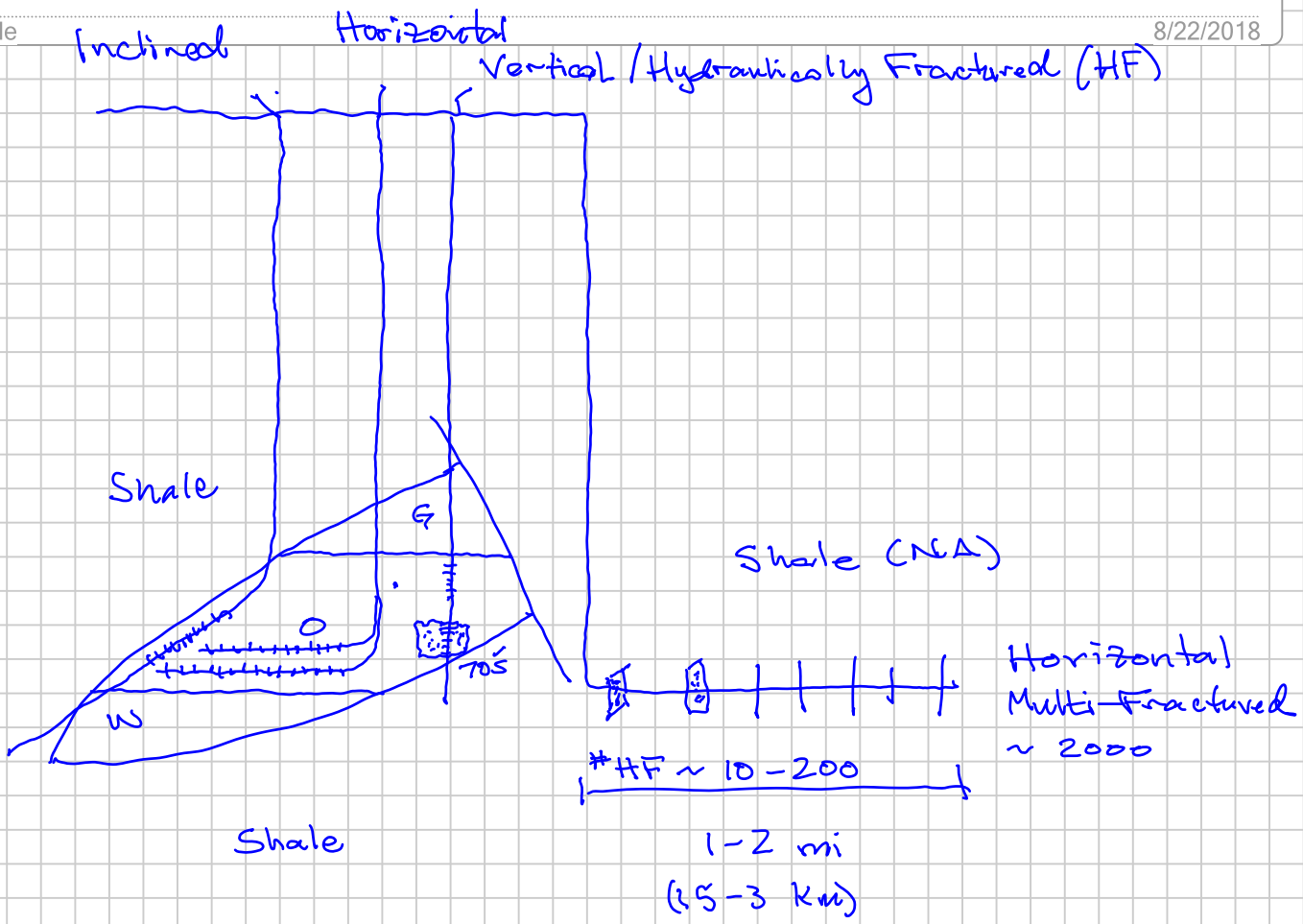
Note Title 8/22/2018

Well Types



RECOVERY

- Recovery of Surface Products

STO	SO	$\bar{o}$
	SG	$\bar{g}$

Categories of Recovery Processes (RO)

- SO
- EOR (2)
- IOR

EOR: Enhanced Oil Recovery

- Inject a Fluid into the Reservoir (1)
  - W + G
    - Water (saline)
    - Gas (HC | CO_2 | N_2 : Flue Gas)
    - Chemicals added to the above

Natural "Depletion"
- No Injection

IOR: Improved Oil Recovery

- EOR
- Well Type & Well Completion
  (Depletion and/or EOR)

Impact of Barriers to Vertical Flow on

① Depletion
② EOR

} & IOR (Well Type)

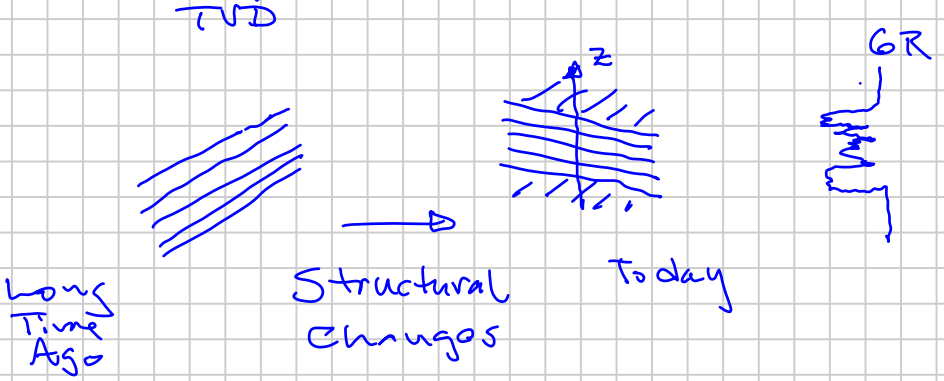
Reservoir rock is made up of sequential, stacked "history".

k_z k_v (z)

TVdepth
TVD

wellbore

k_{xy} : controlling flow R → WB

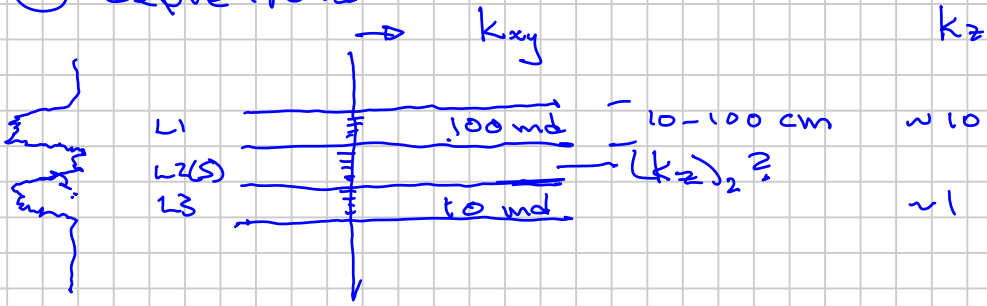


k_v : Defining "Effective" RFUs

- Depletion
- EOR (Injecting Fluid Gas/or W)

$$\frac{k_z}{k_{xy}} \sim 1 \rightarrow \underbrace{0.1 \rightarrow < 0.01}$$

① Depletion:



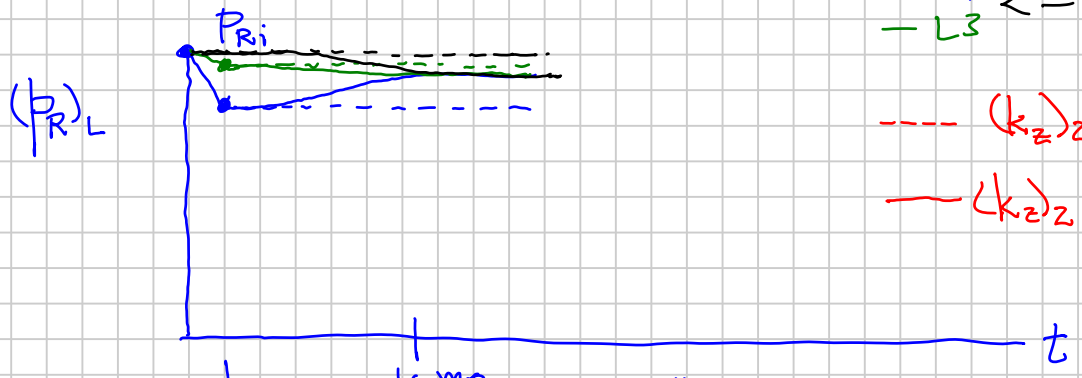
$$(k_z)_2 \sim 10^{-x} \text{ md}$$

Typical Shale
$10 \sim 10{,}000$ md

$10^{-5} - 10^{-2}$ md

Time 0:

$$q_L \propto (k_{xy})_L$$



— L1 < — L2
— L3

---- $(k_z)_2 \cong 0$

—— $(k_z)_2$ "sufficient"

"small"

$$q_z = \frac{k_z}{\mu L} \Delta p \cdot A_\perp$$

L: thickness of shale

$A_\perp$: huge

$$k_z \sim 10^{-3} - 10^{-4} \text{ md}$$

(2) EOR

$p_R \sim$ constant

Driving force of IW / IGR $\quad \underbrace{\Delta \rho_{ow} g}_{\Delta \phi} \quad \underbrace{\Delta \rho_{og} g}_{\Delta \phi}$

$$q_z = \frac{k_z A_s}{\mu L} \Delta \phi_r$$

"small"

$q_z / q_w \sim 0$ small even for $(k_z)_{LZ}$ "large" md

more "RFU_{EOR}" than "RFU_D"