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## Extended Shut-in/'Soaking' – Will it help the Lagging Duvernay in Willesden Green?

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Kaybob Duvernay has always lead the way in development and production, and the oil-rich East Shale Basin Duvernay taking off in the last two years, it has left the Willesden Green area in the dust. In 2018, producing well counts in the East Shale Basin (90 wells) surpassed Willesden Green (66 wells) (GLJ, 2018).

So why has the Willesden Green area been lagging behind? Well, likely a combination of things, when compared to Kaybob or the East Shale Basin:

- Total thickness is lower
- Middle Carbonate appears higher in the section
- Slightly lower TOC on average
- Snowbird Tectonic Zone has affected the maturity contours
- Higher clay content
- Lower IPs

So, what would give the Willesden Green area the boost it needs?

Enhanced recovery methods are fast becoming the new 'norm' in unconventional. With steep decline rates, operators are keen to find ways of squeezing every last drop. One of those ways is called 'soaking' or 'marinating' the wells – after an extended shut-in period, numerous operators across North America have observed improved well performance. Some key observations that have been made on wells that have been shut-in and 'soaked' include:

1. Poor load recovery (~20%)
2. High salinity on flowback (increases with time)
3. No halite observed in fresh core (XRD or SEM)
4. Sub-irreducible water saturation ( $S_w \ll S_{wir}$ )
5. Salt crystallization on fresh core with moisture exposure

To start assessing the viability of 'soaking' we have to look at concepts like sub-irreducible water saturations, abundance of clay, types of clays and degree of clay desiccation.

In the West Shale Basin Duvernay, water saturations are extremely low (sub-irreducible) and is one of the most desiccated reservoirs that Core Labs has looked at globally. The driving mechanism for behind the 'soaking' method and why it works is imbibition. For imbibition to occur in these unconventional reservoirs you need desiccated clays, of which, Willesden Green has plenty (av. VClay = ~20-25%). These clays act like a sponge soaking up the completion fluids and wicking it away from the well bore, hence the very low load recoveries and minimal water production.

This presentation will look closer at the controls, mechanisms and potential benefits of 'soaking' wells and present a few case history examples with respect to the Willesden Green area.

#### **References**

Lemke, Chad, 2018. Early Observations from the East Shale Basin: Looking for the Edge. CSUR- Advanced Technology & Core Workshop Session II – The Three Sub-Plays of the Duvernay, November 2018.