Marcus LD 11-374HN - Request to Extend TD

The following information is provided in support of Great Western's request to extend the TD of the Marcus LD 11-374HN wellbore.

Well Information:
- The 11-374HN well is a 2 section well targeting the Niobrara B formation.
- The well has been spud and surface casing is set at +/-1700' which covers the Fox Hills as well as the Upper Pierre formation.
- This well will be mono-bore wells with the following general design:
  - 13-1/2" surface hole drilled to +/-1700' (done)
  - 9-5/8" surface casing run and cemented to surface (done)
  - 7-7/8" production hole drilled to TD (pending)
  - 5-1/2" production casing run and cemented to surface (pending)
    - The casing point is currently planned and permitted to be 470' FSL of Section 11 (see attachment).
    - The presence of the 5-1/2" cement equipment and shoe track places the deepest frac stage approximately 100' from the TD of the wellbore or approximately 580' FSL of Section 11.

Reason to extend TD:
- While developing/completing nearby acreage Great Western has recently experienced significant difficulty pumping frac jobs to design.
- The main problem is the observed high treating pressures make it difficult to establish sufficient injection rates to pump the full frac stage with the optimal volume of proppant. In the worst cases this results in a screen-out and requires a coiled tubing clean-out or extensive flowback operations before injection can be re-established.
- Difficulty frac'ing in this area typically is encountered along the entire length of the wellbore.
- Great Western is planning to perform a Diagnostic Fracture Injection Test (DFIT) on each of the Marcus wells which will provide us with reservoir properties that will hopefully shed some light on why we experience the high frac pressures in this area.
- In order to successfully perform a DFIT we will want to perforate our injection holes > 200 ft back from the end of the borehole. This allows us to perform the DFIT far away from the toe of the lateral so we avoid the risk that the complex formation stresses routinely observed in this part of the lateral would affect our DFIT analysis and results.
- However doing this would eliminate 2 or 3 frac stages resulting in a significant and unacceptable amount of unrecovered reserves in each of these wells.
- The preferred way to carry out the DFIT is to extend the TD of the wellbore 200' – 300' beyond the 460' set-back line and then place the DFIT holes and first frac stage immediately inside the 460' set-back line.
- This would place the DFIT perforations in an interval of the wellbore that has historically been free of the problems associated with fracing near the TD of the well, yet will provide us with valuable information about the reservoir as a whole without giving up reserves.

Proposed Solution:
In order to eliminate the problems associated with the DFIT placed near the toe of the wellbore Great Western requests the following:
- The production hole TD will be extended from the current location of 470' FSL of Section 11 to a position that is +/-170' FSL of Section 11 (see attachment).
- The production casing will be cemented in place as is currently being done.
- When the production casing is run the Frac Initiation Sleeve will be positioned so that when the casing shoe is at TD, the Frac Initiation Sleeve is no closer than 470' FSL of Section 11.
  - This will ensure that all contact with the reservoir occurs inside the 460' set-back boundary.

- A permanent bridge plug will be set above the Frac Initiation Sleeve.
- The DFIT holes as well as the first perf cluster and the first frac will be located above the permanent bridge plug providing further guarantee that all production comes from inside the 460 set-back boundary.

As the drawing shows, our solution will essentially create the same set of circumstances at the TD of the wellbore that we already have at the landing point of the well – essentially we will have a section of cemented and non-productive casing positioned outside the 460' set-back boundary.