

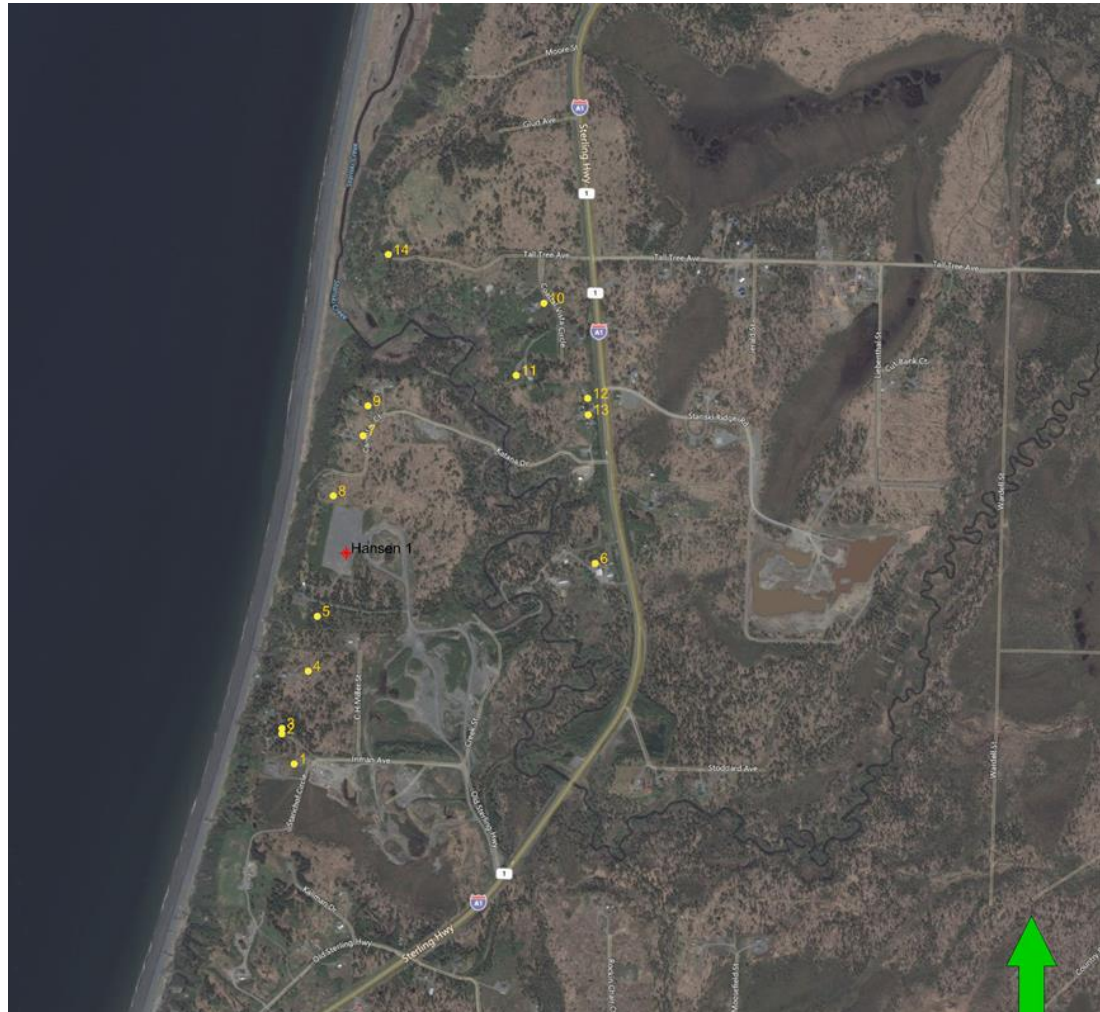


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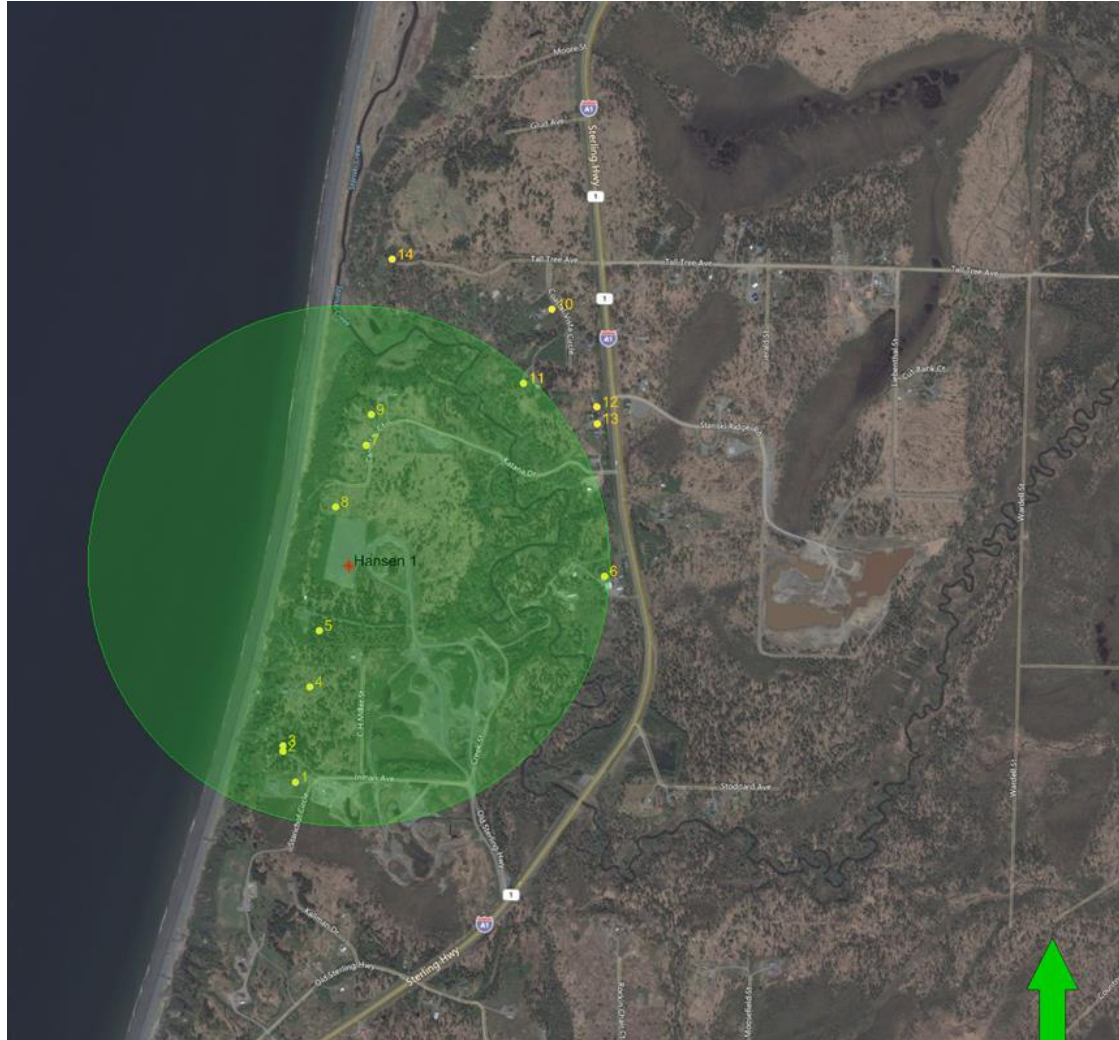
Wellbore Stimulation Overview

5/10/2016

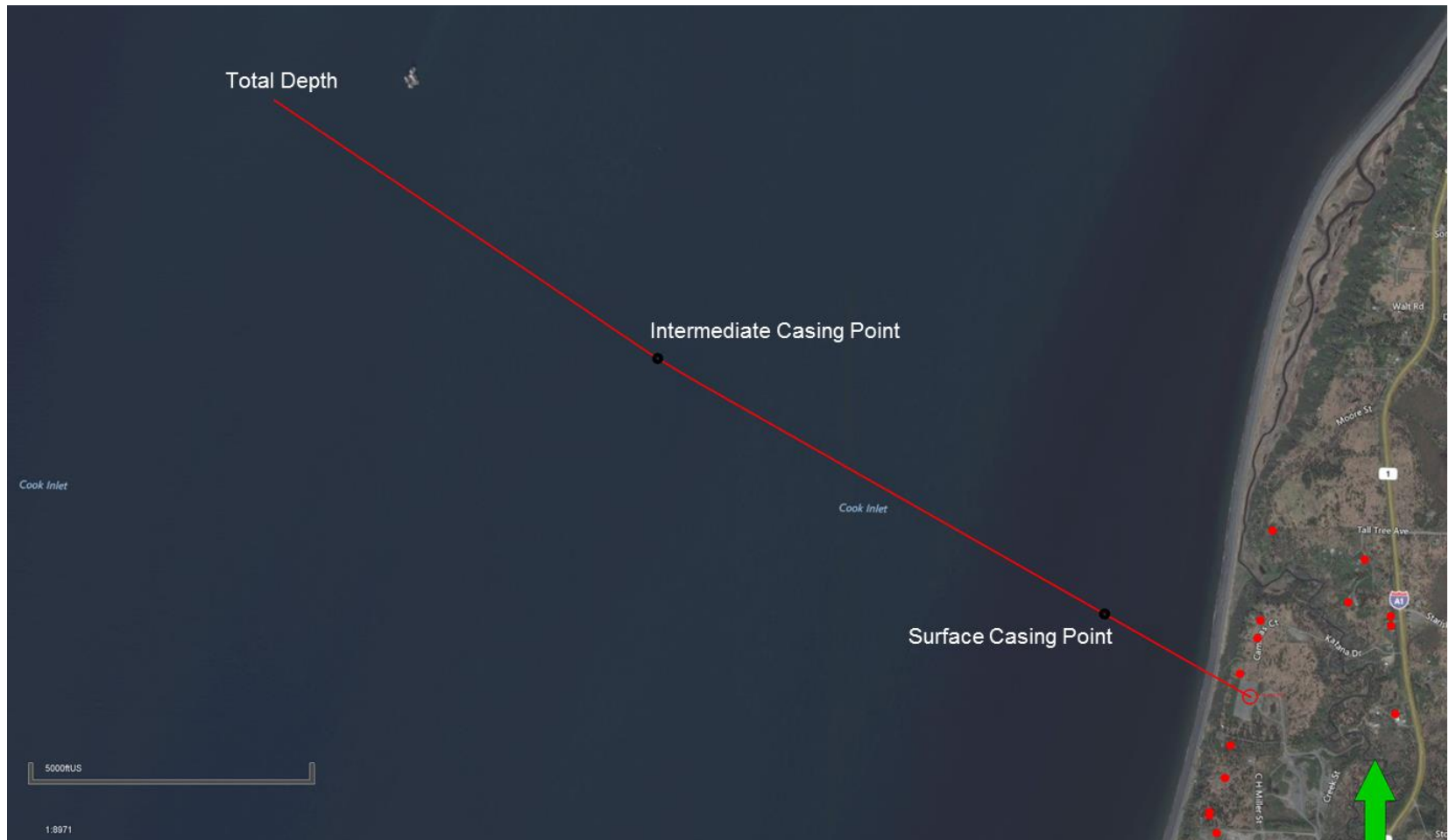
Hansen Pad & Surrounding Water Wells



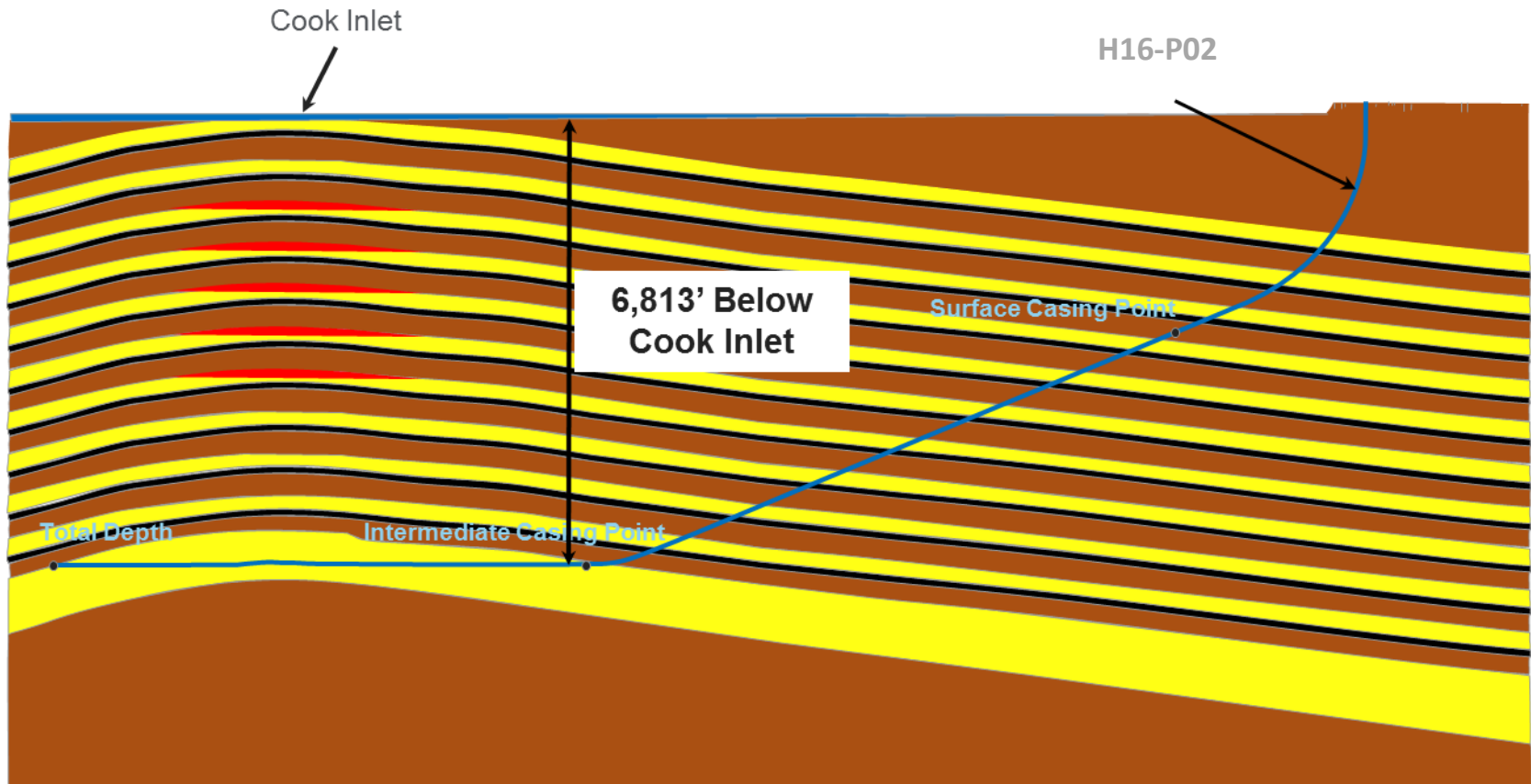
½ Mile Radius – H16-P02



H16-P02 Well Plan



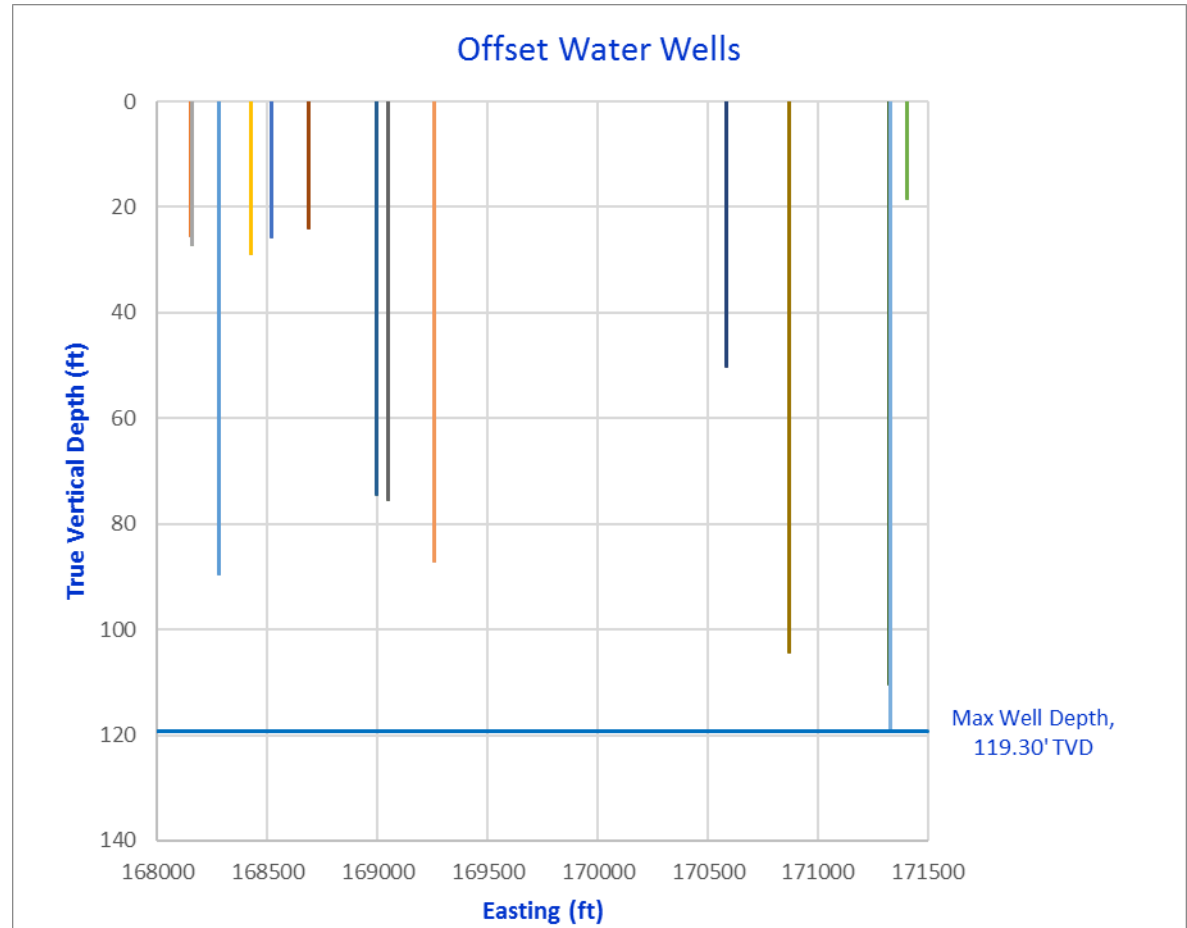
H16-P02 Well Plan



Casing Point Overview

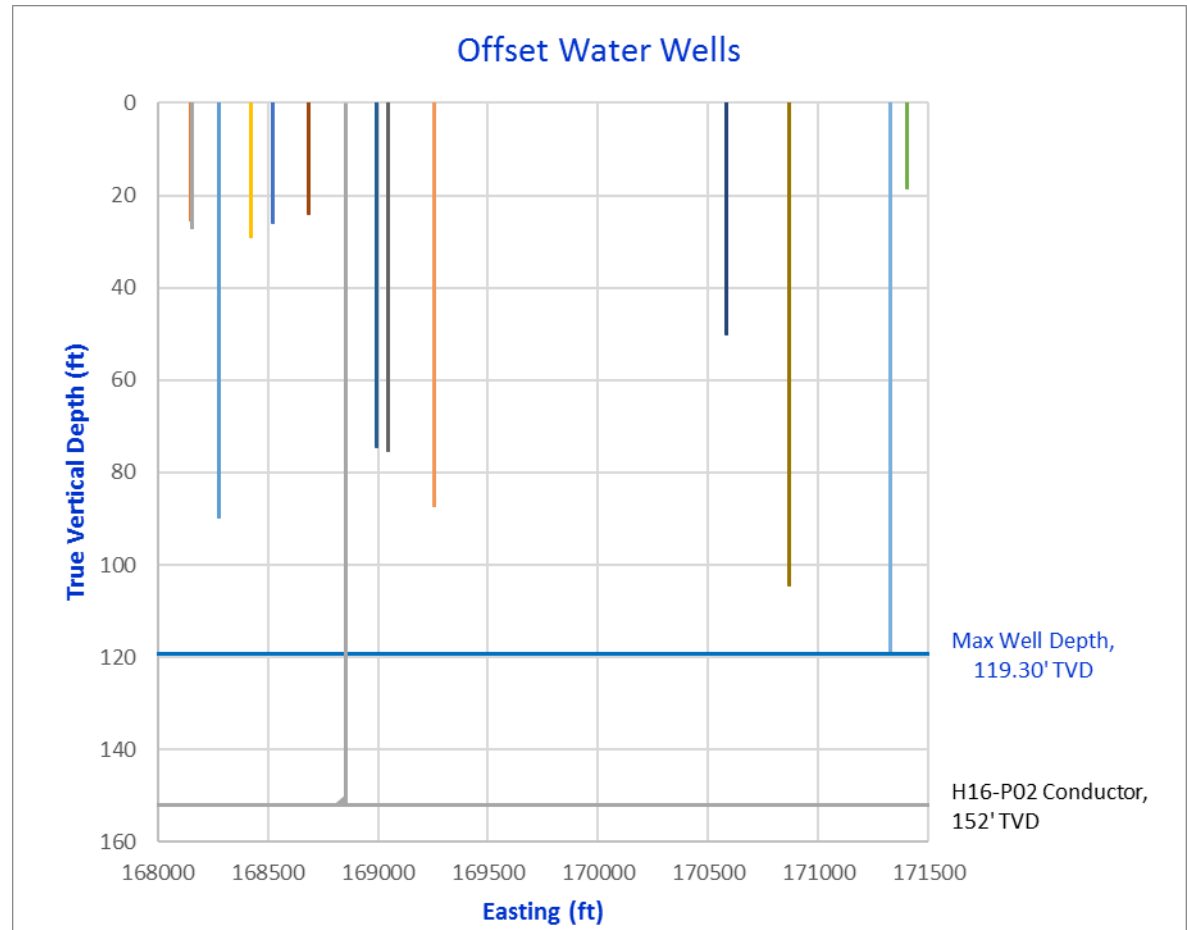


- ▶ 14 Offset Water Wells
- ▶ Deepest Well in the vicinity is 119.3' TVD



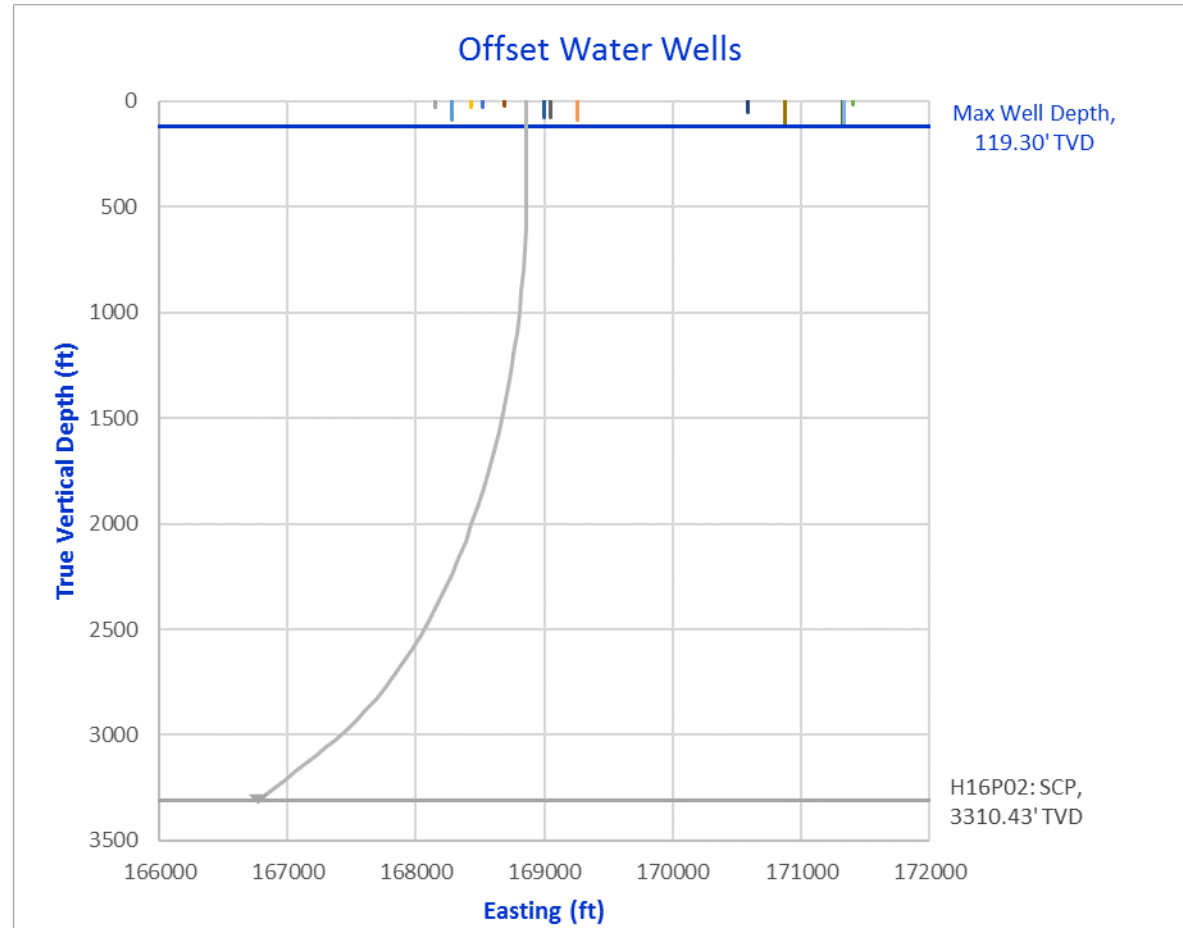
Casing Point Overview

- ▶ 20" Conductor Set to 152' TVD
- ▶ Below all water well depths
- ▶ Rotary Drilled/Driven
- ▶ Provides greater seal capability over auguring and cementing

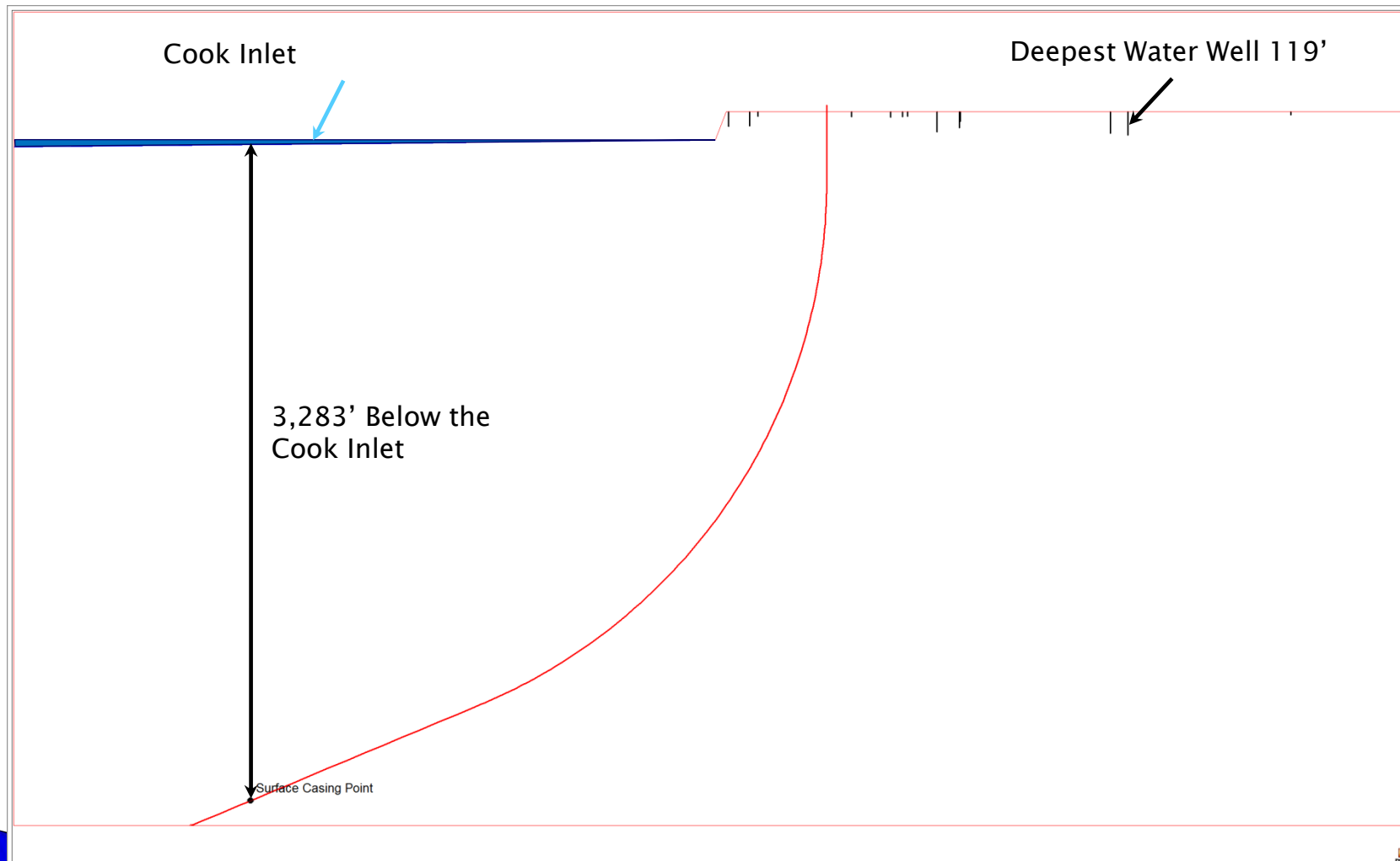


Surface Casing Point Overview

- ▶ Surface Casing drilled to 3310' TVD
- ▶ Cementing to Surface

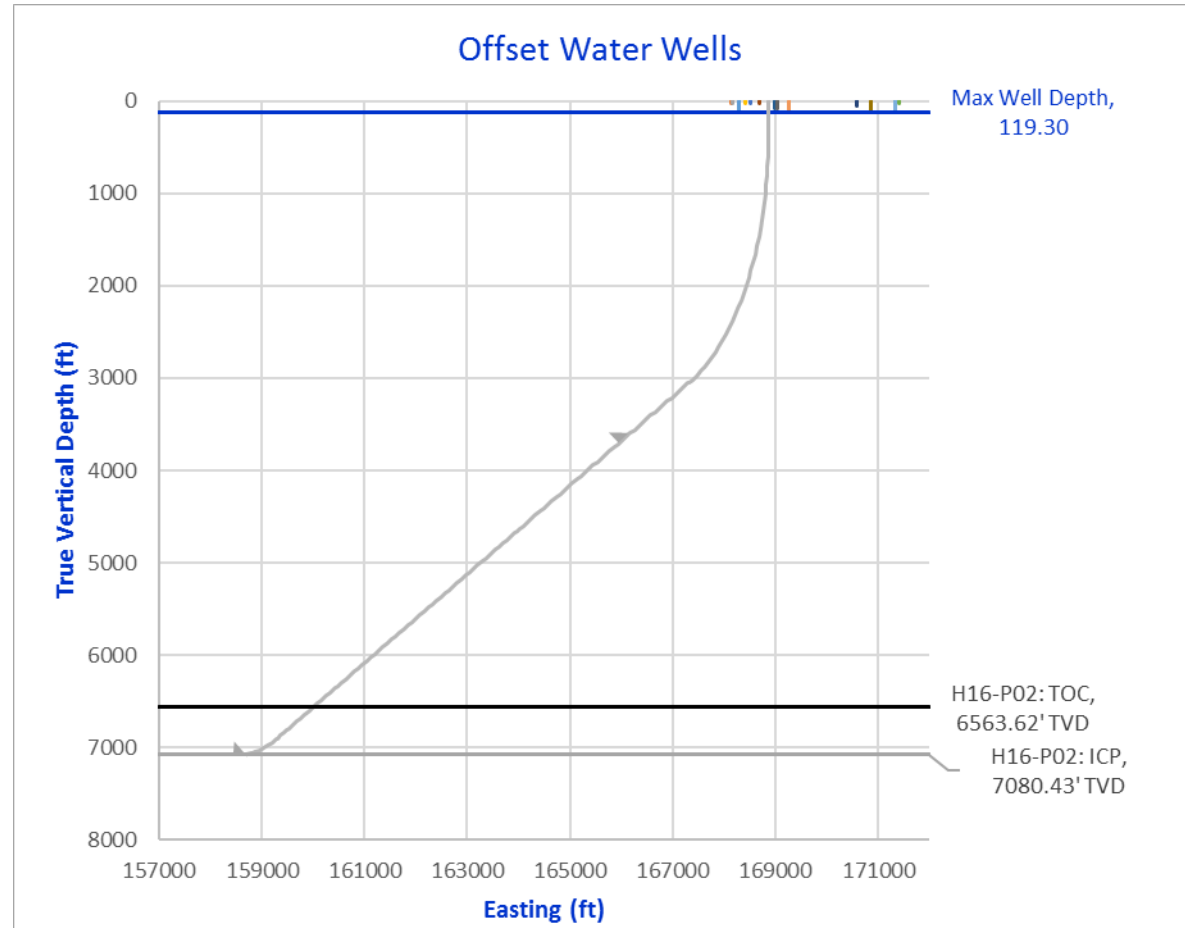


Surface Section



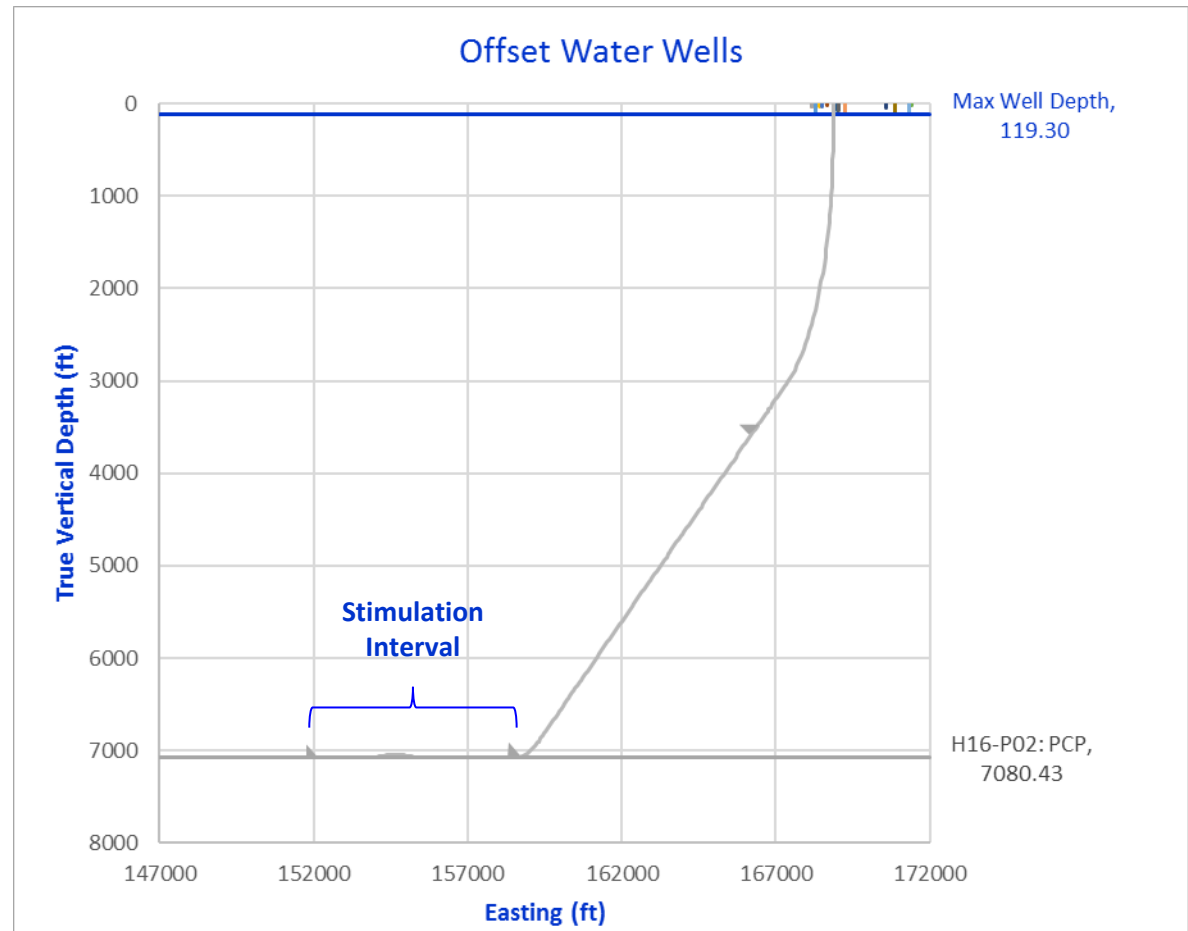
Intermediate Casing Point Overview

- ▶ Intermediate Casing drilled to 7,080' TVD
- ▶ Cemented 500' TVD above casing shoe.
- ▶ Per AOGCC Regulations
- ▶ Top of Cement (TOC) @ 6,563' TVD



Production Casing Point Overview

- ▶ Production Casing set at 7,080' TVD
- ▶ Stimulation interval 6,961' (~1.32 Miles) below deepest offset water well
- ▶ Two strings cemented above



Stimulation Program Engineering Details



General Information	Unit	Notes
Number of frac stages per well	17	
Fluid volume per frac stage	1,783 bbl	
Type of proppant	CarboLite 16/20	Ceramic proppant
Proppant per frac stage	180,200 lb	
Total fluid per well	30,311 bbl	
Total proppant per well	3,063,400 lb	
Estimated frac pressure for well	4,665 psi	
Estimated frac treatment surface pressure	10,000 psi	
Design Height of fracture	218 ft	Calculated with FracCade (FEM pseudo 3D method), assuming Hemlock B formation frac
Design Fracture Half-length	237 ft	Same as above

Chemicals	Unit	Purpose of Chemical
Microbiocide M275	270 lbs	Eliminates bacteria in the water to prevent frac polymer premature breakdown and well souring
Guar Polymer J580	22,554 lbs	Proppant transport
Surfactant, EZEFL0 F103	902 gal	Surface tension reduction for fluid recovery
Breaker J218	902 lbs	Viscosity reducer to flowback fluid
Encapsulated Breaker J475	6,315 lbs	
Enzyme Breaker J134	60 lbs	
Clay Stabilizer L71	1,804 gal	Prevent clay swelling
Potassium Chloride M117	1 lbs	Adjust pH of fluid to maintain effectiveness of other components



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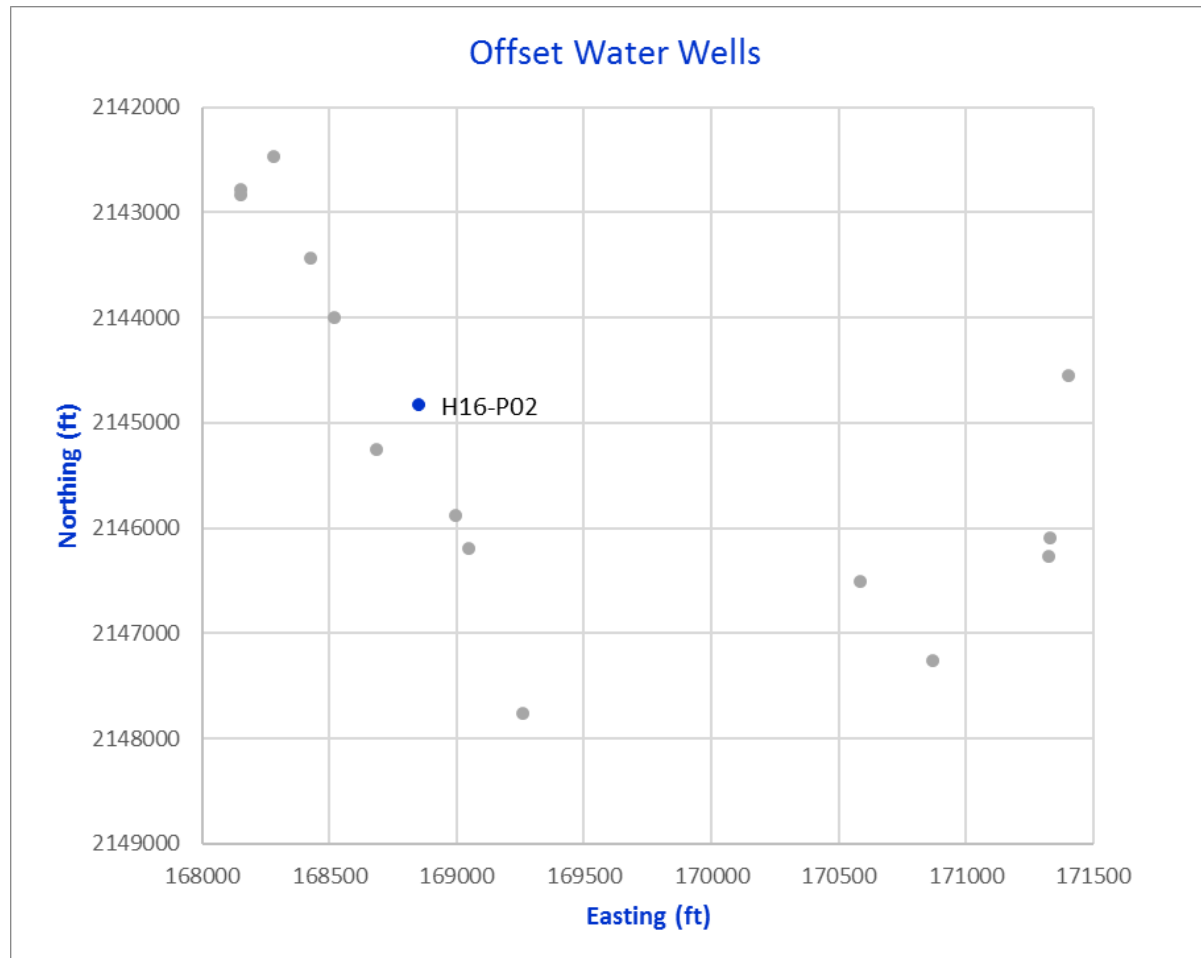
Questions?



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Backup

Offset Water Wells



Stimulation Program Engineering Details



Step	Gel Conc. (lb/mgal)	Step Fluid Volume	Cum Fluid Volume (bbl)	Step Slurry Vol (bbl)	Cum Slurry Volume	Step Prop	Cum Prop (180K)
PAD	25	450	450	450	450	0	0
1 PPA	25	96	546	100	550	4,024	4,024
2 PPA	25	129	675	140	690	10,814	14,837
3 PPA	25	150	825	170	860	18,934	33,771
4 PPA	25	145	969	170	1,030	24,305	58,077
5 PPA	25	139	1,109	170	1,200	29,291	87,367
6 PPA	25	135	1,244	170	1,370	33,930	121,298
7 PPA	25	107	1,351	140	1,510	31,508	152,805
8 PPA	25	81	1,432	110	1,620	27,375	180,181
FLUSH	30	102	1,534	102	1,722	0	180,181

Ramp-up subject to change depending on ability to perform quicker