

## TLS Report PNR1z

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<b>Approver:</b>	Senior Geoscientist	<b>Version No:</b>	1
<b>Reviewer:</b>	HSE&P Manager, Frac Manager, Technical Director	<b>Date of Issue:</b>	26/10/2018
		<b>Proposed date of Review:</b>	n/a

Version	Section	Revision Information	Date	Reviser
0.1	All	Draft Publication	26/10/18	Senior Geoscientist
1.0	All	Final Publication	29/10/18	Senior Geoscientist

*Documents are reviewed as per proposed review date, or sooner if a significant change to the operation has taken place, to ensure relevance to the systems and process that they define.*

## Event Summary

During injection operations of stage 30 for the hydraulic stimulation of PNR1z, a seismicity related traffic light system red light threshold was exceeded. The seismic event had a local magnitude of 0.76 ML. The seismic event hypocenter shown in the map and x-section by the blue dot, was roughly 304.48 m from the injection point.

## Event Classification

Green Event	Amber Light	Red Light	Trailing Event (<=0.5ML)	Trailing Event (>0.5ML)
		<b>X</b>		

## Event Details

Magnitude (ML)	Date	Time (24hr) BST	Last Stage Injection
<b>0.76</b>	<b>26/10/2018</b>	<b>12:36:59</b>	<b>30</b>

## Hypocenter Information

X [mEast] BNG	Y [mNorth] BNG	Z [mTVDGL]	Distance to Nearest Injection Point (m)
<b>336439</b>	<b>432898</b>	<b>-2300</b>	<b>304</b>

## Error / Uncertainties

P Trace Quality	S Trace Quality	Trace Quality	Min Ellipsoid size (m)	Mid Ellipsoid size (m)	Max Ellipsoid size (m)
<b>0.87</b>	<b>0.72</b>	<b>0.69</b>	<b>174</b>	<b>191</b>	<b>597</b>

## Ground Motion & Well Integrity

Max PPV (mm/sec)	Average PPV (mm/sec)	Fit to GMPE (mm/sec)	Annular Pressure Change (psi)
<b>0.6</b>	<b>0.11</b>	<b>0.3</b>	<b>0</b>

### Injection Information

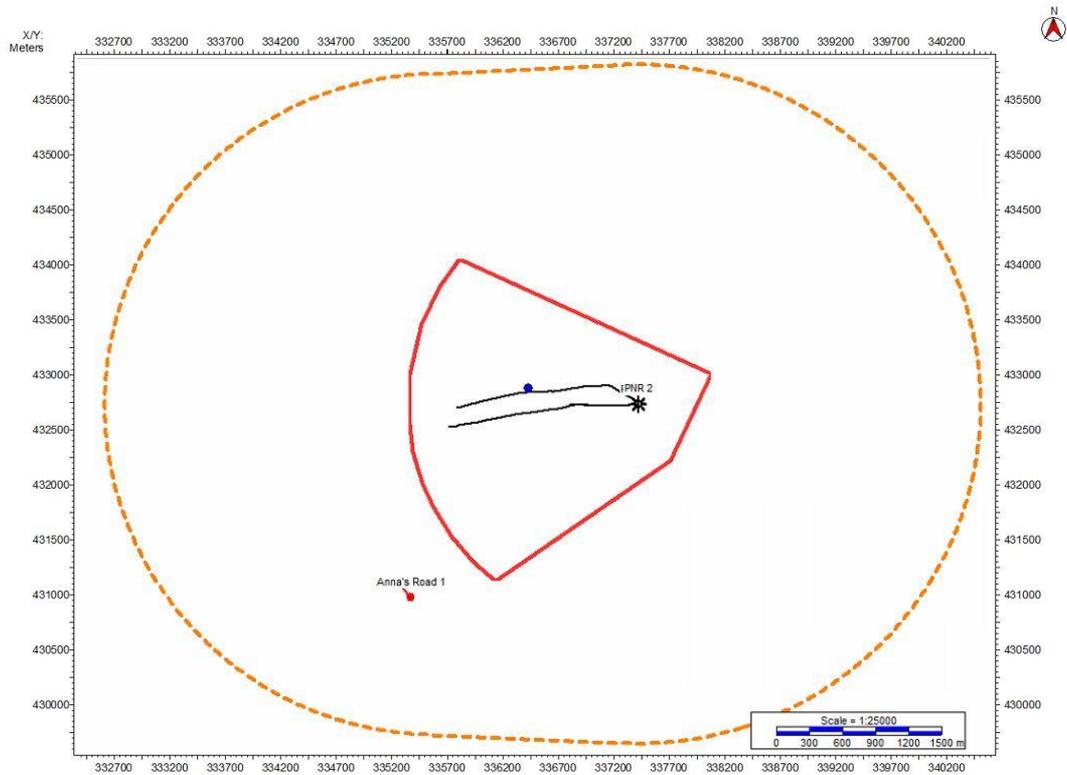
Sleeve	Fluid Volume Injected (m <sup>3</sup> )	Proppant Volume Injected (tonnes)	Average Rate (m <sup>3</sup> /min)	Max Treatment Pressure (surface) (bar)	Average Treatment Pressure (surface) (bar)
30	144.2	3.6	3.6	375	340

Stage (cumulative)	Fluid Volume Injected (m <sup>3</sup> ) (cumulative)	Proppant Volume Injected (tonnes) (cumulative)	Flow Back (m <sup>3</sup> ) (cumulative)
9	2313	139	229

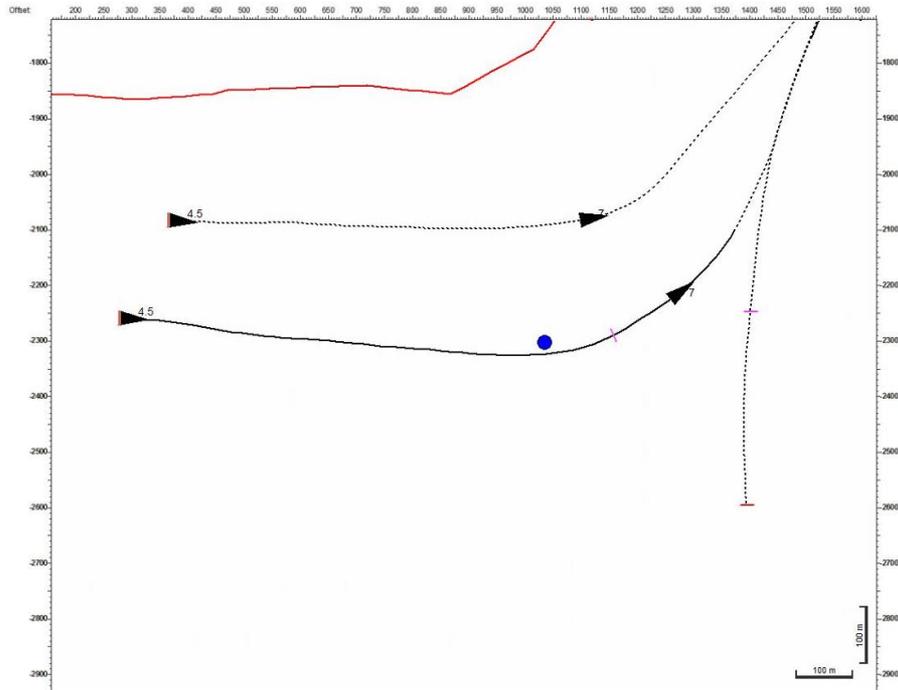
### Forward Injection Schedule / Additional Mitigation

Waiting Time (hr) (<0.0ML)	Next Stage	Proposed Volume (m <sup>3</sup> )	Mini Frac	Additional Mitigation
18	-	-	Yes/no	

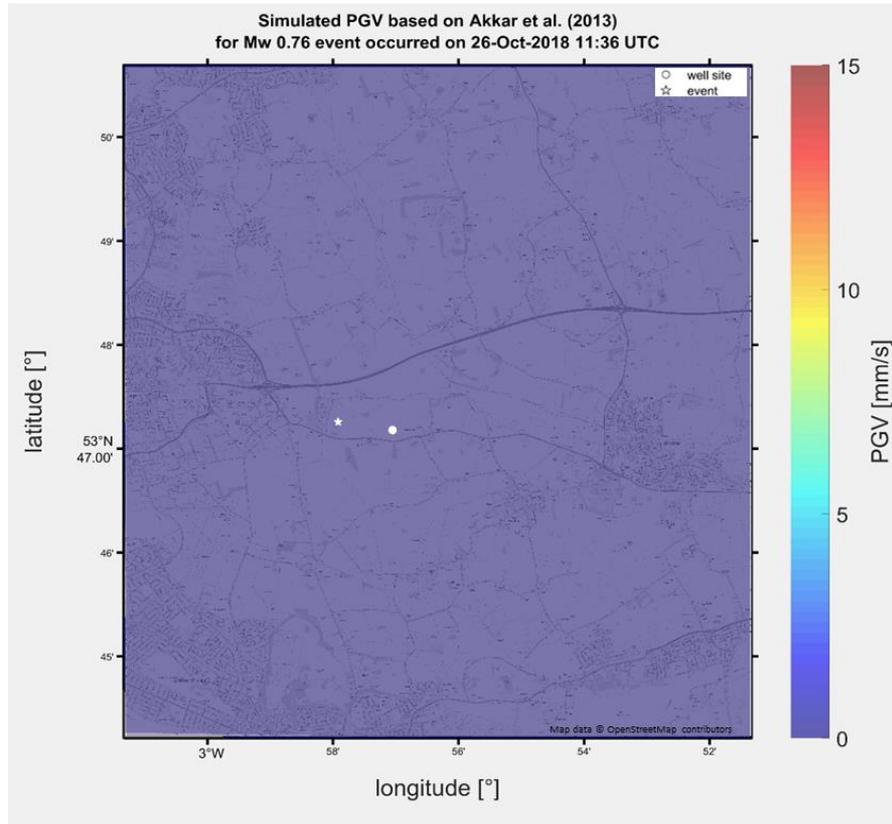
### Base Map



# Cross Section



## Shake Map



The location of the sensor sites has been redacted on the basis of commercial confidentiality and public safety

## Attenuation Curve

