

| TLS Report PNR1z – Final Report | | | | |
|--|--|-----------------------------|---------------------------------|--------------------------------|
| Author | Seismologist | | File Name: | TLS_finalreport_29.10.20_PNR1z |
| Approver: | Senior Geoscientist | | Version No: | 1 |
| Reviewer: | HSE&P Manager, Frac Manager, Technical Director | | Date of Issue: | 29/10/2018 |
| | | | Proposed date of Review: | n/a |
| Version | Section | Revision Information | Date | Reviser |
| 0.1 | All | Draft Publication | | 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 cumulative stage 11 at sleeve 32 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 1.0 ML (reported by BGS as 1.1ML). The seismic event hypocenter shown in the map and x-section by the blue dot, was roughly 362.4 m from the injection point.

Event Classification

| Green Event | Amber Light | Red Light | Trailing Event (<=0.5ML) | Trailing Event (>0.5ML) |
|-------------|-------------|-----------|--------------------------|-------------------------|
| | | X | | |

Event Details

| Magnitude (ML) | Date | Time (24hr) BST | Sleeve Injection Location |
|----------------|-------------------|-----------------|---------------------------|
| 1.0 | 29/10/2018 | 11:30:39 | 32 |

Hypocenter Information

| X [mEast] BNG | Y [mNorth] BNG | Z [mTVDGL] | Distance to Nearest Injection Point (m) |
|---------------|----------------|--------------|---|
| 336429 | 432988 | -2262 | 362.4 |

Error / Uncertainties

| P Trace Quality | S Trace Quality | Trace Quality | Min Ellipsoid size (m) | Mid Ellipsoid size (m) | Max Ellipsoid size (m) |
|-----------------|-----------------|---------------|------------------------|------------------------|------------------------|
| 1 | 0.7 | 0.8 | 183.3 | 227.6 | 698.4 |

Ground Motion & Well Integrity

| Max PPV (mm/sec) | Average PPV (mm/sec) | Fit to GMPE (mm/sec) | Annular Pressure Change (psi) |
|------------------|----------------------|----------------------|-------------------------------|
| 1.16 | 0.23 | 0.8mm | 0 |

Injection Information

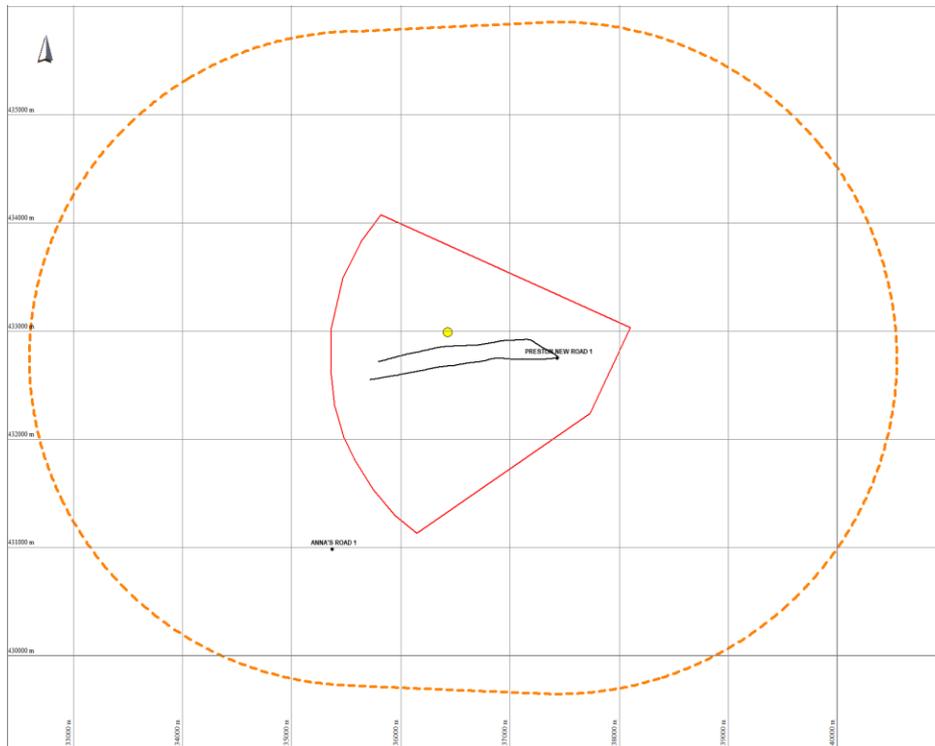
| Sleeve | Fluid Volume Injected (m ³) | Proppant Volume Injected (tonnes) | Average Rate (m ³ /min) | Max Treatment Pressure (surface) (psi) | Average Treatment Pressure (surface) (psi) |
|--------|---|-----------------------------------|------------------------------------|--|--|
| 32 | 120.1 | 4.8 | 4.0 | 6612 | 5626 |

| Stage (cumulative) | Fluid Volume Injected (m ³) (cumulative) | Proppant Volume Injected (tonnes) (cumulative) | Flow Back (m ³) (cumulative) |
|--------------------|--|--|--|
| 11 | 2389.7 | 148.8 | 242.17 |

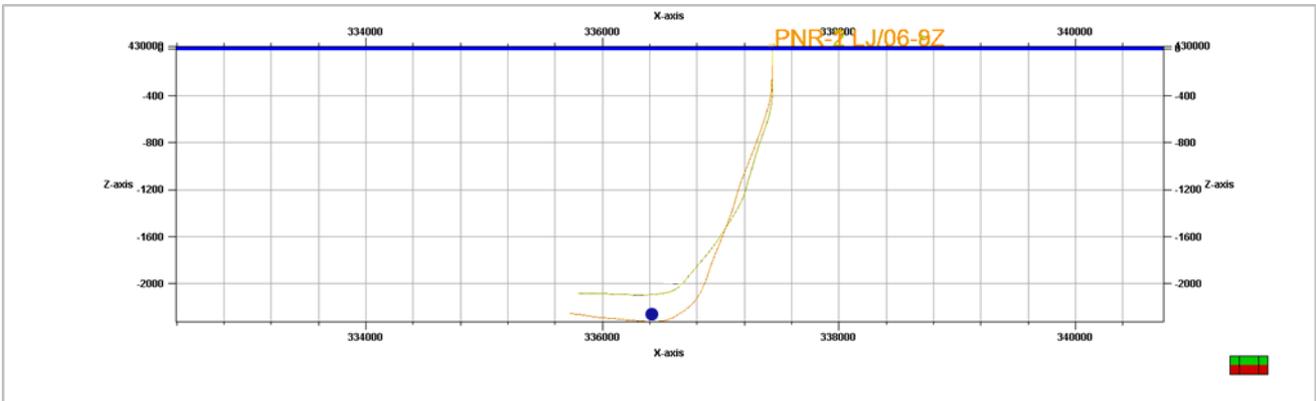
Forward Injection Schedule / Additional Mitigation

| Waiting Time (hr) | Next Stage | Proposed Volume (m ³) | Mini Frac | Additional Mitigation |
|-------------------|------------|-----------------------------------|-----------|---|
| 18 | 12 | 400 | Yes | Move to another sleeve to be decided following overnight microseismic response. |

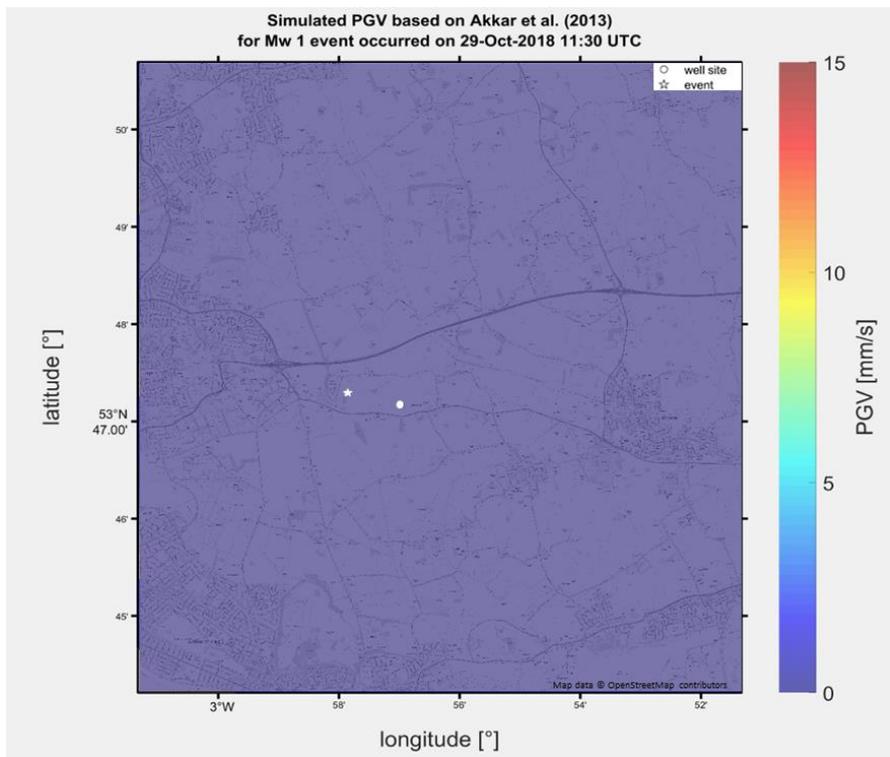
Map from above



Cross Section Looking North



PPV Shake Map



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

PPV Attenuation Curve

