

Induced Seismicity Pre-Assessment

- Hazard Assessment
- Monitoring
- Mitigation Plan

Contents

- Well(s)/Pad Details
- Regional & Analogous Pad Seismic History
- Seismic Hazard Description & Schematic
- Monitoring Solution
- Mitigation & Response Plan

Purpose

The main objective of this document is to provide adequate information on the pad/well induced seismicity risk, monitoring and implemented risk management processes

Operator

PAD Identifier (# of Wells)

WA#(s)

Anticipated Fracturing Operations Start Date

Anticipated Fracturing Operations End Date

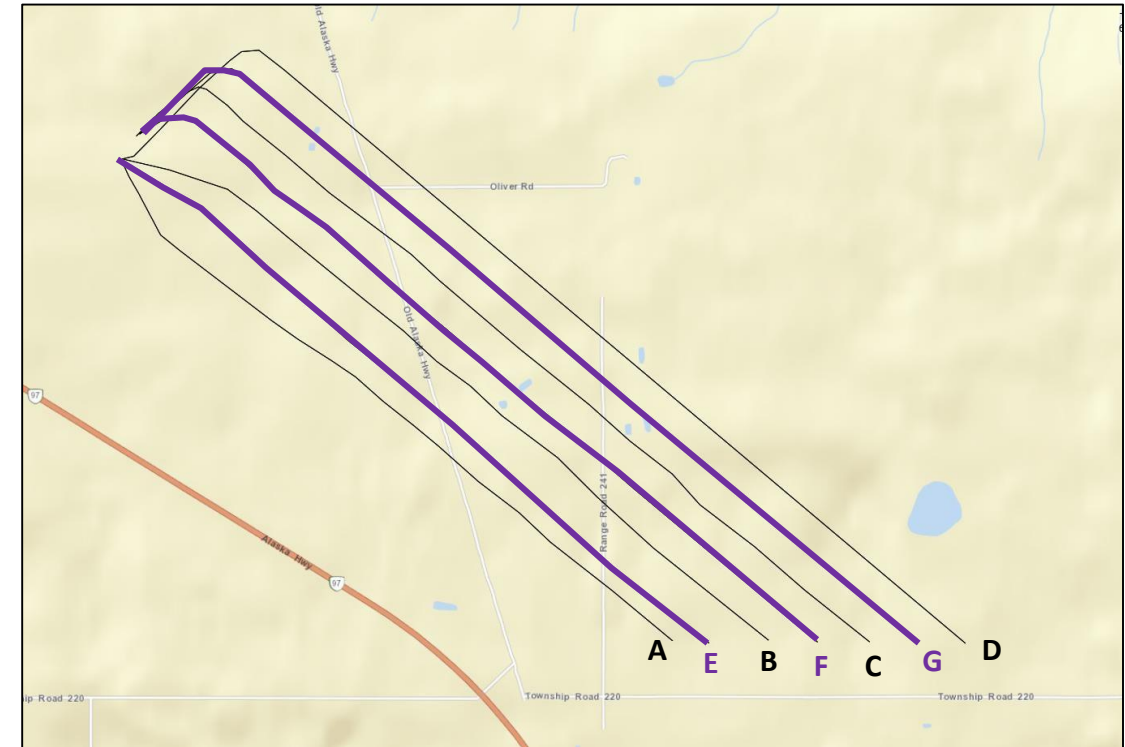
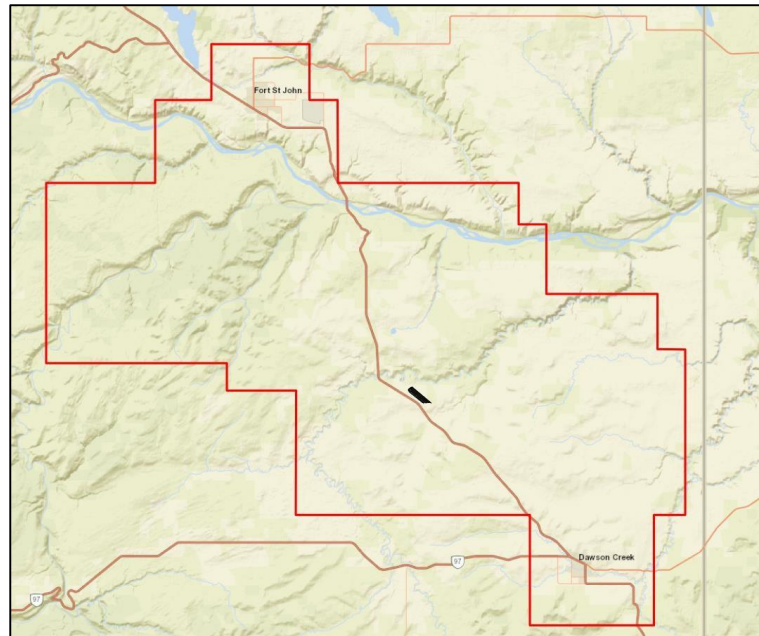
Date Prepared: YYYY-MMM-DD



Regional Overview

Objective:

- **Pad UWI: XX-XX-XXX-XXWX**
- **Well WA#s:**
- **7 Montney Wells (SE):**
 - 4 Upper Montney (A, B, C, D)
 - 3 Lower Montney (B & F)



1 Completions Crew

Start Date: XX-XX-XX

End Date: XX-XX-XX

Localized Overview

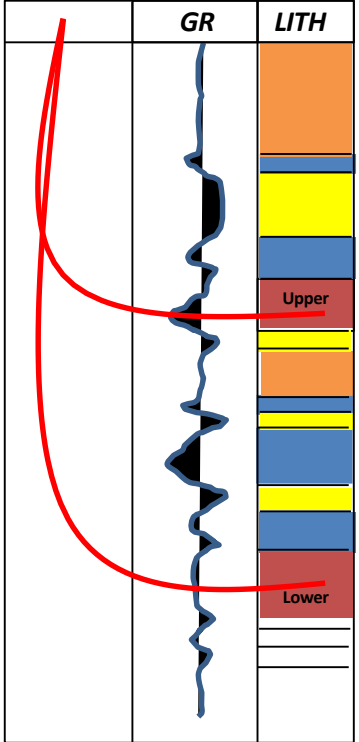
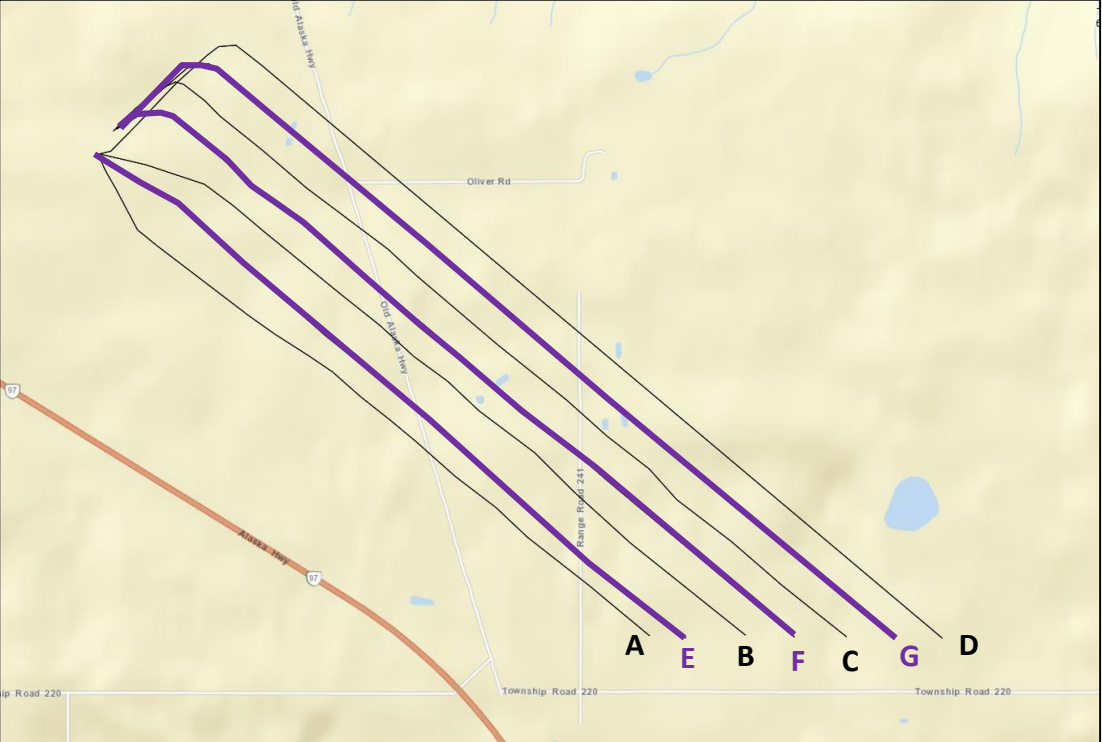
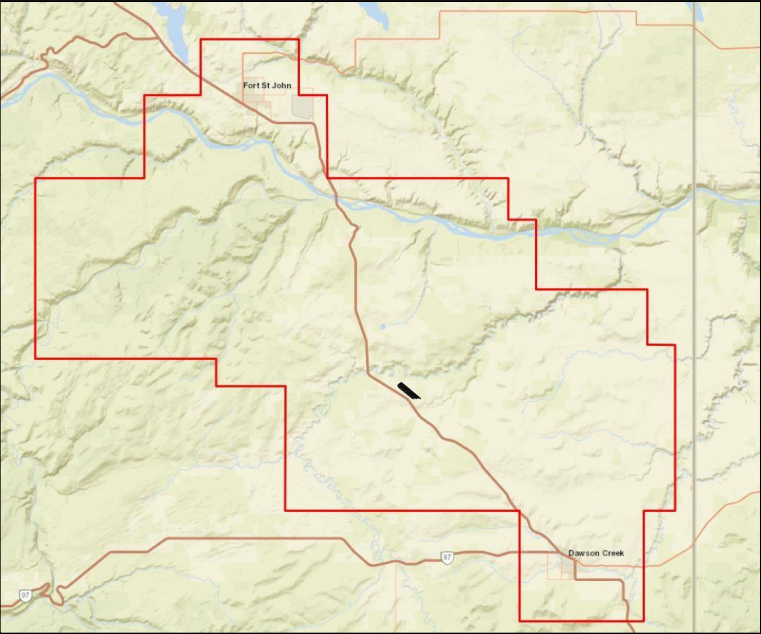
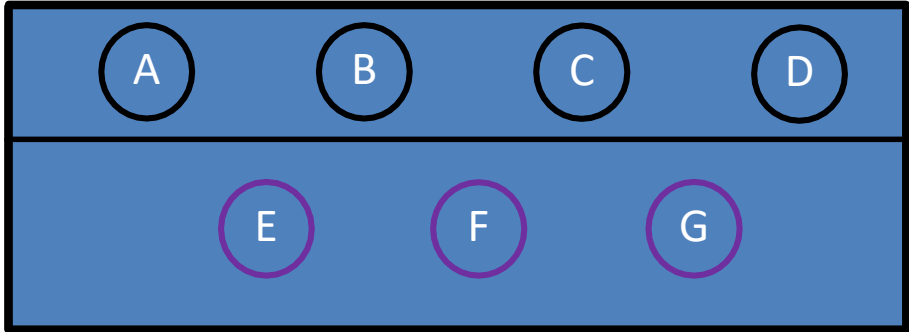
- Pad UWI: XX-XX-XXX-XXWX
- Well WA#s:
- 7 Montney Wells (SE):
 - 4 Upper Montney (A, B, C, D)
 - 3 Lower Montney (B & F)

1 Completions Crew

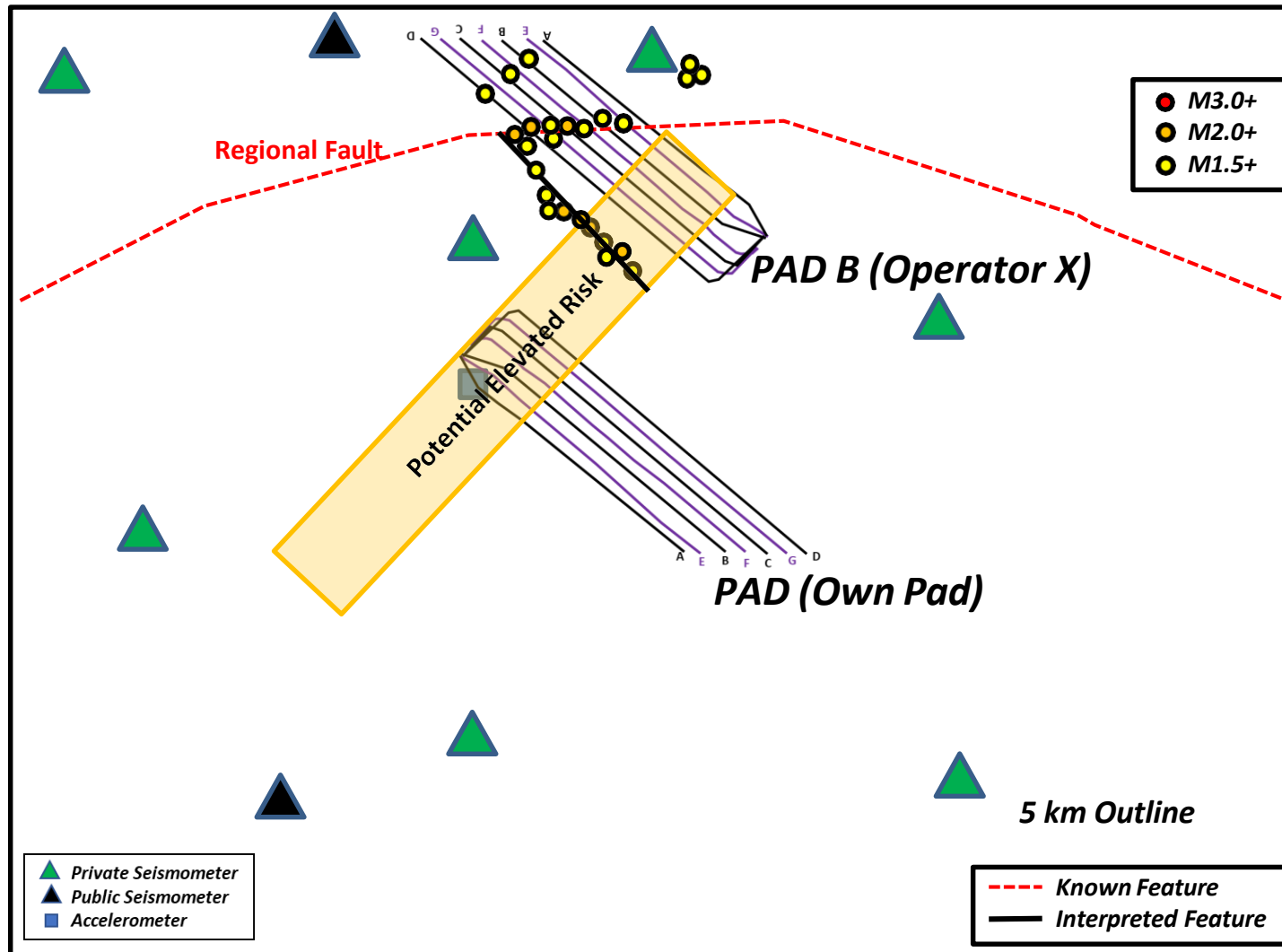
Start Date: XX-XX-XX
End Date: XX-XX-XX

Upper

Lower



Seismic Hazard Assessment



Operations Overview:

1. Pad A (Own Pad)

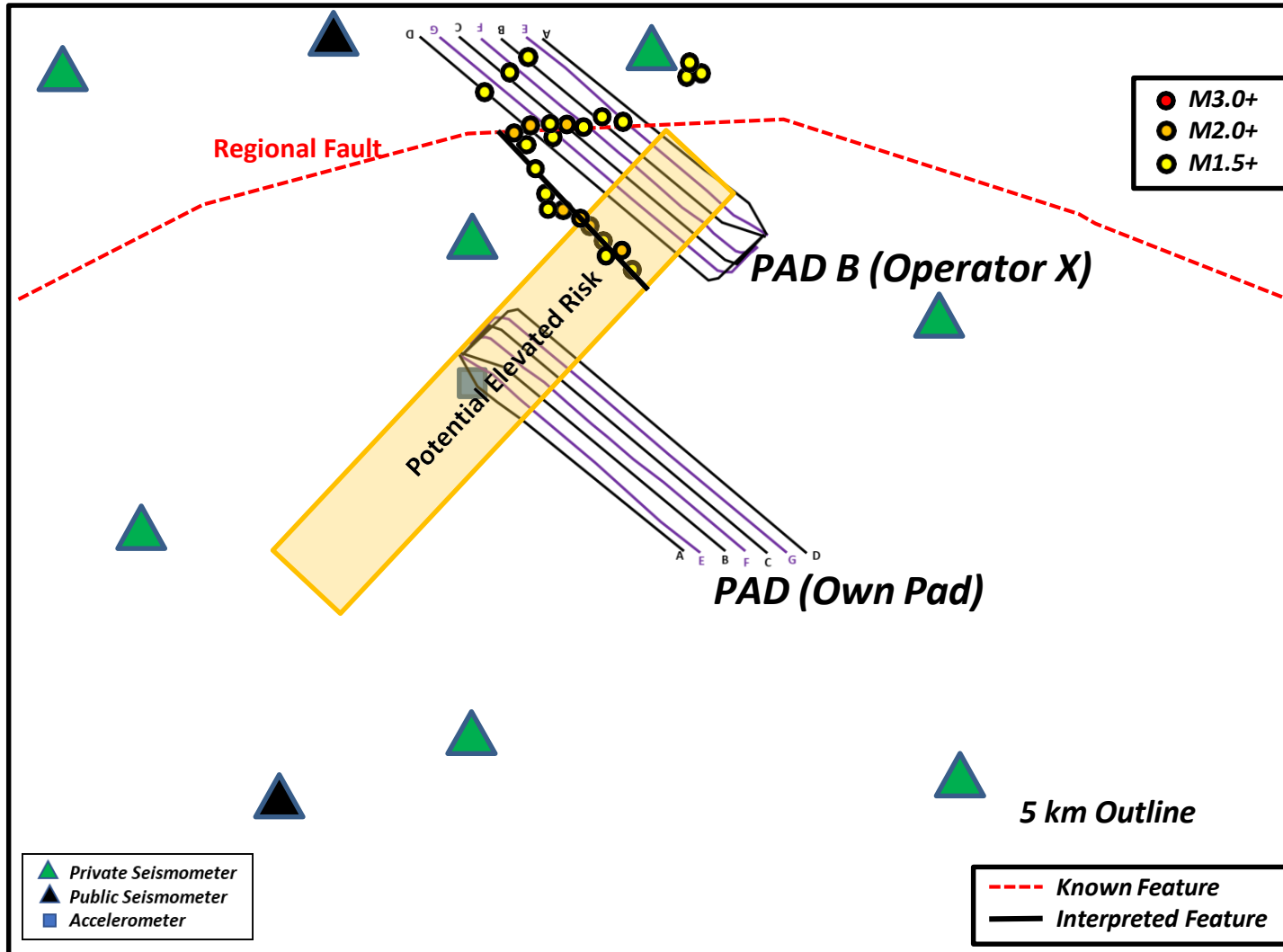
- 7 Montney Wells (SE):
 - 4 Upper Montney (A, B, C, D)
 - 3 Lower Montney (B & F)
- Timing:
 - Start Date: XXXXXX
 - End Date: XXXXXX
- No M1.5+ events; no felt events

2. Pad B (Operator X)

- 7 Montney Wells (NW):
 - 4 Upper Montney (A, B, C, D)
 - 3 Lower Montney (B & F)
- Timing:
 - Start Date: XXXXXX
 - End Date: XXXXXX
- 18 (eighteen) M1.5+ events
- 7 (seven) M2.0+ events
- 2 (known) felt events (reported to Operator X or BCOGC)



Seismic History

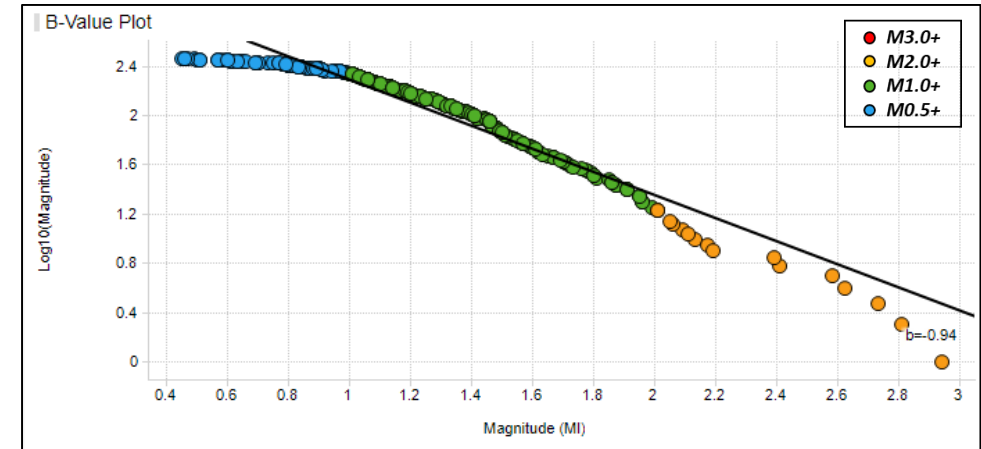


Local Seismic Catalogue Overview:

Pad B (Operator X)

- Data acquired from NRCAN and Private Array
- 18 (eighteen) M1.5+ events
- 7 (seven) M2.0+ events
- 2 (known) felt events (reported to Operator X or BCOGC)

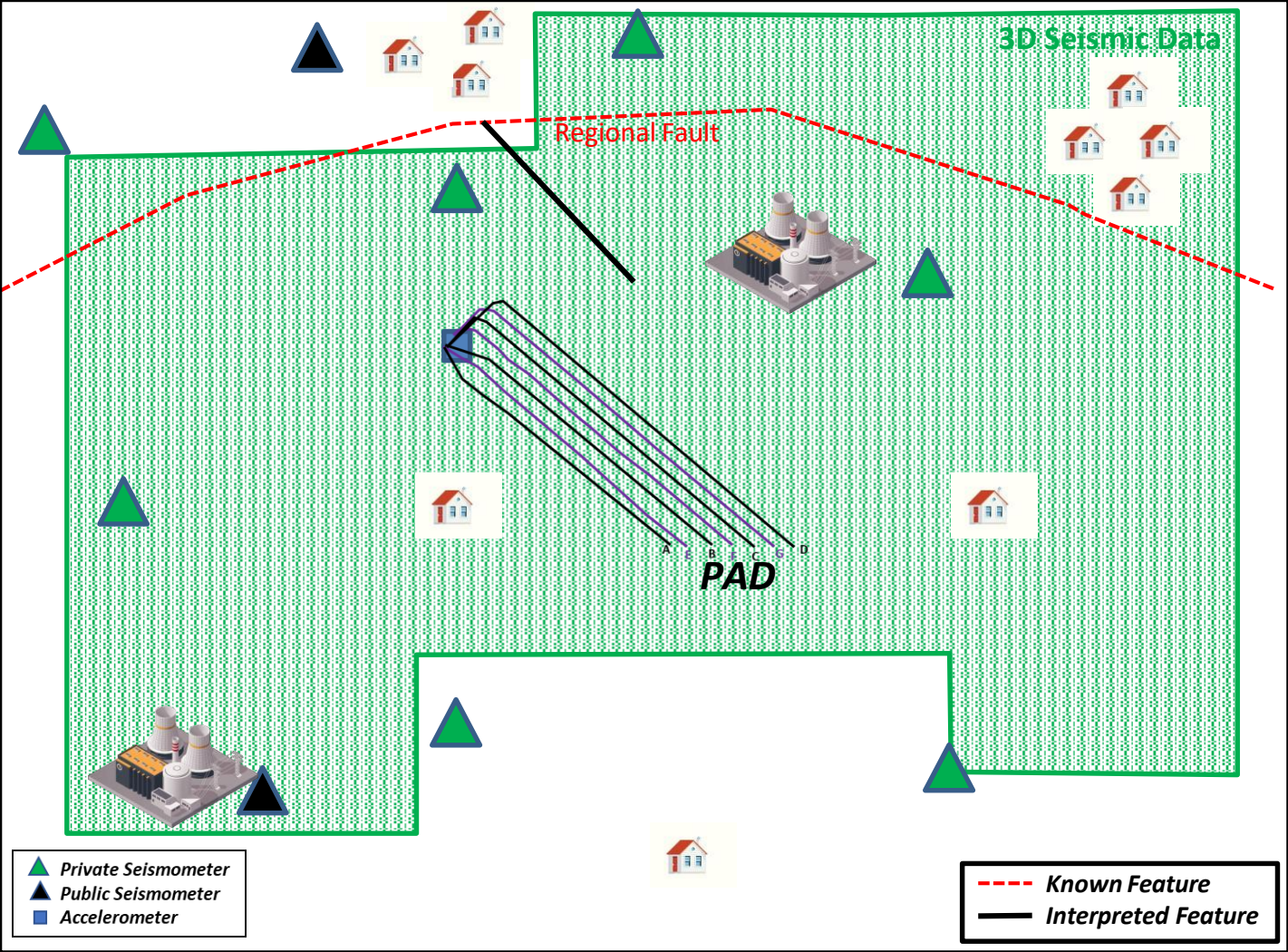
b-Value Plot for Pad B:



- $b\text{-Value} = 0.94$
- Max magnitude = M2.9
- No. of events = 300



Seismic Coverage



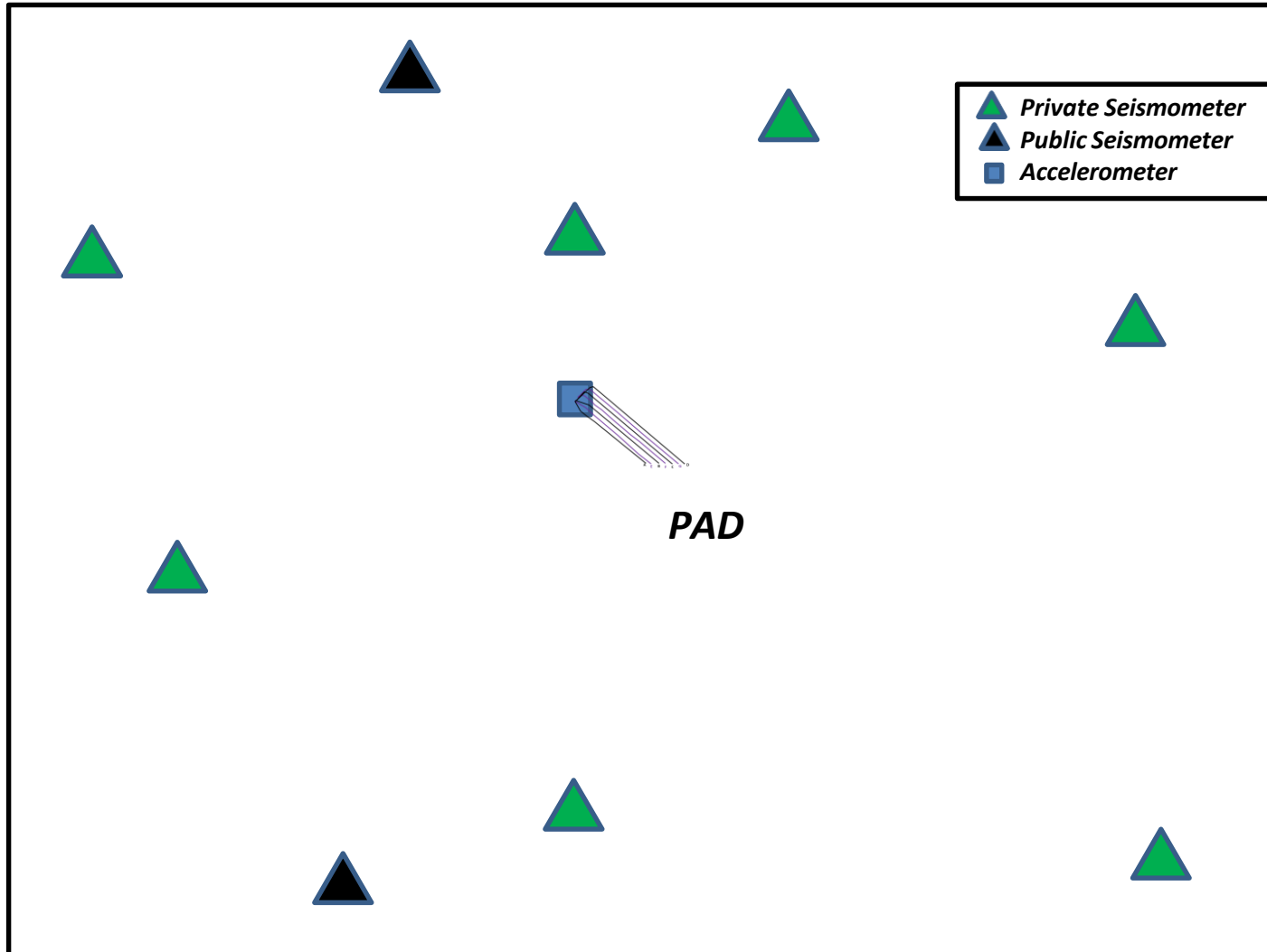
Seismic Coverage Overview:

- Pad has full 3D seismic coverage
- Pad intersects minor local lineaments
- Pad is located XX km South of the Regional Known fault
- Pad is located XX km South of the known XX regional fault
- Pad has low to medium risk of induced seismicity
 - Medium risk for Lower Montney wells E,F and G
 - Low risk for Upper Montney wells A,B,C and D
- 1 facility identified within the 5 km pad outline
 - Closest facility is located 2.5 km Northeast of Well D
- Low population density (6 residences) identified within the 5 km pad outline
 - Closest residence is located 1 km South of Well A

Well UWI	Well WA#	Zone	Stages	IS Risk Ranking
XX-XX-XXX-XXW6	###	Upper	25	Low
XX-XX-XXX-XXW6	###	Upper	25	Low
XX-XX-XXX-XXW6	###	Upper	25	Low
XX-XX-XXX-XXW6	###	Upper	25	Low
XX-XX-XXX-XXW6	###	Lower	25	Medium
XX-XX-XXX-XXW6	###	Lower	25	Medium
XX-XX-XXX-XXW6	###	Lower	25	Medium



Monitoring

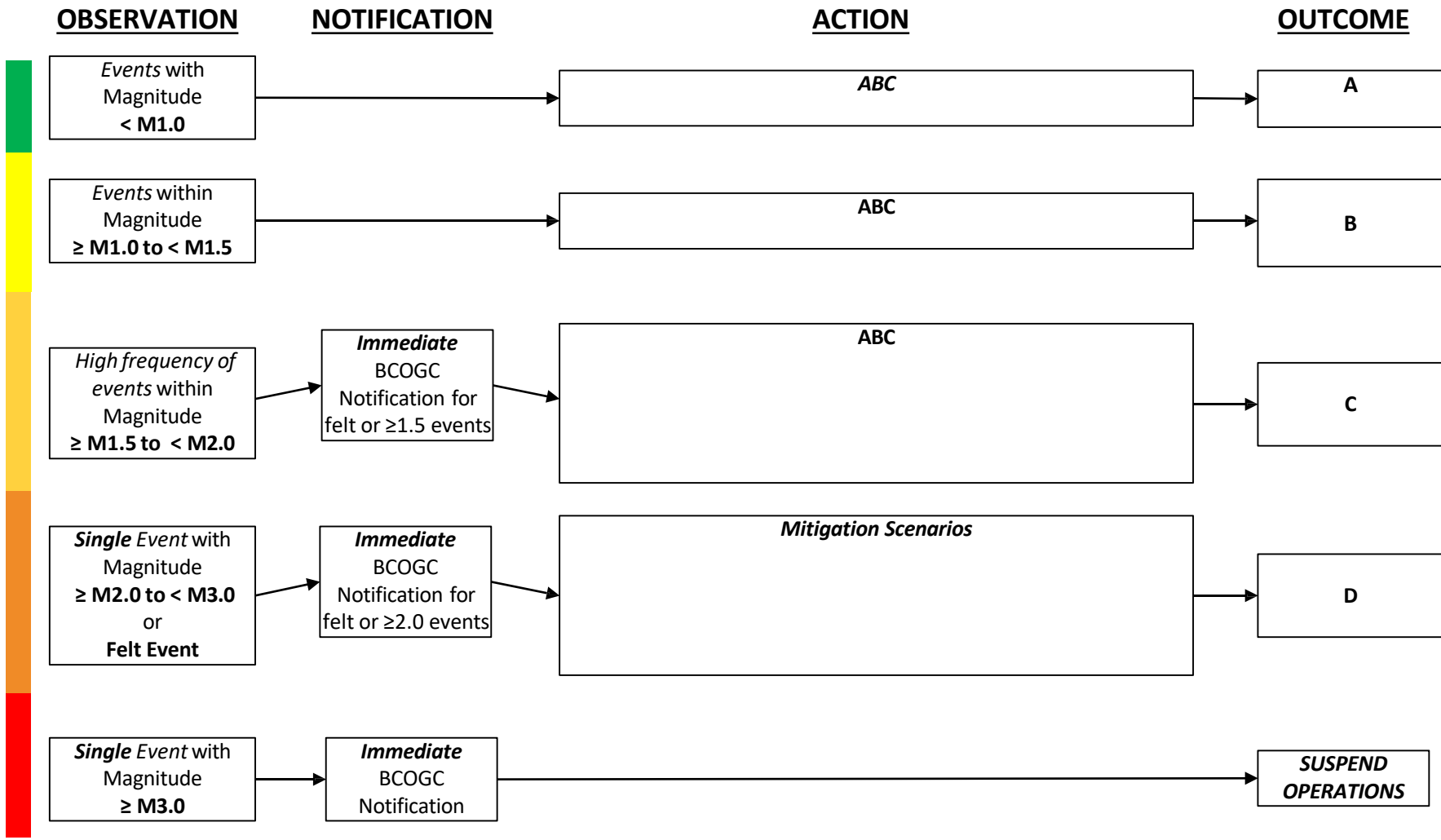


Monitoring Solution Overview:

- Pad has a full 24/7 monitoring and notification monitoring private array
- Array utilizes an additional 2 public government stations
- Pad has ground motion accelerometer deployed on location
- Array specifications:
 - 7 private stations (broadband seismometers)
 - 2 public stations
 - Magnitude of completeness of M1.0 at 2,500 meters depth
 - Spatial location error of ± 150 meters
 - Depth location error of ± 350 meters



Approved Response Plan



On-Call Team Schedule:

- John Doe
 - MMM DD to MMM DD
 - Email
 - Phone #
- Tracy Smith
 - MMM DD to MMM DD
 - Email
 - Phone #
- Jack Sparrow
 - MMM DD to MMM DD
 - Email
 - Phone #

Additional Contacts



Additional Information

- Summary of risk assessment
- Key statements unique to the pad
- Operational design and/or considerations
- Special mitigation and/or communication strategies
- Additional maps, plots, etc.

(Can be me multiple pages, if needed)

BCER Contact Information

24 Hour Emergency Line

1-800-663-3456

Emergency Management
emergencyofficer@bc-er.ca