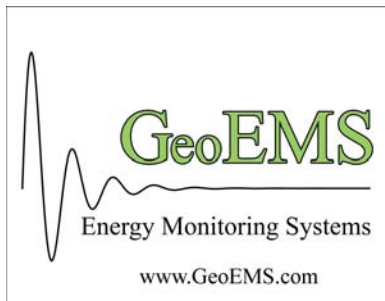


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Neel Duncan  
Integrated Petroleum Technologies, Inc.  
1707 Cole Blvd, Suite 200  
Golden, CO 80401

July 10, 2019

Dear Neel:

### Summary

The C1B facility is covered by NGL stations down to approximately magnitude 1.0. There appears to have been no seismicity in the vicinity of the C1B facility since monitoring by GeoEMS began in December 2014.

**Figure 1** shows NGL seismic station locations (yellow pushpins) with estimated detection levels for M 1.0 (green circles) and M 1.5 (red circles) and the C1B facility is indicated by the blue pushpin. Seismic events having multiple station detections and GeoEMS location estimates from October 10, 2017 to date are shown as red circles and listed in **Table 1**. The closest event in this dataset is approximately 10 km (6 miles) from C1B. The detection threshold circles indicate that the current estimated detection thresholds obtainable from the NGL seismic stations are adequate to monitor the NGL C1B facility down to approximately magnitude 1.0.

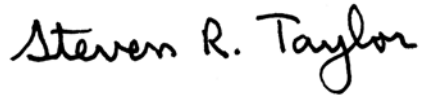
The detection threshold circles in Figure 1 are validated by the seismograms shown in **Figure 4** from the March 30, 2019 magnitude 1.8 event located approximately 20 km from NGL seismic station C3A. The unfiltered seismograms from the event are recorded with excellent signal to noise levels.

**Figure 2** is the same as Figure 1 but using seismic locations from Yeck *et al.*, (2016) spanning the time period from 2014 to 2016. Again, the closest event in this dataset is approximately 10 km (6 miles) from C1B.

**Figure 3** shows seismicity statistics in vicinity of NGL station C4A for the time period December 30, 2014 to date. Events per day (upper left), cumulative sum of events per day

(lower left), local magnitude (upper right), and slant distance from the station based upon S-P wave travel times (lower right). Most of these events are too small to be located. The flattening of the cumulative seismicity plot in the lower left portion of Figure 3 indicates that seismicity in the vicinity of Greeley, CO has been significantly reduced since approximately January 2017.

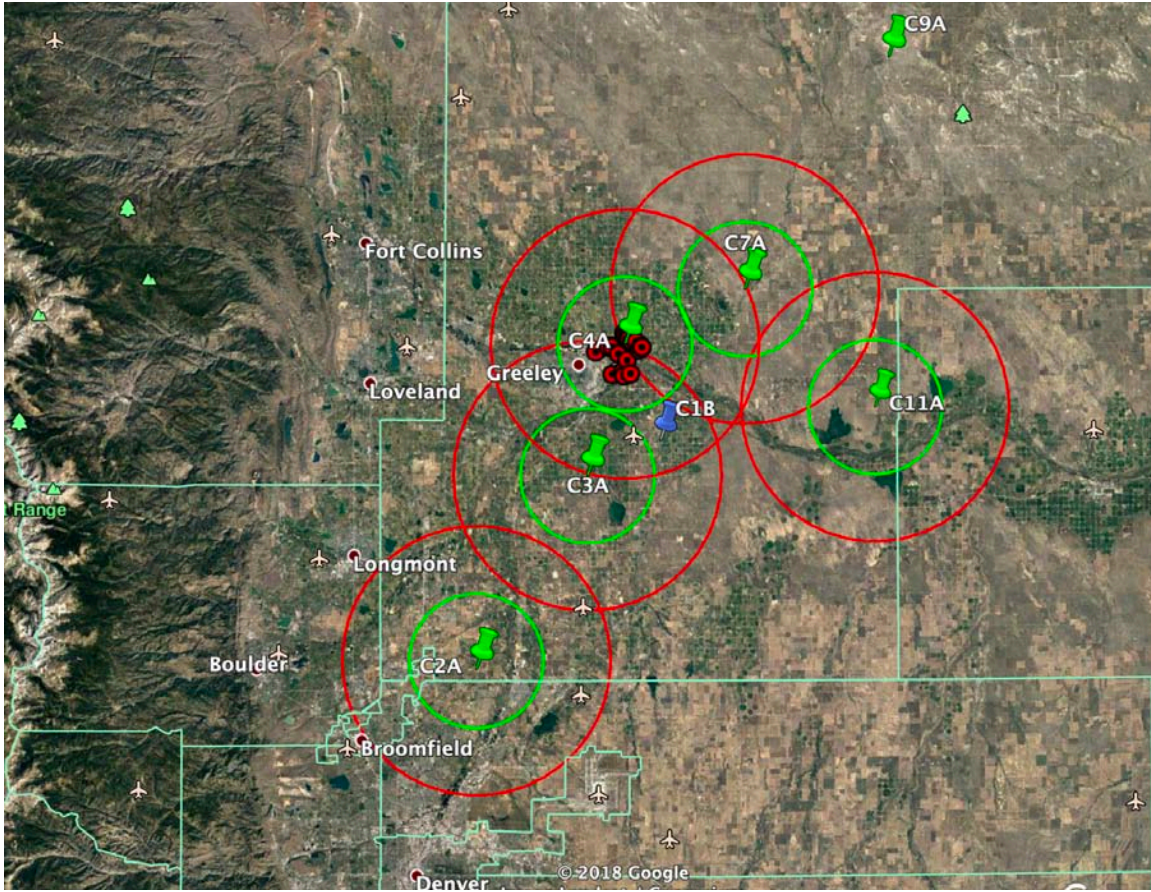
Sincerely,



Steven R. Taylor  
Chief Scientist

**Table 1. GeoEMS Locations and Magnitudes Shown in Figure 1**

Date	Origin Time (GMT)	Lat	Lon	Depth (km)	Magnitude
10/10/17	21:46:25.5	40.4558	-104.6139	8	1.50
12/10/17	21:11:02.1	40.4493	-104.6481	8	1.95
12/10/17	22:26:31.0	40.4493	-104.6554	8	1.78
01/31/18	08:47:45.7	40.4487	-104.5977	6	1.75
02/02/18	17:05:52.8	40.4487	-104.5959	6	2.12
07/05/18	17:25:45.7	40.445	-104.6016	8	1.30
07/20/18	09:26:37.7	40.4397	-104.6374	8	1.81
09/01/18	23:23:14.9	40.5969	-104.5881	12	1.36
09/12/18	00:17:08.9	40.4103	-104.6278	6	1.57
03/11/19	07:39:53.5	40.4679	-104.6276	7	1.02
03/30/19	13:36:05.4	40.4632	-104.6266	8	1.80
03/30/19	14:02:27.2	40.4595	-104.6194	8	2.30
03/30/19	17:49:42.2	40.465	-104.6194	7	1.44
05/08/19	11:03:36.7	40.4561	-104.6067	6	1.80
05/19/19	01:11:51.1	40.4131	-104.6163	8	NaN
05/21/19	12:00:32.9	40.4314	-104.6222	6	1.54
05/23/19	03:31:30.2	40.4123	-104.6484	6.5	0.96
05/23/19	03:37:09.1	40.4168	-104.6294	7.5	0.71
05/29/19	16:48:20.8	40.4597	-104.623	7	0.95



**Figure 1.** NGL seismic station locations (yellow pushpins) with estimated detection levels for M 1.0 (green circles) and M 1.5 (red circles) and the C1B facility is indicated by the blue pushpin. Seismic events having multiple station detections and GeoEMS location estimates from October 10, 2017 to date are shown as red circles and listed in Table 1.

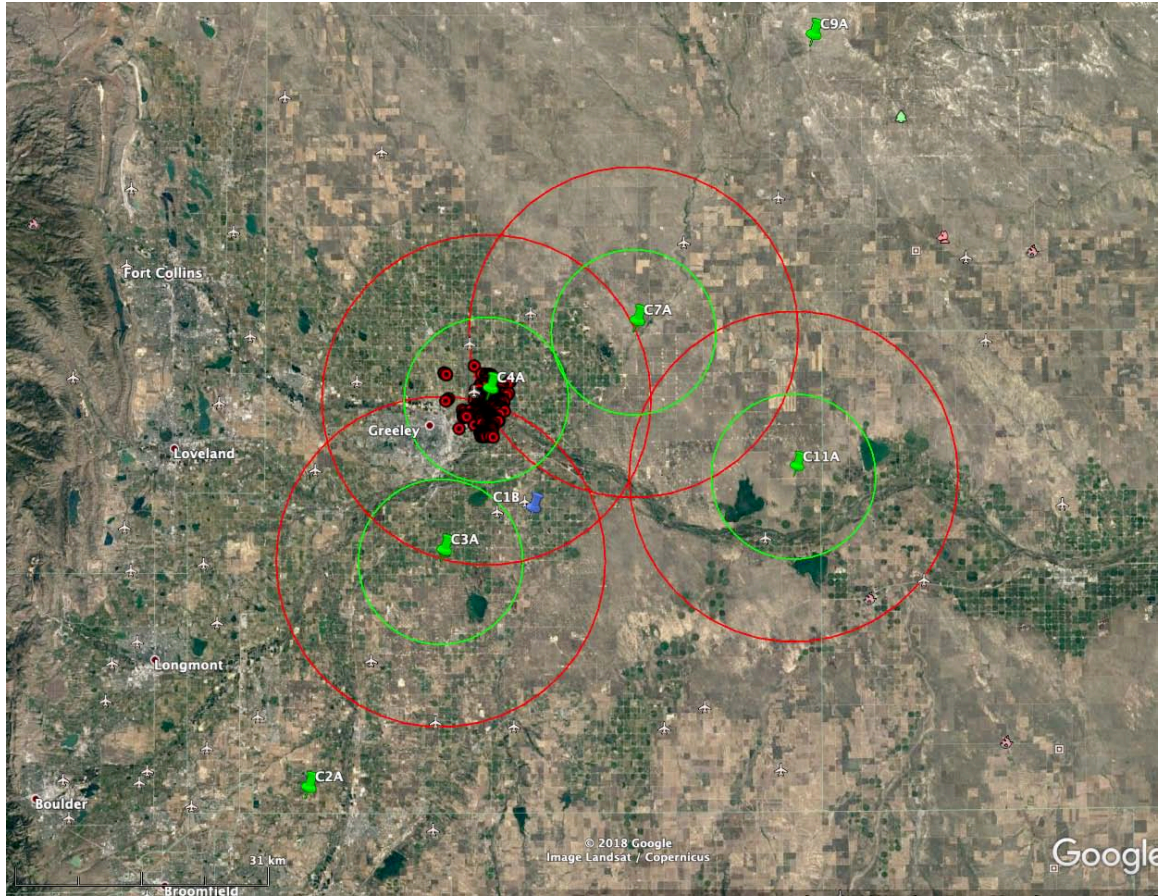
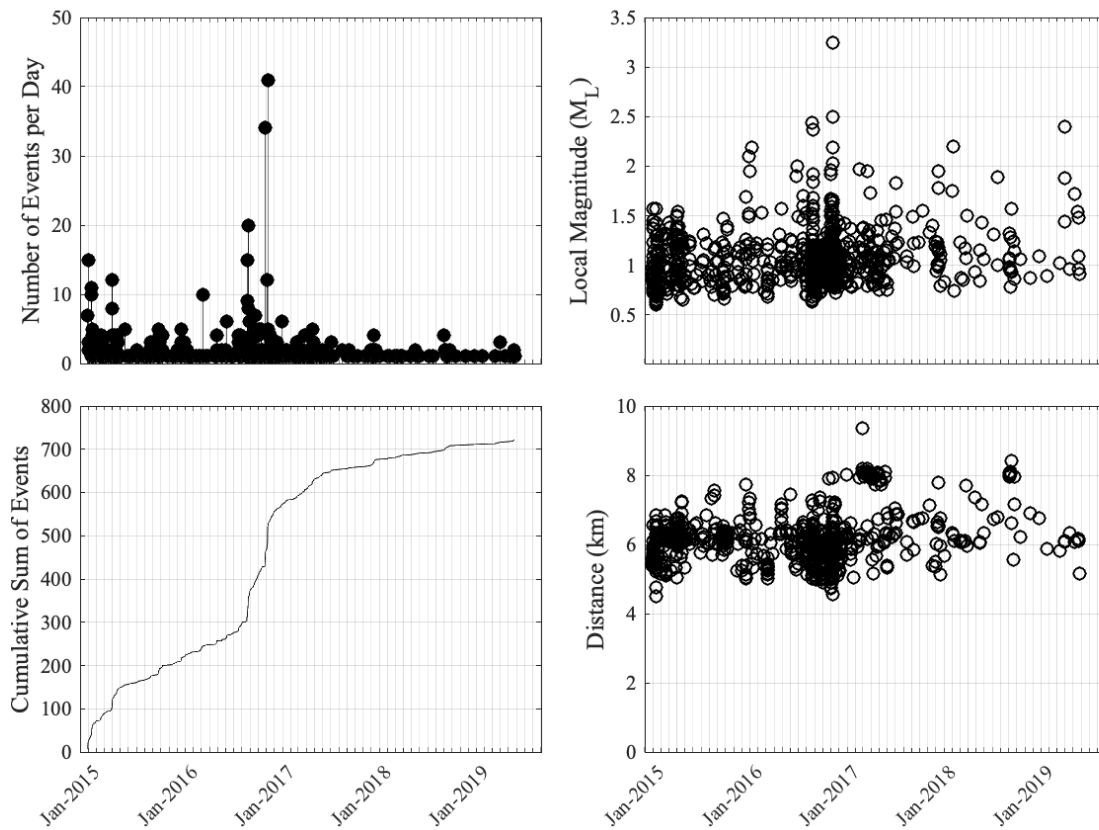
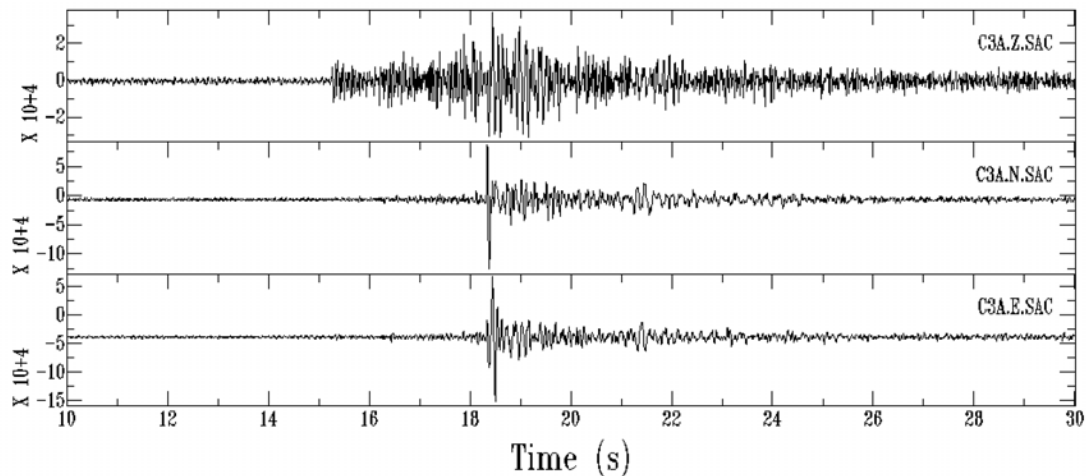


Figure 2. Same as Figure 1, but using seismic locations from Yeck *et al.*, (2016).



**Figure 3.** Seismicity in vicinity of NGL station C4A for the time period December 30, 2014 to date. Events per day (upper left), cumulative sum of events per day (lower left), local magnitude (upper right), and slant distance (based upon S-P arrival times) from the station (lower right).



**Figure 4.** Seismograms from the March 30, 2019 magnitude 1.8 event located approximately 20 km from NGL seismic station C3A.

**Reference**

Yeck, W.L., A.F. Sheehan, H.M. Benz, M. Weingarten and J. Nakai (2016). Rapid response, monitoring, and mitigation of induced seismicity near Greeley, Colorado, *Seism. Res. Lett.*, doi: 10.1785/0220150275.