



UPDATED Oct. 24, 2018

New Seismic Monitoring Plans Required for Operators in Farmington

EFFECTIVE DATE: May 28, 2018

The BC Oil and Gas Commission (Commission) has issued a [Special Project Order](#) requiring permit holders of any well wholly or partially located within the Kiskatinaw Seismic Monitoring and Mitigation Area (commonly known as the Farmington area) to, prior to initiating hydraulic fracturing operations, involving horizontal, multi-stage fracturing in a well (hydraulic fracturing operations), undertake the following:

Pre-Operation Requirements:

1. Submit a seismic monitoring and mitigation plan with any notice of operation that includes hydraulic fracturing operations. The seismic monitoring and mitigation plan must include:
 - a. A pre-assessment of seismic hazard.
 - b. A seismic monitoring and mitigation outline.
2. Notify residents of hydraulic fracturing operations at a well in accordance with the requirements set out in Appendix II of the Order.
3. Notify the Commission not less than 24 hours and not more than 72 hours before hydraulic fracturing operations begin on a common drilling pad.

Active Operation Requirements:

A permit holder must, during hydraulic fracturing operations:

1. Deploy an accelerometer within three km of the common drilling pad.
2. Have access to a seismic array providing real-time seismicity readings.
3. On request, submit a summary of monitoring reports to the Commission.

Seismic Thresholds During Operations:

1. If a well is identified by the well permit holder or the Commission as being responsible for a seismic event with a magnitude of 3.0 or greater, the well permit holder must suspend hydraulic fracturing operations on the common drilling pad immediately. Hydraulic fracturing operations may not continue without the written consent of the Commission.
2. The minimum level at which the well permit holder must take action and initiate their mitigation plan is magnitude 2.0.
3. If a well is identified by the well permit holder or the Commission as being responsible for

a seismic event with a magnitude of 1.5 or greater event, the well permit holder must communicate the initial event to the Commission within 24 hours and develop a protocol satisfactory to the Commission to maintain communication regarding any subsequent magnitude 1.5 or greater events during hydraulic fracturing activities on the common drilling pad.

4. If a common drilling pad is identified as being responsible for a cluster of seismic events, the Commission may require the suspension of hydraulic fracturing activities.

Post-Operation Requirements:

1. Submit to the Commission a report respecting monitoring of hydraulic fracturing in a format acceptable to the Commission within 30 days of concluding hydraulic fracturing operations.

Considering the level of industry activity in the area, the Commission requires permit holders comply with the Special Project Order. More details regarding these requirements can be found in the attachments.

An Order follows.

Should you have any questions regarding this Industry Bulletin, please contact:

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ORDER 18-90-001 (Amendment #1)

Kiskatinaw Seismic Monitoring and Mitigation Area Special Project Order

- A. Under section 75(1)(c) of the *Oil and Gas Activities Act*, the Oil and Gas Commission (Commission) designates an innovative method of carrying out oil and gas activities and related activities as a special project in the following area:
- Kiskatinaw Seismic Monitoring and Mitigation Area (KSMMA) Special Project Order (Appendix I)
- B. Per section 75(2) of the *Oil and Gas Activities Act*, the special project designation in this Order is subject to the following conditions:

Pre-Operation Requirements:

A permit holder of any well wholly or partially located in the KSMMA Area (see Appendix I) must, prior to initiating hydraulic fracturing operations involving horizontal, multi-stage fracturing in a well (hydraulic fracturing operations) on or after May 28, 2018:

1. Submit a seismic monitoring and mitigation plan with any notice of operation that includes hydraulic fracturing operations. The seismic monitoring and mitigation plan must include:
 - a. A pre-assessment of seismic hazard.
 - b. A seismic monitoring and mitigation outline.
2. Notify residents of hydraulic fracturing operations at a well in accordance with the requirements set out in Appendix II.
3. Notify the Commission not less than 24 hours and not more than 72 hours before hydraulic fracturing operations begin on a common drilling pad.

Active Operation Requirements:

A permit holder of any well wholly or partially located in the KSMMA must, during hydraulic fracturing operations:

1. Deploy an accelerometer within three km of the common drilling pad.
2. Have access to a seismic array that will give real-time seismicity readings.
3. On request, submit a summary of monitoring reports to the Commission.

Seismic Thresholds During Operations:

1. If a well is identified by the well permit holder or the Commission as being responsible for a seismic event with a magnitude of 3.0 or greater, the well permit holder must suspend hydraulic fracturing operations on the common drilling pad immediately. Hydraulic fracturing operations may not continue without the written consent of the Commission.
2. The minimum level at which the well permit holder must take action and initiate their mitigation plan is magnitude 2.0.
3. If a well is identified by the well permit holder or the Commission as being responsible for a seismic event with a magnitude of 1.5 or greater event, the well permit holder must communicate the initial event to the Commission within 24 hours and develop a protocol satisfactory to the Commission to maintain communication regarding any subsequent magnitude 1.5 or greater events during hydraulic fracturing activities on the common drilling pad.



4. If the common drilling pad is identified as being responsible for a cluster of seismic events, the Commission may require the suspension of hydraulic fracturing activities.

Post-Operation Requirements:

Submit to the Commission a report respecting monitoring of hydraulic fracturing operations in a format acceptable to the Commission within 30 days of concluding hydraulic fracturing operations.

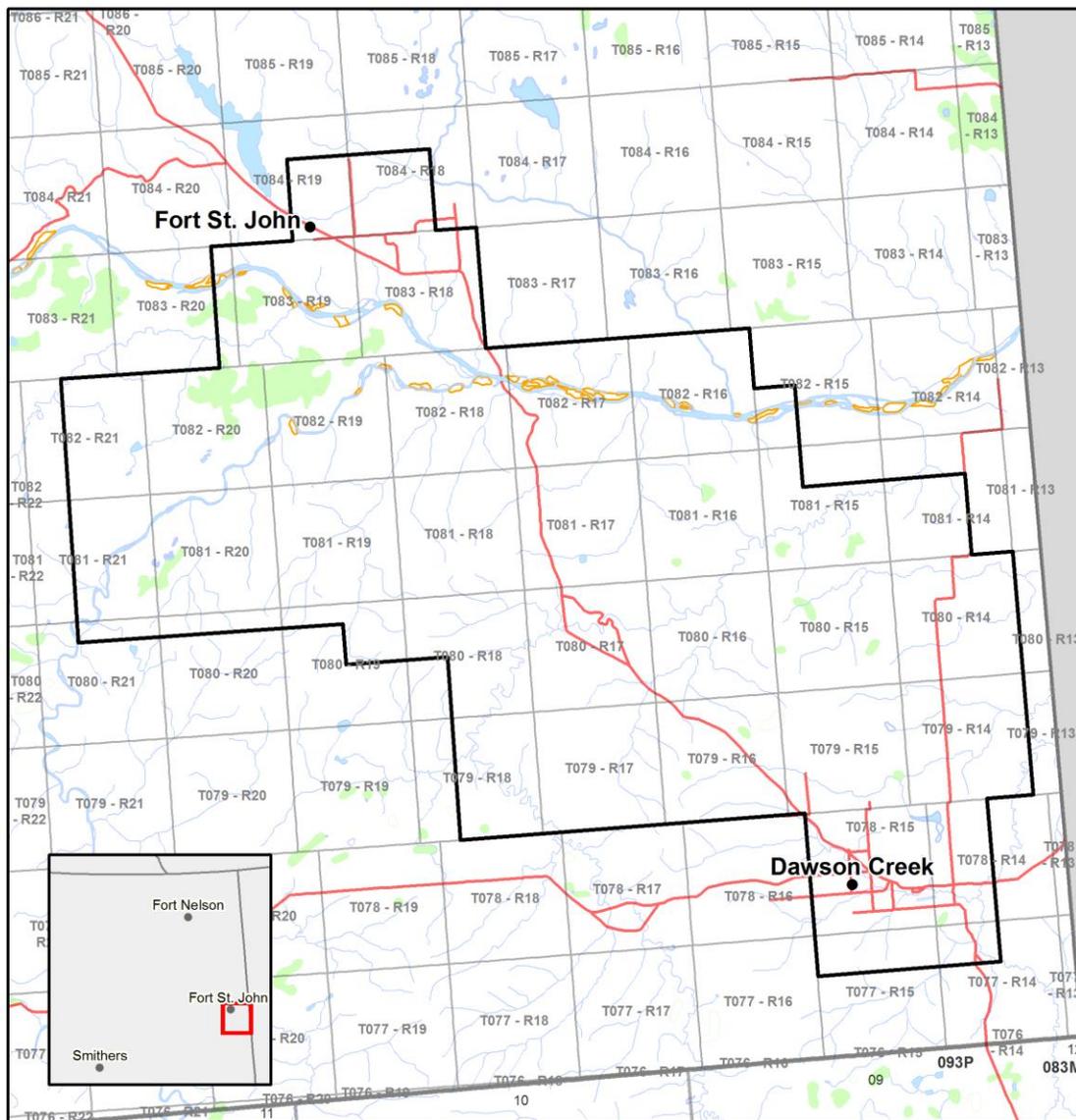
A handwritten signature in black ink, appearing to read "Paul Jeakins", written over a horizontal line.

Paul Jeakins
Commissioner and CEO
BC Oil and Gas Commission

DATED AT the City of Victoria, in the Province of British Columbia, this 24th day of Oct. 2018

Appendix I:

Kiskatinaw Seismic Monitoring and Mitigation Area (KSMMA)



Legend:

Kiskatinaw Seismic Monitoring and Mitigation Area (KSMMA) 

Appendix II

NOTIFICATION REQUIREMENTS

- (1) Subject to (4), a permit holder must give the information set out in (2) to an individual who resides on land that is located in the KSMMA and within 3 km of the well trajectory (resident).
- (2) Subject to (4), the information provided under (1) must include:
 - (a) a description of what activities will be taking place, where the activities will be located and when the activities will happen;
 - (b) an explanation that the activities may induce seismic events;
 - (c) a description of what seismic events are like and impacts that might occur with seismic events;
 - (d) well permit holder contact details, and an explanation that the Commission may require the well permit holder to contact residents as a result of a seismic event;
 - (e) a description of how these activities are regulated and contact information for the BC Oil and Gas Commission (Commission);
 - (f) an outline of seismic monitoring and mitigation plans;
 - (g) a description of monitoring and measurement as well as reporting; and
 - (h) additional information as may be practical, necessary or required in the circumstance.
- (3) Subject to (4), the information given under (1) must be provided no less than two days prior to initiating hydraulic fracturing operations as follows:

RESIDENT	NOTIFICATION METHOD
<p>An individual who resides on land that is:</p> <ul style="list-style-type: none"> • located <u>within</u> district municipalities of Fort St. John, Dawson Creek, Pouce Coupe or Taylor • located within the KSMMA; and • located within 3 km of the well trajectory. 	<p>Notification will preferably be provided verbally and in-person, or by phone. Alternatively, notification may be accomplished using the following method(s):</p> <ol style="list-style-type: none"> (a) by leaving a copy with the individual or an agent of that individual; (b) by sending a copy by ordinary mail or registered mail to the address at which that individual resides; (c) by sending a copy by electronic mail to the electronic mail address provided by that individual; (d) by leaving a copy in a mail box or mail slot for the address at which that individual resides; (e) by attaching a copy to a door or other conspicuous place at the address at which that individual resides; (f) through other means that ensures adequate notification, including but not limited to public meeting, broadcast, publication, and public posting.

<p>An individual who resides on land that is:</p> <ul style="list-style-type: none"> • located <u>outside</u> the district municipalities of Fort St. John, Dawson Creek, Pouce Coupe, or Taylor; • located within the KSMMA; and • located within 3 km of the well trajectory. 	<p>Notification will preferably be provided verbally and in-person, or by phone. Alternatively, notification may be accomplished using the following method(s):</p> <ul style="list-style-type: none"> (a) by leaving a copy with the individual or an agent of that individual; (b) by sending a copy by ordinary mail or registered mail to the address at which that individual resides; (c) by sending a copy by electronic mail to the electronic mail address provided by that individual; (d) by leaving a copy in a mail box or mail slot for the address at which that individual resides; (e) by attaching a copy to a door or other conspicuous place at the address at which that individual resides.
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(4) The Commission, on written request, may exempt a person from one or more of the requirements set out in (1) to (3) above and, on making an exemption, substitute other requirements.

GUIDANCE: ORDER 18-90-001 (Amendment #1)

Kiskatinaw Seismic Monitoring and Mitigation Area Special Project Order

- A. Under section 75(1)(c) of the *Oil and Gas Activities Act*, the Oil and Gas Commission (Commission) designates an innovative method of carrying out oil and gas activities and related activities as a special project in the following area:
- Kiskatinaw Seismic Monitoring and Mitigation Area (KSMMA) Special Project Order (Appendix I)
- B. Per section 75(2) of the *Oil and Gas Activities Act*, the special project designation in this Order is subject to the following conditions:

Pre-Operation Requirements:

A permit holder of any well wholly or partially located in the KSMMA Area (see Appendix I) must, prior to initiating hydraulic fracturing operations involving horizontal, multi-stage fracturing in a well (hydraulic fracturing operations) on or after May 28, 2018:

1. Submit a seismic monitoring and mitigation plan with any notice of operation that includes hydraulic fracturing operations. The seismic monitoring and mitigation plan must include *Guidance: When submitting a notice of operation via eSubmission for a well within the KSMMA, the following documents must be uploaded as supplementary documents in either word (.doc/.docx) or portable document format (.pdf):*
 - a. A pre-assessment of seismic hazard. *Guidance: The permit holder should include a review of any applicable activities in the area and their induced seismicity history, seismic history for the area and an assessment of the potential susceptibility of subsurface faults from 2D/3D seismic data, if available.*
 - b. A seismic monitoring and mitigation outline. *Guidance: The permit holder must include the pre-planned response to induced seismicity addressing both magnitude and frequency response protocols. In addition, the permit holder must outline the anticipated sequence that wells from a common drilling pad will be completed giving specific attention to the sequence of completion for potentially seismogenic prone wellbores located on a common drilling pad to be completed. The document should also outline the seismic monitoring, including type and location of seismic sensors.*
2. Notify residents of hydraulic fracturing operations at a well in accordance with the requirements set out in Appendix II.
3. Notify the Commission not less than 24 hours and not more than 72 hours before hydraulic fracturing operations begin on a common drilling pad. *Guidance: The permit holder must inform the Commission prior to beginning fracturing (pumping) operations within the timeframe given. Notification to the Commission must be one to three days before fracturing (pumping) begins via email (OGCSeismic.Reports@bcogc.ca). This is not for notification of equipment moves or setup. One notification for all wells on a common drilling pad is sufficient.*



Active Operation Requirements:

A permit holder of any well wholly or partially located in the KSMMA must, during hydraulic fracturing operations:

1. Deploy an accelerometer within three km of the common drilling pad. *Guidance: Minimum of one ground motion monitor per common drilling pad location.*
 - *Must be located within three km of the common drilling pad.*
 - *If additional ground motion monitors are deployed within five km of the common drilling pad, include, in the ground motion report, any ground motion data obtained from these monitors.*
 - *Monitoring during all fracturing (pumping) operations during hydraulic fracturing activities. Monitoring during flowback is encouraged, but not required. If monitoring is on-going during flowback, any events of 0.008g and above or reported felt events must be included in the final report.*
 - *Ground motion monitors must meet the following minimum criteria:*
 - *Dynamic range: +/- 2g.*
 - *Minimum detectability of 0.005g.*
 - *The Commission may, at any time, request ground motion monitoring data.*
2. Have access to a seismic array that will give real-time seismicity readings. *Guidance: The permit holder must have access to real-time, continuous seismic monitoring and analysis during all fracturing operations with adequate resolution to monitor seismicity likely to cause felt events.*
3. On request, submit a summary of monitoring reports to the Commission. *Guidance: The permit holder may be requested to submit seismic event location data (lat, long, date, time, magnitude) for all seismic events equal to or above magnitude 1.5 or as requested by the Commission.*

Seismic Thresholds During Operations:

1. If a well is identified by the well permit holder or the Commission as being responsible for a seismic event with a magnitude of 3.0 or greater, the well permit holder must suspend hydraulic fracturing operations on the common drilling pad immediately. Hydraulic fracturing operations may not continue without the written consent of the Commission. *Guidance: The permit holder will be required to suspend all hydraulic fracturing operations. Hydraulic fracturing operations may not continue without the written consent of the Commission.*
2. The minimum level at which the well permit holder must take action and initiate their mitigation plan is magnitude 2.0. *Guidance: the well permit holder's submitted mitigation response plan must initiate at magnitude 2.0 or less.*
3. If a well is identified by the well permit holder or the Commission as being responsible for a seismic event with a magnitude of 1.5 or greater event, the well permit holder must communicate the initial event to the Commission within 24 hours and develop a protocol satisfactory to the Commission to maintain communication regarding any subsequent magnitude 1.5 or greater events during hydraulic fracturing activities on the common drilling pad. *Guidance: The permit holder must communicate the first instance of a seismic event of equal to or greater than magnitude 1.5 to the Commission within 24 hours. The permit holder and the Commission will decide upon a communication plan for the remainder of the hydraulic fracturing operations from the common drilling pad, which may include providing daily updates of all events, including magnitude, location, date and time for any seismic event equal to or greater than magnitude 1.5, if recorded.*
4. If the common drilling pad is identified as being responsible for a cluster of seismic events, the Commission may require the suspension of hydraulic fracturing activities. *Guidance: The Commission may suspend fracturing operations to allow the dissipation of pressure prior to re-starting activities. After re-starting, suspension may be required if further felt events or magnitude 2.5 and above events continue. A cluster is five or more felt events and/or events in excess of magnitude 2.5 identified as being caused by fracturing activities from a common drilling pad.*



Post-Operation Requirements:

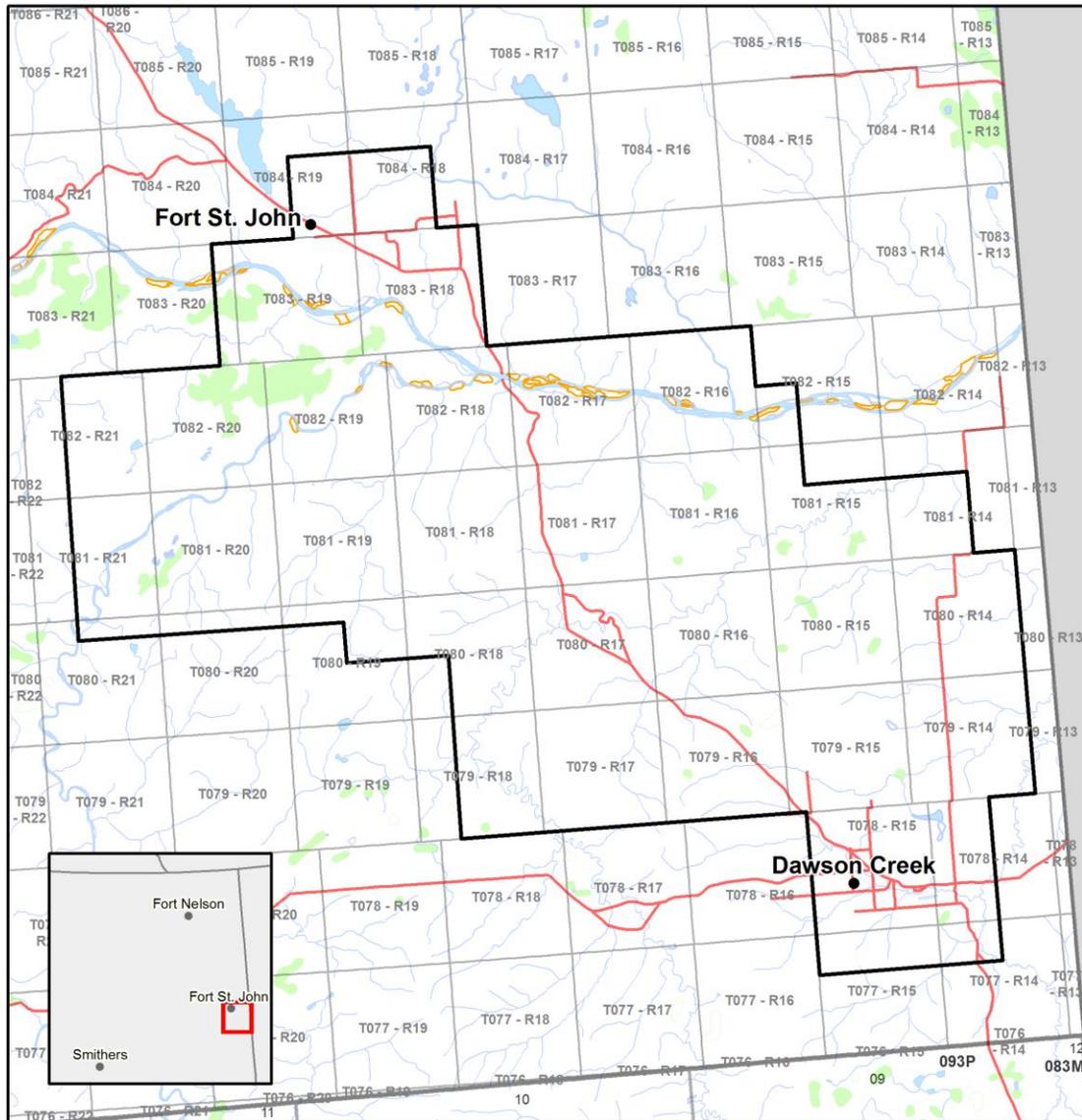
Submit to the Commission a report respecting monitoring of hydraulic fracturing operations in a format acceptable to the Commission within 30 days of concluding hydraulic fracturing operations. *Guidance: This requirement refers to the submission of a ground motion monitoring report. A ground motion monitoring report must be submitted to the Commission in pdf format outlining accelerometer deployment locations and a data summary.*

- *If applicable, one csv report, using the Commission's standard format, summarizing all ground motions equal to 0.008g and greater or reported events that were felt at surface regardless of intensity and one SEED format file for each of the aforementioned ground motions.*
- *For each event of 0.008g and above or felt event, the SEED file containing instrument response and waveform from 30 seconds before the observed event and 60 seconds after must be submitted.*
- *The ground motion monitoring reports must be submitted within 30 days of the completion of hydraulic fracturing activities via email to welldatamail@bcogc.ca.*
- *File naming:
WANUM_GMMR_YYYYMMDD_OPTIONALDESCRIPTION.PDF/CSV/SEED*

Ground motion monitoring reports are considered to be information obtained from or about a well. As such, they will be treated as well reports and well data, as per section 17 (1) of the Oil and Gas Activities Act General Regulation.

Appendix I:

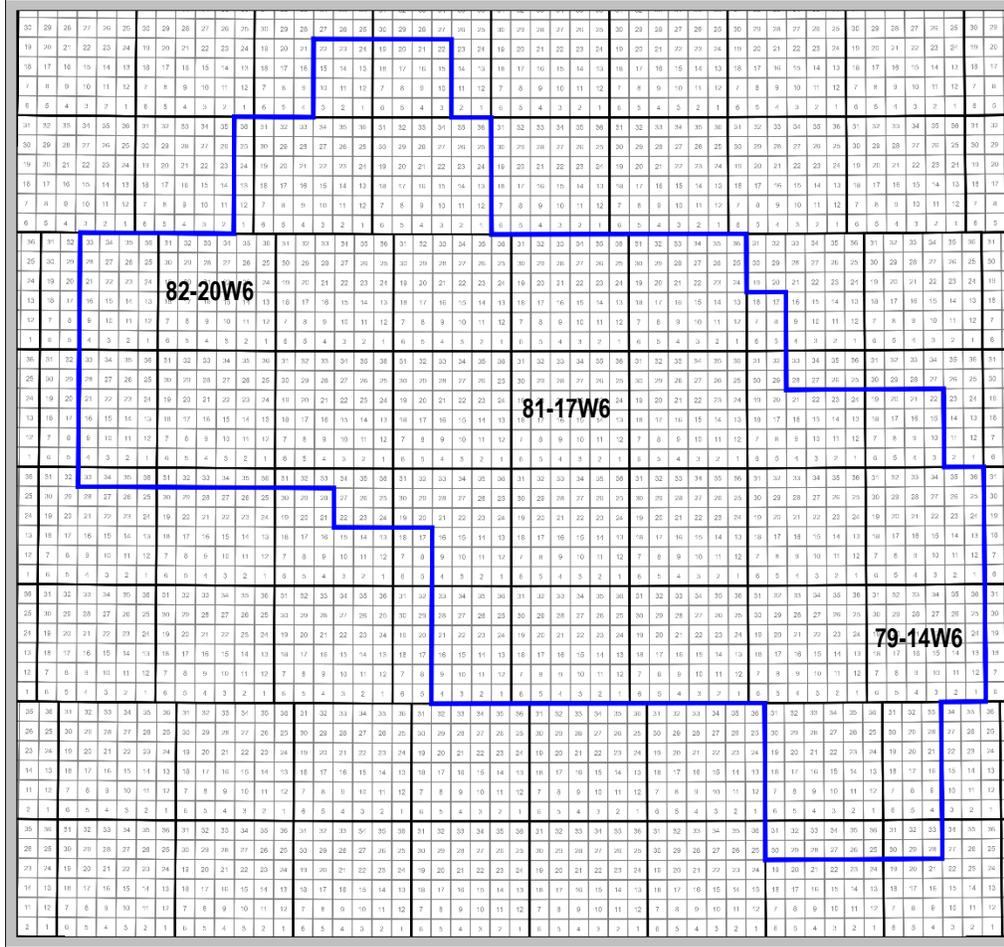
Kiskatinaw Seismic Monitoring and Mitigation Area (KSMMA)



Legend:

Kiskatinaw Seismic Monitoring and Mitigation Area (KSMMA) **—**

The Kiskatinaw Seismic Monitoring and Mitigation Area is also depicted in the following:



Legend:

Kiskatinaw Seismic Monitoring and Mitigation Area (KSMMA) —



Appendix II

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