

Risks to Groundwater from Oil and Gas Drilling and Completion

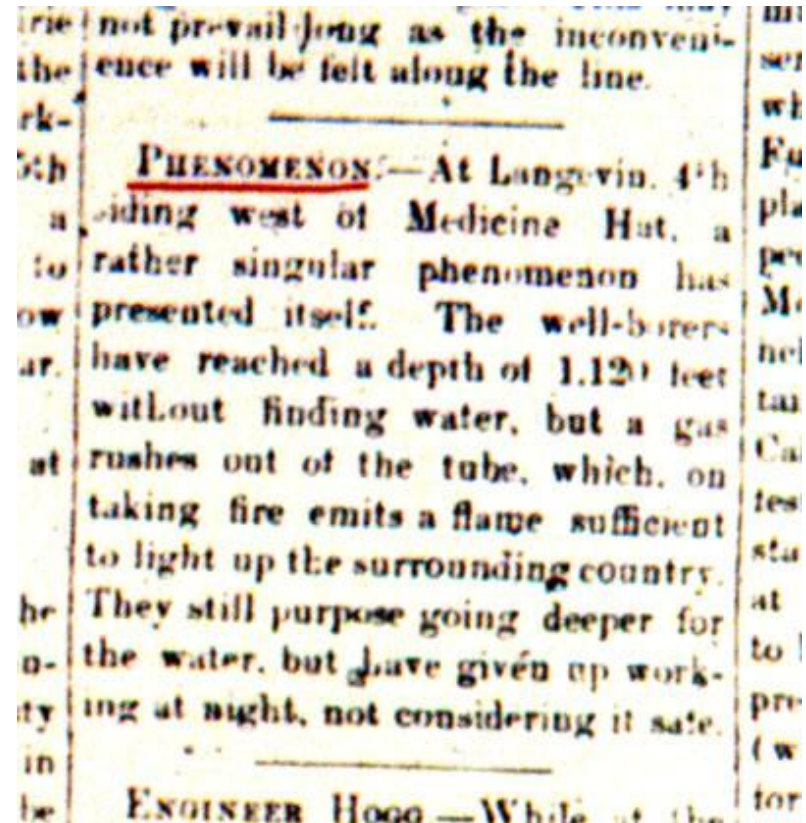
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Background

- Conventional oil and gas activities have been occurring in Alberta since the early 1900's.

“At Langevin 4th siding west of Medicine Hat a rather singular phenomenon has presented itself. The well-borers have reached a depth of 1,120 feet without finding water, but a gas which rushes out of the tube, which, on taking fire emits a flame sufficient to light up the surrounding country. They still purpose going deeper for the water, but have given up working at night, not considering it safe.”

The Calgary Herald Mining and Range Advocate and General Advertiser, December 12, 1883



Background

- There is public concern over the potential risks to groundwater from oil and gas activities.
- These concerns include:
 - Changes in water quantity:
 - Drop in water well yield,
 - Drop in water level
 - Changes in water quality:
 - Presence of gas in water wells,
 - Presence of bacteria/odour,
 - Chemical contamination,
 - Sediment in the water.

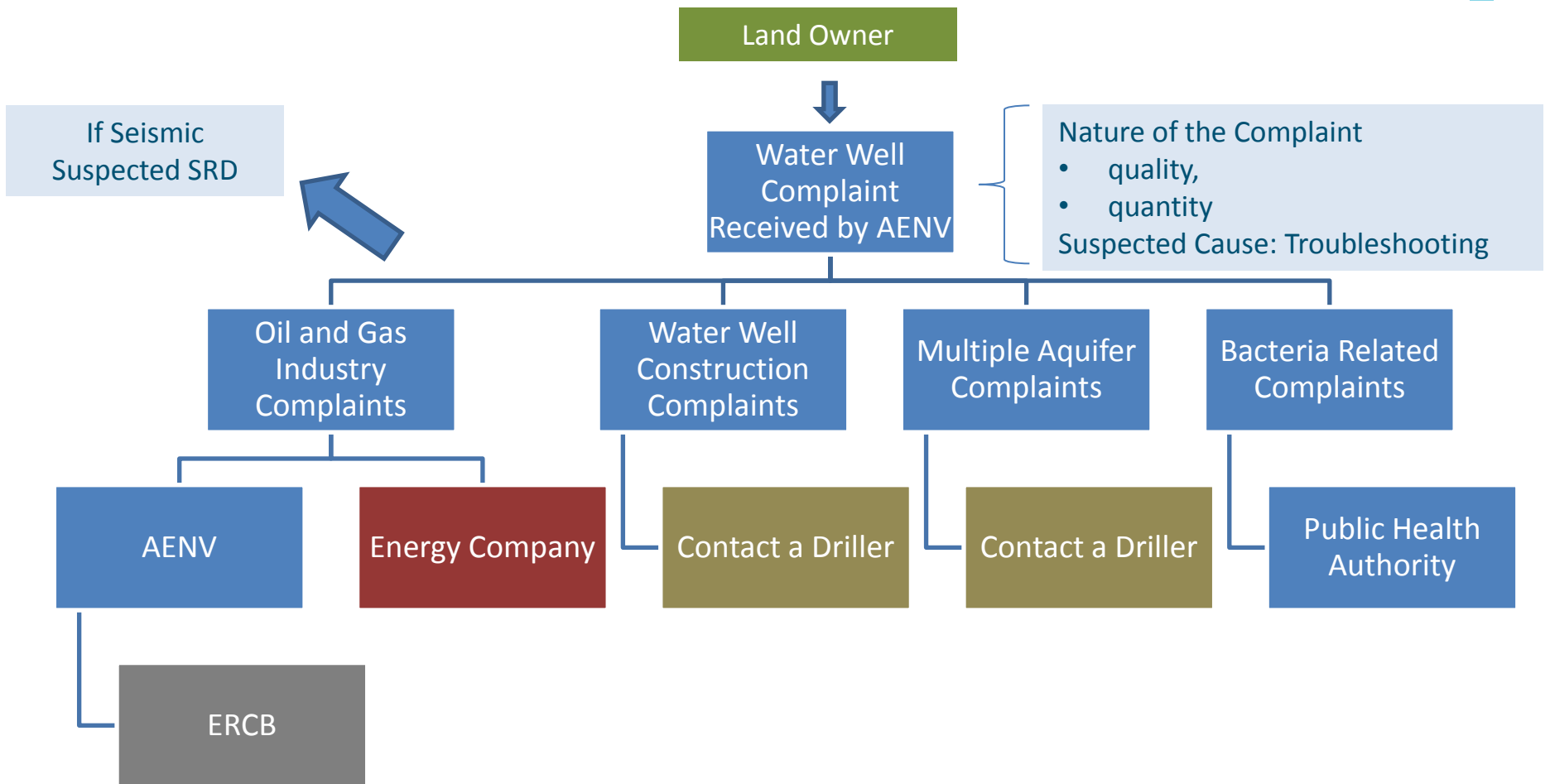
Objectives and Data

- Compile information about water well complaints related to oil and gas activities in Alberta to provide information about the types of documented impacts to help more accurately inform the risk to land owners and help improve investigation of these complaints.
- Sources of information:
 - Alberta Environment EMS Database
 - All water well complaints received by AENV between 2005 and 2010.
 - For the complaints that proceeded to the investigation phase, reports prepared by AENV, energy companies or consultants will also be used.

Water Well Complaints

- **AENV** Receive complaints related to water well impacts and perform the initial assessment, site visit and recommend follow-up activities. Based on their assessment, and any supporting investigations will make the final decision as to whether oil and gas impacted.
- **ERCB** are involved in it is suspected to be related to oil and gas activities. Provide desktop review the operators drilling and completion reports, conduct investigations to AENV to help evaluate impact.
- **FAO** administer the Water Well Restoration or Replacement Program. Landowner can apply for compensation from this program even if impacts have not been conclusively determined.

AENV Water Well Complaints Process



Method

- Phase 1:
 - Compilation of statistics from EMS Database, including nature of initial complaint, perceived problem, etc.
- Phase 2:
 - For those complaints that proceeded to the investigation phase, additional information about distance of water well to energy well, activities performed to investigate complaint, and outcome will be used.

Preliminary Results: Phase 1

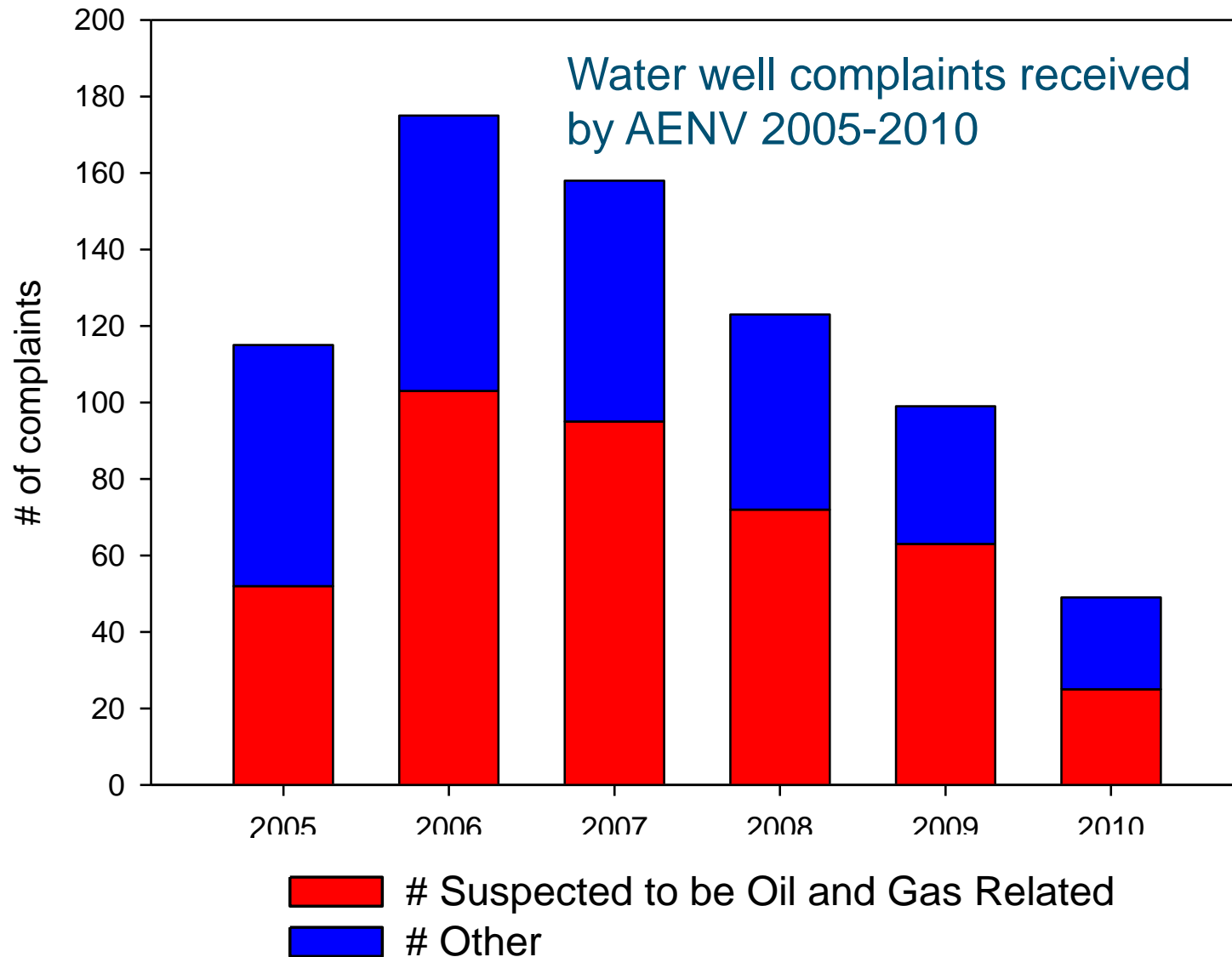
| 2005-2010 Summary of Well Complaints Received by AENV | # |
|---|----------|
| # of Complaints Received | 720 |
| # of Complaints Where the Water Well Owner Suspected Well Problem Related to Oil and Gas Activities | 410 |
| # of Follow-Up Investigation Reports | 49 |
| # of Water Wells with Confirmed Impacts from Oil and Gas Activities | 1 |
| # of Contested Cases | 2 |

Preliminary Results: Phase 1

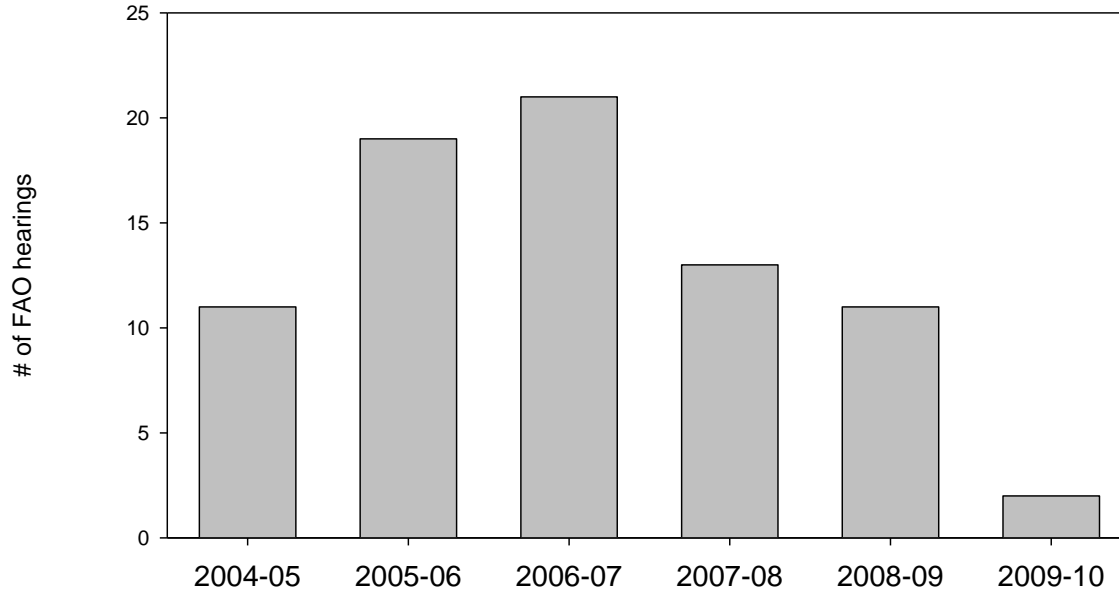
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**Not from
AENV EMS
database**

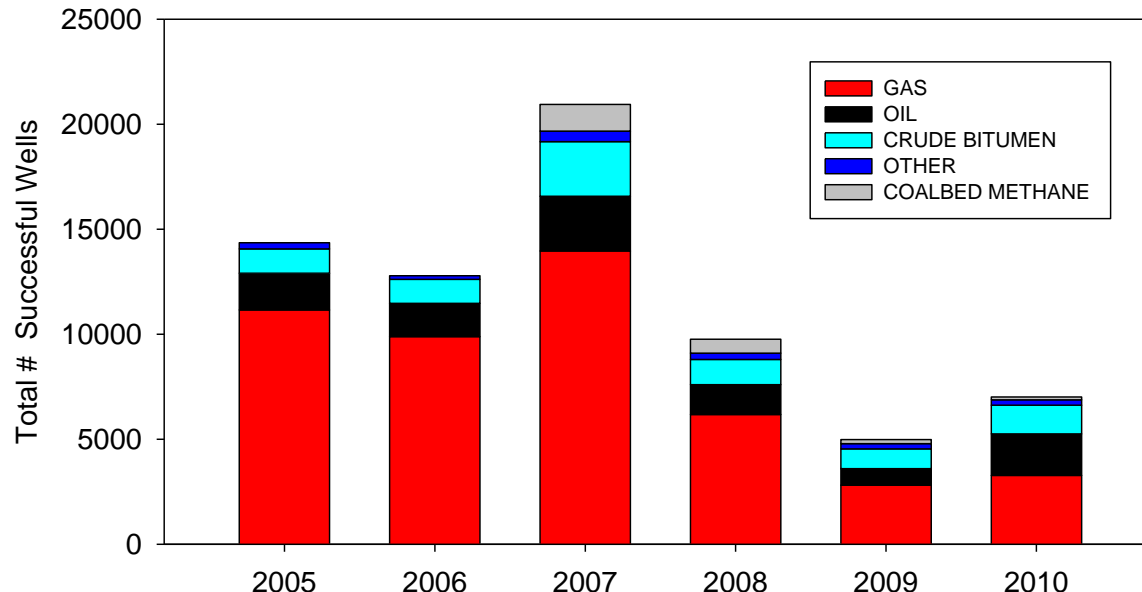
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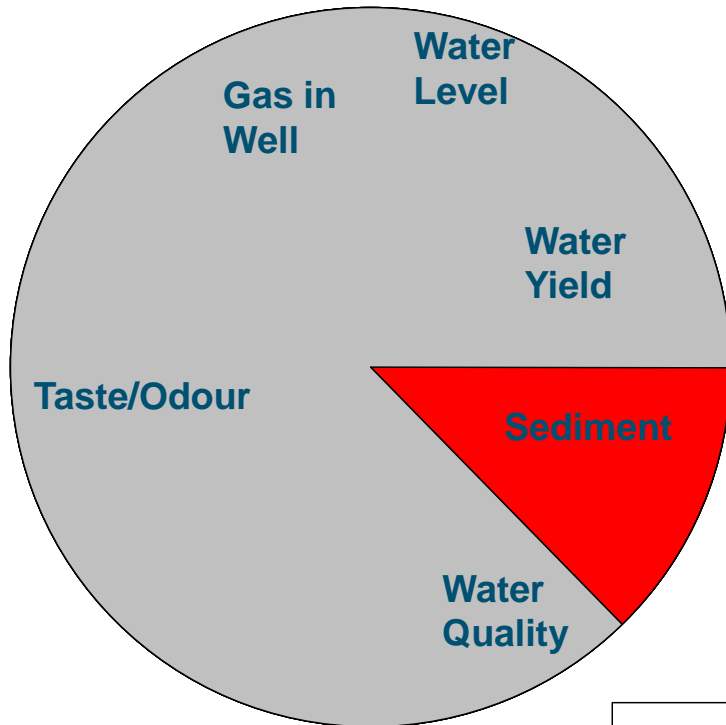
Annual Report of the Office of the Farmers' Advocate of Alberta (FAO), 2008-09, 2010



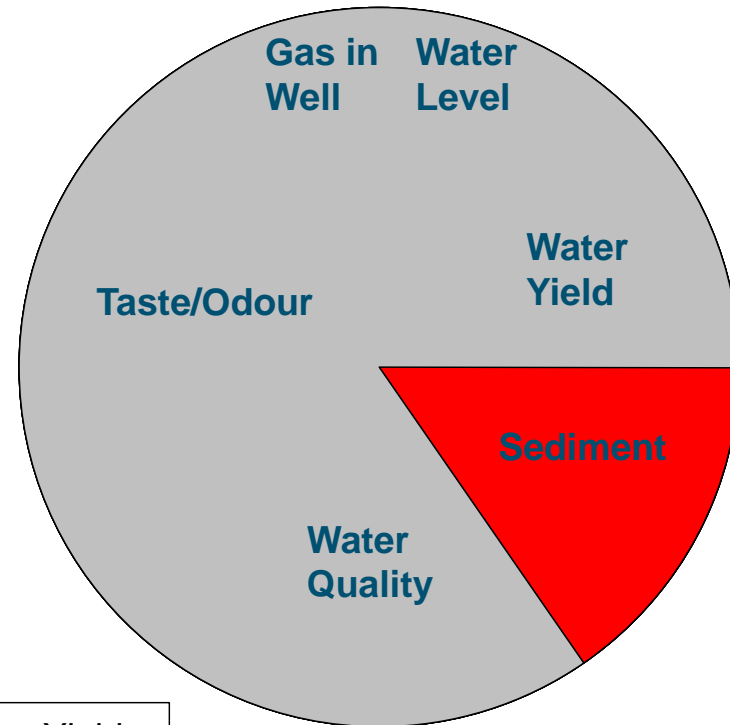
ERCB Alberta Drilling Activity Monthly Statistics, 2005 to 2010

Preliminary Results: Phase 1

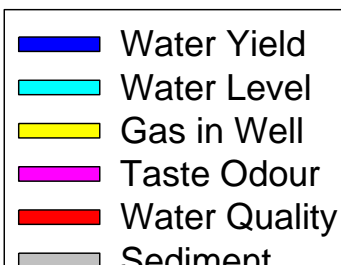
- The breakdown of types of complaints were fairly similar, regardless of whether oil and gas activities were suspected to be the cause of the water well problem.



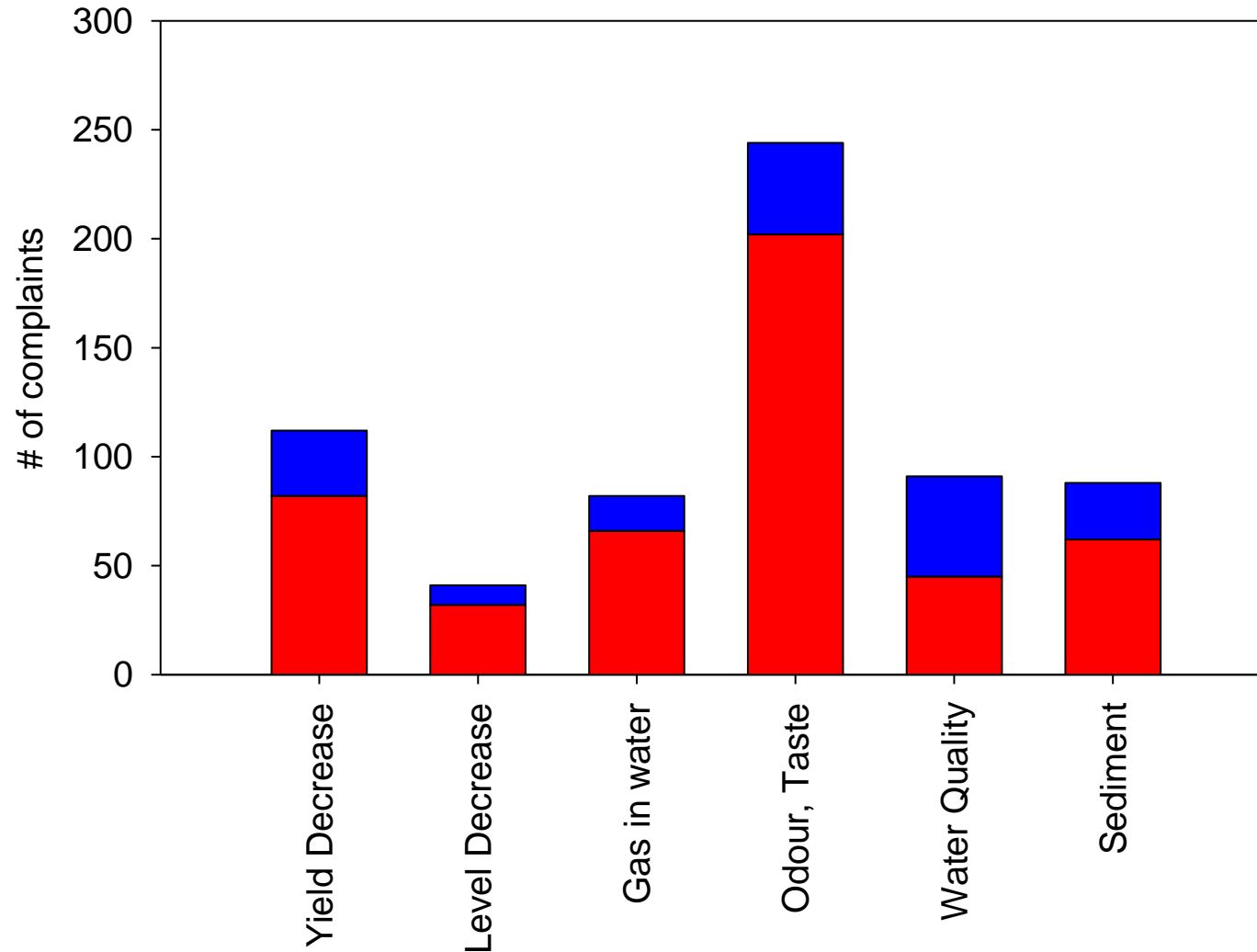
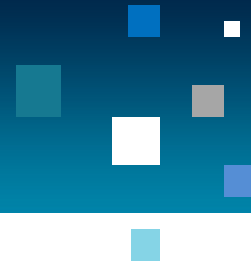
Initial Complaint Thought to be Related to Oil and Gas Activities (n= 410)



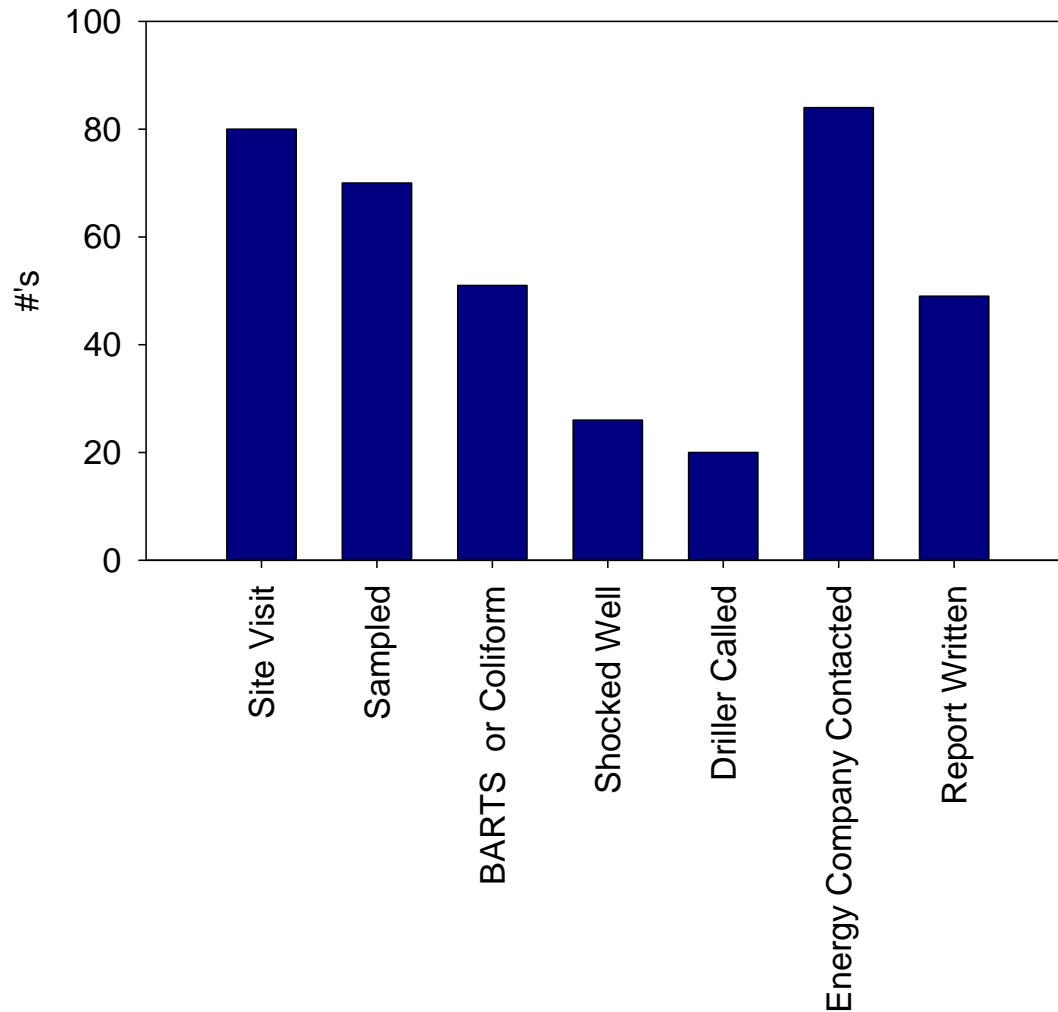
Initial Complaint Not Thought to be Related to Oil and Gas (n= 310)



Preliminary Results: Phase 1

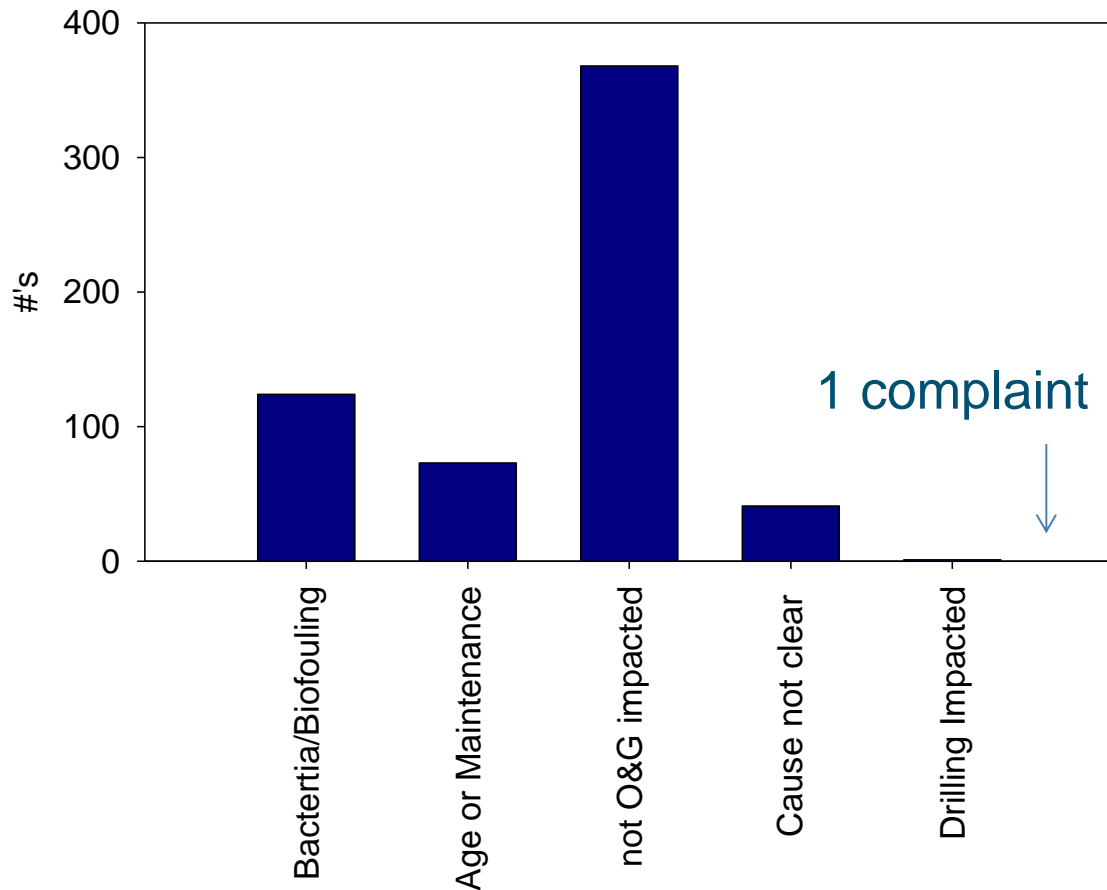


Preliminary Results: Phase 1



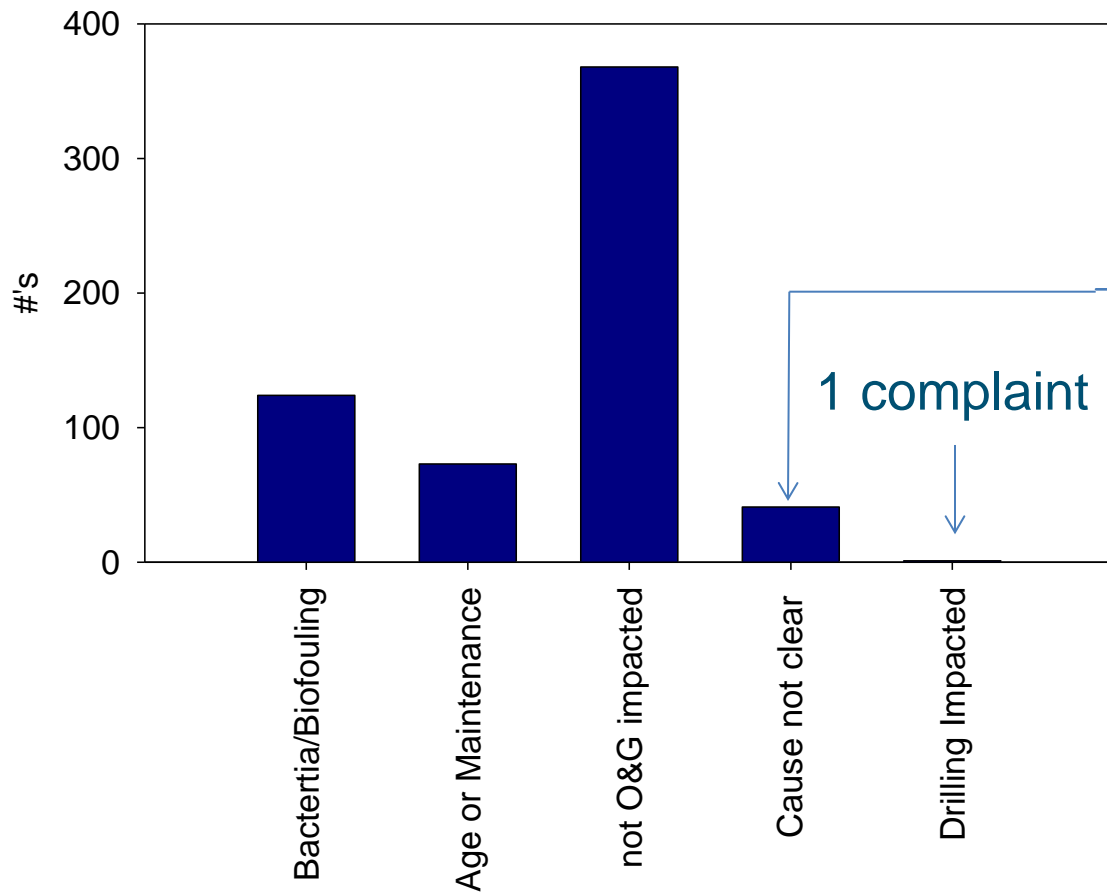
- For the 410 water well complaints thought to be related to oil and gas activities the following follow-up activities occurred.

Preliminary Results: Phase 1



- For the 410 water well complaints initially suspected as being related to oil and gas activities the following causes were noted in the closure of the complaint. For 41 complaints the cause of the problem was not clear.

Results: Phase 1



| | |
|------------------------------------|----|
| | |
| Could not contact owner | 14 |
| Problem stopped | 7 |
| ERCB investigation | 3 |
| SRD/FAO | 3 |
| Energy Company investigation | 3 |
| Inconclusive results | 3 |
| Found other cause | 1 |
| No information | 8 |
| Well deepened prior to conclusions | 1 |

Preliminary Results: Phase 2 (in progress)

- We have about 25 of the 49 investigation reports and are currently compiling information about details of the complaints and approaches used to investigate impacts to water wells.
- Follow-up investigation activities have included:
 - Comparison of pre- post- information (CBM and conventional wells).
 - Mineralogical analyses to determine sources of sediments to wells.
 - Compositional and isotopic analyses to determine the source of gases to water wells.
 - Isotopic tracing of dissolved constituents to identify their sources.

Causes of High Perceived Risk?

- Despite studies that indicate the actual risks are low (e.g. CAPP, 2009; Worley Parsons, 2009) there appears to still a high perceived risk.
- Highly publicized cases:
 - US: Large number of impacts to water wells, but fundamental differences in geological setting and development.
 - Small number of cases in Alberta.
- Lack of knowledge concerning background water quality.
- Industry / Regulatory Processes?
 - Past practice of automatically providing new well/compensation for complaints.
 - Investigations that eliminate role of oil and gas in impacts to a water well, but that do not provide solutions leave land owners unsatisfied.
 - Baseline Water Well Testing requirements go beyond expected impacts.

Solutions

- Educating well owners about well maintenance.
 - *Water Wells that Last for Generations*, Alberta Agriculture Food and Rural Development
 - Synergy Alberta
- Public Relations Efforts:
 - Ensure that all complaints are first registered with AENV to maintain transparency.
 - Provide baseline testing prior to drilling of energy wells even though not regulated.
 - Respond to initial complaints using trusted sources e.g. local drillers.
 - Investigate all complaints even though it may be less expensive to drill a new well.

Acknowledgements:

- Alberta Environment
- ERCB
- Farmers Advocacy Office
- PTAC
- Bonavista
- Canadian Spirit Resources
- Cenovus
- CNRL
- Daylight Energy
- Encana
- Laurus
- NAL Resources
- PENNWest
- Quicksilver
- Seven Energy
- Scollard