RISK OF UNDETECTED GAS MIGRATION VENTING AND EMISSIONS

PREPARED FOR ESAA - REMTECH EAST

PRESENTED BY:

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Well Integrity & Liability Specialist
360 Energy Liability Management

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360 ENERGY LIABILITY MANAGEMENT

AGENDA

INTRODUCTION

WHAT IS “GAS MIGRATION”?

- Description, mechanisms and composition
- How and where it can appear
- Utility gas leak vs gas migration

HOW CAN FIRST RESPONDERS SAFELY ADDRESS GAS MIGRATION EVENTS?

- Identification and response to utility gas or gas migration events

JURISDICTIONAL DIVERSITY

- Regional contrasts in policy and regulations

WHEATLEY EMERGENCY

- Private contractor tactical response to the emergency situation
- Work site process

TAKEAWAYS

INTRODUCTION

RYAN DOULL

- 24 years of experience
- Well Integrity SME
- Led most prominent service teams in the field of Well Integrity
- Inventor of emissions technology
- Regulatory and industry association contributor
- Liability Specialist – 360 ELM

INTRODUCTION

360 Energy Liability Management

Closure Made Simple

Liability Assessment

Liability Management & Asset Retirement Obligations Specialists

Abandonment & Decommissioning

In-house execution of Petroleum Well & Pipeline Abandonments and Facility Decommissioning

Environmental Reclamation & Remediation

Full Environmental Closure, Monitoring, Spill Response & Risk Assessment

Emissions

Specialists on Gas Migration, Emissions Management & Tactical Response

WELL INTEGRITY

- Fugitive emission from a petroleum producing subsurface formation
  - Not a leak from the wellhead or surface infrastructure
- Can be found at active, suspended or abandoned wells
- Usually low pressure and low flow
- Often undetected, unless conditions exist that allow it to concentrate
- Composed of natural gas (mostly methane)
  - Sometimes accompanied by hydrogen sulphide (H2S)
- More common than some would assume

INTERNAL VS EXTERNAL GAS MIGRATION

INTERNAL – "SURFACE CASING VENT FLOW"

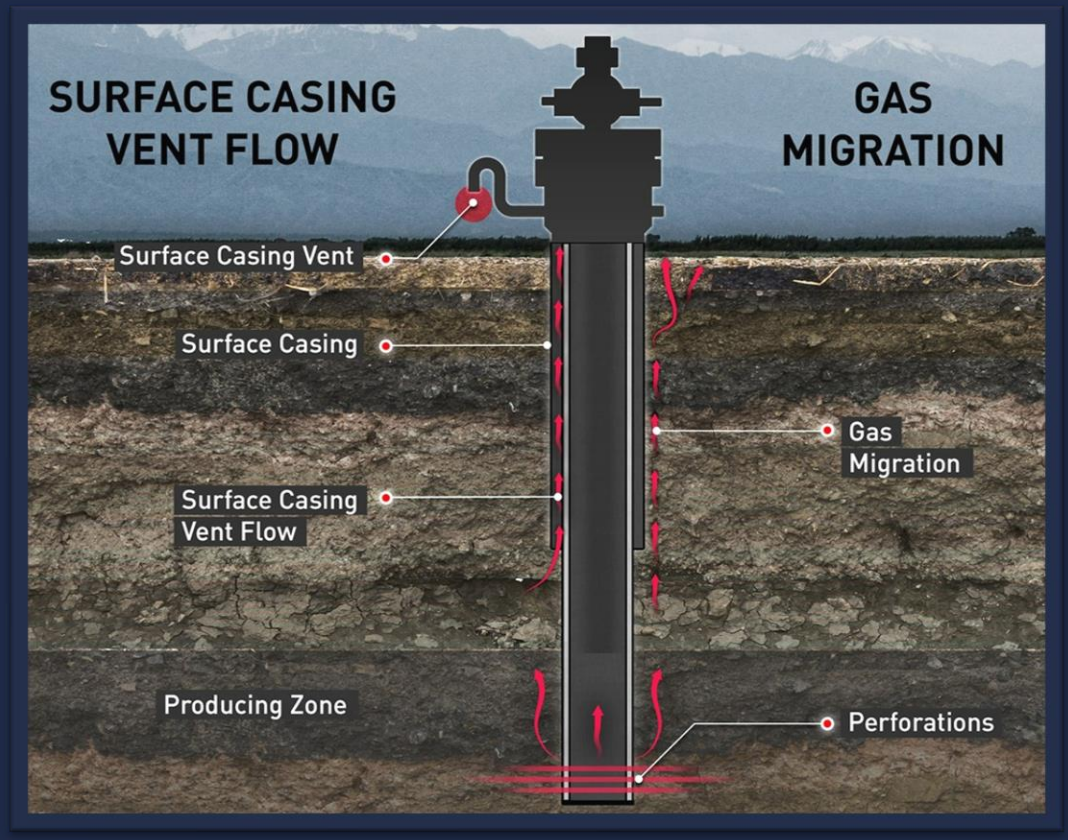
- Gas travels up the wellbore and into the outermost (surface) casing
  - If open, gas can then emit from the top of the surface casing (vent flow, or SCVF)
  - If closed, gas builds pressure and stabilizes (sustained casing pressure) or can over-pressure and fracture the shallow formation causing GM

EXTERNAL – "GAS MIGRATION"

- Gas travels up the wellbore along the outside of the casing(s)

WELL INTEGRITY

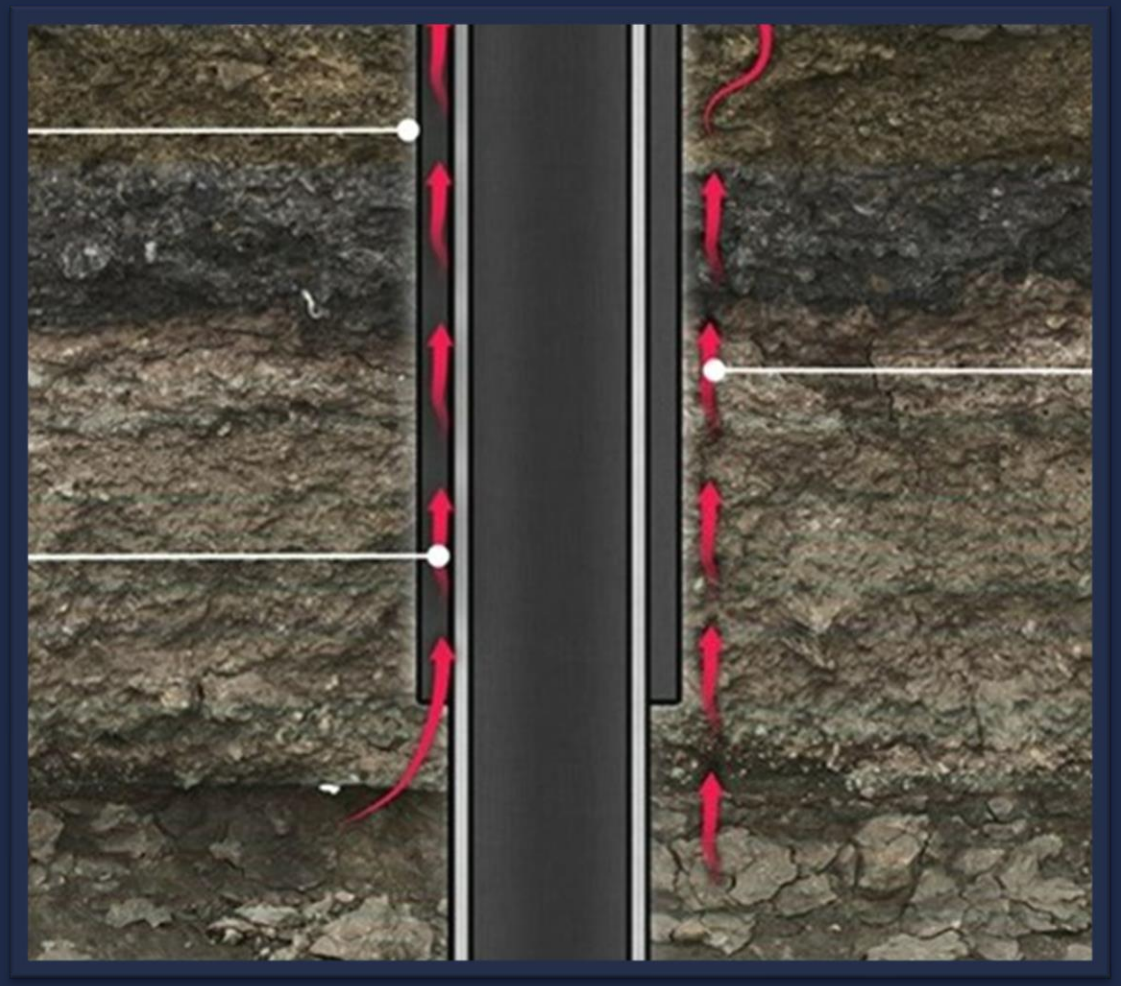
INTERNAL VS EXTERNAL GAS MIGRATION



CASING STRINGS & INTERNAL/EXTERNAL GM

SURFACE CASING

INTERNAL GM
(VENT FLOW)

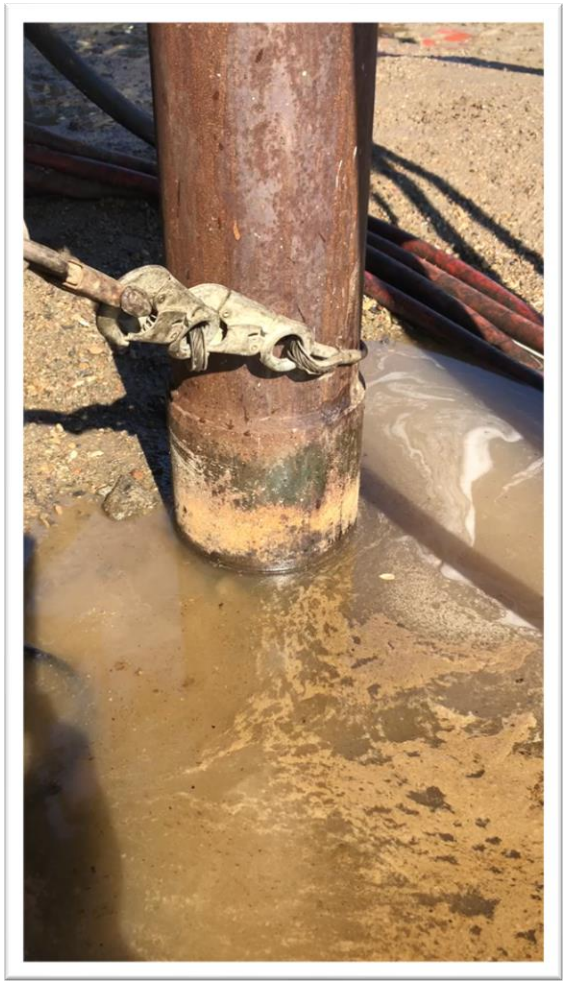


EXTERNAL GM
(MIGRATION)

INTERNAL/EXTERNAL GM

INTERNAL GM (VENT FLOW)

EXTERNAL GM (MIGRATION)

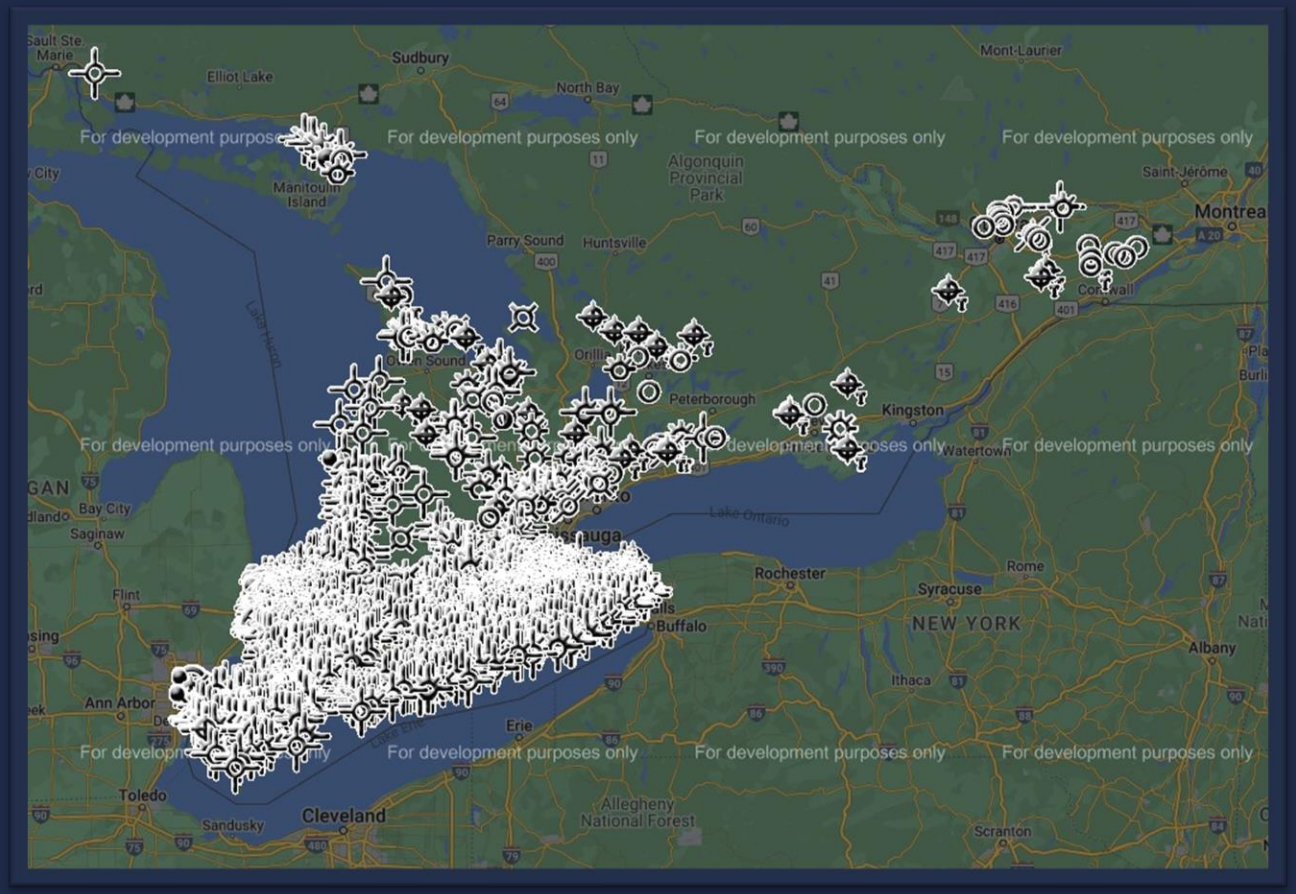


WHERE CAN GAS MIGRATION BE FOUND?

NEAR ANY WELLBORE THAT PENETRATES AN OIL/GAS BEARING FORMATION

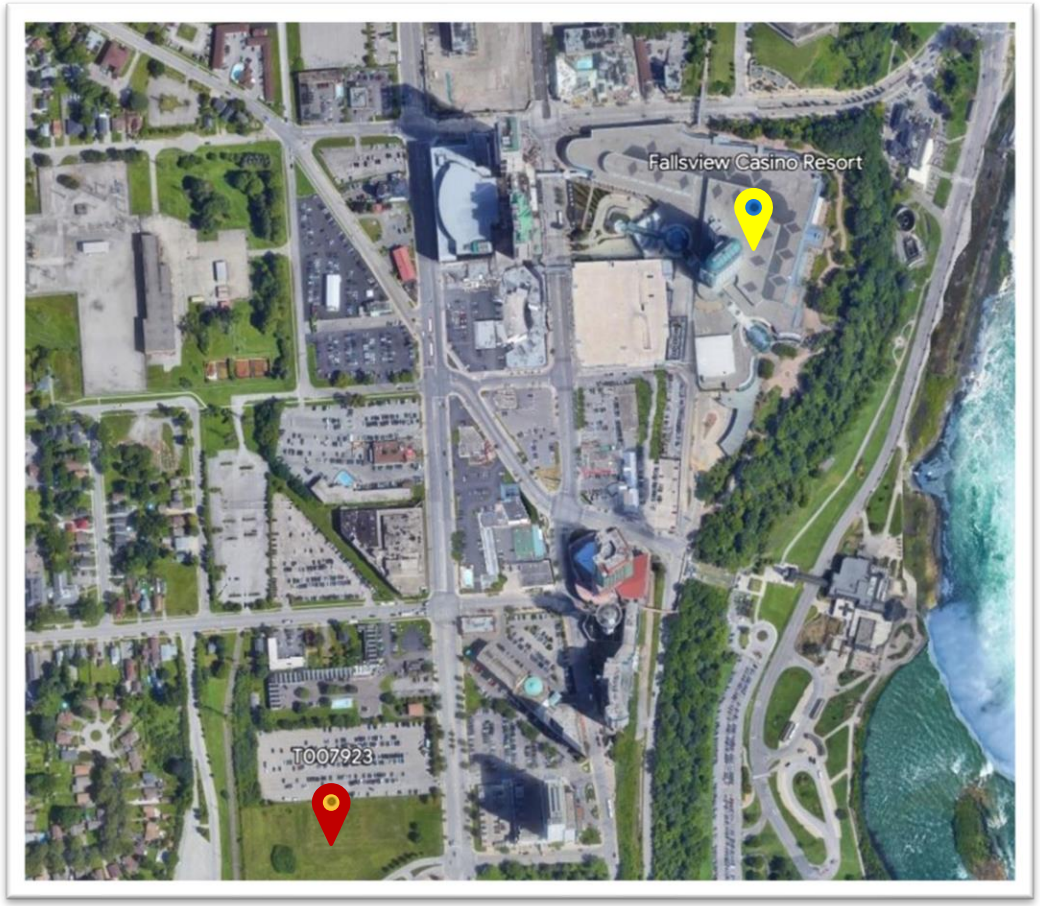
- Sometimes from other conduits adjacent to such wells
- In Western Canada, approximately 5% to 10% of wells tested will have GM
- Can be more or less common depending on certain criteria
  - Age of a well is the most important factor of risk potential for a well to leak
  - Other factors play a role
    - Location
    - Well type
    - Depth
    - Status
    - Construction & Abandonment Processes
      - Materials used
      - Drilling, completion, testing, abandonment, etc. regulations and practices

RISK ASSESSMENT - OIL & GAS WELLS



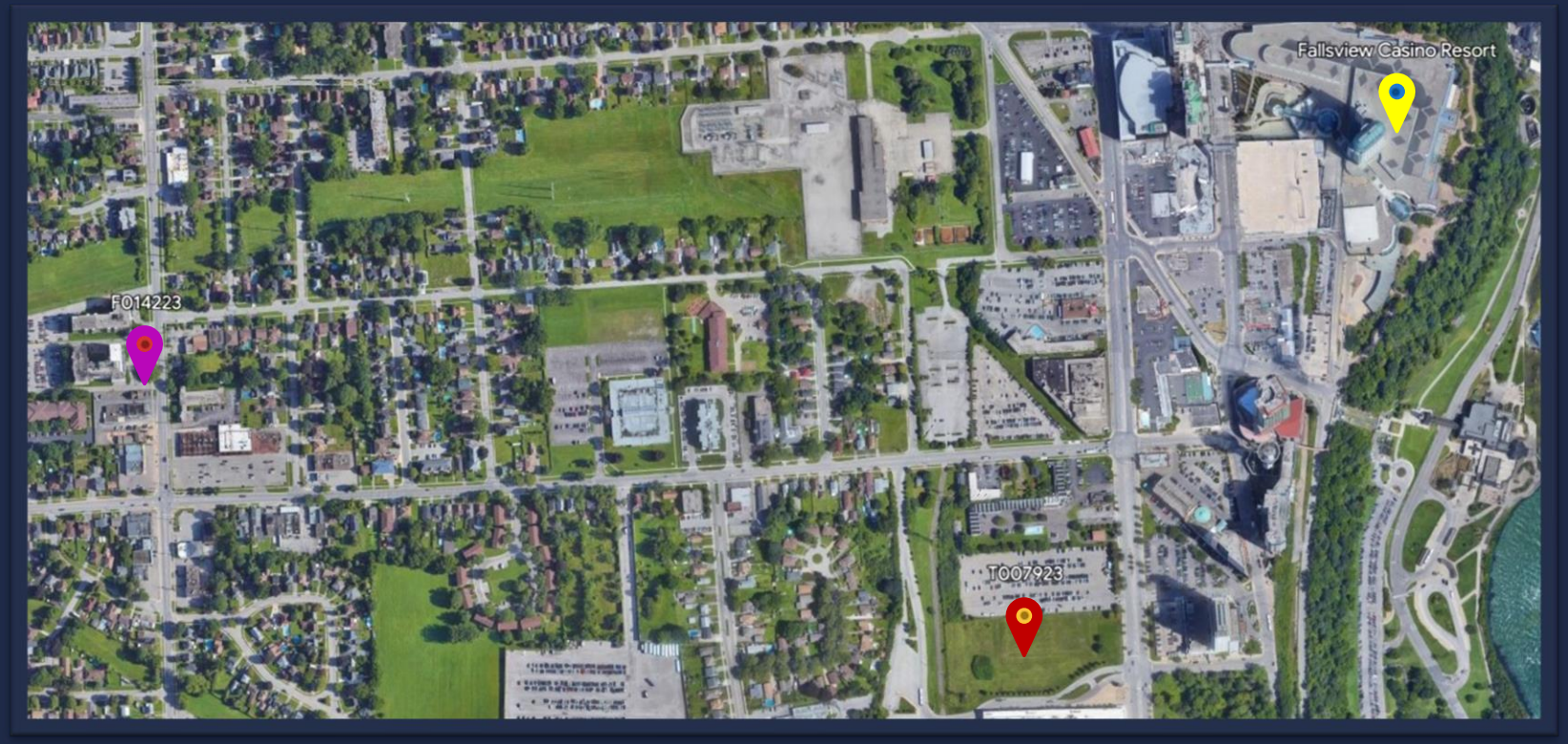
LOCATION OF WELLS

RISK ASSESSMENT - OIL & GAS WELLS



LOCATION OF WELLS

RISK ASSESSMENT - OIL & GAS WELLS



LOCATION OF WELLS

RISK ASSESSMENT - OIL & GAS WELLS

LOCATION OF WELLS

LICENCE #: F014223
WELLNAME: McGlashan Farm - Well No. 1

OPERATOR:	Unknown		
CTY:	Welland	**TWP**:	Stamford
LOT:	158	**CON**:	
LE BLOCK:		**LE TRACT**:	
WELL TYPE:	Natural Gas Well	**CLASS**:	
WELL MODE:	Unknown	**TARGET**:	
		TD FORM:	

DRILLING DATA		DATES		COORDINATES	SAMPLES
RIG TYPE:		LIC. ISSUED:		N/S BOUNDARY: X	TRAY:
GRND ELEV:	190.00	SPUD DATE:		E/W BOUNDARY: X	
KB ELEV:	190.30	TD DATE:		**NAD 83**	**POOL**
TVD:	256.03	CMP DATE:		SUR LAT: 43.08000917	Welland Pool
PBTD:		WO DATE:		SUR LONG: -79.09753083	
		PLUG DATE:		BOT LAT: 43.08000917	
				BOT LONG: -79.09753083	

LOCATION COMMENTS

DATE	ACCURACY	METHOD OBTAINED
	Within 1000 metres	

UTILITY GAS vs GAS MIGRATION

UTILITY GAS

- Hissing sound
- More immediate fire/explosion risk
- Will occur somewhere along distribution network
- Distinct “rotten egg” smell from mercaptan

GAS MIGRATION

- Not likely to make a sound
- Often undetected unless sequestered
- Will occur near an existing wellbore
- Odorless, except in higher concentrations: “gassy/oily smell”

RESPONSE TO GAS MIGRATION ISSUE

OPTIONS IF GAS DETECTED IS NOT UTILITY GAS

- Treat acute situation on scene as if it was a utility gas leak
- Engage a third-party contractor to assist with safely determining the gas source, and advising on next steps
- Contact stakeholders
  - Landowner/occupants
  - Local government
  - Provincial government
  - Others

WHEATLEY EXPLOSION

PRIOR TO & DURING GAS RELEASE EVENTS

WHEATLEY EXPLOSION

PRIOR TO & DURING GAS RELEASE EVENTS

ENSURE ADEQUATE MONITORING & SAFETY PRECAUTIONS

- Data review
- Monitoring system specs and sensor placement
- Design and implement site-specific tools and systems to reduce risk and facilitate site operations

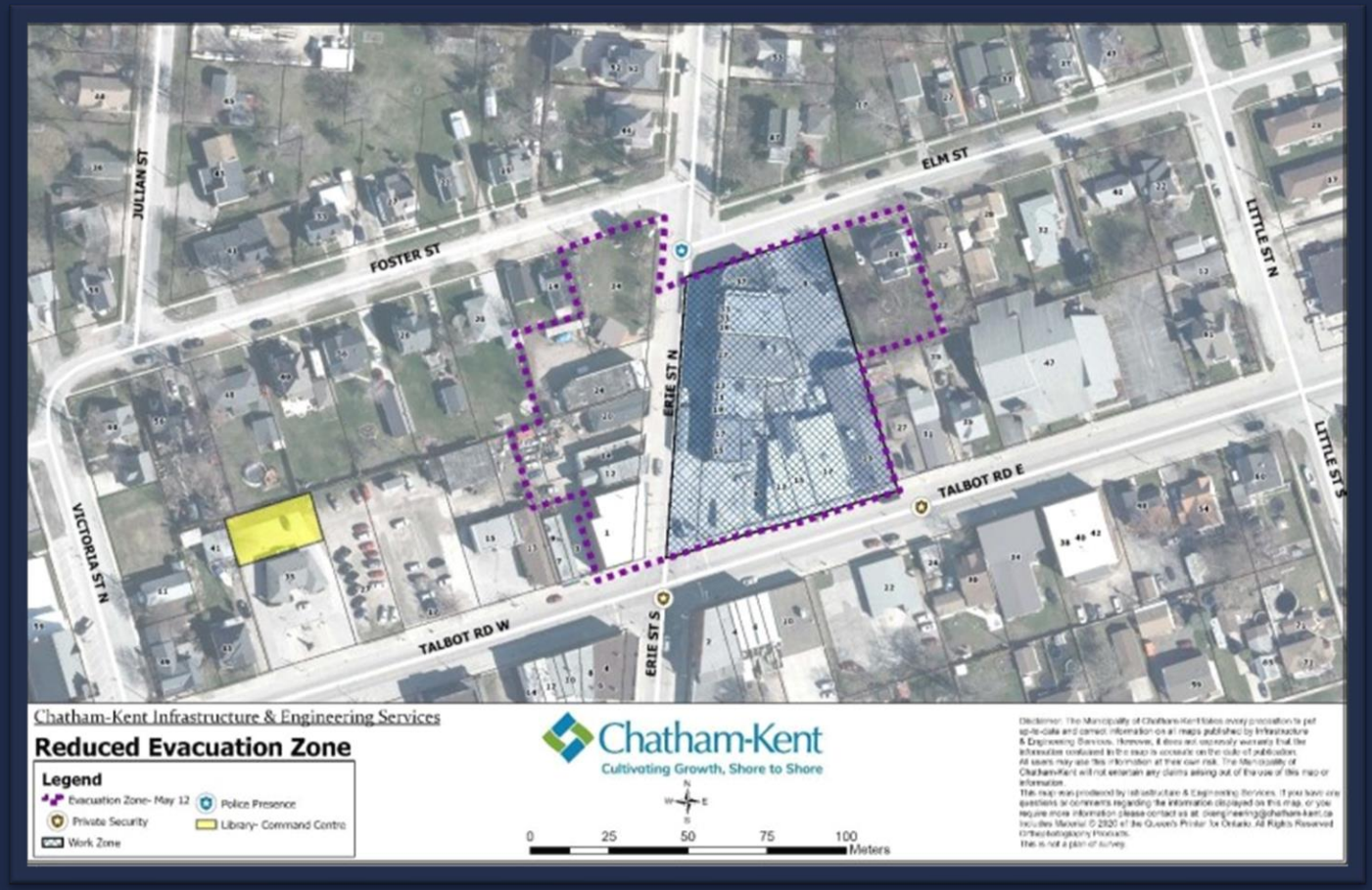
SAMPLE ACQUISITION

- In situ sampling for lab analysis and interpretation
- Baseline and temporal data

ADVISE FD ON EVAC ZONE

- Review continuous monitoring data
- Advise FD on evacuation zone

WHEATLEY EXPLOSION



Evacuation Zone & APECs

WHEATLEY EXPLOSION

Evacuation Zone & APECs

SITE SAFETY & INVESTIGATION ONGOING SUPPORT

REVIEW / ADVISE PLANS – COORDINATE OPERATIONS

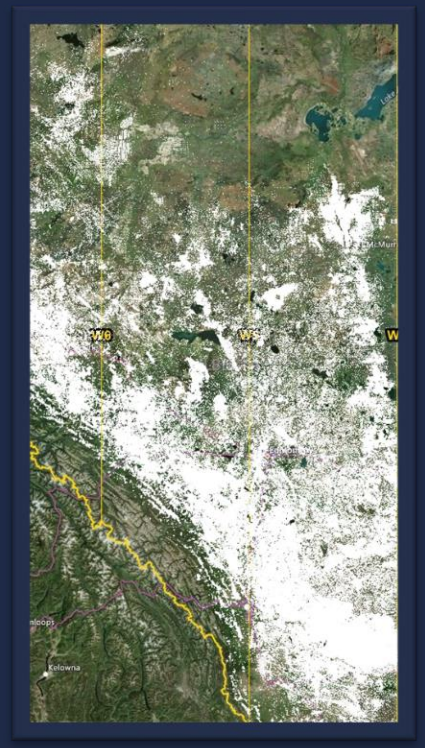
- Are there gaps in operational plans regarding safety from potential gas release?
- Design and implement systems and controls to address such risks
- Do the plans allow for the safe gathering of data?
- Ensure all necessary data is accurately gathered and available for investigation and remediation operations
- Coordinate site ops and subcontractors

RESOURCES AND ONGOING SUPPORT

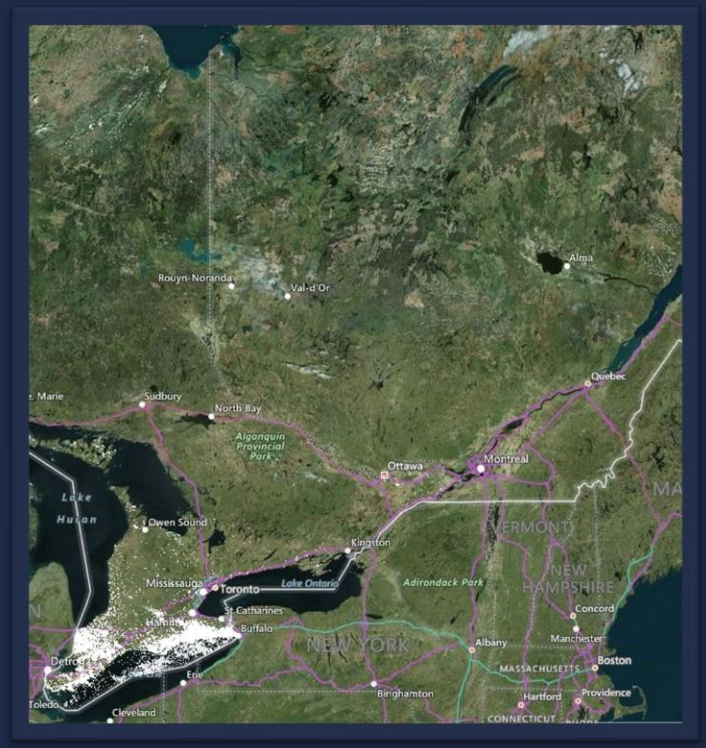
- Set up FD and municipal staff for operational support and long-term site safety
- Provide access to technology and industry-specific resources
- Create a plan for risk assessment and tactical support in the event of future issues

REGULATORY CONSIDERATIONS

REGULATORY DIFFERENCES BY JURISDICTION



460,000 WELLS



30,000 WELLS

REGULATORY CONSIDERATIONS

REGULATORY DIFFERENCES BY JURISDICTION

MINERAL (SUBSURFACE) RIGHTS

- The right to develop resources from below ground

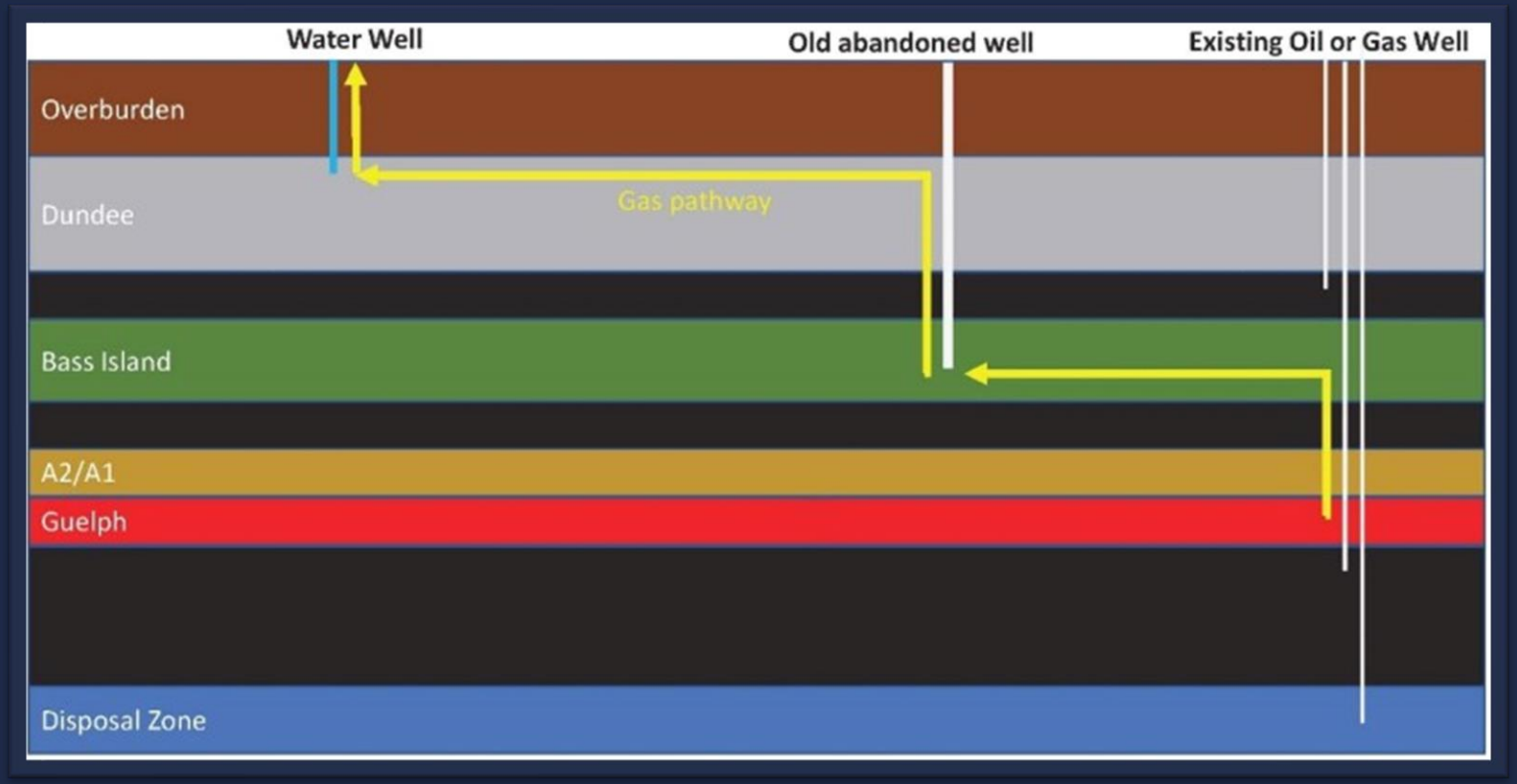
SURFACE RIGHTS

- The right to access the land above

FREEHOLD

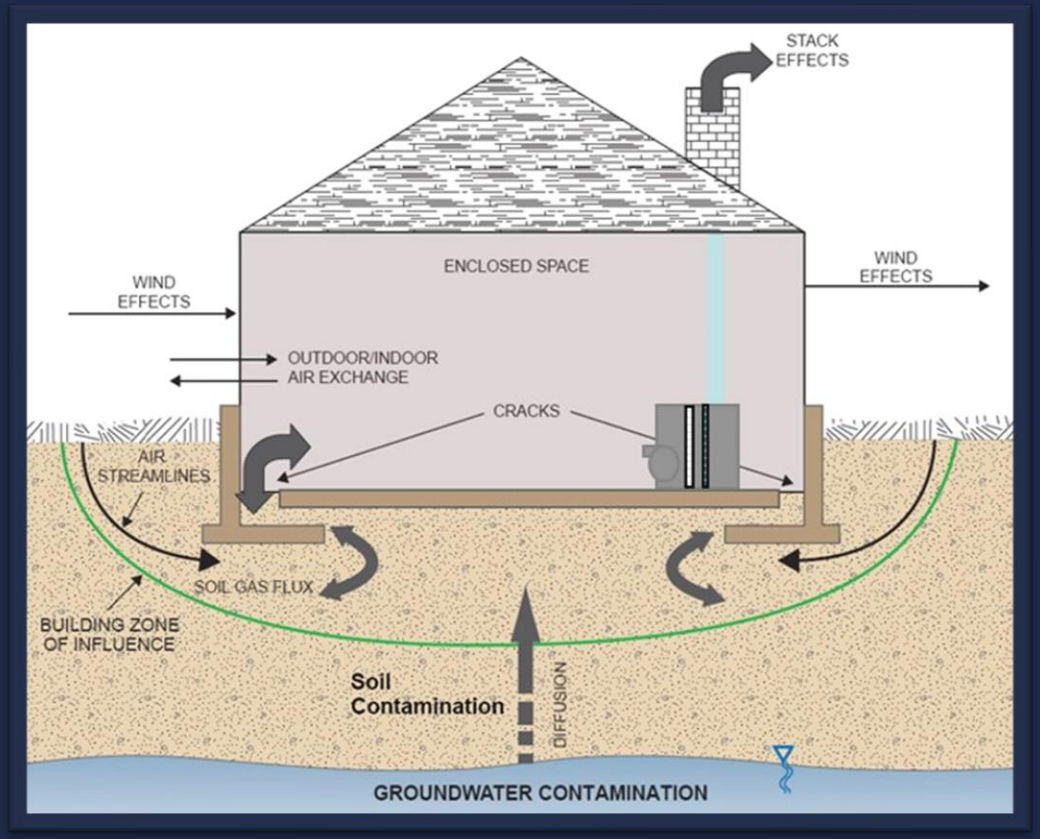
- The right to both land access, and resource development below

REGULATORY CONSIDERATIONS



CROSSFLOW BETWEEN WELLS

REGULATORY CONSIDERATIONS



KEY ELEMENTS OF VAPOUR INTRUSION PATHWAYS

TAKEAWAYS

UNDERSTANDING OF WELL INTEGRITY ISSUES AND THEIR RISKS

. . .

USE THE INFORMATION TO FACILITATE DISCUSSION AT THE LOCAL LEVEL

. . .

OPTIONS AVAILABLE TO IDENTIFY AND MITIGATE RISK, AND BE BETTER PREPARED

ACKNOWLEDGEMENTS

- Chatham-Kent Fire Department
- Chatham-Kent Infrastructure and Engineering Services
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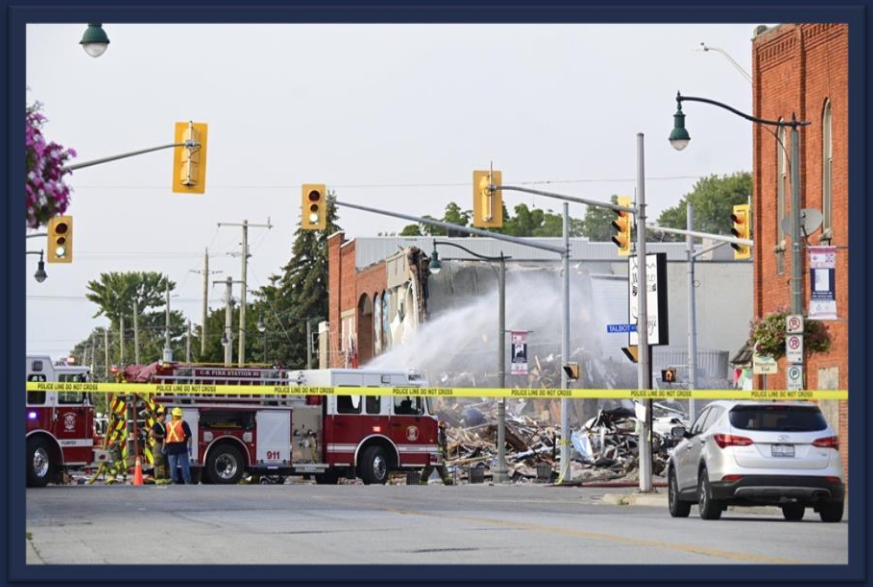
- Alberta Energy Regulator (AER)
- Canadian Association of Petroleum Producers (CAPP)
- Oil, Gas and Salt Resources Library (OGSR)
- Management and Staff at 360 Energy Liability Management

THANK YOU



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