

# **MRBCA for Petroleum Storage Tank Sites – Evaluating the Utility Receptor Pathway**

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# Overview

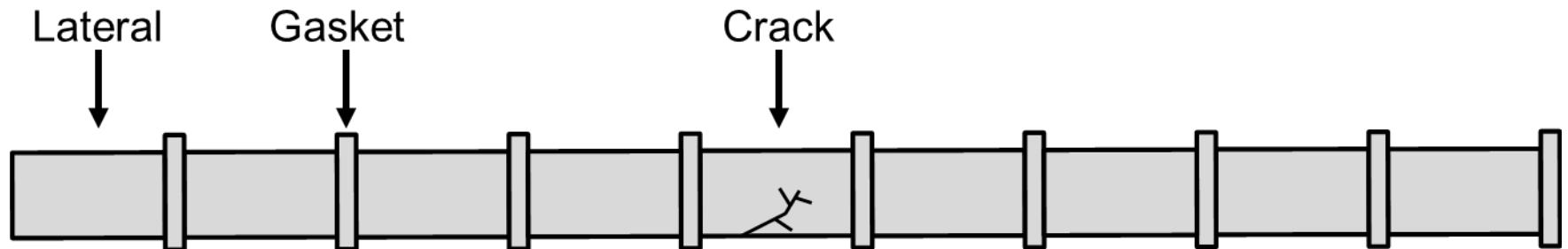
- Why?
- Dynamics of waterline risk
- Considerations for other utility types
- Factsheet (PUB2756)

# Why Consider Utilities?

- Tanks Section has had a number of recent sites with impact to waterlines or other utilities
- Act as preferential migration conduits into buildings
- This can pose a significant risk to human receptors
  - Dermal contact
  - Ingestion
  - Inhalation

# Waterlines

- Permeation – Breakthrough of a contaminant
- Absorption – Absorbing of the contaminant
- Leaching – Release of the contaminant to water
- Volatilization - Release of the contaminant to air



# Waterline Permeation - Laterals

- Polybutylene, polyethylene, and polyvinyl chloride permeable (MDEQ, Cheng 2009)
- Study using polyethelyene pipes (Mao et. al. 2010)
  - Free product had breakthrough within ~7d
  - $0.6 \text{ mg}/L$  benzene soil pore water had breakthrough in 43d
  - Once breakthrough occurred water concentrations quickly exceeded MCLs

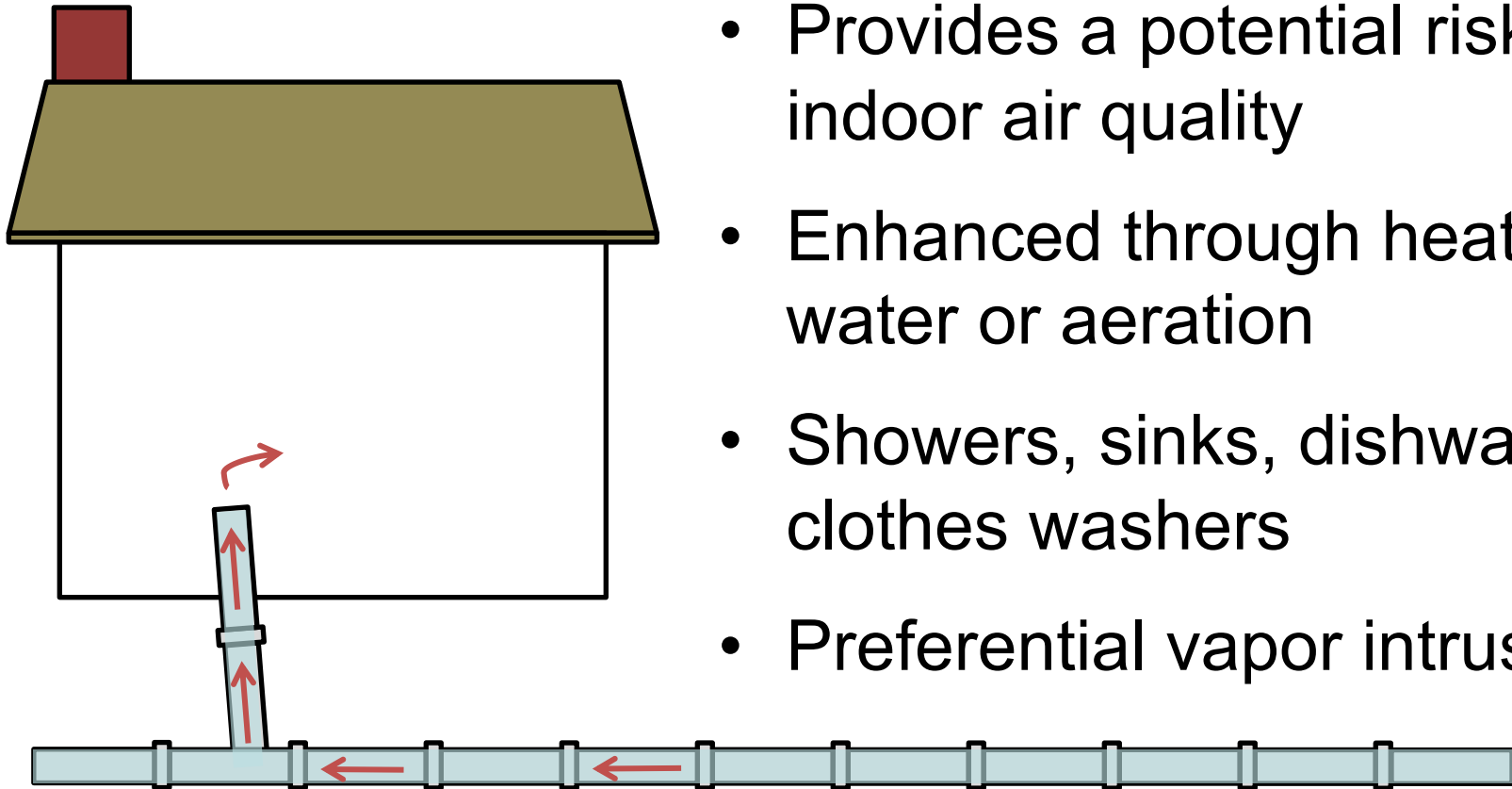
# Waterline Permeation - Gaskets

- Cheng (2009) studied permeation of petroleum through iron pipe gaskets:
  - Most commonly used gaskets in water distribution systems are styrene-butadiene rubber (SBR)
  - Tested five commonly used gaskets, including SBR
  - Benzene and toluene were most likely to permeate
  - Fluoroelastomer rubber and acrylonitrile butadiene rubber had lowest permeability while SBR was highly permeable

# Waterline Absorption/Leaching

- Petroleum can absorb into polyethylene piping (Mao et. al. 2010) and gaskets used in water lines (Cheng 2009)
- Appliance filters (Casteloes et.al. 2015), pipe scale (Treado et. al. 2009), and sediments in water heaters (Casteloes et. al. 2015) can also absorb contaminants
- Once absorbed petroleum can continue to leach/desorb into water within the line
- Dermal contact and ingestion risk

# Waterline Volatilization



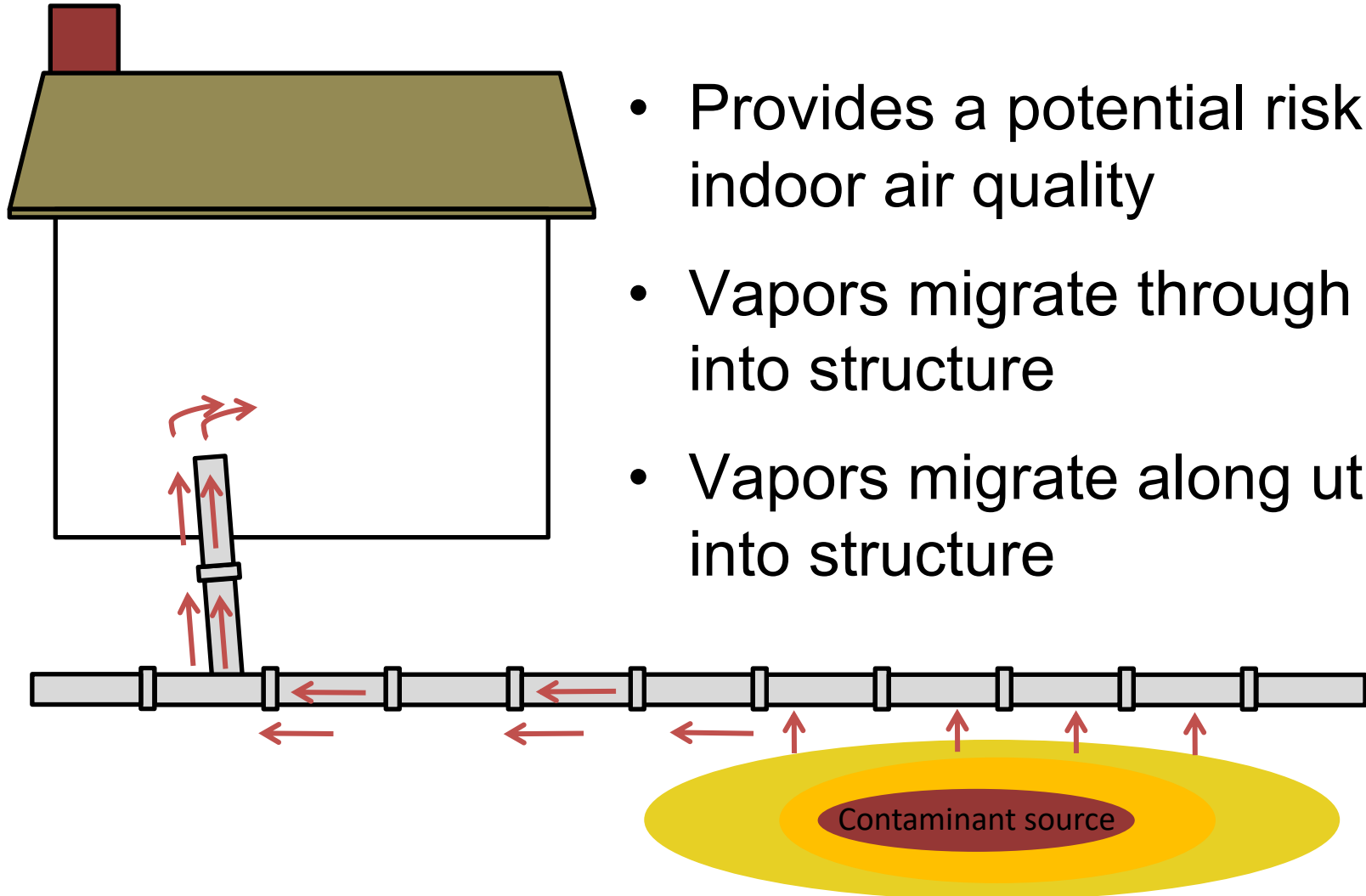
- Provides a potential risk to indoor air quality
- Enhanced through heated water or aeration
- Showers, sinks, dishwashers, clothes washers
- Preferential vapor intrusion



# Sewers/Other Utilities

- Except for construction workers, generally not in contact with contents
- Most concerned with:
  - Providing a route for preferential vapor intrusion
  - Acting as preferential migration conduits in subsurface
  - Excess vapors → Explosive risk
- Fiber optic lines, buried electric, sewers, etc.

# Sewers/Other Utilities



- Provides a potential risk to indoor air quality
- Vapors migrate through utility into structure
- Vapors migrate along utility into structure

# Fact Sheet (PUB2756)

- Vetted by ERP, ESP, WPP, DEQ, and Legal
- Posted July 10, 2019  
<https://dnr.mo.gov/pubs/pub2756.htm>
- Intended to assist in evaluating/addressing issues related to utilities impacted by petroleum releases
- Does not address impacted drinking water wells
  - Immediately sample and report to EER Hotline  
(573) 634-2436

# Utilities Potentially in Contact

- All utilities at the site should be located (MRBCA 5.4.3)
  - Construction materials
  - Depths
  - Demonstrate locations on site maps
- Conduct additional investigation
  - Soil sampling
  - Groundwater gauging and sampling
  - Vapor screening/sampling
  - Preparing cross-sections

# Waterlines in Contact with Contamination

- Contact the Tanks Section and utility provider
- May not remain in contact with FP
- Remove waterline and replace under a CAP
  - CAP must be approved by Department
  - Will have clearly defined endpoints/metrics
  - Place waterline in uncontaminated area of the site
- Clean-up/remediate area under a CAP

# Waterlines in Contact with Contamination

- If residual contamination remains
  - Waterline should be made of petroleum resistant materials (e.g. ductile iron, copper w/o gaskets)
  - Gaskets should be petroleum resistant (e.g. fluorelastomer)
  - Waterline trench lined with bentonite barriers where piping reconnects with plastic piping

# Waterlines in Contact with Contamination

- A written construction authorization from Department may be required
  - Community water suppliers – 10 CSR 60-3.010(1)(A)
  - Non-community water suppliers – 10 CSR 60-3.010(2)(B)
- Contact the Water Protection Control Branch – Permit and Engineering Section

# Drinking Water Sampling

- Required for all waterlines in contact with petroleum contamination
- Used to determine safety of water supply
- Sample on-site building, the upstream building, and downstream building
- Detection limits must be at or below DTLs/MCLs



# Drinking Water Sampling

- Procedure:
  - Collect samples after water has been stagnant for 8 hours or as long as reasonably possible
  - Collect samples upstream of any treatment system
  - Collect 1<sup>st</sup> sample immediately upon opening the tap
  - Collect 2<sup>nd</sup> sample after running the tap for 3 minutes
  - Collect 3<sup>rd</sup> sample after running the tap for 6 minutes

# Drinking Water Sampling

- Results/follow-up actions:
  - If any COC is detected confirmation sampling required
  - If COCs are above DTLs/MCLs:
    - A clean source of water must be provided by the RP
    - All filters for treating drinking water must be replaced
  - Following remediation, replacement, relocation internal waterlines must be flushed
  - Indoor air sampling may be required

# Indoor Air Sampling

- When required:
  - Follow a written procedure
    - U.S. EPA's Office of Solid Waste and Emergency Response – [\*Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air\*](#)
    - Interstate Technology & Regulatory Council's – [\*Petroleum Vapor Intrusion: Fundamentals of Screening, Investigation, and Management\*](#)
  - More than one sampling event
  - Compare to Table 7-1 (residential) or 7-2 (non-residential)

# Utility Infiltrated by Petroleum

- Contact EER hotline, Tanks Section, Utility Provider, Fire Department
- Take steps to immediately repair or remediate contamination
- Vapor monitoring may be required:
  - Utilities
  - Utility corridors
  - Connected buildings

# Vapor Monitoring

- Use a PID and explosimeter
- Begin at utility access point nearest contamination or ingress point and work outward
  - Determine whether vapors are present elsewhere
  - Determine extent of contamination
  - Determine ingress point
- At top of utility point take O<sub>2</sub> and % explosive level, again at the midpoint, and again at water level/bottom of utility

# Vapor Monitoring

- Should be conducted on all lift stations, buildings, or other structures proximate to utility
  - Note location of monitoring points
  - Supply addresses and owner information
- For buildings check:
  - Basements
  - Sewer drains
  - Near foundation joints, seams, and cracks

# Vapor Monitoring

If vapors, odors, PID readings are detected in buildings indoor air sampling will be required

# Vapor Migration Along Corridor

- Vapor screen utility access points
- Vapor screen ingress points into the building
- If vapors are detected in building:
  - Indoor air sampling
  - Sealing ingress point to permanently prevent vapors



# Other Exposure Pathways

- If petroleum contamination is present in utility corridors the construction worker pathway is considered complete
- Risk assessment will be required
- Unacceptable risk evaluated through a CAP

# Literature Cited

- Casteloes et al. (2015). Decontaminating chemically contaminated residential premise plumbing systems by flushing. *Environ. Sci.: Water Res. Technol.* 1, pp. 787 – 799.
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- Montana Department of Environmental Quality. Permeation of Waterlines by Petroleum Constituents Technical Guidance Document.
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# Questions/Comments?

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