

#### **U.S. EPA "State of VI Science" Workshop**

#### Reducing Vapor Intrusion Uncertainties by More Frequent Simple Measurements and Community Involvement

#### Large Buildings (AK):Temporal Variability in Industrial and Residential Style Buildings in a Far Northern Climate

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# Large Building Research

- The objectives are to:
  - (a) characterize vapor intrusion into large building and determine the controlling factors,
  - (b) compare factors controlling vapor intrusion into large buildings to that of nearby residences, and
  - (c) examine indicators, tracers, and surrogates (ITS), such as radon and pressure differential, that may provide us a better understanding of the timing of sampling.
- Needed to test in a climate that is different than past large-scale studies such as at the Sun Devil Manor and Indianapolis Duplex.



#### Size Characteristics of US Commercial Buildings

Figure 2. About half of all commercial buildings make up less than 10% of total floorspace



### Large Building Research (cont.)

- Site Location: Fairbanks, AK
- 8 Buildings selected
  - A. Real Estate Building (1500)
  - B. Church (4000)
  - C. Café (4800)
  - D. Alteration Shop (4000)
  - E. Council Building (5200)
  - F. Fire Station (12000)
  - G. Insurance House (1500)
  - H. City Hall (17000)



## Features of Fairbanks Site

- Two parallel solvent plumes in similar geology
- Coarse sand, gravel, silt and sandy silt
- Groundwater at about 20ft bgs
- Extensive well characterized plume under commercial area
- Relatively little remediation undertaken
- Subartic climate; but not permafrost in this area
- Subject to temperature inversions and large wind driven temperature changes. Extreme winter temperature ranges (65 below to 45 above).
- See http://climate.gi.alaska.edu/history/fairbanks



IECC zones Reprinted form https://basc.pnnl.gov/images/iecc-climate-zonemap

# Large Buildings (cont.)

- Where are we now?
  - Preliminary Screening Data VOCs
  - Data from Radiello passive sample
    - 7 days
    - Non-detects in City Hall
      - Temporarily dropped for now

Detectable everywhere else

Sample ID: IS1-2-072020-Ra		mple ID: IS1-2-072020-Ra	Storage	Stairs Up	<u>10 Fee</u> t
s rs	ileft for	E (ug/m3) - 0.38 E (ug/m3) - 13	Maintenance	tchen Br Br	Îп
				✓ Storage	
		460 ppb		406 ppb	
	Area in Facility				
	2 <sup>nd</sup> floor main area				
	1 <sup>st</sup> floor main area				
	1 <sup>st</sup> floor open room		/	∕ • • • • • • • • • • • • • • • • • • •	Sample ID: IS1-1-072020-Ra TCE (ug/m3) - 0.45 PCF (ug/m3)-12
	1 <sup>st</sup> floor kitchen				
	2 <sup>nd</sup> floor foyer/entrance				
	2 <sup>nd</sup> floor auditorium				
	Outdoor south end				

Analysis Date and Time	Lab File ID	Field Sample ID	TCE (ug/m3)	Flag	PCE (ug/m3)	Flag	Building	Area in Facility
10/5/2020 16:02	20201005006 .D	IS3-1-072020-Ra	0.01		0.86		Real Estate Building	2 <sup>nd</sup> floor main area
10/5/2020 16:26	20201005007 .D	IS3-2-072020-Ra	0.01		3.1	E	Real Estate Building	1 <sup>st</sup> floor main area
10/5/2020 16:50	20201005008 .D	IS1-1-072020-Ra	0.45		12	E	<mark>Church</mark>	1 <sup>st</sup> floor open room
10/5/2020 17:14	20201005009 .D	IS1-2-072020-Ra	0.38		13	E	<mark>Church</mark>	1 <sup>st</sup> floor kitchen
10/5/2020 17:39	20201005010 .D	IS1-3-072020-Ra	0.09		1.9		<mark>Church</mark>	2 <sup>nd</sup> floor foyer/entrance
10/5/2020 18:03	20201005011 .D	IS1-4-072020-Ra	0.07		1.8		<mark>Church</mark>	2 <sup>nd</sup> floor auditorium
10/5/2020 18:22	20201005012 .D	IS1-5-072020-Ra	0.01		2.9	E	<mark>Church</mark>	Outdoor south end

#### PCE Church Soil Gas Depth Comparison



# Preliminary Indoor and Outdoor Radon Data



**Radon Values at Insurance House** 



**Radon Values at Church First Floor** 



# Large Buildings (cont.)

#### Interesting Twists and Turns

Temperature Comparison Between Soil Thermocouples and Weather Station





# Large Buildings (cont.)

- What's next?
  - Basic infrastructure is in place
    - Subslab ports,  $\Delta T$  thermocouples,  $\Delta P$  meters, weather stations, Radon monitors
  - Sampling locations selected for passive samplers
  - Field sampling at most locations has been initiated
  - Field portable GC/ECD is ready to be sent
- Waiting for COVID-19 to pass to get things in full gear
  - Full routine sampling
    - Access to Fire Station and Literacy Council building
  - Intensive sampling