EPA
United States
Environmental Protection
Agency

Ethylene Oxide Monitoring Challenges

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Sampling EtO in the air – it's challenging!

Return Clean Cans to the Field

Take a Sample and Quality Assurance information in the Field –

Send to the laboratory

Analyze the sample in the lab –

Quality Assure the Data

Send the results to the client – More Quality Assurance may occur

Where does sampling typically occur?

On-site at a particular source

At the “facility fenceline”

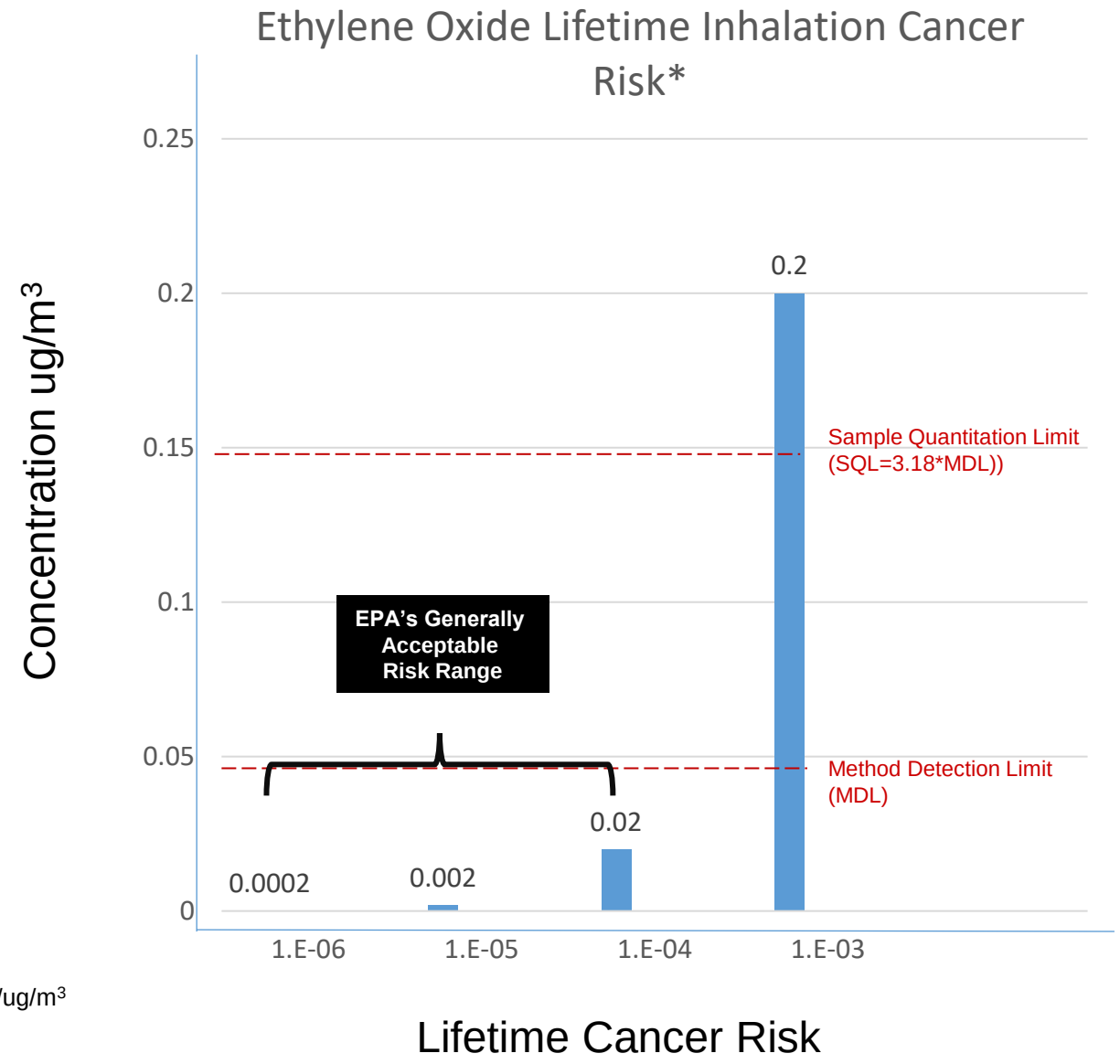
Downwind off-site (e.g., in a community)

Far away from known sources (background)

Concentration generally decreases with distance from a source

What does a sterilizer facility look like?

EtO Concentration at Different Risk Levels



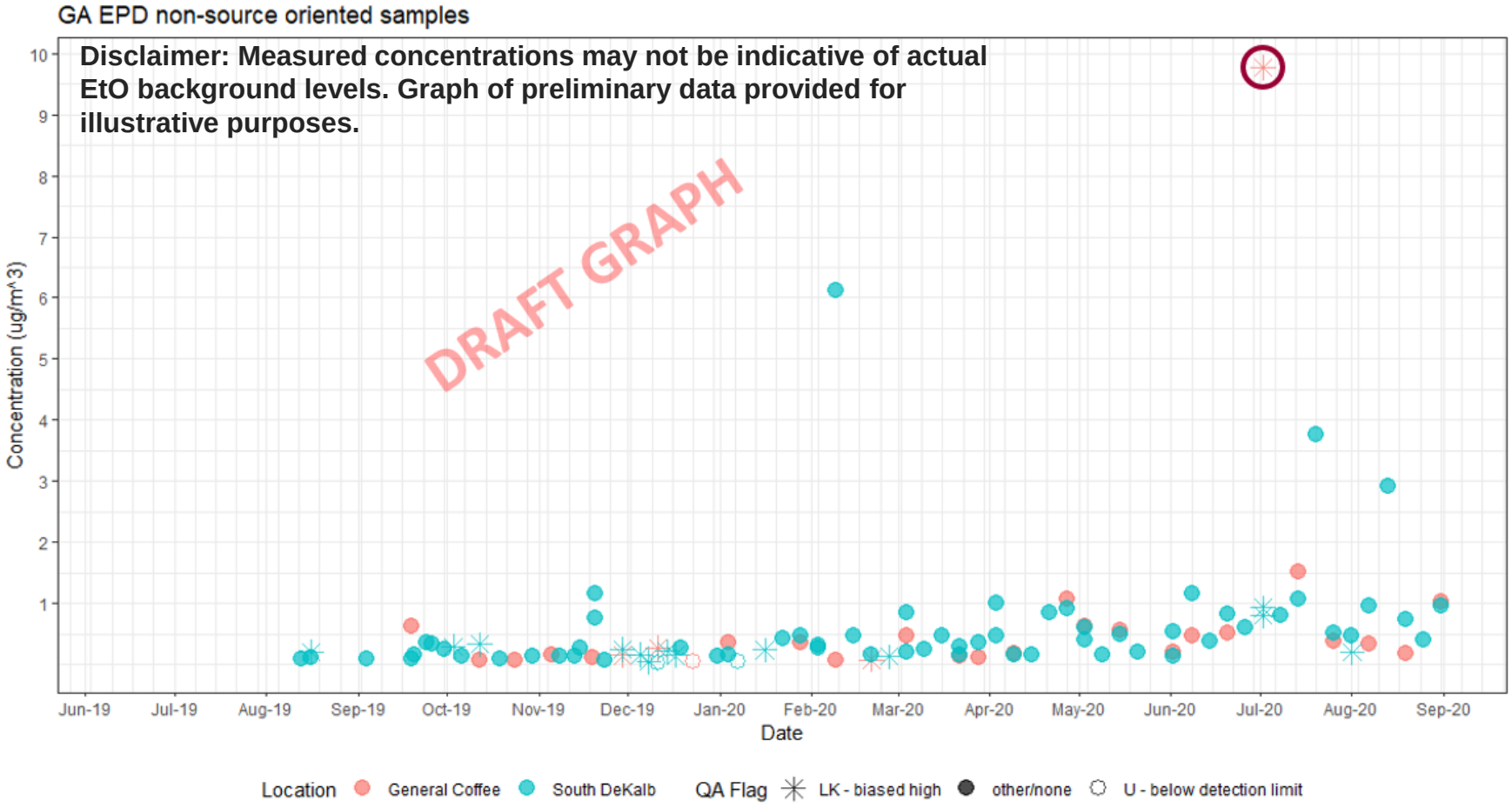
*Using a modified IUR of 0.005/ug/m^3

The difficulties of measuring EtO…

- In addition to sensitivity of the analytical method, other issues with EtO analysis have been identified:
  - Canister Effect
    - Canister effect adds positive measurement bias and uncertainty to the values measured.
      - A technical note is posted at: https://www.epa.gov/sites/default/files/2021-05/documents/technical-note-on-eto-canister-effect-052521.pdf
      - An ORD memo is posted at: https://www.epa.gov/sites/default/files/2021-05/documents/ord-eto-canister-background-memo-05072021.pdf
  - Coelution interference: https://www.epa.gov/sites/default/files/2021-05/documents/eto-technical-webinar-041521-w-qandas.pdf
  - Degradation of Calibration Standards: https://www.epa.gov/sites/default/files/2021-04/documents/eto_stability_memo_082219.pdf
  - Leaks in passive field sampling timers: https://www.epa.gov/sites/default/files/2021-04/documents/use_of_stand-alone_timer_timer_guidance_for_voc_sampling.pdf
  - Variations in GC/MS systems

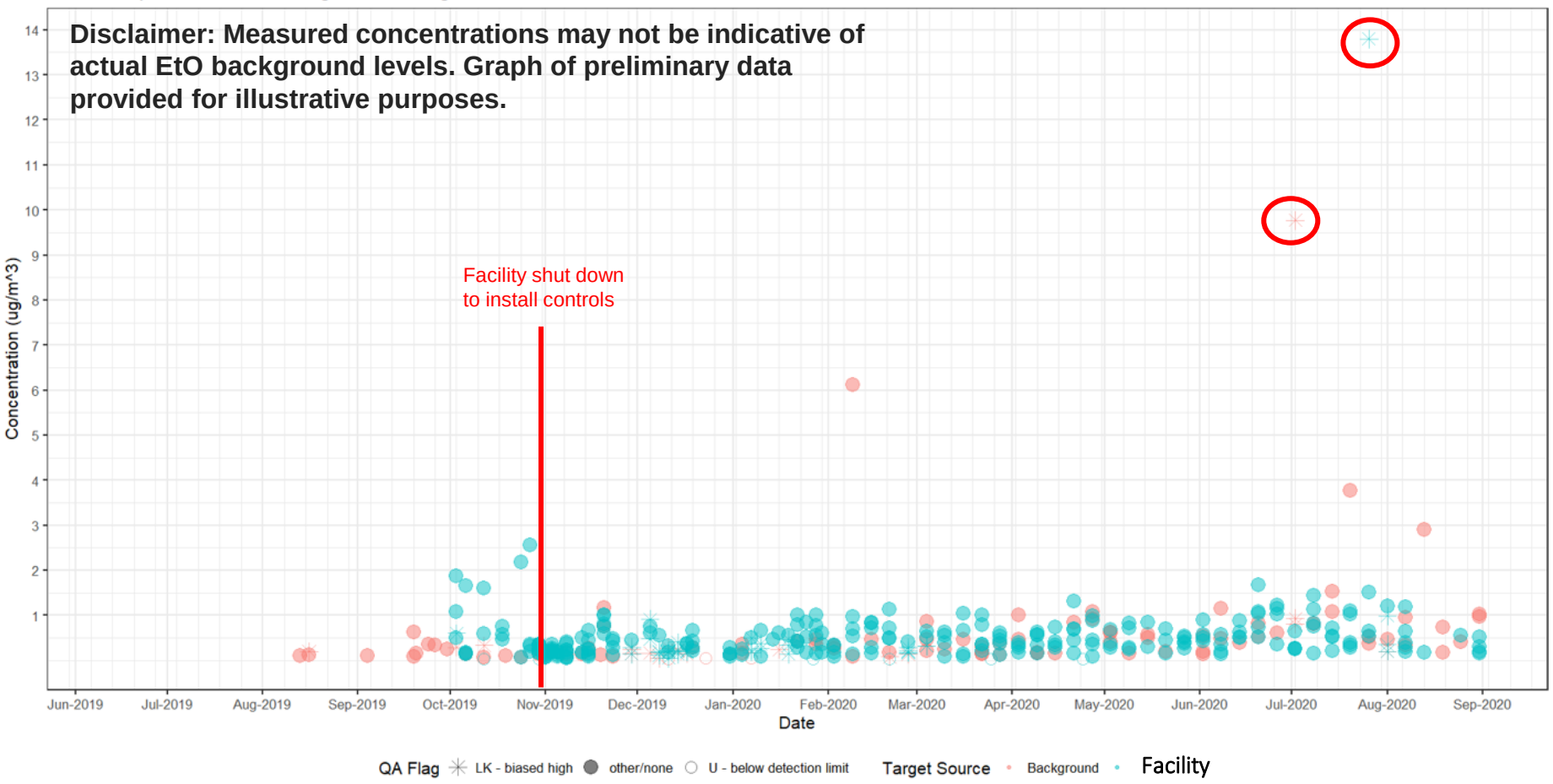
The difficulties of measuring EtO…

Urban and Rural Background Concentrations

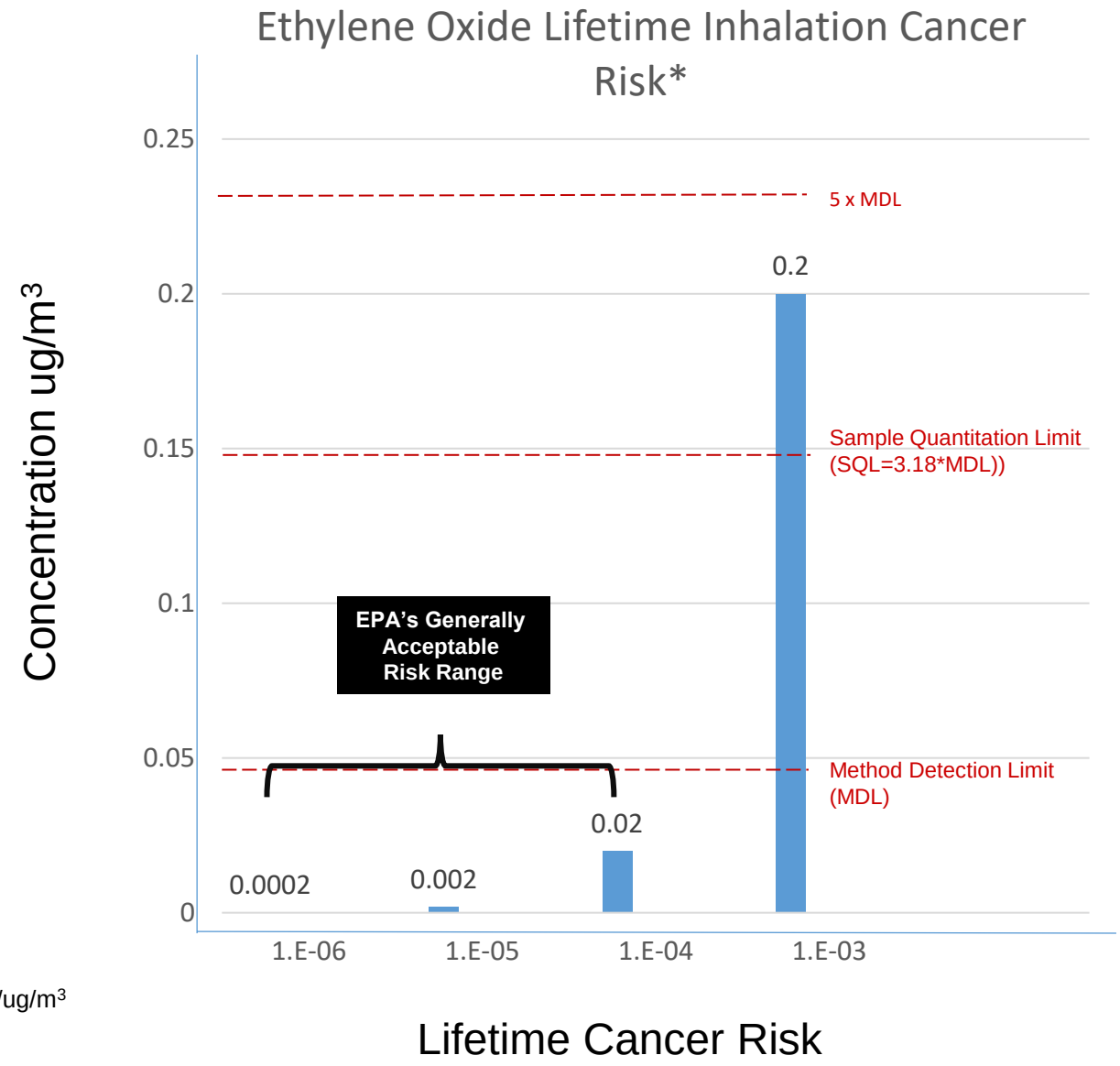


The difficulties of measuring EtO…

Facility (controlled) Concentration Data Compared to Background



The difficulties of measuring EtO…



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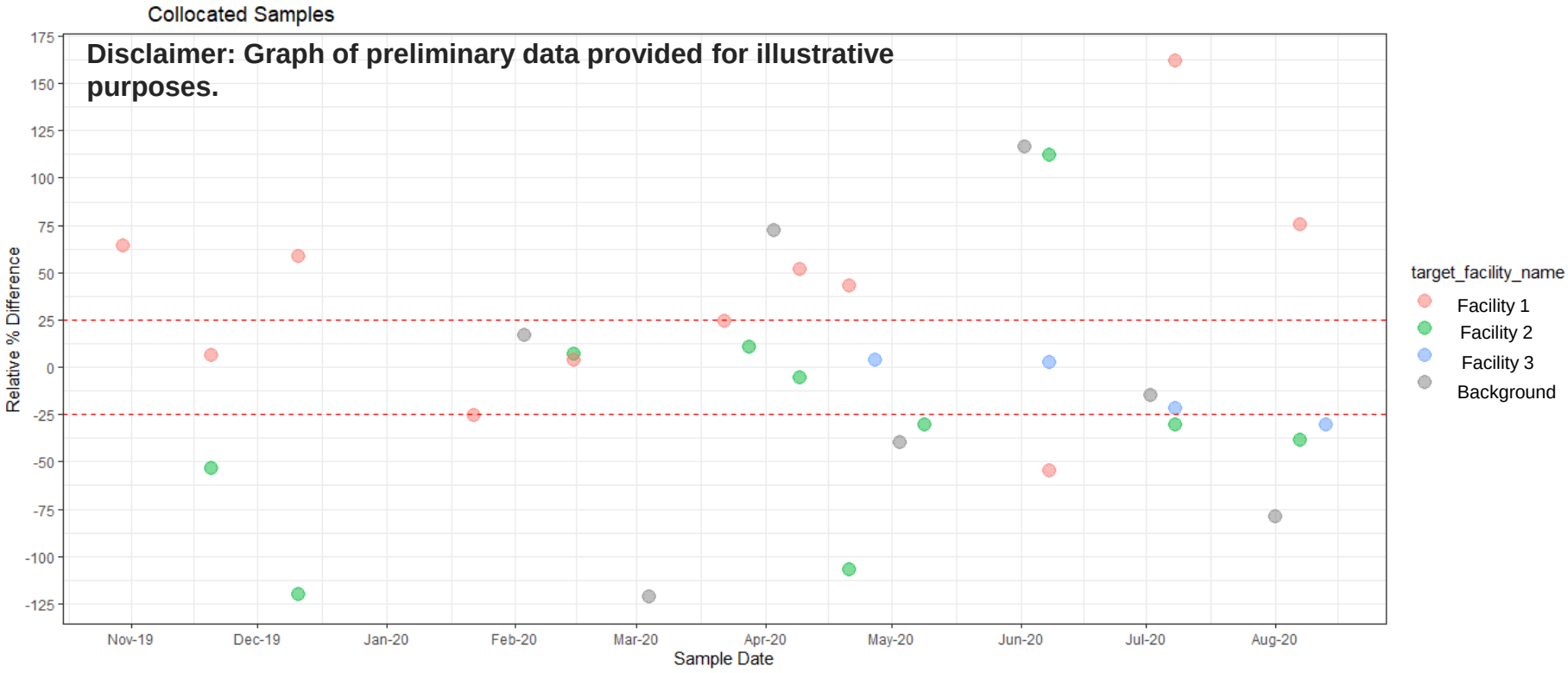
The difficulties of measuring EtO…

EtO Collocated Comparison – Relative Percent Difference for Either Sample >5x MDL



To sum it up – Monitoring for EtO is Challenging!

- We can't measure (yet) down to the 100 in a million level (0.02 ug/m^3) – We are operating at the edge of science!

- We have more confidence in detections at higher concentrations (typically closer to sources)

- We have less confidence in lower concentrations that approach the MDL (typically further away from sources)

As you move away from a source (e.g., out into a community, at a background site), you have to carefully evaluate and articulate the uncertainties associated with the results

Monitoring regimes can benefit from initially collecting samples where there is more likelihood of confidently measuring an impact

Questions?

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