

Benicia Refinery
Benicia, California



H₂S Fence Line Monitoring Update

December 13, 2022

Agenda

1 H₂S Open Path Technology

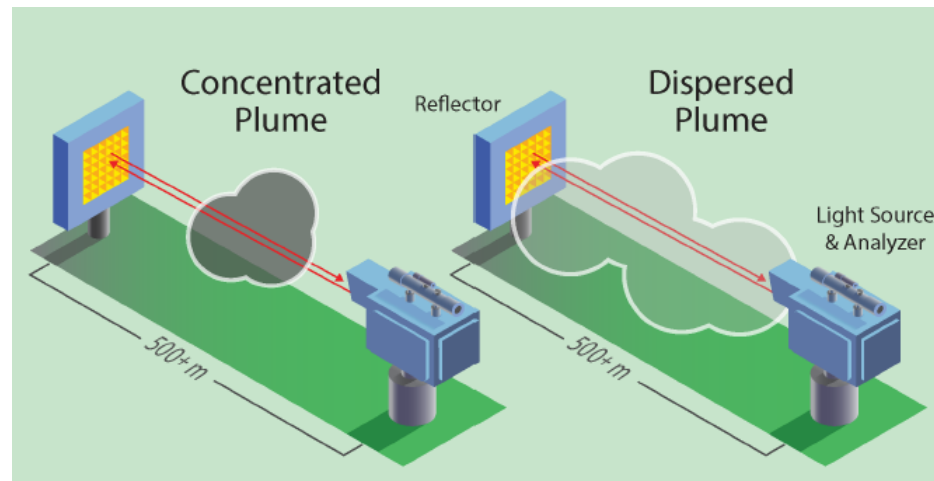
2 History and Path Forward

3 Specifications

4 Community Website

Open Path Background

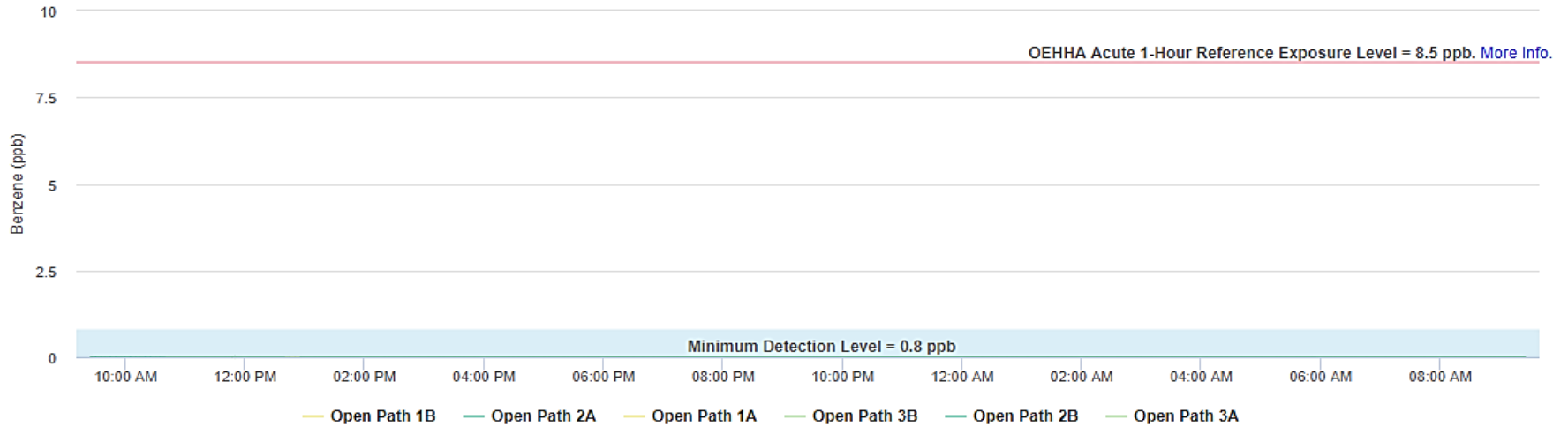
- Broadband UV or IR light source
 - Light-absorbing compounds within the path are detected and quantified using proprietary analysis routines
 - UV monitors multiple compounds simultaneously
- The minimum detection limit (MDL)
 - The lowest concentration a substance can accurately be measured
 - Path length and atmospheric conditions (fog, smoke, etc.) affect detection limits



Fenceline Open Path Monitoring – Ambient levels usually below minimum detection level

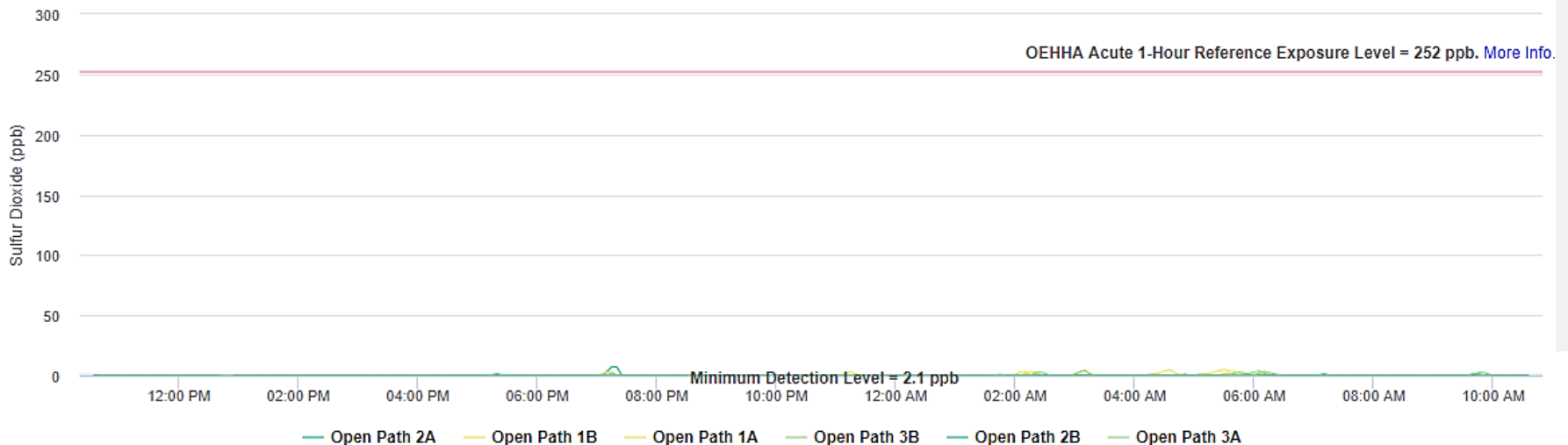
Benzene (ppb)

5-Minute Averages



Sulfur Dioxide (ppb)

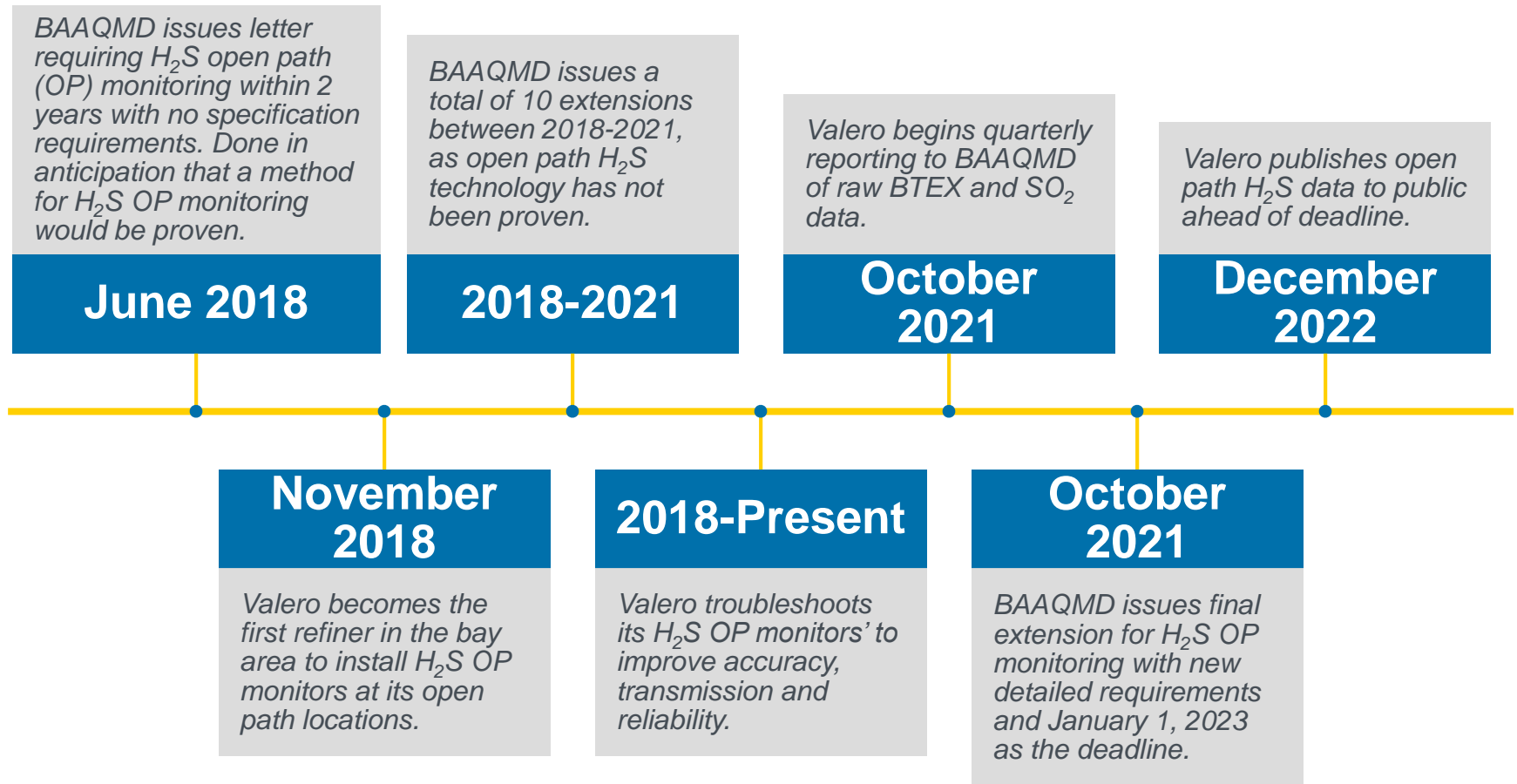
5-Minute Averages



H₂S Open Path Technology

- H₂S Measuring
 - Light absorption similar to that of common atmospheric compounds H₂O and CO₂
 - Small light absorption range (difficult to measure)
 - Special instrument is needed to accurately measure
- H₂S Tunable Diode Laser Absorption Spectroscopy (TDL)
 - Uses infrared to measure a small range of wavelengths
 - Distinguishes H₂S from H₂O and CO₂

Fenceline History



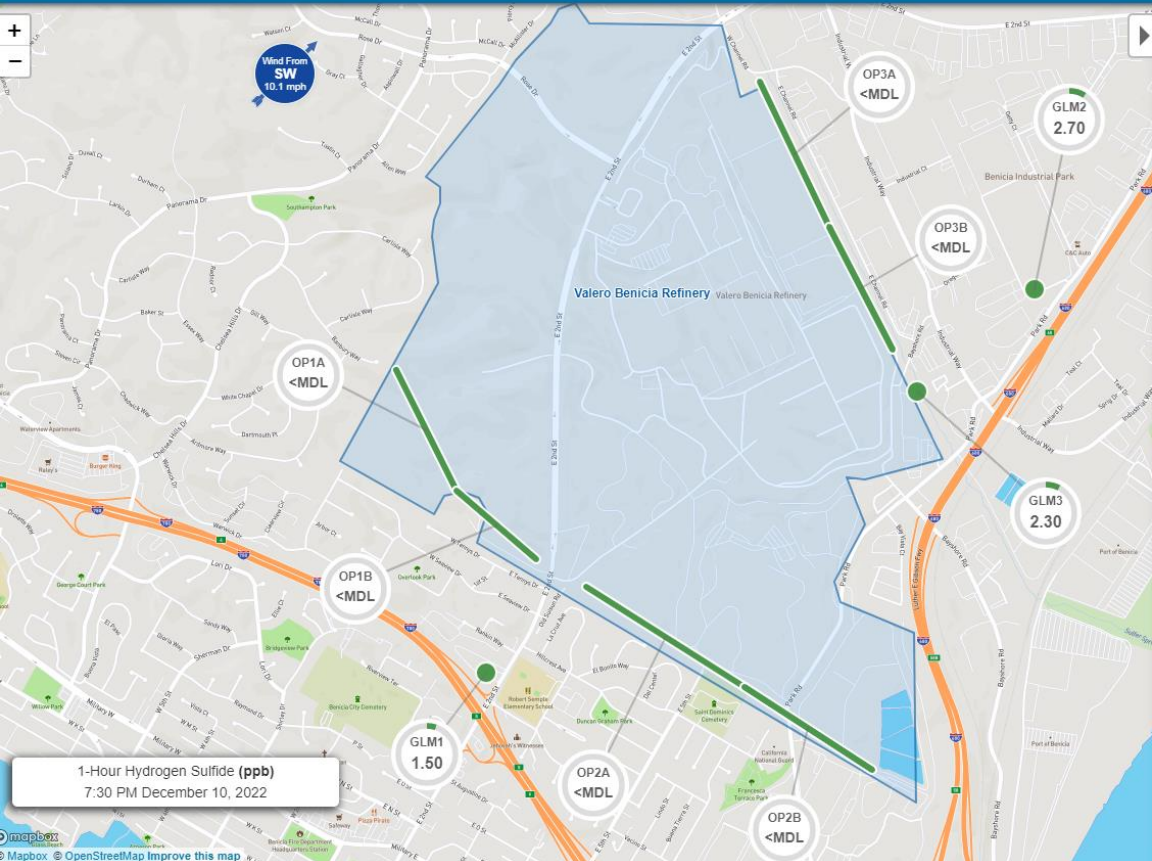
Path Forward

- BAAQMD to issue final H₂S OP monitoring specifications.
- Valero to work with BAAQMD to approve Valero's quality air project plan (QAPP).
- Valero to continue to fine-tune its H₂S OP monitors by implementing a new calibration cell to improve accuracy at low levels.
- Valero to install path 4 after receiving final specifications and QAPP's conditional approval.

H₂S Monitor Specifications

- After years of troubleshooting and fine tuning the following specifications were achieved:
 - Quarterly 3-point calibrations of concentrations as low as 200 ppb with accuracy within 25%
 - Monthly bump tests of concentrations as low as approximately 700 ppb with accuracy within 25%
 - MDLs between 3 and 25 ppb down to 3% transmission
- Maintenance to ensure accurate data
 - Monthly:
 - Inspection of system and optics. Optics cleaning if necessary
 - Bump tests
 - Quarterly:
 - 3-point calibrations
 - Review and test light and signal levels

Community Website

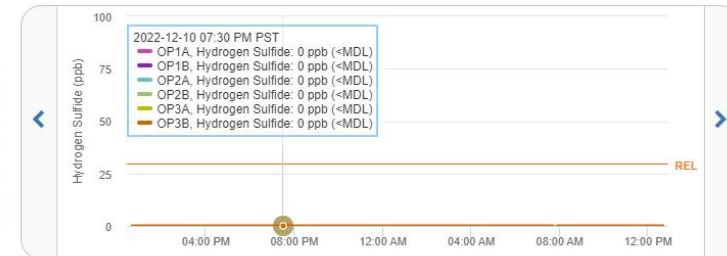


7:30 PM December 10, 2022

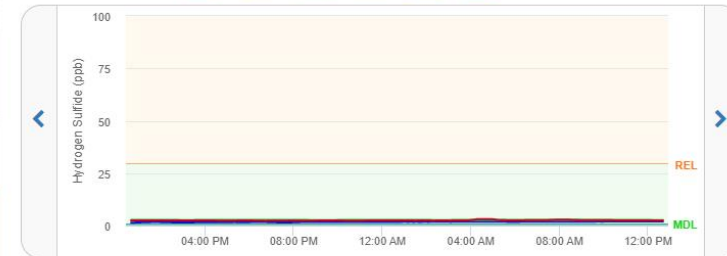
1-HOUR AVG

Hydrogen Sulfide

All data shown are preliminary until validated every 90 days. Exposure averaging time for acute RELs is 1 hour.



Fenceline Monitors **OP1A** **OP1B** **OP2A** **OP2B** **OP3A** **OP3B**



GLM (Ground Level Monitor) **GLM1** **GLM2** **GLM3**

Synchronize Graph with Map Display

FEEDBACK

Questions and Answers

