

Toledo Tank Explosion Air Quality Assessment

Lucas County, Ohio | Event time: October 20, 2026 at 9:30 PM EDT

Executive summary

The evidence points to a delayed particulate air quality impact following the October 20 tank explosion in Toledo. Within one hour, from 1 to 2 AM EDT on October 21, PM2.5 rose from the Moderate ($18.3 \mu\text{g}/\text{m}^3$) to the Very Unhealthy ($157.2 \mu\text{g}/\text{m}^3$) concentration range on the EPA AQI reference scale. At the Erie EPA monitor, 8.23 kilometers south-southwest of the facility, PM2.5 reached 208.7 and PM10 reached 289 micrograms per cubic meter at 3 AM EDT on October 21, approximately 5.5 hours after the reported explosion. The timing and simultaneous particle response support an incident-related pulse; calm to very light winds provide a plausible explanation for delayed transport and accumulation. Satellite observations were inconclusive, and NOAA regional guidance did not reproduce the peak. For emergency management, the priority is continued local monitoring, field confirmation, and coordination with air quality and public health agencies when evaluating conditions and protective actions.

Why satellite confirmation was unavailable. The incident occurred at night, when routine reflected-sunlight air quality retrievals from passive sensors such as TEMPO are unavailable. These measurements require sunlight to retrieve trace gases and aerosol properties. Passive thermal sensors and VIIRS nighttime imaging can still observe after dark, but the products examined do not directly measure surface PM2.5 or chemical exposure. Cloud and fog, limited spatial resolution, and later VIIRS overpasses further restricted detection of this localized event.

Observed sequence

Time EDT	Observation	Interpretation
Oct 20 8:53 PM	Wind from 090 degrees at 3 kt at Toledo Executive Airport	Light easterly flow before the event; the Erie monitor was not directly downwind under this observation.
Oct 20 9:30 PM	Explosion reported	Start of the incident analysis window.
Oct 20 9:53 PM	Calm wind at Toledo Executive Airport	Weak ventilation favored local accumulation and slow, variable transport.
Oct 21 2:00 AM	PM2.5 157.2 and PM10 217 micrograms per cubic meter	Abrupt particulate increase approximately 4.5 hours after the explosion.
Oct 21 3:00 AM	PM2.5 208.7 and PM10 289 micrograms per cubic meter	Maximum observed particulate concentrations.
Oct 21 4 to 6 AM	Both particle measurements declined	Short-lived pulse moved through or dispersed after the peak.

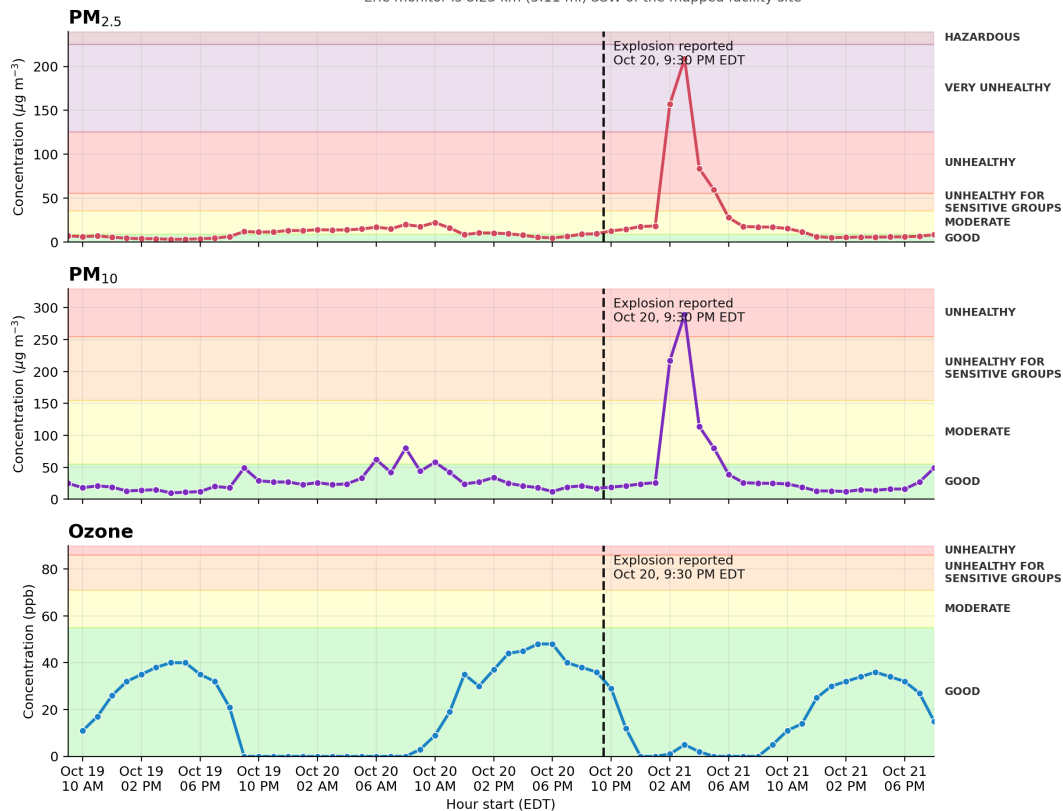
EPA monitor record

The Erie station time series shows normal to modest particulate concentrations before the incident, followed by a pronounced overnight pulse. PM_{2.5} and PM₁₀ rise together beginning around 2 AM and reach their maxima at 3 AM. Ozone does not show a corresponding positive spike, which is consistent with a primary particulate release rather than an ozone event.

Erie EPA Station (39-095-0024): Air-Quality Time Series

October 19, 9:00 AM through October 21, 8:00 PM EDT | preliminary AirNow observations

Erie monitor is 8.23 km (5.11 mi) SSW of the mapped facility site



Background colors are EPA AQI concentration bands for reference only; lines show hourly measurements.
Daily AQI uses 24-hour PM and 8-hour ozone; current AQI uses NowCast. These are not hourly AQI classifications.

Wind at Toledo Executive Airport: 9:53 PM EDT calm, 0 kt (direction undefined); preceding 8:53 PM: 090° at 3 kt (1.5 m s⁻¹). Source: NOAA Aviation Weather.

Figure 1 Hourly PM_{2.5} PM₁₀ and ozone at the Erie EPA monitor from October 19 through October 21

NOAA PM2.5 forecast comparison

Operational implication: regional PM2.5 guidance substantially understated conditions measured at Erie during the overnight peak. At 3 AM EDT, observed PM2.5 was 208.7 micrograms per cubic meter, compared with 10.6 in the raw NOAA Air Quality Model forecast and 7.6 in the bias-corrected guidance at the nearest grid point. The comparison supports using the model for regional context while checking local monitors during a facility incident.

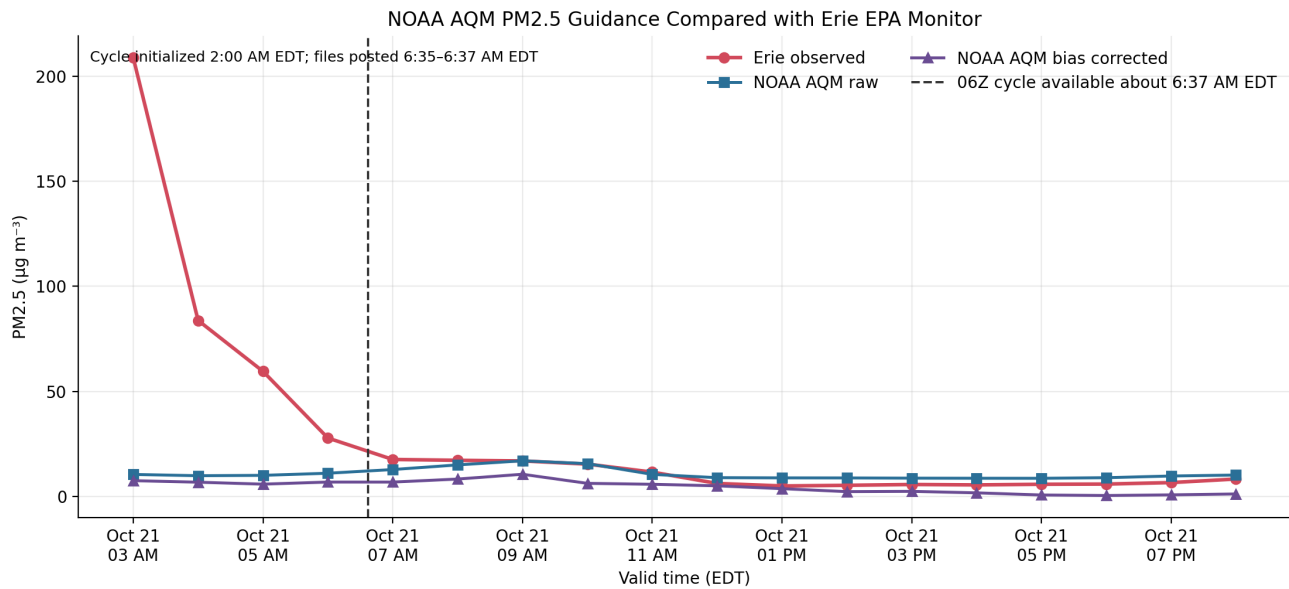


Figure 2 NOAA AQM raw and bias-corrected PM2.5 guidance compared with the Erie observations

Valid time EDT	Erie observed	AQM raw	AQM bias corrected
Oct 21 3 AM	208.7	10.6	7.6
Oct 21 4 AM	83.8	10.0	6.9
Oct 21 5 AM	59.6	10.1	6.0
Oct 21 6 AM	27.9	11.2	7.0

The 06 UTC cycle initialized at 2 AM EDT and its files were posted at approximately 6:35 to 6:37 AM EDT, after the peak. Initialization time and operational availability are different: these files could not have informed decisions at 3 AM. NOAA AQM runs at 06 and 12 UTC with hourly guidance through 72 forecast hours. A small industrial release can be absent from model emissions or diluted within a grid cell; the mismatch alone does not identify its cause.

Source NOAA NCEP AQM Version 7 operational 06 UTC cycle for October 21 2026 and Erie AirNow observations. Concentrations are in micrograms per cubic meter.

Geostationary satellite assessment

GOES 19 provided frequent nighttime observations around the reported explosion time. The thermal infrared imagery was examined for a localized hot signal and its evolution, but no persistent facility-scale anomaly separated clearly from the surrounding urban and atmospheric background.

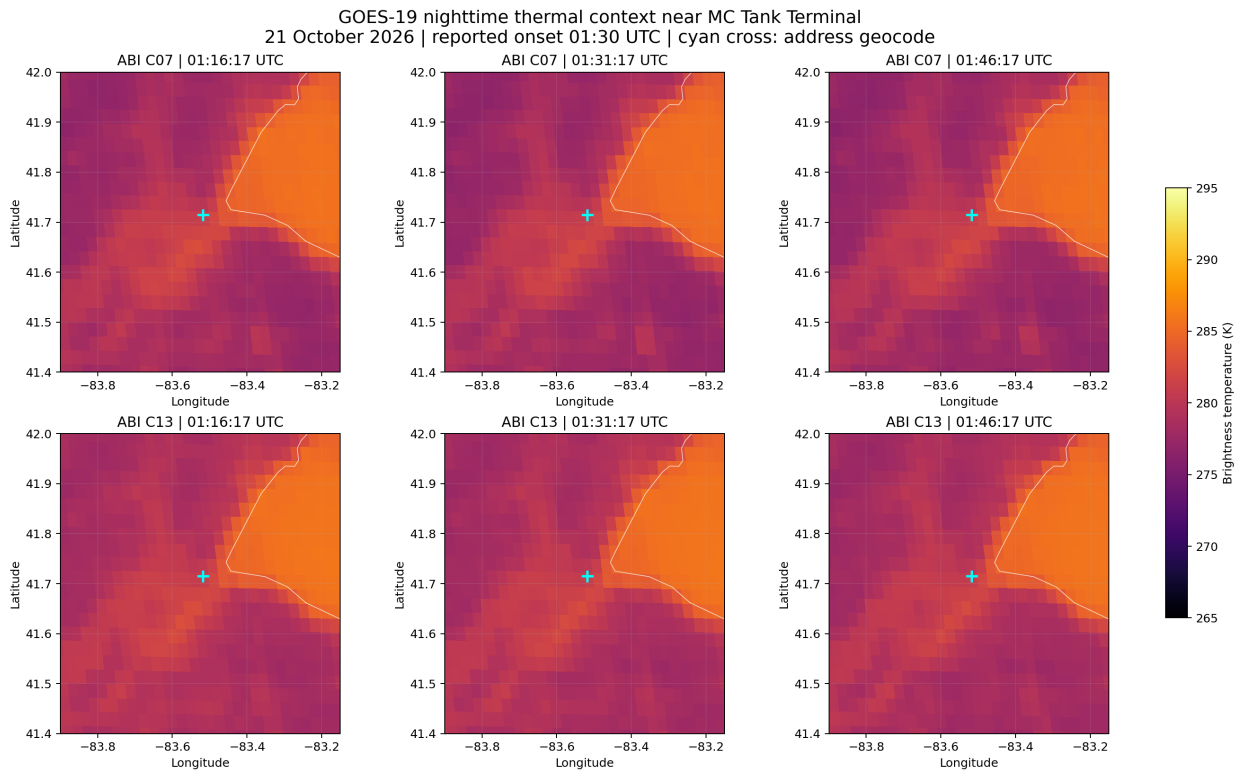


Figure 3 GOES 19 nighttime thermal context around the reported onset

Detection limits relevant to incident command

- **Spatial scale.** A facility fire or narrow plume can occupy only a small fraction of the GOES infrared footprint at Toledo's viewing angle, diluting its signal.
- **Thermal contrast.** A brief or partly contained industrial fire can produce insufficient pixel-averaged temperature contrast for a robust hotspot signature.
- **Atmospheric obscuration.** Low cloud and fog can obscure the surface. Atmospheric moisture further complicates thermal infrared interpretation.
- **Measurement sensitivity.** GOES infrared channels measure radiance and brightness temperature, not PM2.5 concentration or chemical composition directly.

Polar orbiting and daytime satellite assessment

NOAA 20 VIIRS Day Night Band imagery from the previous and incident nights was placed on a common effective two kilometer grid and screened for confidently clear conditions. The four-panel comparison did not show a reliable increase in facility-centered nighttime radiance that could be separated from clouds, fog, background lighting, and sampling differences.

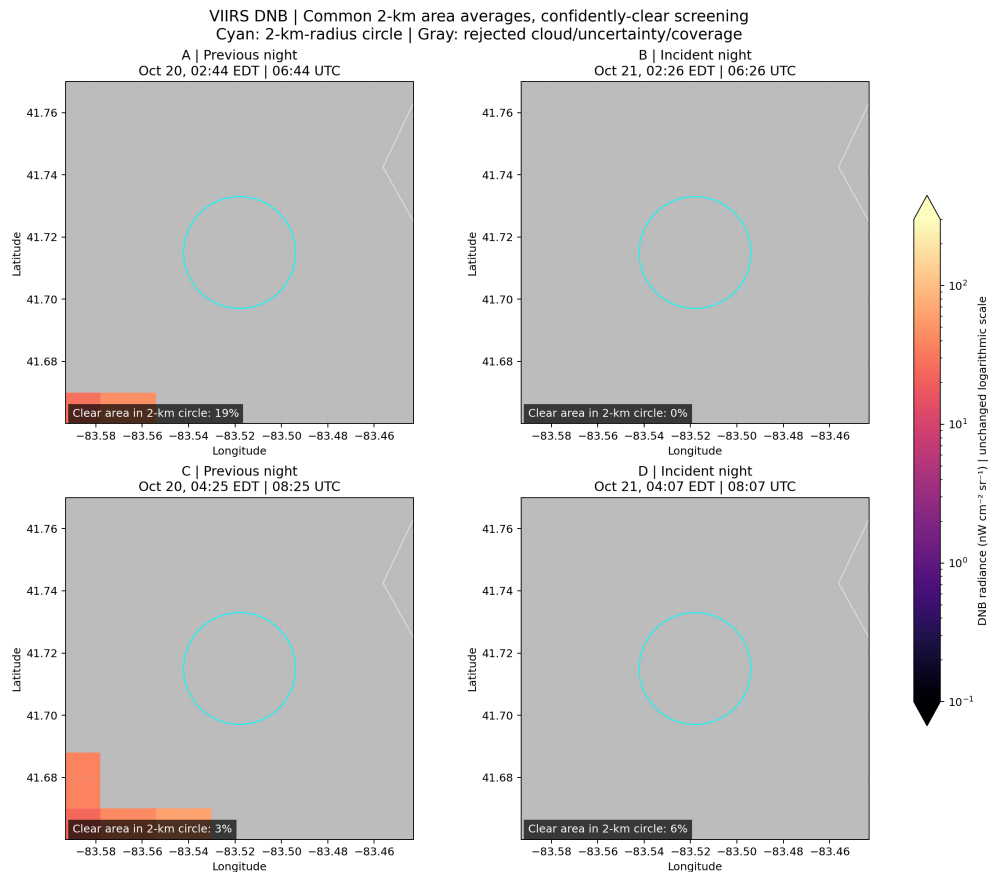


Figure 4 Cloud-screened VIIRS DNB comparison at a common two kilometer effective resolution

How to use the satellite evidence

- **Overpass timing.** VIIRS observed the area only during discrete nighttime passes, several hours after the reported onset; it did not continuously sample the explosion or early plume.
- **Cloud and fog.** The overnight environment contained fog and low-cloud contamination. Screening removed uncertain pixels but also reduced usable coverage near the facility.
- **Nighttime information content.** The DNB is sensitive to emitted and reflected visible light. It does not directly measure PM_{2.5}, PM₁₀, ozone, or the composition of an industrial plume.
- **TEMPO timing.** TEMPO is a daylight spectrometer. Its first useful observations occurred the next day, after the strongest surface particulate pulse, and its gas columns do not provide a direct nighttime PM_{2.5} measurement.
- **Near-surface trapping.** Calm conditions can confine pollution close to the surface. A shallow plume can strongly affect a ground monitor while producing little column-integrated or pixel-averaged satellite contrast.

Emergency management implication: the absence of a satellite signal cannot establish that nearby air was unaffected or support an all-clear decision by itself. Use the imagery to add spatial and atmospheric context, and base local exposure assessment on ground observations, field sampling, and verified incident information.

Sources GOES 19 ABI thermal imagery; NOAA 20 VIIRS DNB and cloud mask products; NASA TEMPO daylight trace-gas imagery for October 21 2026.