



Air Monitoring Compliance on New York DER-10 Remediation Sites

Introduction

Site remediation is an important step in urban regeneration and growth. Transforming disused brownfield sites into office spaces, retail complexes, and other commercial developments can help breathe new life into a city while affording developers a significant return on investment.

Environmental site remediation deals with the removal of hazardous chemicals and contaminants from soil and groundwater. It's a systematic process involving site environmental assessment followed by safe cleanup and re-use.

In 2010, the New York State Department of Environmental Conservation (NYS-DEC) issued Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation. This Guide unpacks the DER-10 guidance and provides an overview of technologies and methods that make it easy to comply with Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) components in the regulation.

Remediation in New York State

Remediation is strongly promoted in New York by the Department of Environmental Conservation (DEC) through a variety of programs that incentivise cleanup and restoration of contaminated sites. These include the State Superfund Program (SSF); Brownfield Cleanup Program (BCP); Environmental Restoration Program (ERP); and Voluntary Cleanup Program (VCP).

The SSF program is an enforcement program whose goal is to identify and characterize suspected inactive hazardous waste disposal sites and to ensure that those sites which pose a significant threat to public health or the environment are properly addressed. The BCP is the NYS-DEC's main urban cleanup incentivisation program that encourages private-sector cleanups by providing tax and other incentives for the redevelopment of brownfield sites. The ERP is a program that aims to provide grants to municipalities for the investigation and remediation of municipally owned properties. The VCP program was superseded by the BCP in 2003.

New York City Mayor's Office of Environmental Remediation (OER) also operates a local Brownfield Cleanup Program. This office can issue E-designations which identifies whether

a NYC site has environmental requirements relating to air, noise or hazardous materials that must be investigated and addressed before an owner can obtain a building permit for the property's redevelopment.

Technologies for cleaning up contaminated sites can be applied in-situ or applied to waste material after removal. Ex-situ methods involve extracting the contaminated soil and groundwater, and then hauling it offsite to an appropriate treatment facility. In-situ methods treat the soil and groundwater without removal. They involve such technologies as soil vapor or steam-enhanced extraction, chemical oxidation, biological remediation, thermal treatment and other chemical interventions.

However, regardless of the cleanup technology selected, once a remediation site becomes operational, air emissions need to be managed according to NYS-DEC's DER-10 regulation to ensure workers and local communities are not exposed to toxic substances. The DER-10 regulation provides an overview of the site investigation and remediation process for sites within New York State and sets minimum technical activities that the NYS-DEC will accept for remediation projects to ensure the cleanup and restoration is undertaken safely.



The DER-10 Regulation

NYS-DEC's DER-10 describes the requirements for remedial site investigations, clean-ups, post clean-up monitoring and site closure. It presents detailed technical guidance for each of the investigative and remedial steps undertaken at contaminated sites. The document also defines health and safety procedures that must be followed including having a Health and Safety Plan (HASP) for on-site workers that conforms to OSHA requirements and a Community Air Monitoring Plan (CAMP).

In 2022, NYS-DEC began reviewing and updating the DER-10 document. Public consultation on the proposed changes is expected to begin early 2024

01. Provide an Overview of the Project

- What are the relevant pieces of legalisation?
- Sort out objectives and a scope of the monitoring plan.

02. Define Potential Risk Factors

- For example: dust plumes, exhaust, emissions.
- Factor in meteorological factors and site location.

03. Draft Monitoring Procedures

04. Establish Mitigation Procedures

- Following a site survey, risk assessment and mitigation plan, it can be helpful to keep a self-inspection checklist.

05. Determine Corrective Action and Emergency Response Plan

- If mitigation procedures are unable to reduce omissions below safe limits, an emergency response will be needed.

06. Draft Monitoring Report

- To regulations and reassure the surrounding community of their continued health and well-being.

The DER-10 Community Air Monitoring Plan

The DER-10 CAMP requirements were prescribed by New York State Department of Health (NYS-DOH) and requires continuous monitoring of VOCs and Particulate Monitoring at the perimeter of the exclusion zone or work area during all ground intrusive activities. Periodic monitoring of VOCs is required during non-intrusive activities such as the collection of soil and water samples – such monitoring usually consists of taking a reading upon arrival at a sample site and monitoring during sampling. If radiological contamination is a concern, additional monitoring requirements may be necessary in consultation with NYSDEC and NYSDOH.

The DER-10 CAMP sets action levels that require operators to take corrective actions to abate emissions including work shutdown if necessary (see table 1). Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those in the generic CAMP can be required. For example, special requirements are necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Parameter	Range	Action Required
Total Organic Vapours	15 min avg. is >5 ppm above background at the downwind perimeter of the work area or exclusion zone	Temporarily halt work activities and monitor. If instantaneous readings readily decrease below 5 ppm over background, work may resume
	15 min avg. persists at levels >5 ppm above background but <25 ppm at the downwind perimeter of the work area or exclusion zone	Halt work activities, identify the source of vapors, take corrective actions, and continue monitoring. Resume work activities if the total VOC level 200 ft downwind of the exclusion zone or half the distance to the nearest potential receptor or residential commercial structure, whichever is less – but in no case less than 20 ft, is below 5 ppm over background for the 15 min avg.
	>25 ppm at the perimeter of the work area	Shutdown work activities
Particulates	15 min avg. is >100 µg/m ³ above background or if airborne dust is observed leaving the work area.	Employ dust suppression techniques. Work activities may continue with dust suppression in place provided that downwind PM ₁₀ levels do not exceed 150 µg/m ³ above the upwind level and no visible dust is migrating from the work area.
	Downwind PM ₁₀ is > 150 µg/m ³ above upwind level.	Stop work and re-evaluate activities initiated. Work can resume when suppression measures reduce downwind PM ₁₀ levels do not exceed 150 µg/m ³ above the upwind level and no visible dust is migrating from the work area.

Table 1: . A summary of monitoring, response levels, and actions for total VOC and particulate matter monitoring under DER-10. Source: Appendix 1A New York State Department of Health Generic Community Air Monitoring Plan, Final DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

VOC Monitoring

Volatile organic compounds (VOCs) according to DER-10 are defined as those organic compounds on the USEPA's OLM04.2 target compound list. Such compounds are 'volatile' because they evaporate into the gas-phase at ambient temperatures and can impact human health via the respiratory system.

Continuous measurement of VOCs is usually undertaken by flame (FID) or photo (PID) ionization detectors. However, FIDs require a source of H_2 gas for operation which is inconvenient in the outdoor environment hence PIDs are most commonly used. PIDs can measure down to ppb VOC levels in ambient air. PID sensors use a UV lamp that ionises VOCs producing positive ions and electrons. A detector then measures the electron current from the ionized gas, which is proportional to the concentration of VOCs present in the sample. The UV lamps used in PID sensors are available at three different energies, 9.8 eV, 10.6 eV and 11.7 eV.

The most commonly used is the 10.6 eV lamp which has a longer life. PID sensors respond to a broad range of VOCs but with different sensitivities depending on the ionisation potential of the compound. PID sensors are typically calibrated with isobutylene, which means a measurement of 1 ppm corresponds to 1 ppm of isobutylene. Different hydrocarbons will give different responses, indicated by a response factor. For example, if a PID sensor is used to measure 17 ppm of heptane, it will give a reading of 10 ppm because heptane has a response factor of 1.7. The concentration of heptane measured is $10 \text{ ppm} \times 1.7 = 17 \text{ ppm}$ of heptane. The response factors are provided by the PID manufacturer. If an atmosphere contains a mixture of VOCs, the measurement is the total VOC concentration in ppm of isobutylene. PID sensors cannot be used to discriminate between different hydrocarbons.



Product Spotlight

Aeroqual AQM and AQS VOC module.

The Aeroqual VOC analyzer module is a continuous PID-based analyzer used to detect VOCs in ambient air. The module is designed for use in the AQM65 and AQS 1 air quality stations. The VOC module is sensitive to a wide range of VOCs, including benzene and toluene.

The VOC module can be field calibrated using standard calibration equipment and gases. In contrast to traditional analyzers

using gas chromatography, the VOC module is compact, lightweight, and costs 5x less to own and operate.

Typical applications include urban and national ambient air quality monitoring, power station perimeter monitoring, solvent and chemical manufacturing, oil and gas perimeter monitoring, and remediation and construction projects.

Sensor specifications:

Range	Display Resolution	Noise Zero; Span of reading	Lower Detection Limit (2 σ)	Precision	Linearity % of FS	Drift - 24 hour (% of FS)
0-500 ppb	0.1 ppb	1 ppb; 1%	1 ppb	2% of reading or 1 ppb	1%	1 ppb; 1%
0-30 ppm	0.01 ppm	0.1 ppm; 1%	0.05 ppm	2% of reading or 0.05 ppm	2%	0.1 ppm; 1%

Particulate Monitoring

Monitoring of fugitive dust as PM₁₀ is also required on the perimeter of remediation projects. PM₁₀ is the subset of air particles that are less than 10 micrometres in diameter. PM₁₀ has human health impacts in of itself since it is small enough to enter the respiratory system. In addition, it is used as a surrogate for determining maximum fugitive airborne concentrations of metals and polycyclic aromatic hydrocarbons which may be bound to the dust particles.

Remediation sites usually require a minimum of two continuous particulate monitors configured to measure PM₁₀ levels in real-time. They must report a running 15-minute average concentration and trigger an alarm to indicate an exceedance of the action level. Work activities can normally continue with dust suppression techniques, provided that downwind PM₁₀ levels do not exceed above the upwind level beyond the alert level (150 µg/m³). On most remediation sites water misting via a water cannon, or a mobile water cart is sufficient as a daily control to minimize the potential for fugitive dust emissions. If the downwind continues to exceed the upwind by 150 µg/m³ then work must stop until the dust levels are controlled (see table 1). There may be situations that require fugitive dust suppression and particulate monitoring requirements with more stringent action levels.

Measurement of PM₁₀ on remediation sites is best achieved using continuous light-scattering PM sensors because they respond quickly to ambient dust levels and enable a fast response if levels become elevated. However, optical PM monitors based on light scattering also need supporting technologies to enable them to measure accurately under all conditions. Key performance elements of a suitable optical PM monitor are:

- Heated inlet to reduce interference from humidity
- Sample flow control to maintain a stable sampling rate over the monitoring period
- Omni-directional sample inlet to ensure efficient sampling under all wind conditions.
- In built zero calibration
- Span calibration adjustment

Aeroqual instruments use light-scattering technology to provide continuous, real-time monitoring of PM₁₀. The Aeroqual Dust Sentry PM₁₀ dust monitor is designed for regulatory compliance, being MCERTS certified and SCAQMD pre-approved. It also meets or exceeds the key performance standards in DER-10 Appendix 1B. Furthermore, Aeroqual's software can automatically calculate the downwind minus upwind PM₁₀ contribution to make DER-10 measurement and reporting easy to implement.

Product Spotlight PCX

Aeroqual has announced the introduction of the PCX Particulate Matter Module, designed for industrial perimeter and remediation fence line monitoring.

The PCX module integrates an optical particle counter, a heated inlet, and automatic flow control to provide accurate measurements. Furthermore, the PCX offers a rich suite of onboard diagnostics that can detect faults and alert users via email/SMS to minimize system downtime. It is also modular, allowing for the replacement of a failing component like an ageing pump.

MCERTS PM_{10} and $PM_{2.5}$ testing for the AQS 1 and Dust Sentry PCX is currently underway. The AQS 1 and Dust Sentry PCX are some of the products that incorporate the use of PCX, making them reliable and efficient tools for industrial monitoring.

“Aeroqual’s monitors exhibited reliable long-term operation using solar and battery power at remote sites without AC power.”

John Van Kirk,
Project Manager, Quandary Consultants

Weather Monitoring

Real-time wind data is useful to correctly position the air monitoring equipment in appropriate upwind and downwind locations. The evaluation of weather conditions is also necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, site work may need to be suspended.

CAMP Reporting

All 15-minute readings of upwind and downwind VOC and PM_{10} must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded. If site works are stopped due to inability to control fugitive emissions to below the action limit, the NYSDEC is to be notified within twenty-four hours of the work stoppage.

A description of the CAMP-related activities must also be included in a monthly progress report submitted to the NYSDEC.

In order to ensure the validity of the VOC and dust measurements, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.



“Aeroqual worked out cost-effective. We were able to give the client valuable insights not available by conventional methods within the budget.”


**Jonathan Harland,
Principal Air Quality Scientist, AECOM**

Site Contribution provides a Simple Solution to Real-time Air Monitoring

Aeroqual's Site Contribution software simplifies real-time air quality monitoring by collecting data from multiple air monitoring stations and automatically collating it. The software streamlines the monitoring of pollution for site remediators, environmental consultants, and air quality professionals. It tracks pollutant levels, wind direction, and speed to calculate the total site contribution, while also providing real-time alerts to notify users within a minute if they are approaching regulatory limits. This enables swift and decisive action to prevent exceedances, comply with local regulations, and protect surrounding communities from fugitive emissions.

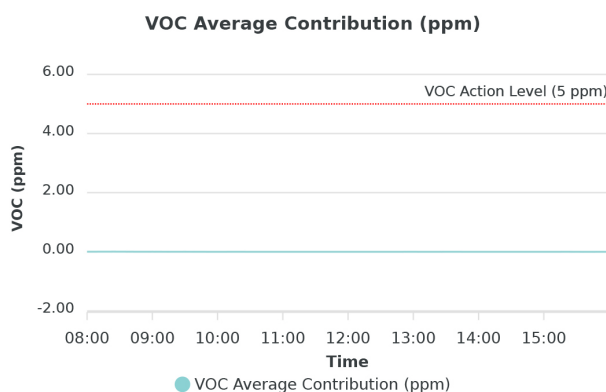
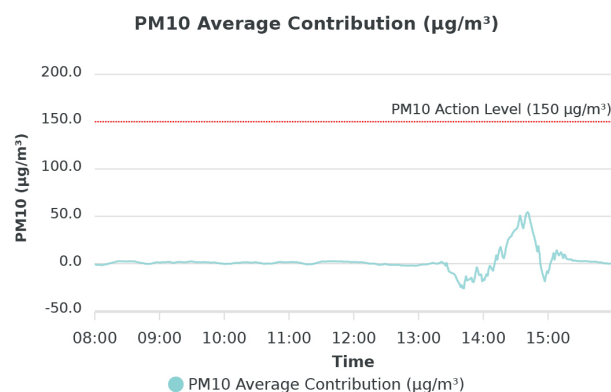
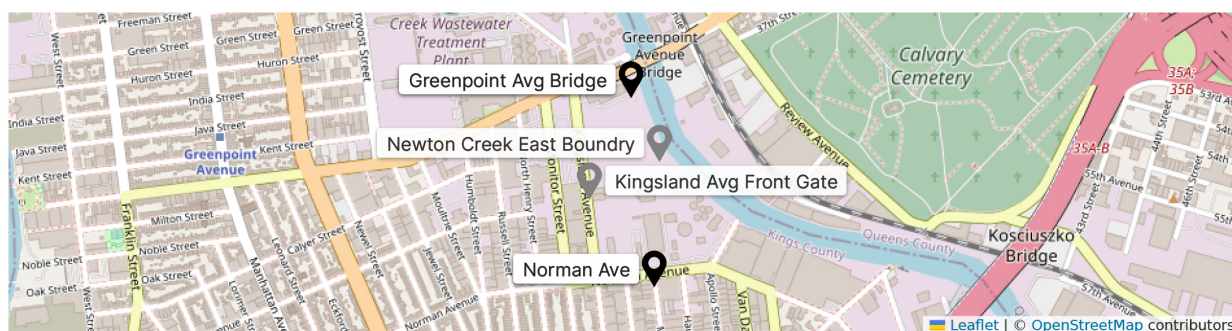
PM and VOC data sets are displayed in a single dashboard, and users can set up action trigger levels and view alerts for all contaminants being monitored. The software's templates are optimized for local regulations, providing actionable

and defensible data with minimal intervention. Automatic contribution calculations and real-time alerts eliminate the need for manual calculations, significantly reducing the margin for human error. Users can set and forget the instruments and access their data from anywhere, providing users with a comprehensive and efficient solution for air quality monitoring and regulatory compliance on site. For a successful remediation project, compliance is key. Aeroqual Site Contribution streamlines the monitoring process with automated calculations and real-time alerts that are customisable to your needs ensuring safe and efficient remediation. Real-time site data is easily accessible from anywhere using the live dashboard, reducing the need for on-site visits, eliminating unnecessary restrictions and ensuring a positive project outcome for both the customer and community.

	Air Monitoring Report	Liberty Superfund Site	
		Report Period	
		From:	5/25/2023 08:00
		To:	5/25/2023 16:00
		PM10 Action Level:	150 µg/m³
		VOC Action Level:	5 ppm

Daily Environmental Summary	Temp (°F)	Relative Humidity (%)	Barometer (inHg)	Windspeed (mph)	Prevailing wind direction
5/25/2023	-	-	-	3.8-23.8	E

Daily Monitoring Summary	Daily Avg PM10 Conc (µg/m ³)	Max 15 min rolling avg PM10 (µg/m ³)	Time of Max 15 min Avg PM10 Reading	Daily Avg VOC Conc (ppm)	Max 15 min rolling avg VOC (ppm)	Time of Max 15 min Avg VOC Reading
Upwind - 5/25/2023	8.7	39.9	14:04:00	0.00	0.00	15:27:00
Downwind - 5/25/2023	10.7	62.0	14:41:00	0.00	0.01	08:24:00



Date/Time	Average Upwind PM10 (µg/m³)	Average Downwind PM10 (µg/m³)	Average Contribution PM10 (µg/m³)	Average Upwind VOC (ppm)	Average Downwind VOC (ppm)	Average Contribution VOC (ppm)	Wind Speed 15 min Avg	Wind Direction
5/25/2023 08:00:00	5.7	4.9	-0.8	0.00	0.00	0.00	10.7	SSE
5/25/2023 08:15:00	4.6	5.2	0.6	0.00	0.00	0.01	9.8	E
5/25/2023 08:30:00	2.4	4.7	2.3	0.00	0.01	0.01	12.3	E
5/25/2023 08:45:00	4.5	5.1	0.6	0.00	0.00	0.00	10.2	ENE
5/25/2023 09:00:00	4.0	5.1	1.1	0.00	0.00	0.00	14.9	E
5/25/2023 09:15:00	4.3	5.5	1.2	0.00	0.00	0.00	14.0	E
5/25/2023 09:30:00	3.2	5.6	2.4	0.00	0.00	0.00	11.1	E
5/25/2023 09:45:00	3.0	4.4	1.4	0.00	0.00	0.00	15.1	E
5/25/2023 10:00:00	3.8	3.3	-0.5	0.00	0.00	0.00	16.5	E
5/25/2023 10:15:00	2.8	3.9	1.1	0.00	0.00	0.00	13.1	ENE
5/25/2023 10:30:00	2.9	4.3	1.4	0.00	0.00	0.00	12.1	E
5/25/2023 10:45:00	4.2	4.4	0.3	0.00	0.00	0.00	12.7	E
5/25/2023 11:00:00	4.2	5.8	1.6	0.00	0.00	0.00	11.9	E
5/25/2023 11:15:00	5.3	4.8	-0.5	0.00	0.00	0.00	10.8	E
5/25/2023 11:30:00	2.4	4.4	2.0	0.00	0.00	0.00	11.8	E
5/25/2023 11:45:00	2.1	4.5	2.4	0.00	0.00	0.00	10.5	E
5/25/2023 12:00:00	2.7	4.4	1.7	0.00	0.00	0.00	10.1	E
5/25/2023 12:15:00	3.2	3.2	0.0	0.00	0.00	0.00	8.8	E
5/25/2023 12:30:00	5.7	5.0	-0.7	0.00	0.00	0.00	8.8	E
5/25/2023 12:45:00	6.7	4.8	-1.9	0.00	0.00	0.00	8.7	ESE
5/25/2023 13:00:00	6.5	4.7	-1.8	0.00	0.00	0.00	6.3	E
5/25/2023 13:15:00	4.8	5.1	0.4	0.00	0.00	0.00	7.4	ENE
5/25/2023 13:30:00	19.9	10.4	-9.5	0.00	0.00	0.00	8.5	E
5/25/2023 13:45:00	32.8	15.0	-17.8	0.00	0.00	0.00	10.9	E
5/25/2023 14:00:00	36.8	20.5	-16.3	0.00	0.00	0.00	10.3	E
5/25/2023 14:15:00	9.7	25.0	15.3	0.00	0.00	0.00	9.3	ENE
5/25/2023 14:30:00	16.4	52.5	36.1	0.00	0.00	0.00	7.0	ENE
5/25/2023 14:45:00	12.9	50.7	37.8	0.00	0.00	0.00	7.3	E
5/25/2023 15:00:00	37.4	27.5	-10.0	0.00	0.00	0.00	7.1	E
5/25/2023 15:15:00	9.2	18.9	9.7	0.00	0.00	0.00	7.4	ENE
5/25/2023 15:30:00	6.8	9.2	2.5	0.00	0.00	0.00	7.2	ENE
5/25/2023 15:45:00	6.4	8.2	1.9	0.00	0.00	-0.00	7.5	E

Figure 1: Sample report created by Aeroqual's Site Contribution software

Contribution wind rose (mph)

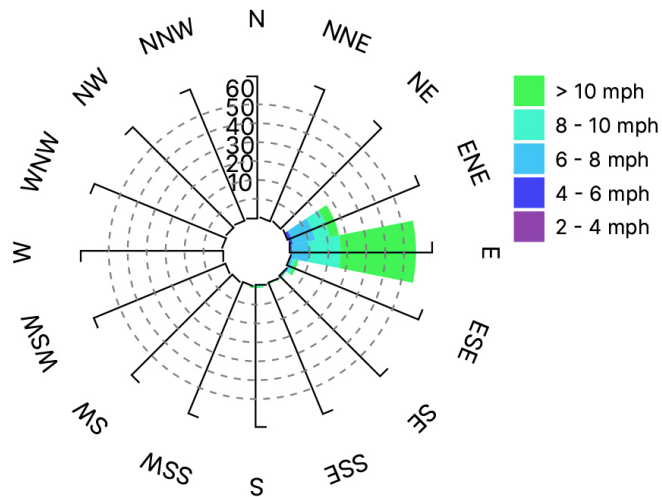


Figure 2

“Aeroqual Cloud allows us to schedule maintenance, reduce time on site, and meet our objective to generate defensible data.”

Volker Schmid,
Clean Air Engineering Environmental
Scientist



Additional Aeroqual features:

- PM₁₀ Auto-zeroing calibration for particulate sensors on startup of the instrument. Auto-zero calibration on start-up increases data defensibility and accuracy and saves remediation professionals time on site.
- Self-orientating Met Sensors (wind direction & speed). When you pack up your instruments at the end of the day you can rest easy that your wind sensors will orient themselves accurately the next day, saving you time and making sure that your windspeed data is accurate..
- Dynamic PM Inlet Heating. The heated inlet is actively controlled based on current environmental conditions, resulting in a significant reduction in power consumption by between 40 and 85% With this innovative feature, you can ensure optimal instrument performance while also minimizing energy consumption, making it a more efficient choice for your air quality monitoring needs.
- Lower Cost of Compliance With integrated 2-way comms you can change setting remotely, reducing travel costs and time spent on-site. Troubleshoot instruments remotely with dialled-in cloud-enabled manufacturer support. Automated site contribution reporting supports local regulations such as SCAQMD Rule 1466 and NYSDEC DER-10 with fully customizable exceedance levels.



“The Aeroqual stations gave us defensible data for multiple pollutants within budget and were easy to deploy onsite.”

**Kenneth Tramm, PhD, PG, CHMM,
Modern Geosciences**

Conclusion

Advances in air quality monitoring technologies make compliance with the CAMP requirements of NYS-DEC DER-10 regulations easier. Aeroqual’s all-in-one air monitoring systems seamlessly integrate software features like automated site contribution reporting, and 2-way communication, with hardware features such as auto-zeroing calibration cycle and self-orientating met sensors. These systems make it more efficient and less costly for site remediation professionals to comply with local air quality regulations.

For a successful remediation project, compliance is key. Aeroqual Site Contribution streamlines the monitoring process with automated calculations and real-time alerts that are customisable to your needs ensuring traceable and reliable compliance reporting. Real-time site data is easily accessible from anywhere using the live dashboard, reducing the need for on-site visits, eliminating unnecessary restrictions and ensuring a positive project outcome for both the customer and community.

Acronyms and Abbreviations

BTEX	benzene, toluene, ethylbenzene, xylene
CAMP	Community Air Monitoring Plan
EPA	U.S. Environmental Protection Agency
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAL	Perimeter Action Limit
PID	Photoionisation Detector
PM	Particulate Matter
ppm	parts per million
SCAQMD	South Coast Air Quality Management District
Superfund	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
TVOC	Total Volatile Organic Compounds
VOC	Volatile Organic Compound

About Aeroqual

Aeroqual designs and manufactures integrated air quality monitoring and software systems. Since 2001 Aeroqual has partnered with government, industry, researchers and consultants on thousands of projects in over 70 countries. With more than 100 regional partners and more than 7000 connected air monitors globally, and backed by industry-leading sensor technology, Aeroqual delivers integrated, all-in-one real-time air quality monitoring solutions that are easy to use; providing site remediation professionals with an air monitoring solution that saves them time and reduces cost and risk.

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