
To: Harman Sond
Tea Leys Energy Storage Limited

From: Dr Zhiyuan Yang

Date: 24th November 2025

Subject: Tea Leys BESS, Staffordshire, ST10 4NS

Air Quality Impact Assessment of Battery Energy Storage Systems (BESS) Fire

Technical Note: Air Quality Impact Assessment Inclusive of Long-Term Exposure Impact in Response to the Comment Made by Planning Officer at Checkley Parish Council

Tetra Tech Air Quality Report Reference: 784-B048497

1.0 BACKGROUND

Tetra Tech has undertaken an air quality impact assessment for a battery energy storage system (BESS) fire incident in support of a planning application for the proposed BESS located on land by Tea Leys Farm, Tea Leys, Leigh, Stoke-on-Trent, Staffordshire, ST10 4NS.

An air quality assessment report, titled 'Air Quality Impact Assessment of Battery Energy Storage Systems (BESS) Fire', dated 1st May 2025, has been produced.

Checkley Parish Council has reviewed the report and made several comments in an email dated 24 October 2025. The comments which are related to air quality are copied as below:

"[...] In the Applicants Air Quality Impact Assessment carried out by Tetra Tech they state the Assessment has been based on only short term health impacts as they consider that a BESS fire would only be expected to be short term and unlikely to generate long term air pollutant exposure.

CPC consider this is far from satisfactory as surely any competent Risk Assessment should always be based on the worst case not the best case. The UK Health Security Agency (UKHSA) who prevents, prepares for and responds to infectious diseases, and environmental hazards, to keep all communities safe states " that there is a high probability that a lithium-ion fire will be left to burn for days or weeks... prolonging the potential exposure of nearby residents to toxic gases". The Applicant should therefore be requested to provide a revised Air Quality Impact Assessment based on the worst-case scenario which in turn will require a reassessment of the Fire risk Assessment based on the worst-case scenario. [...]"

This technical note has been produced to include the potential long-term air pollutant exposure of local communities to the BESS fire releases in response to Parish Council comments and should be read in conjunction with the above-mentioned air quality assessment report.

2.0 AIR QUALITY ASSESSMENT METHODOLOGY

2.1 AIR QUALITY STANDARDS USED FOR LONG-TERM AIR QUALITY IMPACT ASSESSMENT

Air Quality Standards, Objectives and Limit Values used for assessing the long-term air quality impact are copied from Tetra Tech 2025 May air quality report and are presented in **Table 2-1** along with European Commission (EC) Directive Limits as below.

Table 2-1. Air Quality Standards, Objectives and Limit Values

Pollutant	Applies	Objective	Concentration Measured as	Date to be achieved and maintained thereafter	European Obligations	Date to be achieved and maintained thereafter	New or existing
NO ₂	UK	200µg/m ³ not to be exceeded more than 18 times a year	1-Hour Mean	31 st December 2005	200µg/m ³ not to be exceeded more than 18 times a year	1 st January 2010	Retain Existing
	UK	40µg/m ³	Annual Mean	31 st December 2005	40µg/m ³	1 st January 2010	
Particles (PM ₁₀)	UK	50 µg/m ³ by end of 2004 (max 35 exceedances a year)	24-hour Mean	1 st January 2005	50 µg/m ³ by end of 2004 (max 35 exceedances a year)	1 st January 2005	Retain Existing
	UK	40 µg/m ³ by end of 2004	Annual Mean	1 st January 2005	40 µg/m ³	1 st January 2005	
PM _{2.5}	UK	10 µg/m ³	Annual Mean	31 st December 2040	-	-	New
CO	UK	10mg/m ³	Maximum daily 8-Hour Mean	31 st December 2004	10mg/m ³ Maximum daily 8-hour mean	1 st January 2005	Retain Existing

3.0 DETAILED MODELLING METHODOLOGY OF IMPACT OF A BESS FIRE ON AIR QUALITY

3.1 MODELLING PARAMETER AND AVERAGING PERIOD

The long-term impact assessment periods in this technical note are detailed in **Table 3-1**

Table 3-1. Modelling Parameters and Averaging Period

Parameter	Modelled As:
	Long-Term
NO ₂	Annual mean
PM ₁₀	Annual mean
PM _{2.5}	Annual mean

3.2 PROPOSED BESS SYSTEM

The proposed BESS system is the MC Cube Energy Storage System (ESS). The MC Cube ESS integrates all power electronics, controls, and safety features required to support the DC side of a battery energy storage system. The MC Cube ESS contains 10 MC Cubes and each MC Cube contains 416 Lithium Iron Phosphate (LFP) Batteries (cells)

The BESS system consists of the ESS units, and the power conversion system (PCS) units.

The details of the proposed BESS parameters are presented as follows:

- Battery Chemistry: Lithium Iron Phosphate (LFP).
- The LFP Cell Capacity for 4h BYD (Build Your Dreams) ESS: 403Ah.
- MC Cube Configuration: 1P416S battery.
- Each MC Cube consists of 416 batteries/cells.
- MC Cube ESS Cabinet contains: 10 MC Cubes.
- System Configuration: 10P416S (10 Racks or 10 MC Cubes).
- Total Number of battery/cell in one cabinet: 4,160 batteries/cells).
- Cabinet Dimension (L*H*W – mm): 6058 * 2896* 2438.
- The outer material of the cabinet: steel.

3.3 POLLUTANT EMISSION RATE CALCULATIONS

The MC Cube ESS cabinet houses 10 MC Cubes, each of which incorporates heat and smoke detection along with fire suppression systems. The MC Cubes are separated by the outside structure faces adjacent to neighbouring ones, therefore creating a delay in heat transfer between MC Cubes in the event of a fire. In the event that an MC Cube were to catch fire, it is likely that it would burn out before neighbouring MC Cubes further away within the container would catch fire.

The MC Cube ESS cabinets will be installed with a minimum clearance for the front and rear sides, and area above the cabinets, for maintenance, ventilation and fire propagation prevention.

It is assumed that only one MC Cube would be on fire at a given time.

There is limited information publicly available on a real-world occurrences of BESS fires and the associated pollutant emissions data. In addition, a standardised set of emission factors for BESS is not currently available from the Environment Agency and, therefore, equivalent fire development and thermal runaway, smoke and heat releases, pollutant emissions data must be sourced from the research literature, BESS fire testing reports and Tetra Tech's project experiences on air quality impact assessment on battery fire / thermal runaway testing.

In 2016 a U.S. based organisation, the Fire Protection Research Foundation (FPRF), published a report of '*Hazard Assessment of Lithium-Ion Battery Energy Storage Systems, February 26, 2016*' that included gas sample measurements from batteries subjected to external and internal ignition tests for a BESS at 100 kWh size.

Tetra Tech has completed an air quality impact assessment of pollution emissions from a battery testing facility. The battery testing facility has tested different types and sizes of batteries.

- The battery types include Lithium Iron Phosphate (LFP), Lithium Nickel Manganese Cobalt (NMC) and Lithium Ion; and
- The battery sizes range from 2.2 Ah to 63 Ah.

The heat release, gas temperature, gas volumes produced, gas species generated, for example, H₂, CO₂, CO, NO₂, HCL, HF during the battery fire / thermal runaway tests have been recorded.

Based on the testing results using a LFP battery at the battery testing facility, the generated pollutants/species dangerous to human health are NO₂, CO, HCL and HF.

Tetra Tech have reviewed and studied available battery testing and BESS fire test reports. A number of assumptions have been made in building a conceptual model to simulate a BESS fire.

1. One rack on fire at one time (due to inbuilt fire suppression systems and safety spacing between battery units);
2. A total of 416 cells in one rack;
3. LFP cell capacity of 280 Ah;
4. A fire/thermal runaway being taking place inside the container which is similar to an "internal ignition testing" reported in 2016 USA Fire Protection Research Foundation (FPRF) testing report;
5. 'Tetra Tech 2025 May air quality report' detailed the short-term air quality impact based on that BESS fire would last for 180 minutes, which is deriving from the "internal ignition testing" results reported in 2016 USA Fire Protection Research Foundation (FPRF) testing report;
6. For the long-term air quality impact in this technical note, a BESS fire in a container would last up to 4 weeks;
7. Exhaust plume temperature 60 °C which is deriving from the "internal ignition testing" results reported in 2016 USA Fire Protection Research Foundation (FPRF) testing report;
8. Gas volume generations being derived from the battery testing facility testing results;

9. Pollutants/species generations being derived from the battery testing facility testing results; and
10. A Leclanché system container size of 6.058m x 2.896m x 2.438m.

The fire gas volumes, pollutant mass emissions and modelling parameters are presented in **Table 3-2**.

Table 3-2. Mass Emissions and Emission Source Parameters for Fire Modelling

Parameter	One MC Cube on Fire	Unit
No. of MC Cube will be on Fire	1	-
Total No. of Cells per MC Cube	416	Batteries/cells
Cell Capacity for 4h BYD (Build Your Dreams) ESS (each cell)	403	Ah
Total Energy Capacity per Rack	167,648	Ah
Gas Release per Ah ^a	7.1	Litter/Ah
A MC Cube Fire Duration ^b	4	weeks
Fire Duration of One Cell ^a	494	second
No. of Cells on Fire at One Time	20	Cells
Fire Gas Volume Generations	57.23	m ³ /hr
	0.0159	m ³ /s
Fire gas escaping temperature	60	°C
NO _x Gas Volume within Total Gas Generated ^a	4.0	%
CO Gas Volume within Total Gas Generated ^a	11.0	%
HCL Gas Volume within Total Gas Generated ^a	0.2	%
HF Gas Volume within Total Gas Generated ^a	0.4	%
NO _x Mass Emission Rate during the Fire	1.2	g/s
CO Mass Emission Rate during the Fire	3.29	g/s
Particulate Matter Mass Emission Rate during the Fire ^c	0.66	g/s
HCL Mass Emission Rate during the Fire	0.047	g/s
HF Mass Emission Rate during the Fire	0.073	g/s
Gas Escaping Area	0.016	m ²
Fire gas upward velocity	1.0	m/s
Fire gas Escaping Height	2.8	m

Note:

- a. Derived from the battery testing facility results;
- b. Following the comments made by Planning officer at Checkley Parish Council and
- c. Using the CO/PM emission ratio of 5 which has been derived from the published data in the EA's report of "Review of emission factors for incident fires", Innovation for efficiency science programme, Science report: SC060037/SR3, August 2009

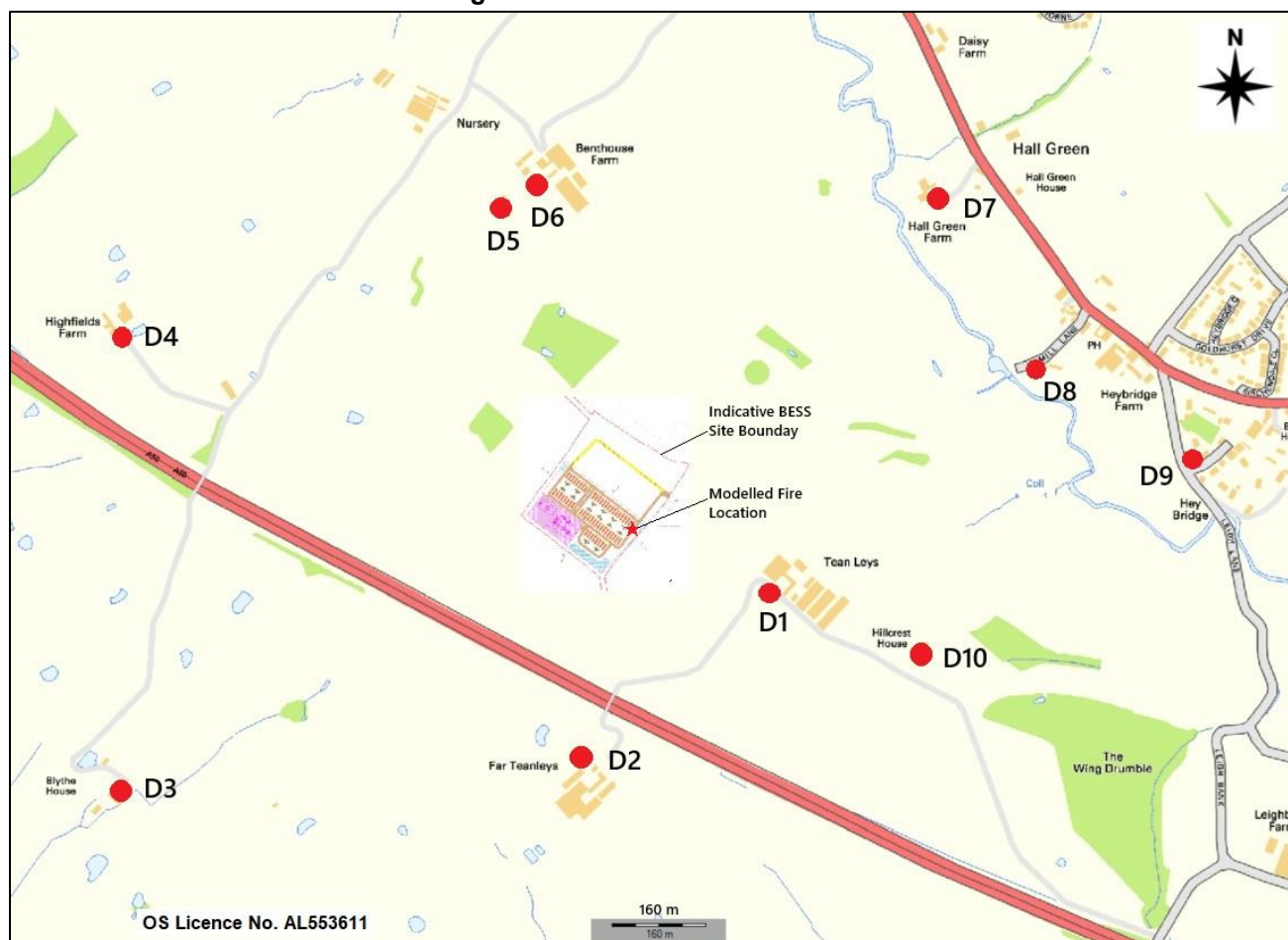
It is noted that the pollution emission rates vary at different BESS fire stages: incipient, growth, fully developed and decay. The USA Fire Protection Research Foundation (FPRF) report of 'Hazard Assessment of Lithium-Ion Battery Energy Storage Systems, February 26, 2016, presented the testing results of CO concentration in

the exhaust gas reached the maximum 12 minutes after a fire started and the concentration began to be tailing off after 60 minutes.

It is assessed that the pollutant emission rate remain the same as the values presented in **Table 3-2** over a four-week fire period to produce a worst-case assessment.

The location of the modelled fire is illustrated in **Figure 3-1**. The selected fire location is within the site layout plan as near as possible to the sensitive receptor to represent worst-case.

Figure 3-1. Modelled Fire Location



3.4 SENSITIVE RECEPTORS

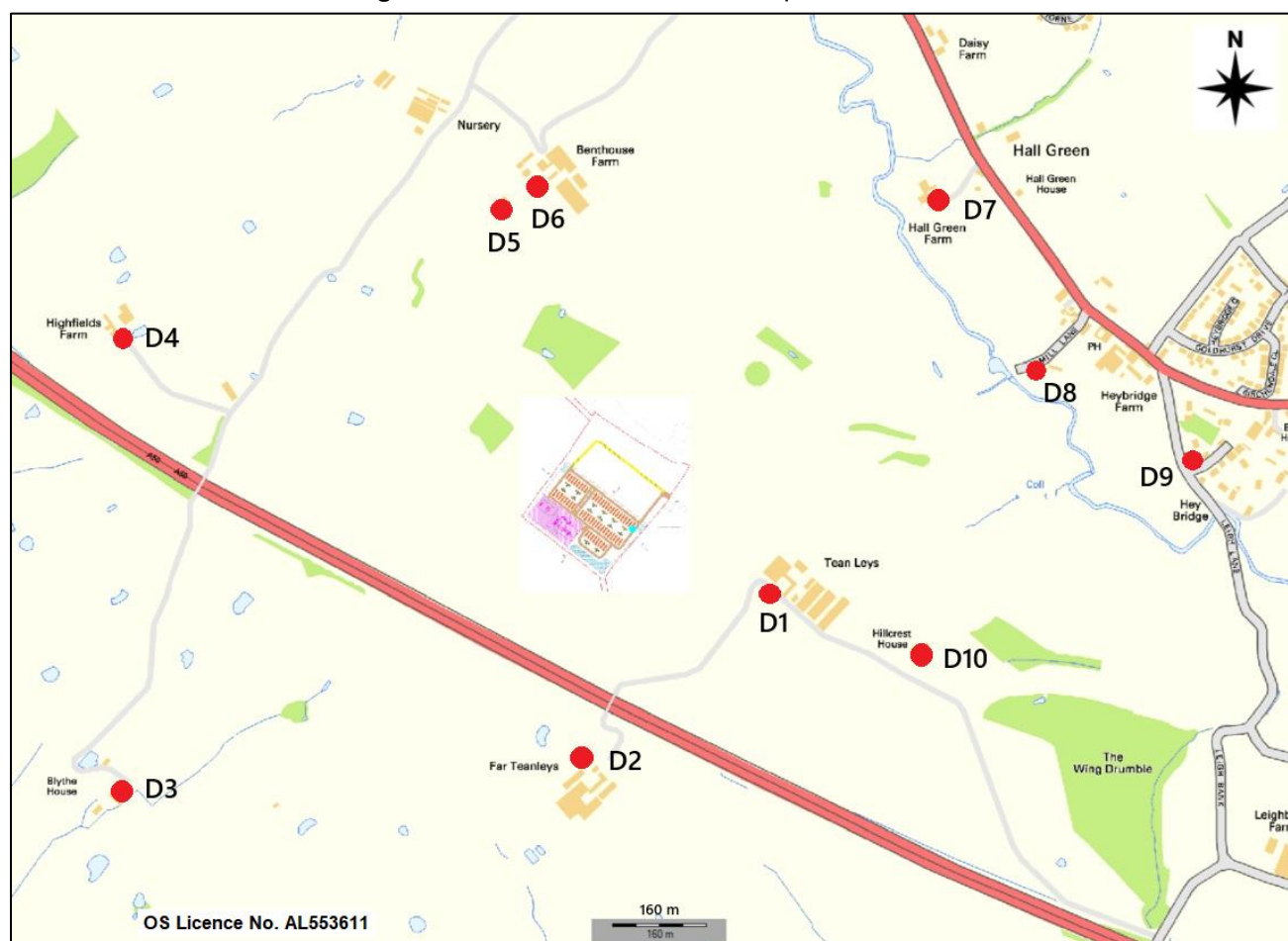
3.4.1 Discrete Human Receptors

The residential receptors surrounding the BESS site boundary will be incorporated into the modelling. The selected residential receptors are presented in **Table 3-3** and shown in **Figure 3-2**. The modelled fire location has been selected as the nearest point to the Tean Leys Farm receptor to produce a worst-case assessment.

Table 3-3. Modelled Sensitive Receptors

Discrete Sensitive Receptor		UK NGR (m)		Bearing from Site	Approx. Distance from BESS Site Redline Boundary (m)	Approx. Distance from the MC Cube ESS Unit/PCS Unit (m)
		X	Y			
D1	Tean Leys Farm	401011	338147	E	240	270
D2	Lower Tean Leys Farm	400697	337880	S	305	350
D3	Blythe House	399924	337822	SW	825	875
D4	Highfields Farm	399913	338593	NW	770	800
D5	Hillside Croft	400564	338814	N	460	505
D6	Benthouse Farm	400626	338846	N	480	525
D7	Hall Green Farm	401306	338825	NE	740	780
D8	Riverside Cottages (Mill Lane)	401477	338532	SSE	715	765
D9	1 Nightingale Close	401741	338371	E	940	985
D10	Hillcrest House	401272	338055	E	510	540

Figure 3-2. Modelled Sensitive Receptor Locations



3.4.2 Ecological Receptors

According to 'Guidance of air emissions risk assessment for your environmental permit' (Defra and Environment Agency, 2 August 2016) states that assessments should consider the impact on the conservation areas:

Examining if there are any of the following within 10 km of the site (or within 15 km for coal or oil-fired power stations):

- Special Protection Areas (SPAs);
- Special Areas of Conservation (SACs); and
- Ramsar sites (protected wetlands).

Examining if there are any of the following within 2 km of the site:

- Sites of Special Scientific Interest (SSSIs); and
- Local Nature Sites (ancient woods, local wildlife sites and national and local nature reserves)

There are no SPAs, SACs, Ramsar or SSSIs sites identified based on above criteria.

There are an un-named Ancient & Semi-Natural Woodlands and the Wing Drumble Ancient & Semi-Natural Woodlands located approximately 670 m SE of the BESS site.

Given that (1) a BESS fire incident would only last a relatively short period, e.g. typically from a few days to a maximum of a few weeks, and (2) the identified designated sites are located a considerable distance away from the proposed BESS site (for example, there are no Ramsar site, SPA and SAC within 10 km of the site and there is no SSSI within 2 km of the site), it is unlikely that there will be long-term significant air quality impacts in the event of a battery fire. Therefore, no designated sites are included in the assessment.

3.4.3 Cartesian Grid Receptors

A Cartesian receptor grid was used in the model in order to produce the concentration contour lines. The Cartesian receptor grid consists of receptors identified by their x (east-west) and y (north-south) coordinates.

The grid was constructed with grid spacing (x, y) of 50 m x 50 m over an area covering 3000 m x 3000 m with south-west corner UK NGR (m) of 399300, 336600.

3.5 METEOROLOGICAL DATA

The 5-year meteorological data (2020 - 2024) used in the assessment are derived from East Midland Airport weather station, which is considered representative of conditions within the vicinity of the site, with all the complete parameters necessary for the AERMOD model. Reference should be made to **Figure 3-3** for an illustration of the prevalent wind conditions at the weather station.

3.6 SURFACE CHARACTERISTICS

The land uses surrounding the Site are currently being used for agricultural purposes in arable production. A surface roughness value of 0.3 (agricultural areas (max)) has been used in the modelling for a worst-case assessment.

3.7 BUILDINGS IN THE MODELLING ASSESSMENT

Buildings nearby or immediately adjacent to the fire location could potentially cause building downwash effects on emission sources.

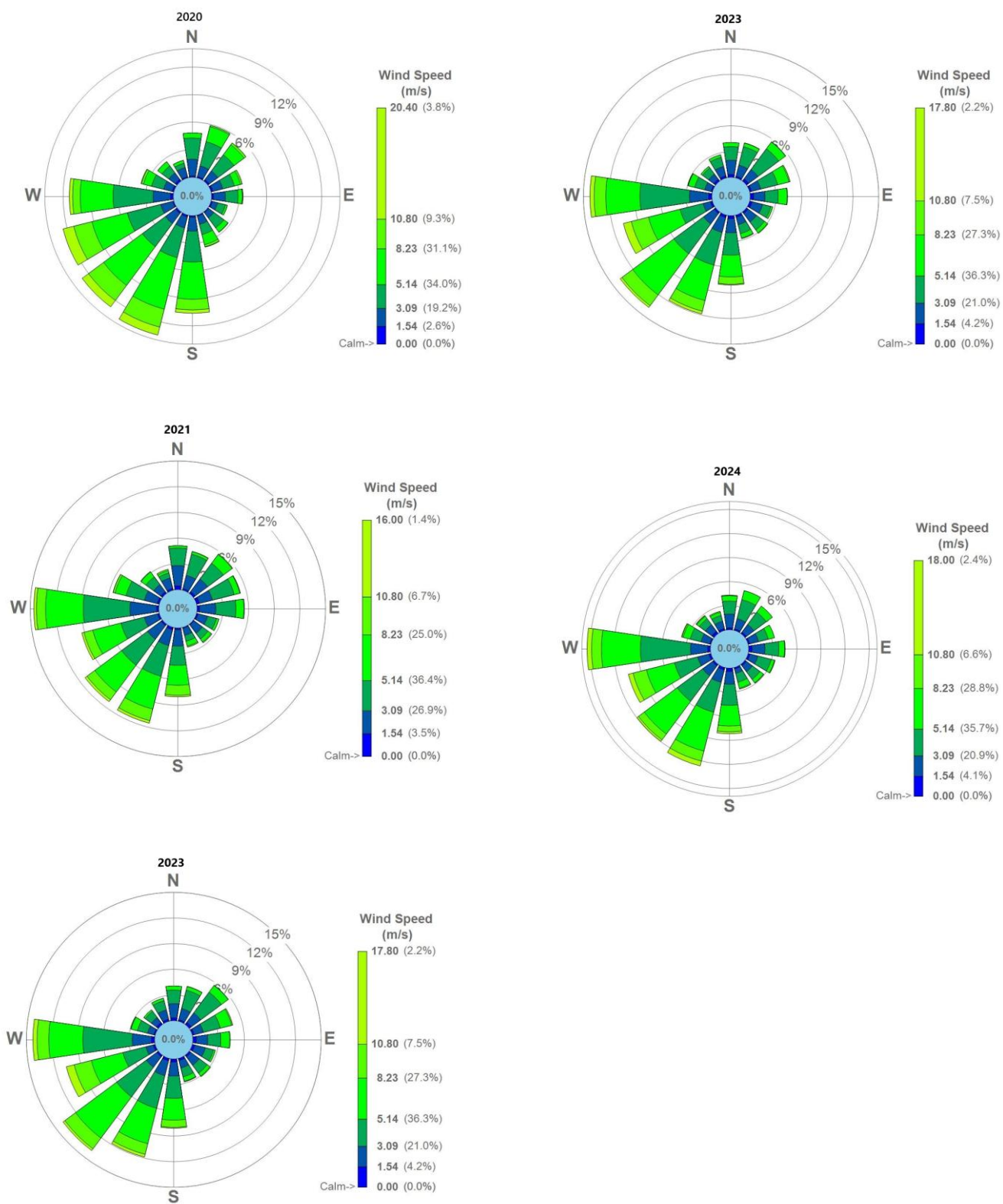
In terms of plume and pollutant dispersion, if there is an effluent release within that disturbed flow region, the dispersion of the effluent plume can be vastly different from that without the obstacle. This effect often results in an elevated plume being brought to the ground rapidly and is referred to as building downwash.

There would be no large buildings located adjacent to the battery energy storage unit area and therefore, no buildings have been included in the model for the assessment.

3.8 TREATMENT OF TERRAIN

The presence of steep terrain can influence the dispersion of emissions and the resulting pollutant concentrations. USEPA guidance indicates that terrain effects should be considered if the gradient exceeds 1:10. Digital terrain files in the UK Ordnance Survey (OS) Landranger format (.NTF) have been used in the assessment.

Figure 3-3. Meteorological Station Wind Rose



3.9 MODELLING UNCERTAINTY

Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - including emissions estimates, background estimates and meteorology; and
- Variability - randomness of measurements used.

However, potential uncertainties in model results have been minimised as far as practicable and worst-case inputs considered in order to provide a robust assessment. This included the following:

- Choice of model – ADMS-Roads is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Emission rates - Emissions were based on the number of battery cells could be on fire at a time;
- Background concentrations - Background pollutant concentrations were obtained from a number of recognised sources in order to consider baseline levels in the vicinity of the site, as detailed within the main report text; and
- Variability - All model inputs are as accurate as possible and worst-case conditions have been considered where necessary in order to ensure a robust assessment of potential pollutant concentrations.

4.0 DETAILED MODELLING ASSESSMENT RESULTS – LONG-TERM IMPACT

The detailed computational modelling assessment of process emissions was undertaken using the input parameters detailed in Section 3.

4.1 NITROGEN DIOXIDE (NO₂)

Long-Term (Annual Mean) NO₂

The long-term emissions of NO₂ from the sources considered were assessed for all 5 years of meteorological data. The maximum process contributions (PCs) within the modelled receptor locations and their associated predicted environmental concentrations (PECs) are compared against the relevant AQO, in **Table 4-1**.

From the meteorological dataset, the year resulting in maximum long-term NO₂ PC concentration was identified as 2022. The predicted maximum PC occurs at the receptor location of Tean Leys Farm (D1).

The maximum NO₂ PC in **Table 4-1** is 1.28 µg/m³ and the associated NO₂ PEC is 7.79 µg/m³, which is below the relevant long-term AQS of 40 µg/m³ for the protection of human health.

Table 4-1. The Maximum Long-Term (Annual Mean Concentration of NO₂

Pollutant	Year	Process Contrib'tn (PC)	PC as %age of AQO	PEC ^(a) (PC + Background)	Easting (m)	Northing (m)	Receptor Name
NO ₂	2020	0.76	1.89	7.27	401011	338147	Tean Leys Farm
NO ₂	2021	1.16	2.90	7.67	401011	338147	Tean Leys Farm
NO ₂	2022	1.28	3.20	7.79	401011	338147	Tean Leys Farm
NO ₂	2023	0.78	1.96	7.29	401011	338147	Tean Leys Farm
NO ₂	2024	0.90	2.25	7.41	401011	338147	Tean Leys Farm
AQO		40 µg/m³					

Note:

a. Inclusive of Background concentration of 6.51 µg/m³.

Table 4-2 presents a summary of the predicted nitrogen dioxide concentrations, both PCs and PECs, at the modelled receptors locations.

The impact description of changes associated with the modelled emissions with respect to annual mean NO₂ exposure has been assessed and the outcomes of the assessment are summarised in **Table 4-2**.

Table 4-2. The Long-Term (Annual Mean) Concentrations of NO₂ and Impact Description of Effects at Receptors

Receptor		Predicted Annual Mean Concentration (µg/m ³) – 2022 Met Data, and NO ₂ Impact Description at Receptors						
ID	Name	Process Contribution (PC)	PC as percentage of AQO (%)	Background	PEC ^(a) (PC +Background)	PEC as percentage of AQO	PC as percentage of AQO	Impact Descriptor
D1	Tea Leys Farm	1.28	3.20	6.51	7.79	19.5%	2-5% of AQO	Insignificant
D2	Lower Tea Leys Farm	0.35	0.88	6.51	6.86	17.2%	<1% of AQO	Insignificant
D3	Blythe House	0.09	0.22	6.51	6.60	16.5%	<1% of AQO	Insignificant
D4	Highfields Farm	0.08	0.21	6.51	6.59	16.5%	<1% of AQO	Insignificant
D5	Hillside Croft	0.15	0.39	6.51	6.66	16.7%	<1% of AQO	Insignificant
D6	Benthouse Farm	0.15	0.37	6.51	6.66	16.6%	<1% of AQO	Insignificant
D7	Hall Green Farm	0.21	0.53	6.51	6.72	16.8%	<1% of AQO	Insignificant
D8	Riverside Cottages (Mill Lane)	0.16	0.39	6.51	6.67	16.7%	<1% of AQO	Insignificant
D9	1 Nightingale Close	0.11	0.28	6.51	6.62	16.6%	<1% of AQO	Insignificant
D10	Hillcrest House	0.34	0.86	6.51	6.85	17.1%	<1% of AQO	Insignificant
AQO		40 µg/m³						

Note:

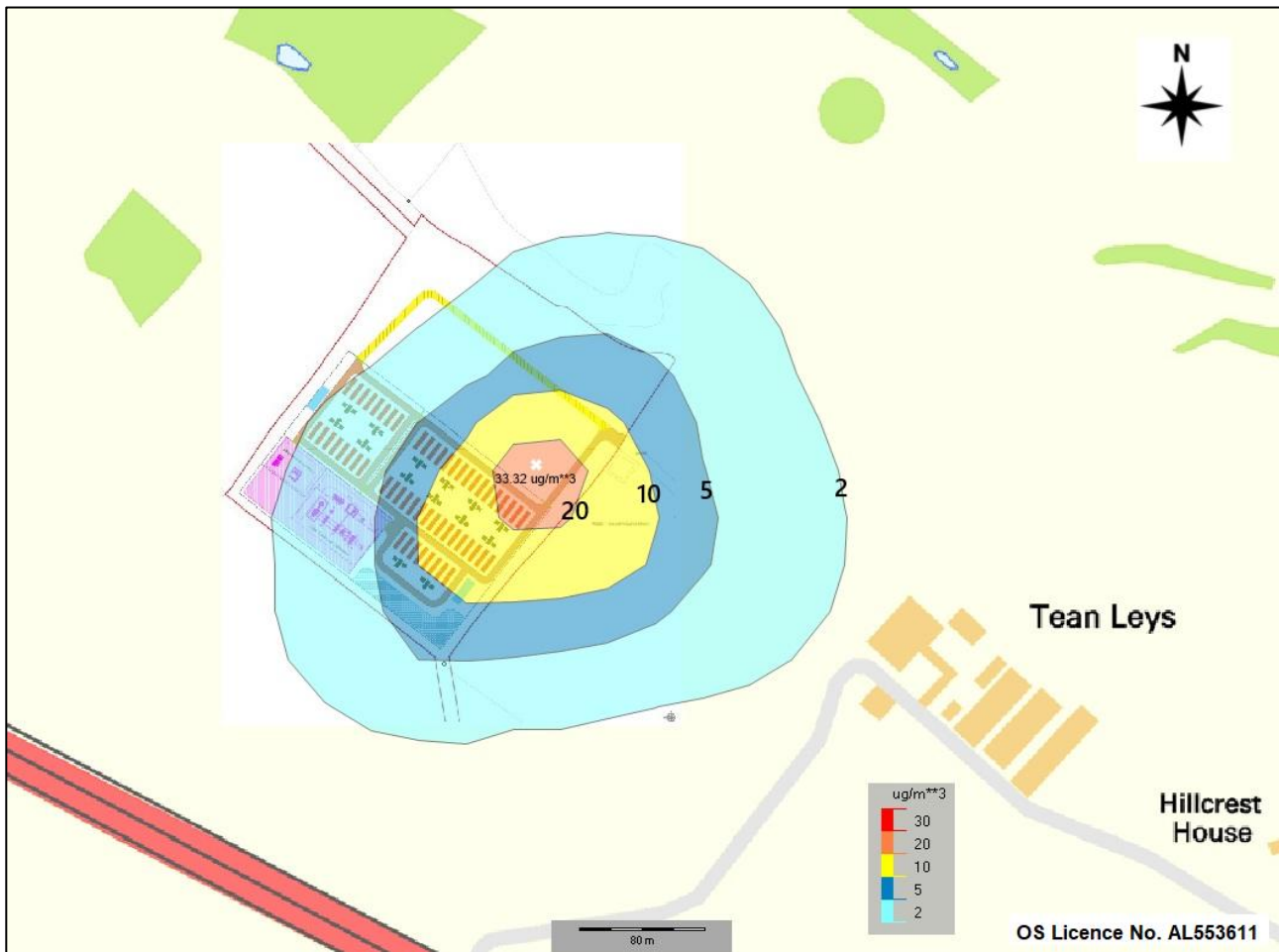
- a. Inclusive of traffic modelling background concentrations.

The percentage changes in process contribution of NO₂ relative to the AQO as a result of the fire emissions at all receptor locations, with respect to NO₂ exposure, are determined to be 3.2% or less. The long-term PEC is less than 75% of AQO and the impact is determined to be insignificant.

The predicted long-term NO₂ concentrations from the modelled emission sources are considered acceptable for the protection of human health.

The contour plots of the predicted long-term ground level PCs of NO₂ for all receptors, including discrete and grid receptors are presented in **Figure 4-1**. The contour plots show that the predicted long-term maximum concentrations occur at an area located north-northeast to the emission source, with a predicted decrease in concentration with the increased distance from the fire location.

Figure 4-1. Long-Term NO₂ Ground Level PC – 2022 Met Data



4.2 PARITICUATE MATTER (PM₁₀)

Long-Term (Annual Mean) PM₁₀

The predicted long-term PCs and PECs from 2022 meteorological data, the year resulting in maximum long-term PM₁₀ PC concentration, at receptor locations are compared against the relevant AQS in **Table 4-3**.

Table 4-3. The Long-Term (Annual Mean) Concentrations of PM₁₀ and Significance of Effects at Key Receptors

Receptors		Predicted Annual Mean Concentration (µg/m ³) – 2022 Met Data, and PM ₁₀ Significance Impacts at Receptors					
ID	Name	Process Contribution (PC) (µg/m ³)	PC as %age of AQO	Background (µg/m ³)	PEC (PC + Background) (µg/m ³)	PC as percentage of AQO	Impact Descriptor
D1	Teian Leys Farm	0.71	1.77	10.19	10.90	2-5% of AQO	Insignificant
D2	Lower Teian Leys Farm	0.19	0.49	10.19	10.38	<1% of AQO	Insignificant
D3	Blythe House	0.05	0.12	10.19	10.24	<1% of AQO	Insignificant
D4	Highfields Farm	0.05	0.11	10.19	10.24	<1% of AQO	Insignificant
D5	Hillside Croft	0.08	0.21	10.19	10.27	<1% of AQO	Insignificant
D6	Benthouse Farm	0.08	0.21	10.19	10.27	<1% of AQO	Insignificant
D7	Hall Green Farm	0.12	0.29	10.19	10.31	<1% of AQO	Insignificant
D8	Riverside Cottages (Mill Lane)	0.09	0.21	10.19	10.28	<1% of AQO	Insignificant
D9	1 Nightingale Close	0.06	0.15	10.19	10.25	<1% of AQO	Insignificant
D10	Hillcrest House	0.19	0.47	10.19	10.38	<1% of AQO	Insignificant
AQO and Limit Value		40 µg/m ³					

As shown in **Table 4-3**, the long-term PM₁₀ PECs at selected receptor locations are all below the relevant AQS.

The percentage change in process concentrations relative to the AQS at all receptor locations, with respect to PM₁₀ exposure, are determined to be 1.77% or less. The impact is determined to be 'insignificant'.

Therefore, the predicted long-term PM₁₀ concentrations from the stack emissions are considered acceptable for the protection of human health.

Daily (24-Hour Mean) PM₁₀

The impact of the daily (24-hour mean) PM₁₀ has also assessed. The predicted Daily PCs and PECs from 2022 meteorological data, the year resulting in maximum daily PM₁₀ PC concentration, at receptor locations are compared against the relevant AQS, in **Table 4-4**.

Table 4-4. The Daily (24-Hour Mean) Concentrations of PM₁₀ at Key Receptors

Receptors		Predicted 24-Hour Mean (90.41 th Percentile) Concentration (µg/m ³) – 2022 Met Data at Receptors					
ID	Name	Process Contribution (PC) (µg/m ³)	PC as %age of AQO	Background (µg/m ³)	PEC (PC + Background) (µg/m ³)	PC as percentage of AQO	Impact Descriptor
D1	Tea Leys Farm	2.10	4.20	10.19	12.29	<10% of AQO	Insignificant
D2	Lower Tea Leys Farm	0.84	1.67	10.19	11.03	<10% of AQO	Insignificant
D3	Blythe House	0.17	0.33	10.19	10.36	<10% of AQO	Insignificant
D4	Highfields Farm	0.18	0.35	10.19	10.37	<10% of AQO	Insignificant
D5	Hillside Croft	0.26	0.52	10.19	10.45	<10% of AQO	Insignificant
D6	Benthouse Farm	0.26	0.52	10.19	10.45	<10% of AQO	Insignificant
D7	Hall Green Farm	0.32	0.65	10.19	10.51	<10% of AQO	Insignificant
D8	Riverside Cottages (Mill Lane)	0.22	0.45	10.19	10.41	<10% of AQO	Insignificant
D9	1 Nightingale Close	0.17	0.34	10.19	10.36	<10% of AQO	Insignificant
D10	Hillcrest House	0.60	1.21	10.19	10.79	<10% of AQO	Insignificant
AQO	50 µg/m³						

As shown in **Table 4-4**, there are no exceedances of the daily PM₁₀ AQS at any of the identified sensitive receptors. The predicted impacts are significantly below the AQS of 50 µg/m³.

The percentage change in process concentrations relative to the daily AQS at all receptor locations are less than 10% of the relevant AQS and the 24-hour impact is determined to be 'insignificant'.

Therefore, the predicted daily PM₁₀ concentrations from the emission source are considered acceptable for the protection of human health.

The contour plots of the predicted daily ground level PCs of PM₁₀ are not presented as the process concentrations is less than 10% of the AQS.

4.3 PARTICULATE MATTER (PM_{2.5})

4.3.1 Long-Term Particulate Matter (PM_{2.5})

A worst-case scenario assumption of 100% of PM₁₀ to be PM_{2.5} was made in the assessment. The predicted long-term PCs of PM_{2.5} and the significance of changes associated with the operations of the emission source with respect to annual mean PM_{2.5} exposure is presented and assessed in

Table 4-5.

Table 4-5. The Long-Term (Annual Mean) Concentrations of PM_{2.5} and Significance of Effects at Key Receptors

Receptors		Predicted Annual Mean Concentration (µg/m ³) – 2022 Met Data, and PM _{2.5} Significance Impacts at Receptors					
ID	Name	Process Contribution (PC) (µg/m ³)	PC as %age of AQO	Background (µg/m ³)	PEC (PC + Background) (µg/m ³)	PC as percentage of AQO	Impact Descriptor
D1	Tea Leys Farm	0.71	3.53	6.56	7.27	2-5% of AQO	Insignificant
D2	Lower Tea Leys Farm	0.19	0.97	6.56	6.75	<1% of AQO	Insignificant
D3	Blythe House	0.05	0.24	6.56	6.61	<1% of AQO	Insignificant
D4	Highfields Farm	0.05	0.23	6.56	6.61	<1% of AQO	Insignificant
D5	Hillside Croft	0.08	0.42	6.56	6.64	<1% of AQO	Insignificant
D6	Benthouse Farm	0.08	0.41	6.56	6.64	<1% of AQO	Insignificant
D7	Hall Green Farm	0.12	0.58	6.56	6.68	<1% of AQO	Insignificant
D8	Riverside Cottages (Mill Lane)	0.09	0.43	6.56	6.65	<1% of AQO	Insignificant
D9	1 Nightingale Close	0.06	0.31	6.56	6.62	<1% of AQO	Insignificant
D10	Hillcrest House	0.19	0.95	6.56	6.75	<1% of AQO	Insignificant
AQO		20 µg/m³					

As shown in

Table 4-5, there are no exceedances of the long-term PM_{2.5} AQS at any of the identified sensitive receptors. The predicted impacts are below the AQS of 20 µg/m³.

The percentage change in process concentrations relative to the long-term AQS at all receptor locations are less than 3.53% of the relevant AQS and the long-term impact is determined to be 'insignificant'.

Therefore, the predicted long-term PM_{2.5} concentrations are considered acceptable for the protection of human health.

5.0 SUMMARY AND CONCLUSIONS

Tetra Tech has undertaken an air quality impact assessment from a battery energy storage system (BESS) fire incident, undertaken in support of a planning application for a proposed BESS located on land by Tean Leys Farm, Tean Leys, Leigh, Stoke-on-Trent, Staffordshire, ST10 4NS.

An air quality assessment report, titled 'Air Quality Impact Assessment of Battery Energy Storage Systems (BESS) Fire', dated 1st May 2025, has been produced.

This technical note has been produced to include the long-term air pollutant exposures in response to Checkley Parish Council's comments.

Air Quality Impact Assessment Using Long Period UK Air Quality Standards

The long-term (annual mean) environmental concentrations of NO₂, PM₁₀ and PM_{2.5} at Tean Leys Farm receptor are predicted to be below the relevant long-term AQS for the protection of human health in the event of a BESS fire lasting up to 4 weeks.

In addition, the daily PM₁₀ emission impact has been assessed and the environmental concentrations of PM₁₀ are below the relevant AQS.

The long-term and daily impacts are determined to be not significant for the protection of human health in the event of a BESS fire lasting up to 4 weeks. As such, the long-term and daily impacts are considered acceptable for the protection of human health.

It should be noted that the pollution emission rates vary at different BESS fire stages: incipient, growth, fully developed and decay. The USA Fire Protection Research Foundation (FPRF) report of 'Hazard Assessment of Lithium-Ion Battery Energy Storage Systems', February 26, 2016, presented the testing results of CO concentration in the exhaust gas, showing the maximum concentration was reached 12 minutes after a fire started, with the concentration then beginning to tail off after 60 minutes. The assessment has been undertaken based on the assumption that the pollutant emission rate remains the same as the peak emission values over a four-week fire period to produce a worst-case assessment.

BESS Fire Action Plan

As presented in the Tetra Tech report titled 'Air Quality Impact Assessment of Battery Energy Storage Systems (BESS) Fire', dated 1st May 2025, a BESS Fire Action Plan will be implemented.

The safety measures of the BESS Fire Action Plan include:

"The site manager/fire safety representative will need to assess the fire location(s), wind directions and surrounding receptors. The site manager/fire safety representative will take appropriate actions accordingly. The actions to be taken include:

(1) to inform any potentially affected residents, especially those that are located at downwind locations to the BESS fire;



(2) to cancel outdoor events and keep windows closed for any potentially affected residents, especially those that are located at downwind locations to the BESS fire; and

(3) to stop any farming activities and to move any farmers/workers within 500 m of the BESS fire to a cleaner air location. A cleaner air location would preferably not be downwind, and be at a distance greater than 500 m from the BESS fire; and

(4) Ensure that sufficient water is available for manual firefighting. An external fire hydrant should be in close proximity of the BESS containers or an Emergency Water Supply (EWS) should be incorporated into the design of the site e.g. an open water source and/or tank(s)."

The implementation of the BESS fire action plan will further ensure that both the long-term and short-term impacts, in the event of a BESS fire lasting up to 4 weeks, will not be significant in terms of the protection of human health and the protection of vegetation and ecosystems.

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