

Particulate Matter (PM₁₀) Monitoring
St. Stephen-in-Brannel, Treviscoe, Nanpean and
St Dennis

December 2017 –February 2018

Prepared by Sarah Hodgson

Project Reference	AQM21032017
Issue Date	March 2018
Author	SC Hodgson

Client:**St. Stephen-in-Brannel Parish Council****Prepared by:****Sarah Hodgson****Air Quality Monitors Ltd****Queensgate House****48 Queen Street****EXETER EX4 3SR****T: 0845 686 2270****www.aqmonitors.co.uk**

This report has been prepared in pursuance of a contract between Air Quality Monitors Ltd and St. Stephen-in-Brannel Parish Council. All intellectual property rights remain the property of Air Quality Monitors Ltd unless otherwise agree

Table of Contents

1.0	Introduction	4
1.1	Introduction	4
1.2	Sources of PM ₁₀ Particles	4
2.0	Policy Context	6
2.1	International Legislation and Policy.....	6
2.2	National Legislation and the UK Air Quality Strategy	6
2.3	Local Air Quality Management	6
2.4	Assessment Criteria.....	7
3.0	Assessment Methodology.....	9
3.1	Monitoring Technique	9
3.2	Monitoring Locations	9
4.0	Monitoring Results.....	11
4.1	St Stephen-in- Brannel Monitoring Site	11
4.2	Treviscoe Monitoring Site	13
4.3	Nanpean Monitoring Site.....	15
4.4	St Dennis Monitoring Site	18
4.5	Diurnal Profiles for Exceedences at Multiple Sites on the Same Day	20
5.0	Conclusions	22
	Appendix A - Air Quality Terminology.....	24
	Appendix B –PM ₁₀ Monitoring Results	25

1.0 Introduction

1.1 Introduction

Air Quality Monitors Ltd was initially commissioned by St. Stephen-in-Brannel Parish Council to review and analyse continuous PM₁₀ monitoring data from the air quality particulate monitor in the village of St. Stephen-in Brannel.

The purpose of the analysis was to establish baseline PM₁₀ air quality data in the St. Stephen area prior to the commissioning of the Energy from Waste (EfW) plant at Rostowrack Farm in St Dennis. The Parish Council intended to continue monitoring, following the commissioning of the EfW plant, in order that a comparison of the baseline conditions could be made to the operating conditions.

The monitoring site in St. Stephen-in Brannel is located approximately four kilometres to the south of the EfW plant and although neither site is within an Air Quality Management Area (AQMA), they both lie within an area that has a significant china clay industry. A two-year study undertaken by the China Clay Area Dust Monitoring Forum¹ from 2003 – 2005, indicated that the china clay industry increased ambient concentrations of PM₁₀ levels by as much as 8 µg/m³ as a daily average, depending on location and weather conditions.

St-Stephen-in-Brannel Parish Council have purchased three further AQM DM11 PM₁₀ monitors that are located in the villages of Treviscoe, Nanpean and St Dennis. The monitors in Treviscoe and Nanpean were installed during the summer of 2016 and valid data is available from the end of August 2016. The monitor in St Dennis was installed on the 12th October 2016.

Monitoring data from the AQM DM11 PM₁₀ monitor can only be used for screening assessments to identify where there is a potential for an air quality objective to be exceeded. This is due to differences in the monitoring technique and in order to determine whether an exceedance of the National Air Quality Strategy (NAQS) Air Quality Objectives has occurred, gravimetric monitoring would be required. However, the AQM DM11 is a very useful tool and provides indicative or semi quantitative results.

This report forms part of an on-going series and provides:

- The results and analysis of the PM₁₀ monitoring from 1st December 2017 to 28th February 2018 for the monitoring sites in St Stephen-in-Brannel, Treviscoe, Nanpean and St Dennis.
- Comparison of data from the four DM11s against the PM₁₀ air quality objectives.

A glossary of common air quality terminology is provided in **Appendix A**.

1.2 Sources of PM₁₀ Particles

The term PM₁₀ refers to particulate matter with a diameter of approximately 10 µm or less and represents the respirable fraction of dust. Particles of this size are not filtered out by the nose and throat and can settle deep in the lungs causing health problems.

1 The China Clay Dust Monitoring Forum (March 2007). An investigation into of the China Clay Industry's Impact on PM₁₀ in Cornwall.

The health effects of particle pollution have been widely studied, and include premature death, worsening of lung and heart disease, often increasing admissions to hospital. ²

PM_{10s} are made up of a wide range of materials and arise from a variety of sources, both man-made and natural. It is generally accepted that PM₁₀ concentrations fall into two main categories:

- Primary particles include mobile sources i.e. road transport and stationary sources such as the burning of fuels for industrial, commercial and domestic purposes. Emissions of dust can also generate high concentrations of PM₁₀ close to quarries and construction sites. Natural sources include sea spray and dust from the Saharan desert travelling vast distances.
- Secondary particulate matter is formed from chemical reactions of the gases ammonia (NH₃), sulphur dioxide (SO₂) and nitrogen oxides (NO_x) in the atmosphere to form ammonium sulphates and ammonium nitrates. NH₃ is emitted mainly from agricultural sources, particularly livestock waste. SO₂ is formed by combustion of sulphur containing fuels such as coal. NO_x is formed by combustion of fuels used in power generation, domestic heating and traffic. Secondary particulate matter is also formed from organic compounds by reactions that occur in the atmosphere.

² World Health Organization (2013). Review of evidence on health aspects of air pollution REVIHAAP Project. Air Quality Expert Group (2005). Particulate Matter in the UK: Summary. Defra, London.

Royal College of Physicians & Royal College of Paediatrics and Child Health (2016). Every Breath we take. The lifelong Impact of Air Pollution. London.

2.0 Policy Context

2.1 International Legislation and Policy

The EU Directive 2008/50/EC³ on ambient air quality and cleaner air for Europe (the CAFE directive) sets out a series of limit values for the protection of human health and critical levels for the protection of vegetation. Compliance with the EU Limit Values is mandatory for all EU members and the UK may incur infringement action if it does not meet the required objective limits within the agreed time limits. The UK is currently exceeding the objective limits for NO₂ and PM₁₀ within London and a number of other areas within the UK. The Air Quality Standards Regulations 2010⁴ implements the requirements of the Directive into UK legislation.

2.2 National Legislation and the UK Air Quality Strategy

The National Air Quality Strategy (NAQS) for England, Scotland, Wales and Northern Ireland⁵ published in July 2007, is part of the Government's overall strategy to improve the quality of life for people in the UK. The NAQS contains policies for the assessment of UK air quality and implementation of European Union and International agreements. The NAQS sets out air quality objectives and dates for achievement for nine airborne pollutants, which are designed to protect human health and the environment.

The National Air Quality Objectives (NAQOs) apply to external air where there is relevant exposure to the public over the associated averaging periods within each objective. Guidance is provided within Local Air Quality Management Technical Guidance 2016 (LAQM.TG (16))⁶ issued by DEFRA for Local Authorities on where the NAQOs apply, as detailed in **Table 2.1**. The objectives do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e. centre of roadways).

It should be noted that the EU Limit Values are numerically the same as the NAQO values but differ in terms of compliance dates. The compliance date for the PM₁₀ Limit Values is 1st January 2005. The EU Limit Values are also mandatory, whereas the NAQOs are policy objectives. Local authorities are not required to achieve them, but to work towards their achievement.

The strategy also sets out the roles that Government, industry, the Environment Agency, local government, business, individuals and transport have in protecting and improving air quality.

2.3 Local Air Quality Management

Local authorities are seen to play a particularly important role in local air quality management. Section 82 of the Environment Act 1995 requires every local authority to conduct a review of the air quality from time to time within the authority's area. The recently released DEFFA technical guidance, LAQM.TG(16), describes a new streamlined approach to the Local Air Quality Management (LAQM) regime, whereby every authority has to undertake and submit a single Annual Status Report/Annual Progress Report within its area, to identify whether the objectives have been or will be achieved at relevant locations by the applicable date. If the objectives are not being met, the authority must declare an Air Quality Management Area (section 83 of the Act) and prepare an

³ Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

⁴ Air Quality Regulations 2010 – Statutory Instrument 2010 No. 1001

⁵ Defra (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

⁶ DEFRA (2016) Local Air Quality Management. Technical Guidance LAQM.TG(16)

action plan (section 84) which identifies measures that will be introduced in pursuit of the objectives.

Table 2.1: Locations Where Air Quality Objectives Apply		
Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual Mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence Gardens of residential properties. Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term.
24 Hour Mean	All locations where the annual mean objective would apply together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.

2.4 Assessment Criteria

To protect our health, the Government has set air quality standards and objectives for PM₁₀. The air quality standards are concentrations below which risks to public health are considered unlikely or exceedingly small. They are based on scientific and medical evidence reviewed by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO).

The objective is the target date on which exceedences of a standard are expected to be achieved by the Government. They take account of economic efficiency, practicability, technical feasibility and timescale. There are two air quality objectives for PM₁₀:

- The 24-hour (daily) mean short term objective, which is the concentration of PM₁₀ in the air averaged over 24 hours, is designed to ensure that the public are not exposed to high concentrations of PM₁₀ for short periods. This objective applies at building façades and gardens of residential properties, schools, hospitals, care homes and hotels;
- The annual objective, which is the concentration of PM₁₀ in the air averaged over one year, aims to protect the public from PM₁₀ over a long-time period. This objective applies at all locations detailed above except gardens and hotels, unless people live there as their permanent address.

The relevant assessment criteria for this report are provided in **Table 2.2**.

Table 2.2: Relevant Objectives set out in the Air Quality Strategy			
Pollutant	Concentrations	Measured As	Date to be Achieved By
Particulate Matter PM ₁₀	50 µgm ⁻³ not to be exceeded more than 35 times per year	24-hour mean	31.12.2004
	40 µgm ⁻³	Annual mean	31.12.2004

For the 24-hour (daily) mean objective, an agreed number of exceedences are permitted. This allows for events such as Bonfire Night, where it is not possible or practicable to expect 24-hourly mean concentrations to remain within the agreed limit.

3.0 Assessment Methodology

3.1 Monitoring Technique

Continuous monitoring of particles can be undertaken using many different types of monitor. For this study four AQM DM11 airborne particulate monitors supplied by Air Quality Monitors were used. The real time AQM DM11 monitors measure PM₁₀ using a light scattering technique, similar to the Turnkey Osiris monitor. Light scattering instruments work on the principle that there is a relationship between the scattering of light that reaches the particle and particle size. A pump continuously draws an air sample through a nephelometer which sizes the individual particles as they pass through a beam. The particles are then collected on a filter to allow further analysis if necessary. The data is accessed remotely via a modem allowing it to be downloaded at frequent intervals.

The AQM DM11 monitors are serviced on an annual basis by Air Quality Monitors. The instrument was also granted Mcerts approval in February 2014. Light scattering instruments are ideal for screening surveys and provide indicative or semi quantitative results.

Wind data was supplied by the anemometers attached to the AQM DM11's at the monitoring sites located in St Stephen-in-Brannel, Treviscoe, Nanpean and St Dennis.

3.2 Monitoring Locations

St. Stephen-in-Brannel is a small village in mid Cornwall and lies approximately 9 km west of St Austell on the southern edge of Cornwall's china clay industry. The EfW site is located approximately 4 km to the north of the village. The AQM DM11 monitor is located on the roof of the Saint Stephen-in Brannel Parish Council Building.

Treviscoe lies approximately 1km to the southwest of the EfW site. The monitor is located within the grounds of Nuco Training Ltd offices in Central Treviscoe.

Nanpean is a small village on the B3279 road, approximately 6.5 km northwest of St Austell in the heart of the china clay industry in mid Cornwall. The monitor lies approximately 2.2 km to the southeast of the EfW site and is located within the cemetery of St Georges Mission Church in Nanpean.

St Dennis is a civil parish and village in Cornwall situated on the B3279 between Newquay and St Austell. The monitor lies approximately 1km northeast of the EfW site and is located within St Dennis Cemetery off Hall Road.

The position of the monitoring locations in relation to the EfW site are presented in **Figure 3.1**.

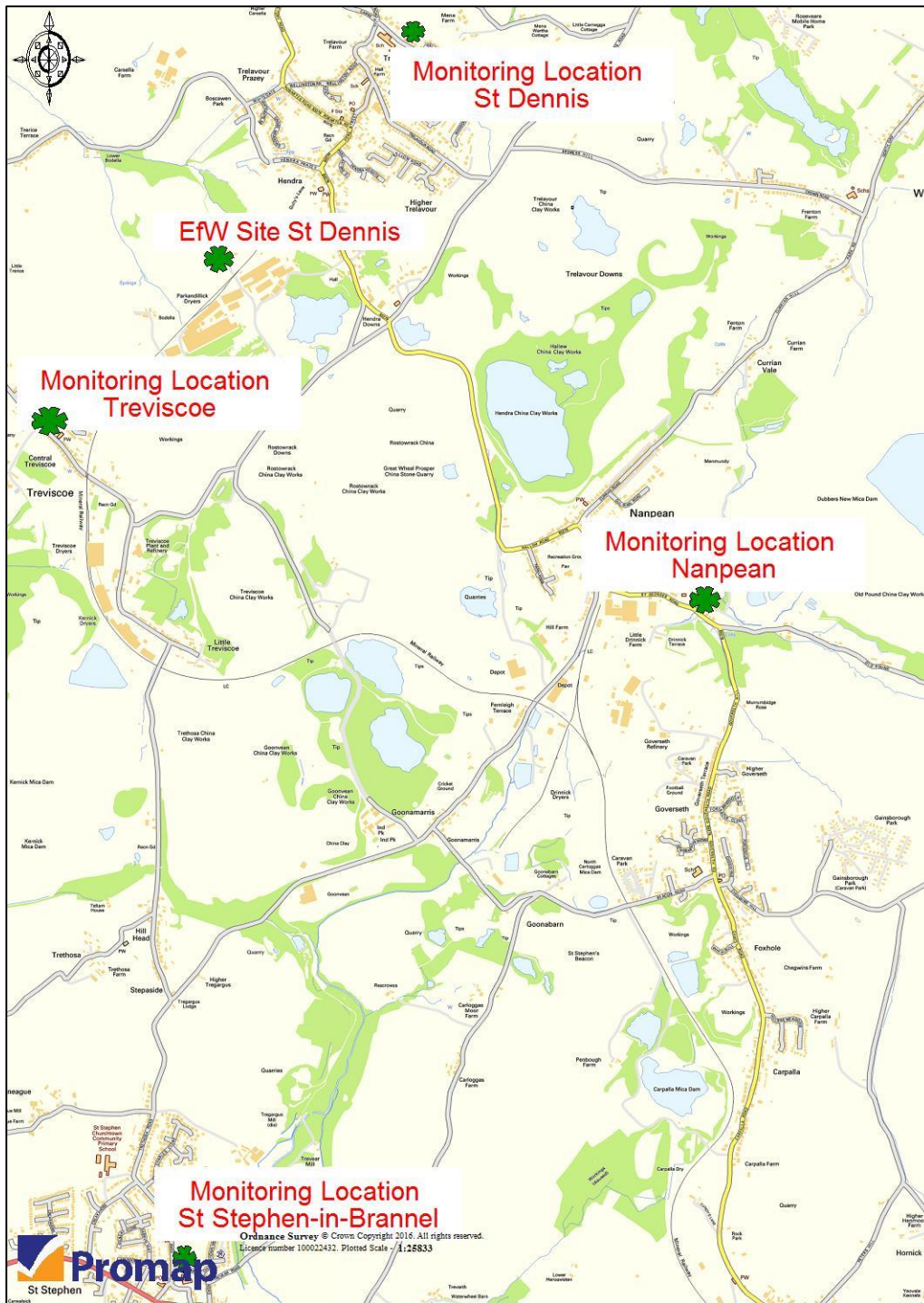


Figure 3.1: Monitoring Locations

4.0 Monitoring Results

4.1 St Stephen-in-Brannel Monitoring Site

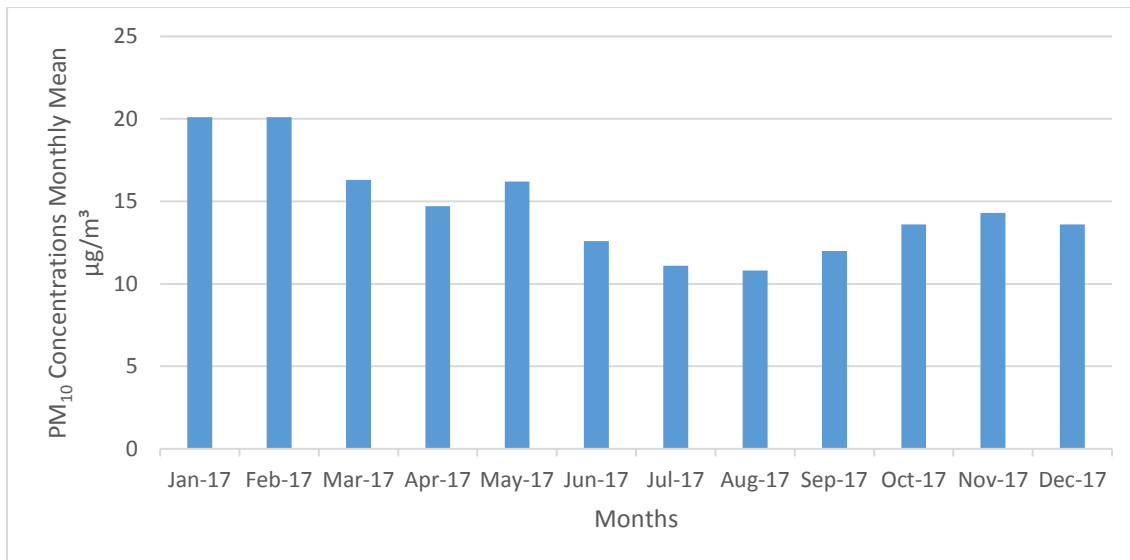
Results for Calendar Year 2017

A summary of the results for the calendar year 2017, in accordance with the 2010 Air Quality Standards Regulations, are presented in **Table 4.1**.

Table 4.1: Summary of Monitoring Results for Calendar Year 2017 St Stephen-in-Brannel	
Statistic	St. Stephen-in-Brannel Parish Council Offices
Monitoring Period	1 st January 2017 to 31 st December 2017
No. of Days	365
Data Capture (%)	94.9
Annual Mean PM ₁₀ Concentration (µg/m ³)	14.5
Maximum 15- Min Mean PM ₁₀ Concentration (µg/m ³)	386.7
No of Days > 50 µg/m ³ (35 allowed a year)	0
Maximum 24-Hour Mean PM ₁₀ Concentration (µg/m ³)	47.1

From the beginning of January 2017, up to and including 31st December 2017, the results indicate that the annual mean PM₁₀ concentration was 14.5 µg/m³ (**Table 4.1**) which is well below the NAQS annual mean objective of 40 µg/m³. There were no recorded exceedences of the short term (24-hour mean) objective during the year. Data capture for the year was 94.9%. A data capture rate of 85% for ratified data is specified in the relevant DEFRA Technical Guidance and is recommended as a target for PM₁₀ monitoring⁷.

The monthly mean PM₁₀ concentrations for 2017, presented in Graph 1, indicate that the highest concentrations occurred during January and February 2017. The lowest monthly mean PM₁₀ concentrations were recorded in July 2017.



Graph 1: Monthly Mean PM₁₀ Concentrations January 2017 to December 2017 St Stephen-in-Brannel

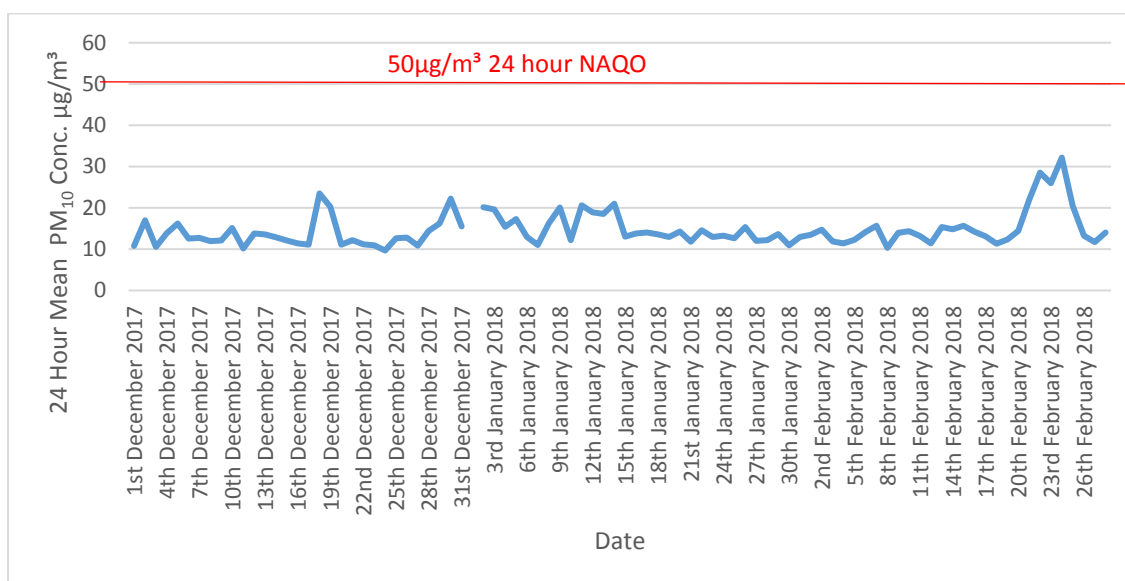
Results for Period 1st December 2017 to 28th February 2018 - St Stephen-in-Brannel

A summary of the results for the monitoring period 1st December 2017 to 28th February 2018 are presented in **Table 4.2**.

The 24-hour (daily) mean concentrations are presented in **Appendix B** in tabular format.

Table 4.2: Summary of Monitoring Results for Period 1 st Dec 2017 to 28 th Feb 2018		
Statistic	St. Stephen-in-Brannel Parish Council Offices	
Monitoring Period	1 st Dec 2017 to 31 st Dec 2017	1 st Jan 2018 to 28 th Feb 2018
No. of Days	31	59
Data Capture (%)	95.7	97.5
Period Mean PM ₁₀ Concentration (µg/m ³)	13.7	15.2
Maximum 15- Min Mean PM ₁₀ Concentration (µg/m ³)	139.1	141.7
No of Days > 50 µg/m ³ (35 allowed a year)	0	0
Maximum 24-Hour Mean PM ₁₀ Concentration (µg/m ³)	23.5	32.2

The PM₁₀ period mean for the month of December 2017 was 13.7µg/m³ (**Table 4.2**) and for January to the end of February 2018, the period mean was 15.2µg/m³, which is well below the NAQS annual mean objective of 40 µg/m³. The results also indicate no exceedences of the short term (24-hour mean) objective for PM₁₀ during the three months of monitoring. The maximum recorded 24-hour (daily) PM₁₀ concentration was 32.2µg/m³, recorded on the 24th February 2018 (**Graph 2**). Data capture for the monitoring period was very good at over 90%.



Graph 2: Daily Mean PM₁₀ Concentrations 1st December 2017 to 28th February 2018 St Stephen-in-Brannel

4.2 Treviscoe Monitoring Site

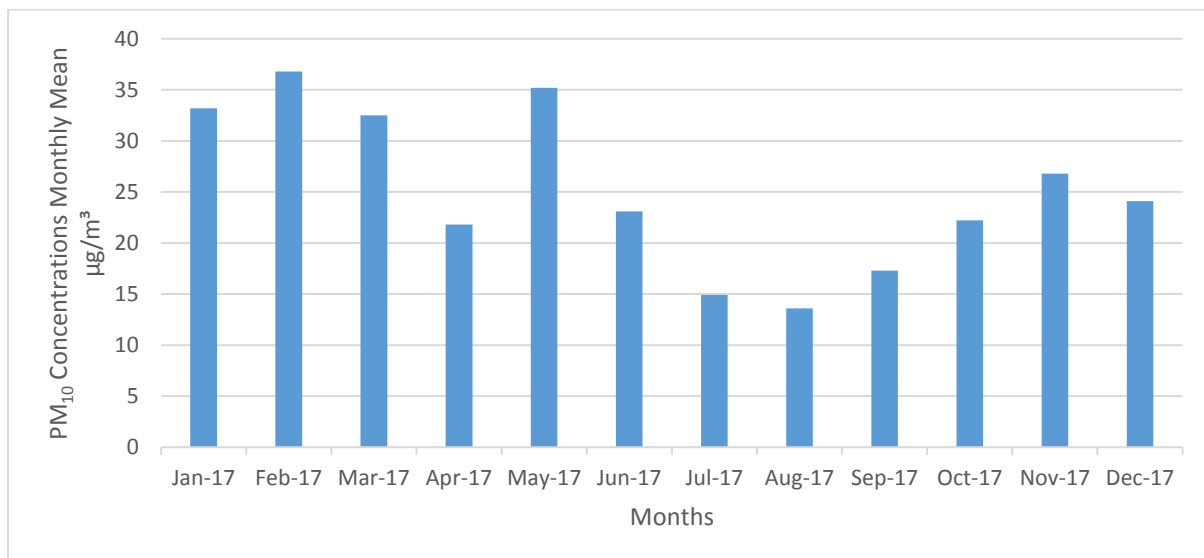
Results for Calendar Year 2017

A summary of the results for the calendar year 2017, in accordance with the 2010 Air Quality Standards Regulations, are presented in **Table 4.3**.

Table 4.3: Summary of Monitoring Results for Calendar Year 2017 Treviscoe	
Statistic	Treviscoe
Monitoring Period	1 st January 2017 to 31 st December 2017
No. of Days	365
Data Capture (%)	96.2
Annual Mean PM ₁₀ Concentration (µg/m ³)	24.8
Maximum 15- Min Mean PM ₁₀ Concentration (µg/m ³)	1252.4
No of Days > 50 µg/m ³ (35 allowed per year)	31
Maximum 24-Hour Mean PM ₁₀ Concentration (µg/m ³)	168.7

From the beginning of January 2017, up to and including 31st December 2017, the results indicate that the annual mean NO₂ concentration was 24.8 µg/m³ (**Table 4.3**) which is less than 75% of the annual mean objective of 40 µg/m³ (well below). The results also indicate 31 exceedences of the short term (24-hour mean) objective limit, however, as the objective allows for up to 35 exceedences of the limit in any given year, the objective has been met at this monitoring location during 2017. Data capture for the year was 96.2%.

The monthly mean PM₁₀ concentrations for 2017, presented in **Graph 3**, indicate that the highest concentrations occurred during February 2017. The lowest monthly mean PM₁₀ concentrations were recorded in August 2017.



Graph 3: Monthly Mean PM₁₀ Concentrations January 2017 to December 2017 - Treviscoe

Results for Period 1st December 2017 to 28th February 2018 Treviscoe

A summary of the results for the monitoring period 1st December 2017 to 28th February 2018 are presented in **Table 4.4**.

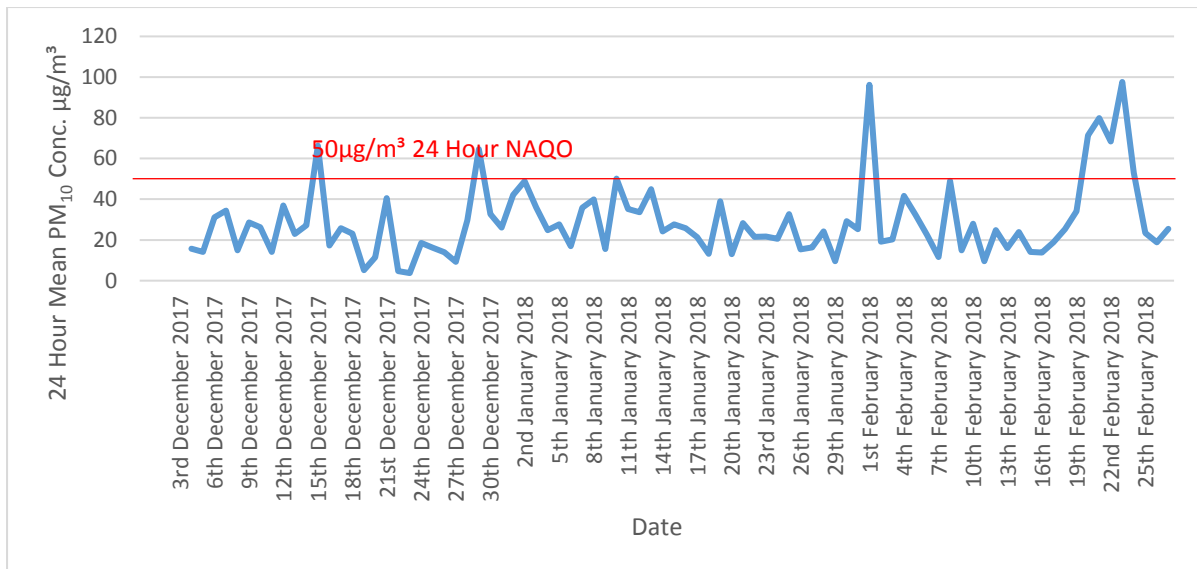
The 24-hour (daily) mean concentrations are presented in **Appendix B** in tabular format.

Table 4.4: Summary of Monitoring Results for Period 1st Dec 2017 to 28th Feb 2018		
Statistic	Treviscoe	
Monitoring Period	1 st Dec 2017 to 31 st Dec 2017	1 st Jan 2018 to 28 th Feb 2018
No. of Days	31	59
Data Capture (%)	85.2	99.8
Period Mean PM ₁₀ Concentration (µg/m ³)	24.1	30.3
Maximum 15- Min Mean PM ₁₀ Concentration (µg/m ³)	405.3	1427.2
No of Days > 50 µg/m ³ (35 allowed a year)	2	7
Maximum 24-Hour Mean PM ₁₀ Concentration (µg/m ³)	64.6	97.6

The PM₁₀ period mean for December 2017 was 24.1µg/m³ and for January 2017 to the end of February 2017, the period mean was 30.3µg/m³ which is below the NAQS annual mean objective of 40 µg/m³. There were 2 recorded exceedences of the short term (24-hour mean) objective for PM₁₀ during the month of December and 7 during January to February 2018 (**Graph 4**). The exceedences occurred on the following days:

- 22nd and 30th December 2017;
- 11th January 2018; and
- 2nd, 21st, 22nd, 23rd, 24th and 25th February 2018.

The maximum recorded daily PM₁₀ concentration was 97.6µg/m³ recorded on Saturday 24th February 2018 (**Graph 4**).



Graph 4: Daily Mean PM₁₀ Concentrations 1st December 2017 to 28th February 2018 Treviscoe

The diurnal profile for the 21st to 25th February 2018, which includes the highest 24-hour PM₁₀ concentration of 97.6µg/m³ is presented in **Graph 9**.

4.3 Nanpean Monitoring Site

Results for Calendar Year 2017

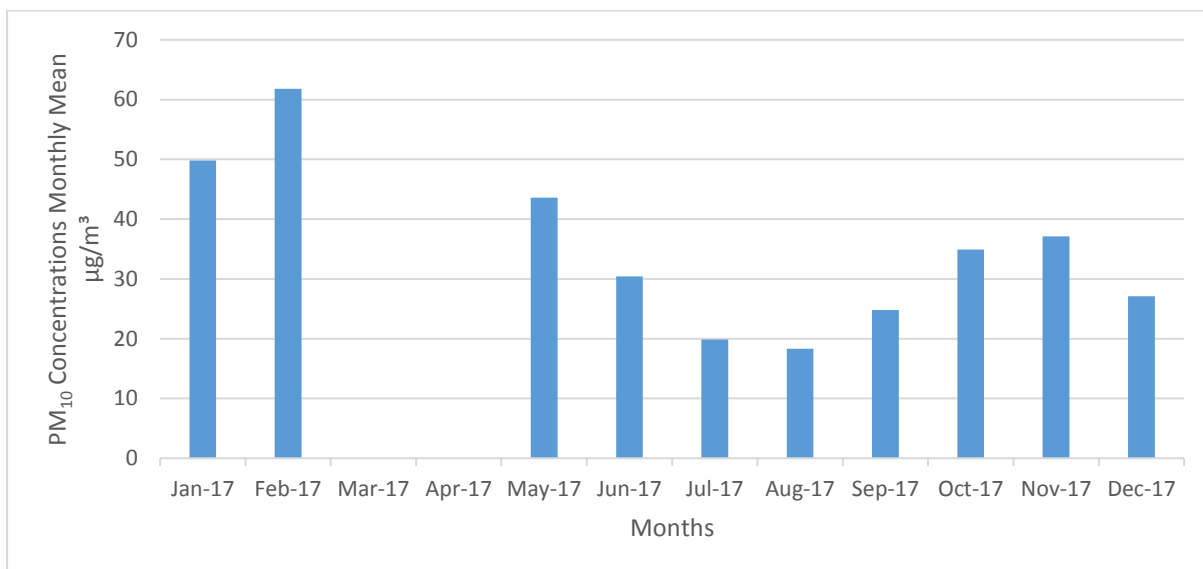
A summary of the results for the calendar year 2017, in accordance with the 2010 Air Quality Standards Regulations, are presented in **Table 4.5**.

Table 4.5: Summary of Monitoring Results for Calendar Year 2017 Nanpean	
Statistic	Nanpean
Monitoring Period	1 st January 2017 to 31 st December 2017
No. of Days	365
Data Capture (%)	80.3
Annual Mean PM ₁₀ Concentration (µg/m ³)	33.1

Maximum 15- Min Mean PM ₁₀ Concentration ($\mu\text{g}/\text{m}^3$)	2457.4
No of Days > 50 $\mu\text{g}/\text{m}^3$ (35 allowed a year)	34
Maximum 24-Hour Mean PM ₁₀ Concentration ($\mu\text{g}/\text{m}^3$)	221.4

From the beginning of January 2017, up to and including 31st December 2017, the results indicate that the annual mean NO₂ concentration was 33.1 $\mu\text{g}/\text{m}^3$ (**Table 4.5**) which is below the NAQS annual mean objective of 40 $\mu\text{g}/\text{m}^3$. There were 34 recorded exceedences of the short-term objective (24-hour daily) objective out of a permitted 35 exceedences. Data capture for the year was 80.3%.

The monthly mean PM₁₀ concentrations for 2017, presented in **Graph 5**, indicate that the highest concentrations occurred during February 2017. The lowest monthly mean PM₁₀ concentrations were recorded in July 2017.



Graph 5: Monthly Mean PM₁₀ Concentrations January 2017 to December 2017 Nanpean

Results for Period 1st December 2017 to 28th February 2018 - Nanpean

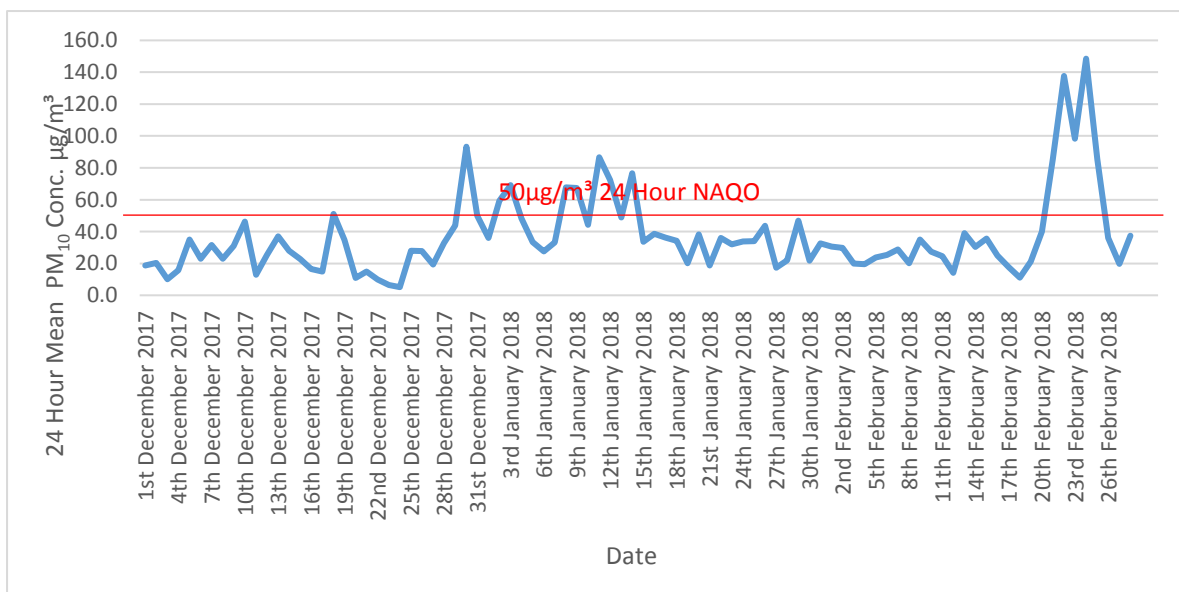
A summary of the results for the monitoring period 1st December 2017 to 28th February 2018 are presented in **Table 4.6**. The 24-hour (daily) mean concentrations are presented in **Appendix B** in tabular format.

Table 4.6: Summary of Monitoring Results for Period 1st Dec 2016 to 28th Feb 2017 Nanpean		
Statistic	Nanpean	
Monitoring Period	1 st Dec 2017 to 31 st Dec 2017	1 st Jan 2018 to 28 th Feb 2018
No. of Days	31	59
Data Capture (%)	99.7	99.9
Period Mean PM ₁₀ Concentration ($\mu\text{g}/\text{m}^3$)	27.0	41.9

Maximum 15- Min Mean PM ₁₀ Concentration ($\mu\text{g}/\text{m}^3$)	591.0	1509.9
No of Days > 50 $\mu\text{g}/\text{m}^3$ (35 allowed a year)	2	12
Maximum 24-Hour Mean PM ₁₀ Concentration ($\mu\text{g}/\text{m}^3$)	93.2	148.3

The PM₁₀ period mean for December 2017 was $27.0\mu\text{g}/\text{m}^3$ and for January 2018 to the end of February 2018, the period mean was $41.9\mu\text{g}/\text{m}^3$ which is above the NAQS annual mean objective of $40\mu\text{g}/\text{m}^3$. However, the period mean is based on only two months of monitoring and in order to make a direct comparison with the annual mean objective, twelve months of monitoring is required. There were 2 recorded exceedences of the short term (24-hour mean) objective for PM₁₀ during the month of December and 12 during January to February 2018 (**Graph 6**). The exceedences occurred on the following days:

- 18th and 30th December 2017;
- 2nd, 3rd, 8th, 9th, 11th, 12th and 14th January 2018; and
- 21st, 22nd, 23rd, 24th and 25th February 2018.



Graph 6: Daily Mean PM₁₀ Concentrations 1st December 2017 to 28th February 2018 Nanpean

The maximum recorded 24-hour (daily) PM₁₀ concentration was $148.3\mu\text{g}/\text{m}^3$ recorded on the 24th February 2018 (**Graph 6**). Data capture for the monitoring period was very good at 98.8 %.

The diurnal profile for the 21st to 25th February 2018, which includes the highest 24-hour PM₁₀ concentration of $148.3\mu\text{g}/\text{m}^3$ is presented in **Graph 9**.

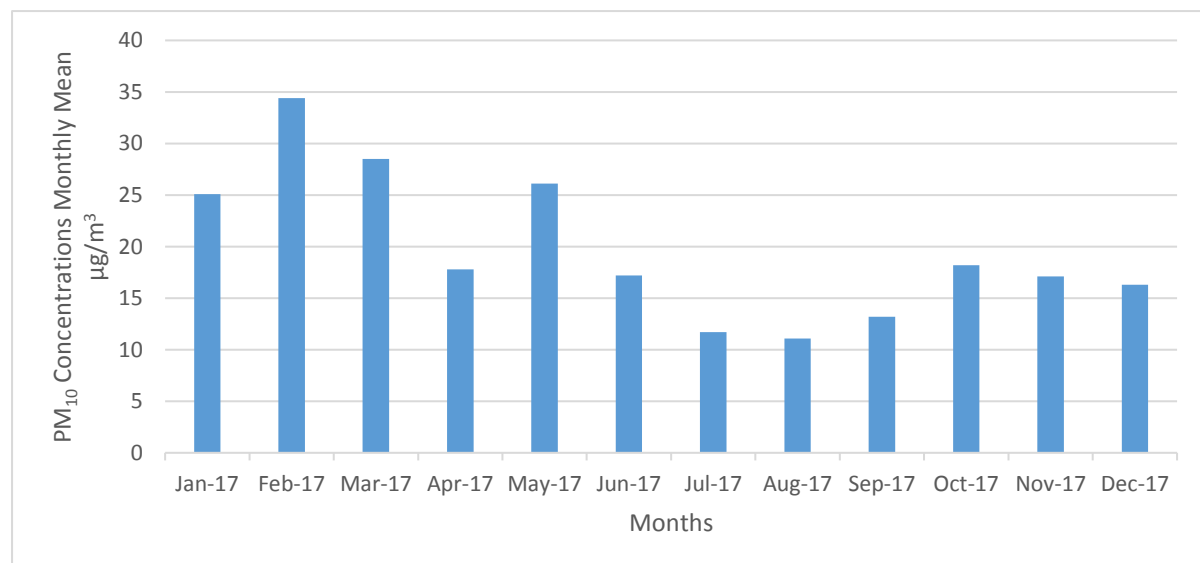
4.4 St Dennis Monitoring Site

Results for Calendar Year 2017

A summary of the results for the calendar year 2017, in accordance with the 2010 Air Quality Standards Regulations, are presented in **Table 4.7**.

Table 4.7: Summary of Monitoring Results for Calendar Year 2017 St Dennis	
Statistic	St Dennis
Monitoring Period	1 st January 2017 to 31 st December 2017
No. of Days	365
Data Capture (%)	94.4
Annual Mean PM ₁₀ Concentration (µg/m ³)	19.4
Maximum 15- Min Mean PM ₁₀ Concentration (µg/m ³)	790.5
No of Days > 50 µg/m ³ (35 allowed a year)	15
Maximum 24-Hour Mean PM ₁₀ Concentration (µg/m ³)	128.7

From the beginning of January 2017, up to and including 31st December 2017, the results indicate that the annual mean NO₂ concentration was 19.4µg/m³ (**Table 4.7**) which is less than 50% of the annual mean objective of 40 µg/m³. The results also indicate 15 exceedences of the short term (24-hour mean) objective limit, however, as the objective allows for up to 35 exceedences of the limit in any given year, the objective has been met at this monitoring location during 2017. Data capture for the year was 94.4 %.



Graph 7: Monthly Mean PM₁₀ Concentrations January 2017 to December 2017 St Dennis

The monthly mean PM₁₀ concentrations for 2017, presented in Graph 7, indicate that the highest concentrations occurred during February 2017. The lowest monthly mean PM₁₀ concentrations were recorded in August 2017.

Results for Period 1st December 2017 to 28th February 2018 – St Dennis

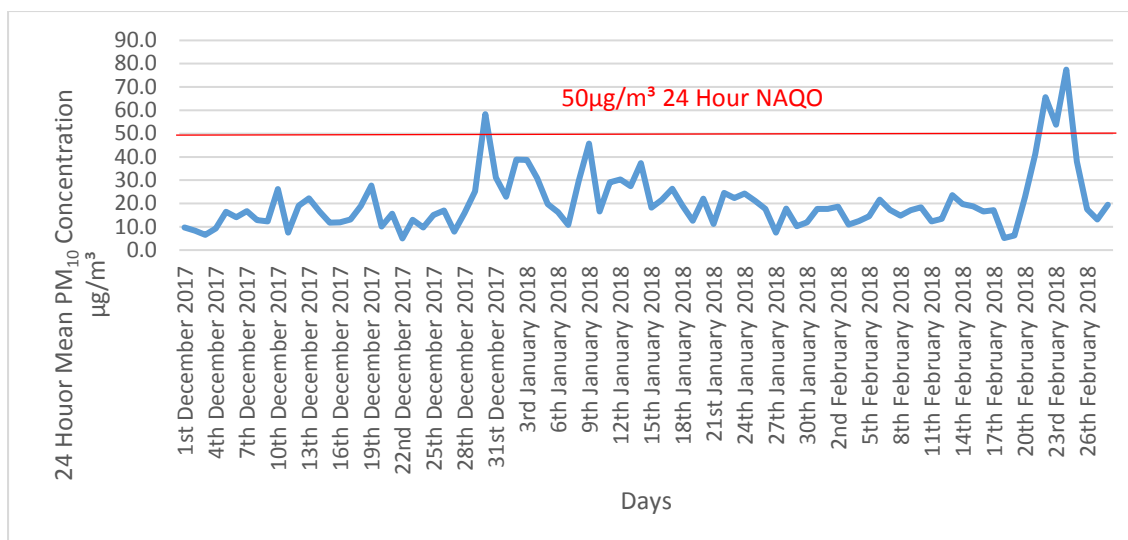
A summary of the results for the monitoring period 1st December 2017 to 28th February 2018 are presented in **Table 4.8**.

The daily (24-hourly) mean concentrations are presented in **Appendix B** in tabular format.

Table 4.8: Summary of Monitoring Results for Period 1st Dec 2017 to 28th Feb 2018		
Statistic	St Dennis	
Monitoring Period	1 st Dec 2017 to 31 st Dec 2017	1 st Jan 2018 to 28 th Feb 2018
No. of Days	31	59
Data Capture (%)	98.8	99.3
Period Mean PM ₁₀ Concentration (µg/m ³)	16.3	22.8
Maximum 15- Min Mean PM ₁₀ Concentration (µg/m ³)	130.8	364.3
No of Days > 50 µg/m ³ (35 allowed a year)	1	3
Maximum 24-Hour Mean PM ₁₀ Concentration (µg/m ³)	58.4	77.5

The PM₁₀ period mean for December 2017 was 16.3µg/m³ and for January 2018 to the end of February 2018, the period mean was 22.8µg/m³ which is below the NAQS annual mean objective of 40 µg/m³. There was 1 recorded exceedence of the short term (24-hour mean) objective for PM₁₀ during the month of December and 3 during January to February 2018 (**Graph 8**). The exceedences occurred on the following days:

- 30th December 2017; and
- 22nd, 23rd and 24th February 2018;



Graph 8: Daily Mean PM₁₀ Concentrations 1st December 2017 to 28th February 2018 St Dennis

The maximum recorded daily PM₁₀ concentration was 77.5µg/m³ recorded on Saturday 24th February 2018 (Graph 8).

4.5 Diurnal Profiles for 21st February 2018 to 25th February 2018

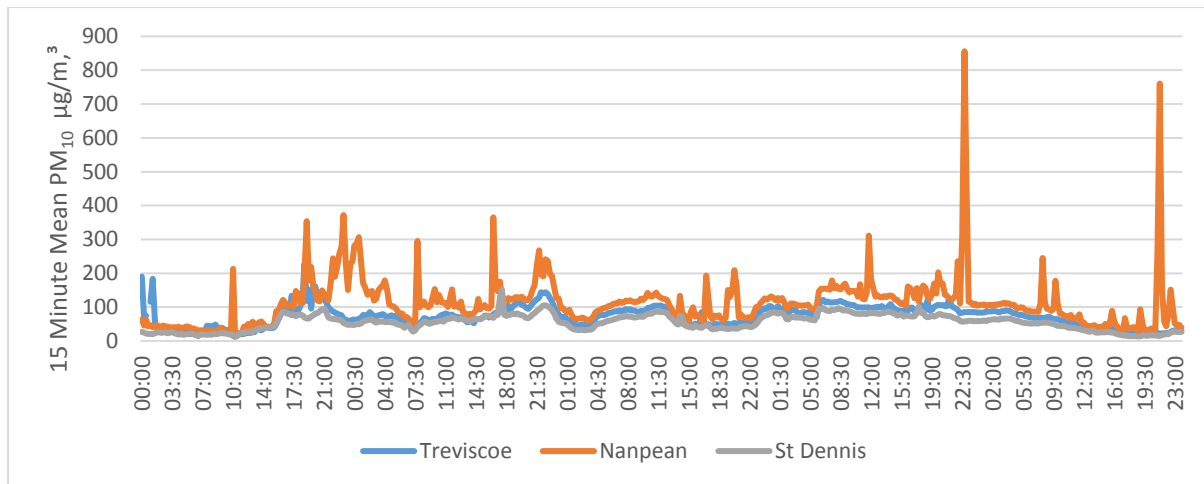
From the 21st February to 25th February 2018, there were a number of exceedences on consecutive days at three of the monitoring sites. These are detailed in Table 4.9.

Date	24 Hour (Daily) PM ₁₀ Concentration (µg/m ³)			Wind Direction	Wind Direction	Wind Direction
	Treviscoe	Nanpean	St Dennis	Treviscoe	Nanpean	St Dennis
Wednesday 21 st February 2018	71.3	85.4	41.2	NE	NE	E
Thursday 22 nd February 2018	79.9	137.7	65.7	NE	SE	SE
Friday 23 rd February 2018	68.4	98.3	53.8	NE	SE	SSE
Saturday 24 th February 2018	97.6	148.3	77.5	NE	SE	ESE
Sunday 25 th February 2018	52.9	85.5	38.0	NNE	SE	ESE

21st to 25th February 2018

Graph 9 indicates that the 15-minute mean PM₁₀ concentrations at the monitoring sites followed a similar trend over the five days, with several peaks evident at the Nanpean monitoring site. The wind direction (Table 4.9) recorded at Treviscoe, was predominantly from the northeast during the 21st to 25th February 2018; the wind direction at Nanpean ranged from northeast to southeast during the

five days and the wind direction at St Dennis ranged from south easterly to east south easterly during the period 22nd to 24th February 2018. Areas most consistently affected by dust/PM₁₀ are influenced by prevailing winds that are generally located downwind of an emissions source. Therefore, the highest risks would have occurred at receptors to the southwest, west and north west of the EfW site. The wind speed recorded at the monitoring sites from the 21st to 25th February 2018 ranged from 0.02 to 4.45m/s.



Graph 9: Diurnal PM₁₀ Concentrations at Treviscoe, Nanpean and St Dennis 21st to 25th February 2018

5.0 Conclusions

Air Quality Monitors Ltd was commissioned by St. Stephen-in-Brannel Parish Council to review and analyse continuous PM₁₀ monitoring data from the air quality particulate monitors in the villages of St. Stephen-in-Brannel, Treviscoe, Nanpean and St Dennis.

St Stephen-in-Brannel Monitoring Site

PM₁₀ monitoring for the 2017 calendar year was comfortably within the NAQS annual mean and short term (24-hour) objectives. The short-term objective was not exceeded during the year. The annual mean concentration in 2017 was 14.5 µg/m³, compared to 15-16 µg/m³ in the previous two years. There were also 4 recorded exceedences of the short-term (24-hour mean) objective in 2015 compared to no exceedences in 2016 and 2017.

The PM₁₀ monitoring for the 1st December 2017 to 28th February 2018, indicated that the values did not exceed the NAQS annual mean objective at the monitoring site in St Stephen-in-Brannel. There were no recorded exceedences of the 24-hour NAQO of 50 µg/m³.

Treviscoe Monitoring Site

PM₁₀ monitoring for the 2017 calendar year was within the NAQS annual mean and short term (24-hour) objectives. There were 31 exceedences of the 50 µg/m³ short term objective during the year however, as the objective allows for up to 35 exceedences of the limit in any given year, the objective has been met at this monitoring location during 2017.

The PM₁₀ monitoring from the 1st December 2017 to 28th February 2018 at the Treviscoe monitoring site, indicated that the values did not exceed the NAQS annual mean objective level of 40µg/m³, whilst the 24-hour mean objective was exceeded on 9 occasions, out of a permitted 35.

Nanpean Monitoring Site

PM₁₀ monitoring for the 2017 calendar year was within the NAQS annual mean and short term (24-hour) objectives. There were 34 exceedences of the 50 µg/m³ short term objective during the year however, as the objective allows for up to 35 exceedences of the limit in any given year, the objective has been met at this monitoring location during 2017.

As discussed previously (section 1.1), the DM11 instruments only provide indicative results when compared against the annual PM₁₀ or short term (24-hour mean) objective as they are not accurate enough to meet the expanded uncertainty requirements of equivalent gravimetric instruments. This is predominantly due to the differences in the monitoring technique. Therefore, as the number of exceedences during 2017 is only marginally below the objective, this should be treated with caution as monitoring with a gravimetric instrument may result in an exceedence at this monitoring location.

The PM₁₀ monitoring from the 1st December 2017 to 28th February 2018 at the Nanpean monitoring site indicated that the values were below the NAQS annual mean objective level of 40µg/m³, whilst the short term (24-hour mean) objective was exceeded on 14 occasions.

St Dennis Monitoring Site

PM₁₀ monitoring for the 2017 calendar year was within the NAQS annual mean and short term (24-hour) objectives. There were 15 exceedences of the 50 µg/m³ short term objective during the year however, as the objective allows for up to 35 exceedences of the limit in any given year, the objective has been met at this monitoring location during 2017.

The PM₁₀ monitoring from the 1st December to 28th February 2018 at the St Dennis monitoring station, indicated that the values did not exceed the NAQS annual mean objective, and there were 4 exceedences of the 24-hour mean objective during the three months of monitoring.

According to the Cornwall Council website⁸, CERC formerly started its operational phase on the 23rd March 2017, having completed its construction and testing phases.

The next quarterly report is due in June 2018.

8 Cornwall County Council <https://www.cornwall.gov.uk/environment-and-planning/recycling-rubbish-and-waste/the-cornwall-energy-recovery-centre-cerc/>

Appendix A - Air Quality Terminology

Term	Definition
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
AQMA	Air Quality Management Area.
DEFRA	Department for Environment, Food and Rural Affairs.
EPAQS	Expert Panel on Air Quality Standards
Exceedence	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LAQM	Local Air Quality Management.
MCERTS	This is the Environment Agency of England and Wales (EA) Monitoring Certification Scheme. Compliance with MCERTS gives the EA confidence in the monitoring of emissions to the environment.
NAQO	National Air Quality Objective
PM₁₀	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
WHO	World Health Organisation
µgm⁻³ micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1µg/m ³ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

Appendix B –PM₁₀ Monitoring Results

DM11 Results

Appendix A: 24-Hour (Daily) Mean µg/m ³					
Date	Day of Week	Location 1 (St Stephen in Brannel)	Location 2 (Treviscoe)	Location 3 (Nanpean)	Location 4 (St Dennis)
1 st December 2017	Friday	10.8		18.7	9.7
2 nd December 2017	Saturday	17.0		20.4	8.4
3 rd December 2017	Sunday	10.6		10.1	6.6
4 th December 2017	Monday	13.9		15.7	9.3
5 th December 2017	Tuesday	16.2		35.0	16.5
6 th December 2017	Wednesday	12.6	14.1	23.0	14.1
7 th December 2017	Thursday	12.7	31.2	31.5	16.7
8 th December 2018	Friday	11.9	34.4	22.9	12.8
9 th December 2017	Saturday	12.1	14.9	31.0	12.3
10 th December 2017	Sunday	15.2	28.6	46.1	26.2
11 th December 2017	Monday	10.2	26.2	13.0	7.5
12 th December 2017	Tuesday	13.8	14.2	25.4	19.1
13 th December 2017	Wednesday	13.5	36.9	37.0	22.2
14 th December 2017	Thursday	12.9	22.9	27.9	16.6
15 th December 2017	Friday	12.1	27.1	22.7	11.7
16 th December 2017	Saturday	11.4	20.2	16.6	11.9
17 th December 2017	Sunday	11.1	17.2	15.0	13.2
18 th December 2017	Monday	23.5	25.8	51.1	19.0
19 th December 2017	Tuesday	20.3	23.2	34.8	27.7
20 th December 2017	Wednesday	11.1	5.2	10.8	10.1
21 st December 2017	Thursday	12.2	11.5	14.8	15.7
22 nd December 2017	Friday	11.2	40.6	9.9	5.0
23 rd December 2017	Saturday	10.9	4.7	6.4	12.9
24 th December 2017	Sunday	9.7	3.7	5.1	9.7
25 th December 2017	Monday	12.7	18.5	28.0	15.1
26 th December 2017	Tuesday	12.8	16.2	27.7	17.0
27 th December 2017	Wednesday	10.8	14.0	19.2	8.0
28 th December 2017	Thursday	14.4	9.3	32.9	15.9
29 th December 2017	Friday	16.2	29.7	43.9	25.2
30 th December 2017	Saturday	22.3	64.6	93.2	58.4
31 st December 2017	Sunday	15.6	32.7	49.8	31.2
1 st January 2018	Monday		26.1	35.9	22.8
2 nd January 2018	Tuesday	20.2	42.1	59.2	38.9
3 rd January 2018	Wednesday	19.6	48.9	69.1	38.7
4 th January 2018	Thursday	15.4	36.0	48.3	30.9
5 th January 2018	Friday	17.3	24.9	33.3	19.7
6 th January 2018	Saturday	13.0	27.6	27.6	16.4
7 th January 2018	Sunday	11.0	16.9	33.2	10.8
8 th January 2018	Monday	16.2	35.8	67.7	29.8

9 th January 2018	Tuesday	20.1	39.9	67.3	45.6
10 th January 2018	Wednesday	12.2	15.6	44.3	16.6
11 th January 2018	Thursday	20.6	50.2	86.5	29.1
12 th January 2018	Friday	18.9	35.3	72.3	30.3
13 th January 2018	Saturday	18.6	33.6	48.9	27.4
14 th January 2018	Sunday	21.0	44.9	76.5	37.4
15 th January 2018	Monday	13.1	24.1	33.7	18.3
16 th January 2018	Tuesday	13.8	27.7	38.7	21.6
17 th January 2018	Wednesday	14.1	25.8	36.3	26.3
18 th January 2018	Thursday	13.5	21.4	34.2	19.0
19 th January 2018	Friday	12.9	13.2	20.2	12.5
20 th January 2018	Saturday	14.3	39.0	38.3	22.0
21 st January 2018	Sunday	11.8	13.1	18.7	11.2
22 nd January 2018	Monday	14.6	28.2	36.1	24.5
23 rd January 2018	Tuesday	13.0	21.5	31.9	22.4
24 th January 2018	Wednesday	13.2	21.7	33.7	24.3
25 th January 2018	Thursday	12.6	20.6	33.9	21.1
26 th January 2018	Friday	15.4	32.6	43.6	17.6
27 th January 2018	Saturday	12.0	15.3	17.3	7.5
28 th January 2018	Sunday	12.2	16.3	22.0	17.8
29 th January 2018	Monday	13.7	24.2	46.7	10.2
30 th January 2018	Tuesday	10.9	9.6	21.7	11.9
31 st January 2018	Wednesday	13.0	29.2	32.5	17.7
1 st February 2018	Thursday	13.5	25.2	30.6	17.7
2 nd February 2018	Friday	14.8	96.2	29.7	18.6
3 rd February 2018	Saturday	11.9	19.2	19.9	10.9
4 th February 2018	Sunday	11.4	20.3	19.6	12.4
5 th February 2018	Monday	12.3	41.7	23.7	14.5
6 th February 2018	Tuesday	14.2	32.3	25.3	21.7
7 th February 2018	Wednesday	15.7	22.5	28.8	17.3
8 th February 2018	Thursday	10.3	11.5	20.2	14.8
9 th February 2018	Friday	14.0	49.1	35.1	17.1
10 th February 2018	Saturday	14.3	14.9	27.3	18.4
11 th February 2018	Sunday	13.2	27.9	24.5	12.3
12 th February 2018	Monday	11.4	9.5	14.1	13.4
13 th February 2018	Tuesday	15.3	24.8	39.1	23.5
14 th February 2018	Wednesday	14.8	16.0	30.3	19.7
15 th February 2018	Thursday	15.7	23.9	35.7	18.8
16 th February 2018	Friday	14.2	14.2	25.0	16.5
17 th February 2018	Saturday	13.1	13.8	17.8	17.1
18 th February 2018	Sunday	11.3	18.9	11.1	5.1
19 th February 2018	Monday	12.3	25.2	21.1	6.3
20 th February 2018	Tuesday	14.4	34.1	40.0	22.8
21 st February 2018	Wednesday	22.0	71.3	85.4	41.2
22 nd February 2018	Thursday	28.6	79.9	137.7	65.7
23 rd February 2018	Friday	26.0	68.4	98.3	53.8
24 th February 2018	Saturday	32.2	97.6	148.3	77.5
25 th February 2018	Sunday	20.5	52.9	85.5	38.0
26 th February 2018	Monday	13.3	23.4	36.0	17.6
27 th February 2018	Tuesday	11.7	18.8	19.7	13.1

28 th February 2018	Wednesday	14.0	25.4	37.5	19.4
Number in red indicates exceedence of the 24-hour (daily) mean					