AQM
AIR QUALITY MONITORS

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

December 2016 –February 2017

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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 PM_{10} 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 PM_{10} 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 Forum[1] from 2003 – 2005, indicated that the china clay industry increased ambient concentrations of PM_{10} levels by as much as 8 $\mu g/m^3$ as a daily average, depending on location and weather conditions.

St-Stephen-in-Brannel Parish Council have purchased three further AQM DM11 PM_{10} 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 PM_{10} 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 PM_{10} monitoring from 1st December 2016 to 28th February 2017 for the monitoring sites in St Stephen-in-Brannel, Treviscoe, Nanpean and St Dennis.
- Comparison of data from the four DM11s against the PM_{10} air quality objectives.

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

1.2 Sources of PM_{10} Particles

The term PM_{10} 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 PM_{10} 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 PM_{10} 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 PM_{10} 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 (NH_3), sulphur dioxide (SO_2) and nitrogen oxides (NO_x) in the atmosphere to form ammonium sulphates and ammonium nitrates. NH_3 is emitted mainly from agricultural sources, particularly livestock waste. SO_2 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/EC[3] 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 NO_2 and PM_{10} within London and a number of other areas within the UK. The Air Quality Standards Regulations 2010[4] 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 Ireland[5] 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 (016))[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 PM_{10} 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 have 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

[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)

declare an Air Quality Management Area (section 83 of the Act) and prepare an 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 PM_{10}. 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 PM_{10}:

- The 24-hour (daily) mean objective, which is the concentration of PM_{10} in the air averaged over 24 hours, is designed to ensure that the public are not exposed to high concentrations of PM_{10} 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 PM_{10} in the air averaged over one year, aims to protect the public from PM_{10} 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 PM_{10} 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, 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 2016

A summary of the results for the calendar year 2016 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 2016	
Statistic	**St. Stephen Parish Council Offices**
Monitoring Period	1st January 2016 to 31st December 2016
No. of Days	366
Data Capture (%)	78%
Annual Mean PM_{10} Concentration (µg/m^3)	15.2
Maximum 15- Min Mean PM_{10} Concentration (µg/m^3)	401.6
No of Days > 50 µg/m^3 (35 allowed a year)	0 (23.5) *
Maximum 24-Hour Mean PM_{10} Concentration (µg/m^3)	36.1
*The number in brackets is the 90.4th percentile.	

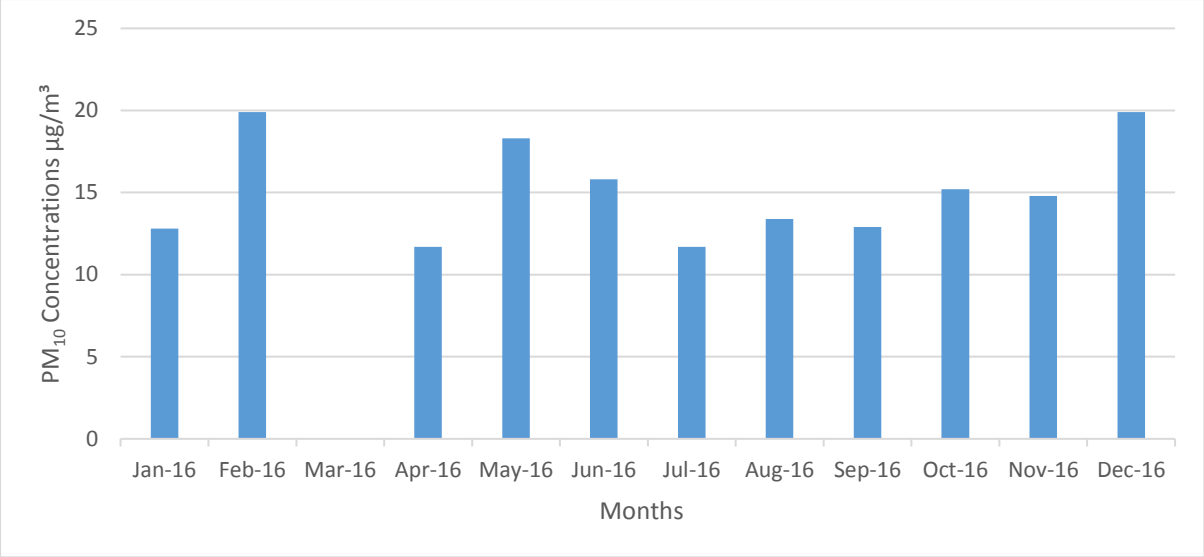
From the beginning of January 2016, up to and including 31st December 2016, the results indicate that the annual mean NO_2 concentration was 15.2 µg/m^3 which is well below the NAQS annual mean objective of 40 µg/m^3. Data capture for the year was 78%. A data capture rate of 85% for ratified data is specified in the relevant DEFRA Technical Guidance and is recommended as a target for PM_{10} monitoring[7]. The low data capture was due to the Osiris being sent away for its annual service and calibration, and its subsequent replacement with the Air Quality Monitors DM11.

As annual data capture was less than 85% for the year, DEFRA guidance[8] suggests that the 90.4th percentile is used as an indication of PM_{10} concentration. The percentile equates to 23.5 µg/m^3 which is below 50 µg/m^3 and indicates that there would have been less than 35 exceedences of the 24-hour (daily) mean during 2016. The regulations allow for 35 exceedances during one calendar year.

The monthly mean PM_{10} concentrations for 2016, presented in **Graph 1**, indicate that the highest concentrations occurred during February and December 2016. The lowest monthly mean PM_{10} concentrations were recorded in April and July 2016.

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

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



Graph 1: Monthly Mean PM_{10} Concentrations January 2016 to December 2016.

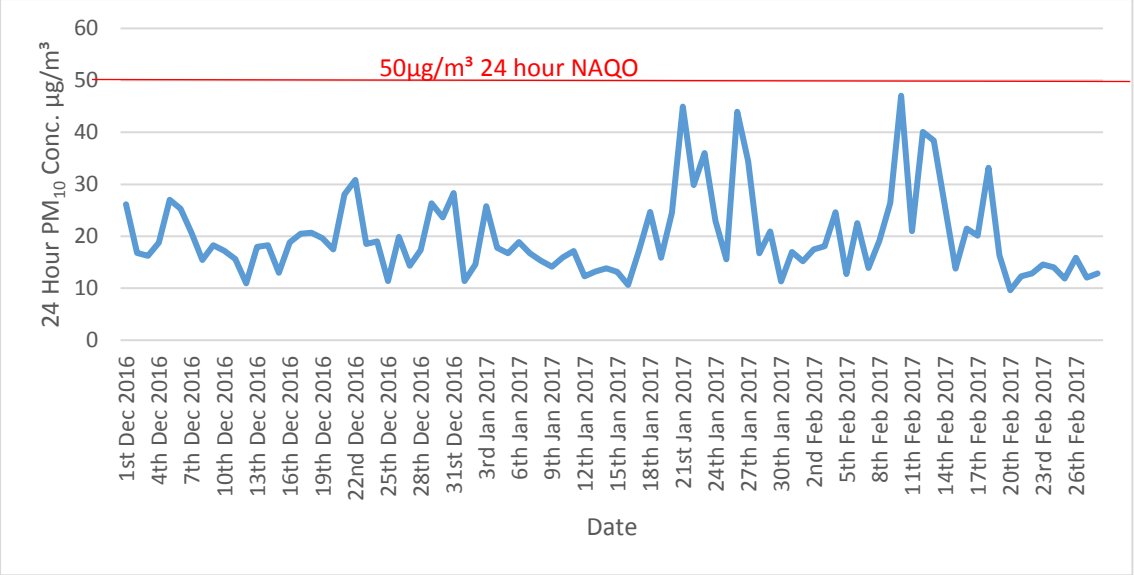
Results for Period 1st January 2017 to 28th February 2017

A summary of the results for the monitoring period 1st December 2016 to 28th February 2017 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 1st Dec 2016 to 28th Feb 2017		
Statistic	**St. Stephen Parish Council Offices**	
Monitoring Period	1st Dec 2016 to 31st Dec 2016	1st Jan 2017 to 28th Feb 2017
No. of Days	31	59
Data Capture (%)	96.4%	98.6%
Period Mean PM_{10} Concentration ($\mu g/m^3$)	19.9	20.1
Maximum 15- Min Mean PM_{10} Concentration ($\mu g/m^3$)	213.2	348.6
No of Days > 50 $\mu g/m^3$ (35 allowed a year)	0	0
Maximum 24-Hour Mean PM_{10} Concentration ($\mu g/m^3$)	31	47

The PM_{10} period mean for the month of December 2016 was 19.9$\mu g/m^3$ (**Table 4.2**) and for January to the end of February 2017, the period mean was 20.1 $\mu g/m^3$, which is well below the NAQS annual mean objective of 40 $\mu g/m^3$. The results also indicate no exceedences of the 24-hour (daily) mean objective for PM_{10} during the three months of monitoring. The maximum recorded 24 hour (daily) PM_{10} concentration was 47.1 $\mu g/m^3$, recorded on the 10th February 2017 (**Graph 2**). Data capture for the monitoring period was very good at over 90%.



Graph 2: Daily Mean PM_{10} Concentrations 1st December 2016 to 28th February 2017 St Stephen-in-Brannel

4.2 Treviscoe Monitoring Site

Results for Period 1st January 2017 to 28th February 2017

A summary of the results for the monitoring period 1st December 2016 to 28th February 2017 are presented in **Table 4.3**.

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

Table 4.3: Summary of Monitoring Results for Period 1st Dec 2016 to 28th Feb 2017 Treviscoe

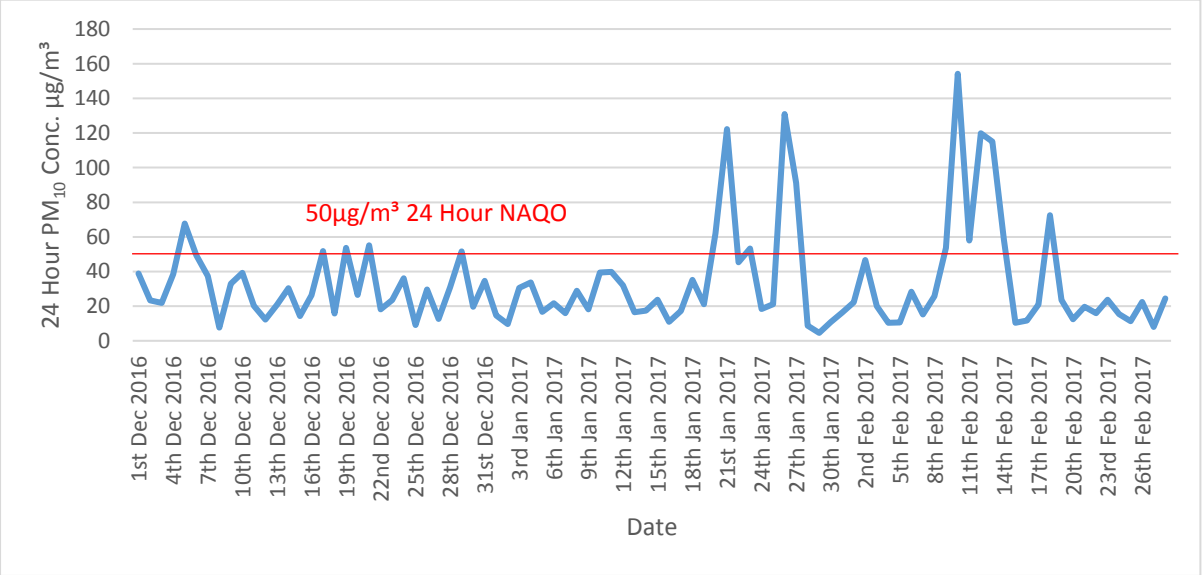
Statistic	Treviscoe	
Monitoring Period	1st Dec 2016 to 31st Dec 2016	1st Jan 2017 to 28th Feb 2017
No. of Days	31	59
Data Capture (%)	100%	98.3%
Period Mean PM_{10} Concentration (µg/m³)	30.7	35.3
Maximum 15- Min Mean PM_{10} Concentration (µg/m³)	364.3	481.8
No of Days > 50 µg/m³ (35 allowed a year)	5	12
Maximum 24-Hour Mean PM_{10} Concentration (µg/m³)	68	154

The PM_{10} period mean for December 2016 was 30.7µg/m³ (Table 4.3) and for January to the end of February 2017, the period mean was 35.3 µg/m³ which is below the NAQS annual mean objective of 40 µg/m³. The results also indicate that there were five exceedences of the 24-hour (daily) mean PM_{10}

objective during the month of December 2016 and twelve exceedences from January to the end of February 2017. These exceedences occurred on the following days:

- 5th, 17th, 19th, 21st and 29th December 2016;
- 20th, 21st, 23rd, 26th and 27th January 2017; and
- 9th, 10th, 11th, 12th, 13th 14th and 18th February 2017.

Six of these exceedences occurred during the monitoring period Thursday 9th February to Tuesday 14th February 2017. The maximum recorded daily PM_{10} concentration was 154 µg/m^3 recorded on the 10th February 2017 (**Graph 3**). Data capture for the monitoring period was good at over 98%.



Graph 3: Daily Mean PM_{10} Concentrations 1st Dec 2016 to 28th Feb 2017 Treviscoe

The diurnal profile for the 10th February 2017, which indicates the highest 24-hour (daily) PM_{10} concentration of 154µg/m³ is presented in **Graph 9**.

The Treviscoe site does not have an anemometer attached, so there is no local wind speed or direction data available for this site.

4.3 Nanpean Monitoring Site

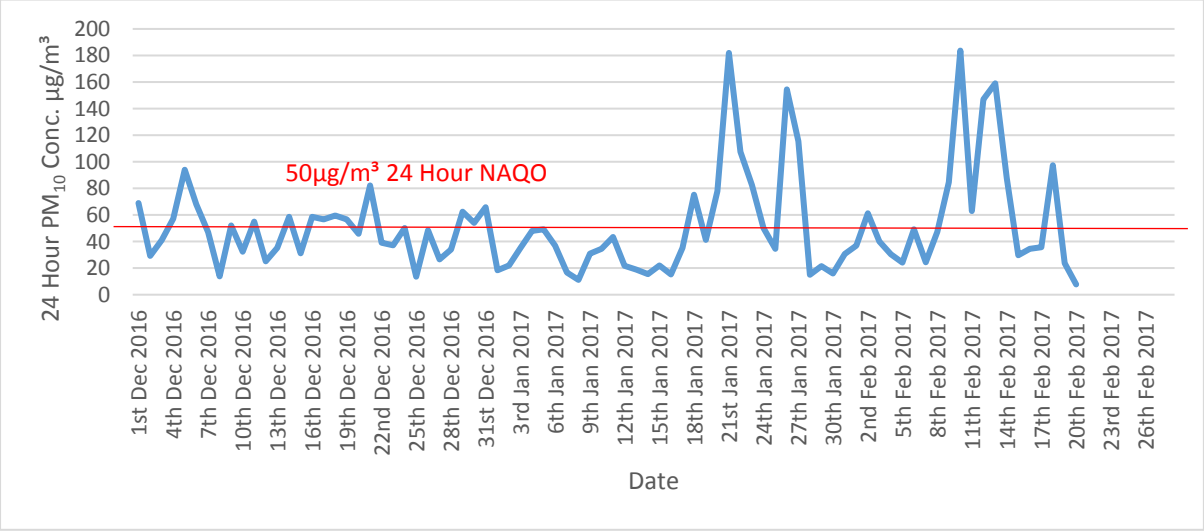
A summary of the results for the monitoring period 1st December 2016 to 28th February 2017 are presented in **Table 4.4**.

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 2016 to 28th Feb 2017 Nanpean		
Statistic	**Nanpean**	
Monitoring Period	1st Dec 2016 to 31st Dec 2016	1st Jan 2017 to 28th Feb 2017
No. of Days	31	59
Data Capture (%)	100%	86%
Period Mean PM_{10} Concentration ($\mu g/m^3$)	48.4	53.9
Maximum 15- Min Mean PM_{10} Concentration ($\mu g/m^3$)	517.1	1205.3
No of Days > 50 $\mu g/m^3$ (35 allowed a year)	16	16
Maximum 24-Hour Mean PM_{10} Concentration ($\mu g/m^3$)	94	184

The PM_{10} period mean for December 2016 was 48.4$\mu g/m^3$ and for January to the end of February 2017, the period mean was 53.9 $\mu g/m^3$ which is above the NAQS annual mean objective of 40 $\mu g/m^3$. However, the annual mean objective of 40 $\mu g/m^3$ is based on a full calendar year of data and the results are for December 2016 (31 days) and January to February 2017 (59 days) only, therefore the results cannot be strictly classed as an exceedence and should be treated with caution. The results also indicate 16 exceedences of the 24-hour (daily) mean PM_{10} objective during each of the monitoring periods out of a permitted 35 exceedences. These exceedences occurred on the following days:

- 1st,4th,5th,6th,9th,11th,14th,16th,17th,18th,19th,21st,24th,29th,30th and 31st December 2016;
- 18th,20th,21st,22nd,23rd,24th,26th and 27th January 2017; and
- 2nd, 9th,10th,11th,12th,13th,14th and 18th February 2017.



Graph 4: Daily Mean PM_{10} Concentrations 1st Dec 2016 to 28th Feb 2017 Nanpean

The maximum recorded 24 hour (daily) PM_{10} concentration was 184µg/m^3 recorded on the 10th February 2017 (**Graph 4**). Data capture for the monitoring period was over 85%.

The diurnal profile for the 10th February 2017, which indicates the highest 24-hour (daily) PM_{10} concentration of 184µg/m^3 is presented in **Graph 9**.

4.4 St Dennis Monitoring Site

A summary of the results for the monitoring period 1st December 2016 to 28th February 2017 are presented in **Table 4.5**.

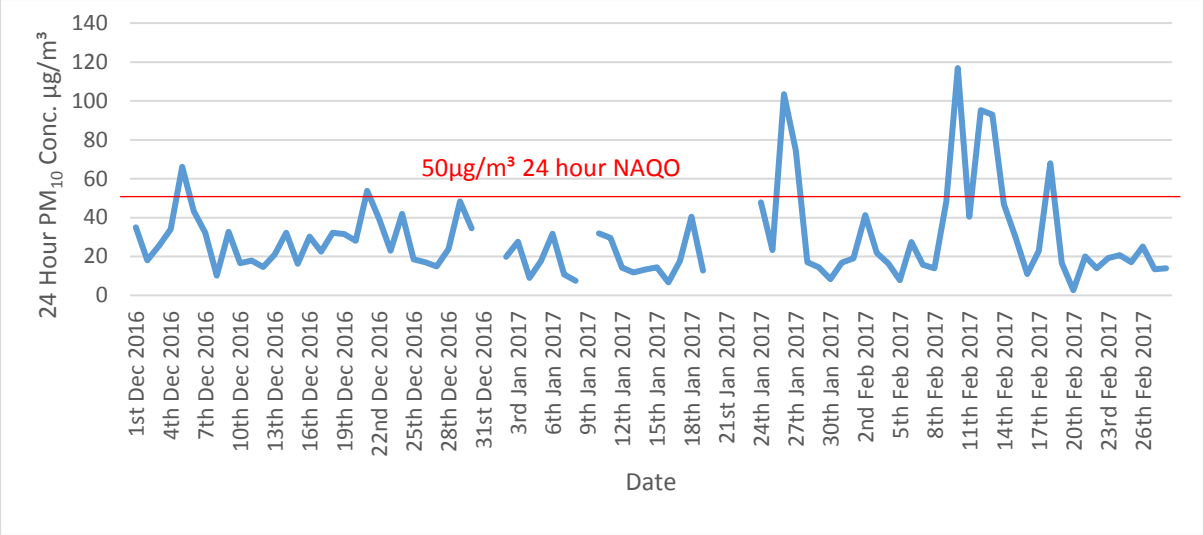
The daily (24-hourly) mean concentrations are presented in **Appendix B** in tabular format.

Table 4.5: Summary of Monitoring Results for Period 1st Dec 2016 to 28th Feb 2017 St Dennis

Statistic	St Dennis	
Monitoring Period	1st Dec 2016 to 31st Dec 2016	1st Jan 2017 to 28th Feb 2017
No. of Days	31	59
Data Capture (%)	96.8%	83%
Period Mean PM_{10} Concentration (µg/m^3)	29.2	29.4
Maximum 15- Min Mean PM_{10} Concentration (µg/m^3)	486.7	790.5
No of Days > 50 µg/m^3 (35 allowed a year)	2	6
Maximum 24-Hour Mean PM_{10} Concentration (µg/m^3)	66.1	117

The PM_{10} period mean for December 2016 was 29.2µg/m^3 and for January 2017 to the end of February 2017, the period mean was 29.4 µg/m^3 which is below the NAQS annual mean objective of 40 µg/m^3. There were two recorded exceedences of the 24-hour (daily) mean objective for PM_{10} during the month of December and 6 during January to February 2017 (**Graph 5**). The exceedences occurred on the following days:

- 5th and 21st December 2016;
- 26th and 27th January 2017; and
- 10th, 12th, 13th and 18th February 2017.



Graph 5: Daily Mean PM_{10} Concentrations 1st Dec 2016 to 28th Feb 2017 St Dennis

Exceedences also occurred at one or more of the other monitoring sites on all the recorded exceedence days in St Dennis and three of these exceedences also occurred during the monitoring period from the Thursday 9th February to Tuesday 14th February 2017. The diurnal profile for the 10th February 2017, which indicates the highest 24-hour (daily) mean PM_{10} concentration of 117µg/m³ is presented in **Graph 9**. Data capture for the monitoring period was over 83%.

4.5 Diurnal Profiles for Exceedences at More than One Site

Throughout the monitoring period, exceedences of the 24-hour (daily) PM_{10} objective occurred at more than one monitoring site on a number of days. These are detailed in **Table 4.6.**

Table 4.6: Diurnal Profiles for Exceedances at More than one Site

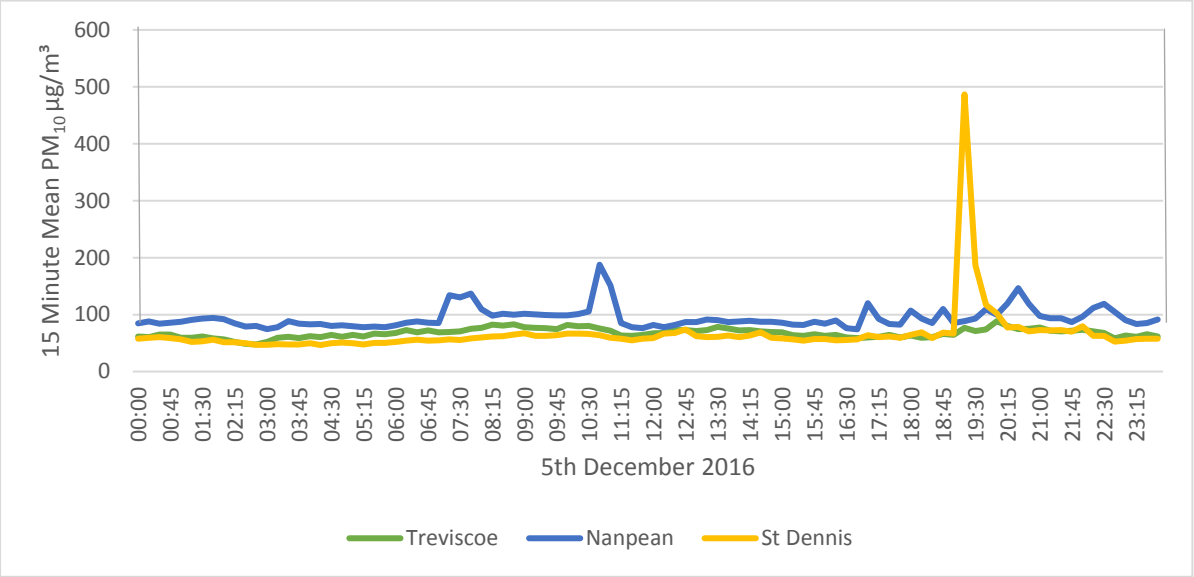
Date	24 Hour (Daily) PM_{10} Concentration (µg/m³)			Wind Direction Nanpean	Wind direction St Dennis
	Treviscoe	Nanpean	St Dennis		
Mon 5th Dec 2016	68	94	66	SSE, S	SSE, S
Wed 21st Dec 2016	55	82	54	S, W	SW
Thurs 26th Jan 2017	131	155	104	SE,	S
Fri 27th Jan 2017	91	115	75	SE	S
Fri 10th Feb 2017	154	184	117	NE	E
Sun 12th Feb 2017	120	147	95	ENE	E, ESE
Mon 13th Feb 2017	115	159	93	ENE, SE	ESE

The diurnal profiles for each of the days detailed in **Table 4.6** for the three monitoring sites of Treviscoe, Nanpean and St Dennis are presented in **Graphs 6 to 10** below**.**

5th December 2016

Graph 6 indicates that the 15-minute mean PM_{10} concentrations at the three sites of Treviscoe, Nanpean and St Dennis followed a similar trend throughout the day with a localised peak in concentrations at St Dennis at approximately 19:15 hours.

The wind direction (**Table 4.6**) recorded at Nanpean and St Dennis, was predominately from the south and south southeast on the 5th December 2016. Areas most consistently affected by dust/PM_{10} 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 north and north northwest of the EfW site which is away from the villages of Treviscoe and Nanpean. The wind speed recorded at the monitoring sites on the 5th December 2016 ranged from 0.1 to 4.9m/s.

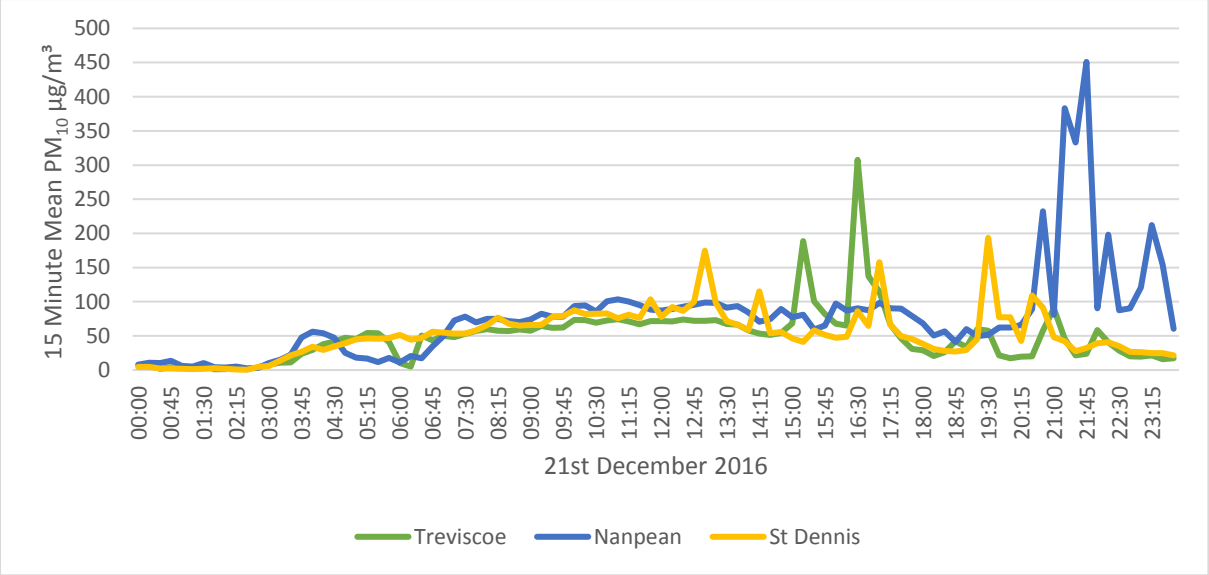


Graph 6: Diurnal PM_{10} Concentrations at Treviscoe, Nanpean and St Dennis – 5th December 2016

21st December 2016

On the 21st December 2016, the diurnal profiles at the three monitoring sites again followed a similar trend throughout the day with a number of localised peaks occurring at Treviscoe and Nanpean during the afternoon and late evening (**Graph 7**).

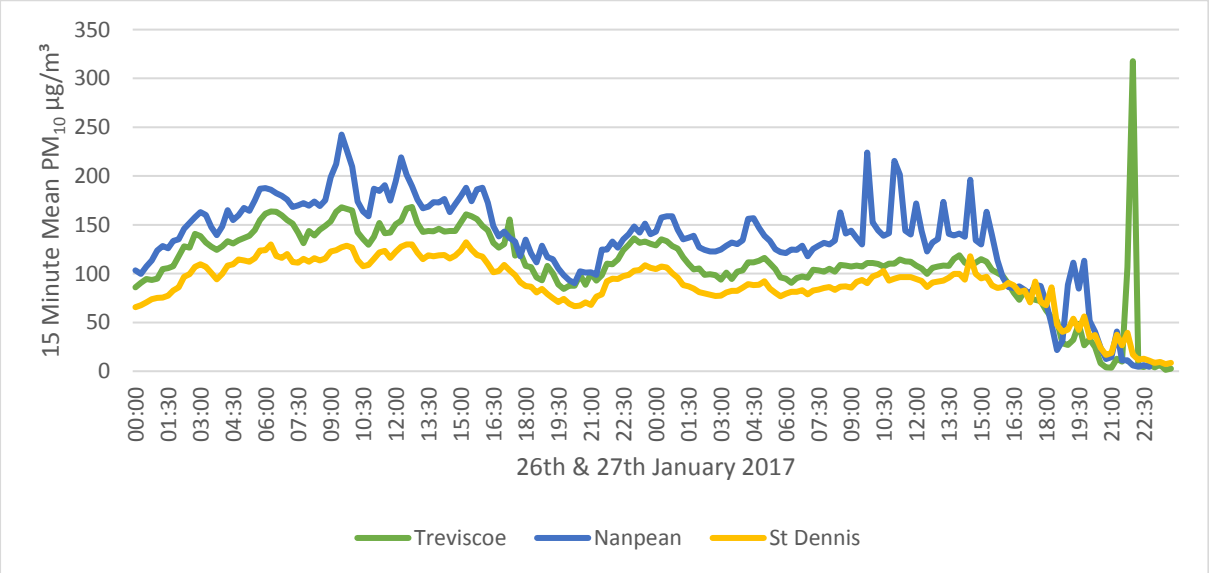
The prevailing wind direction was predominantly from the south/west at Nanpean and the southwest at St Dennis. The highest risks would have occurred to the north/east and northeast of the EfW site. The wind speed ranged from 0.06 to 3.96m/s.



Graph 7: Diurnal PM_{10} Concentrations at Treviscoe, Nanpean and St Dennis - 21st December 2016

26th and 27th January 2017

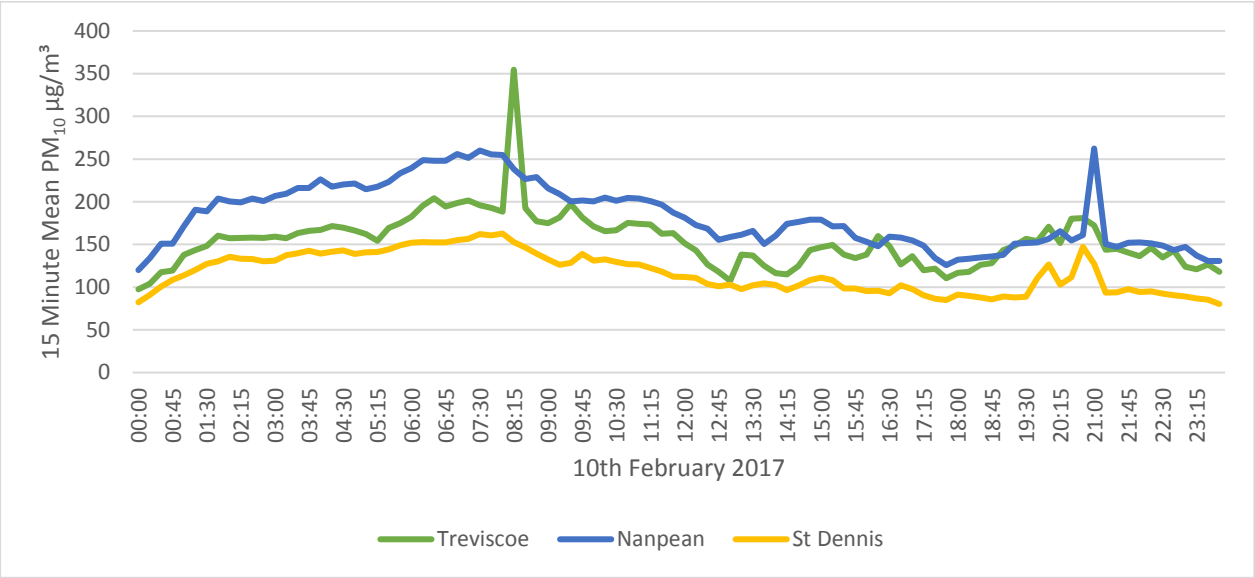
The diurnal profile for the 26th and 27th January 2017, at the three monitoring sites is presented in **Graph 8.** The 15-minute mean PM_{10} concentrations again follow a similar trend throughout the day, although a large peak is evident at Treviscoe at approximately 22:00 hours on the 27th January 2017. The prevailing wind direction ranged from southerly to southeasterly, therefore the highest risks would have occurred to the north/north west of the EfW site. The wind speed ranged from 0.04 to 7.69m/s over the two days.



Graph 8: Diurnal PM_{10} Concentrations at Treviscoe, Nanpean and St Dennis – 26th & 27th Jan 2017

10th February 2017

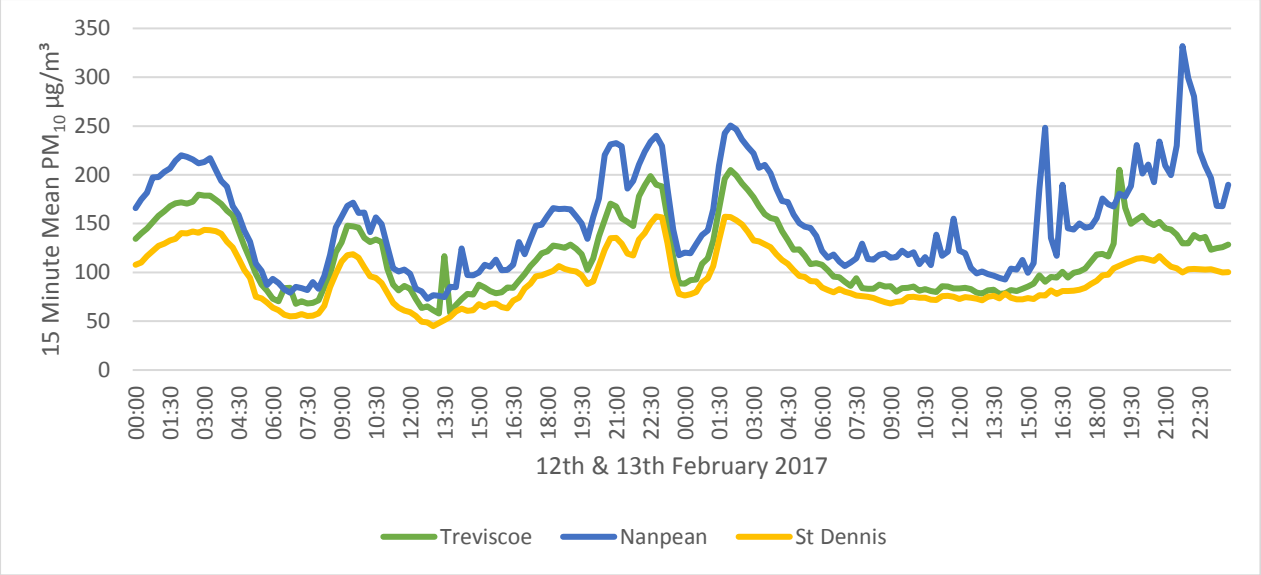
On the 10th February 2017, the 15-minute mean PM_{10} concentrations again follow a similar trend throughout the day, although two localised peaks are evident at Treviscoe at approximately 08:15 and Nanpean at approximately 21:00 hours (**Graph 9**). The prevailing wind direction ranged from easterly/north easterly, therefore the highest risks would have occurred to the west/southwest of the EfW site.



Graph 9: Diurnal PM_{10} Concentrations at Treviscoe, Nanpean and St Dennis – 10th February 2017

12th and 13th February 2017

The diurnal profiles for the 12th and 13th February 2017 is presented in **Graph 10.** The 15-minute mean PM_{10} concentrations again follow a similar trend throughout the day with the highest concentrations being experienced at the Nanpean monitoring site. The prevailing wind direction ranged from east north easterly/ easterly and east south easterly over the two days, therefore the highest risks would have occurred to the west southwest/west and west northwest of the EfW site.



Graph 10: Diurnal PM_{10} Concentrations at Treviscoe, Nanpean and St Dennis – 12th & 13th Feb 2017

5.0 Conclusions

Air Quality Monitors Ltd was commissioned by St. Stephen-in-Brannel Parish Council to review and analyse continuous PM_{10} 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

PM_{10} monitoring data for the 2016 calendar year was comfortably within the NAQS annual mean and 24-hour mean objectives. The 24-hour (daily) PM_{10} objective was not exceeded during the year. The annual mean concentration has remained the same at between 15 to 16µg/m³ during 2015 and 2016 and there were four exceedences of the 24-hour mean during 2015 compared to no exceedences in 2016.

The PM_{10} monitoring for December 2016 and January to the end of February 2017, indicated that the values did not exceed the NAQS annual mean objective at the monitoring site in St Stephen St Brannel. There were no recorded exceedences of the 24 hour NAQO of 50 µg/m³.

Treviscoe Monitoring Site

The PM_{10} monitoring for December 2016 and January to the end of February 2017, indicated that the values did not exceed the NAQS annual mean objective level, whist the 24-hour mean objective was exceeded five times during December and twelve times during January to February 2017. The NAQS objectives are based on monitoring for a full calendar year, and the number of permitted exceedences of the 50µg/m³ hour (daily) PM_{10} objective is 35 over the year.

Nanpean Monitoring Site

The PM_{10} monitoring for December 2016 and January to the end of February 2017, indicated that the values were above the NAQS annual mean objective level. However, the annual mean objective of 40 µg/m^3 is based on a calendar year of data and the results are for December 2016 and January to February 2017 only, therefore the results cannot be strictly classed as an exceedence and should be treated with caution. The results also indicated 16 exceedences of the 24-hour (daily) mean PM_{10} objective during each of the monitoring periods out of a permitted 35 exceedences.

As discussed previously (section 1.1), the DM11 instruments only provide indicative results when compared against the annual PM_{10} or 24-hour (daily) 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. However, they are extremely useful for screening monitoring.

St Dennis Monitoring Site

The PM_{10} monitoring for December 2016 and January to the end of February 2017, indicated that the values did not exceed the NAQS annual mean objective, whist the 24-hour mean objective was exceeded twice during December and six times during January to February 2017, out of a permitted 35 exceedences.

According to the Cornwall Council website[9], the testing phase at CERC is still ongoing. It is not possible to determine whether any of the exceedences could have been related to the CERC activities, or

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

indeed local sources of PM_{10}, for example, smoke from wood burning stoves, chimneys, or china clay activities and the DM11 monitors would need to be fitted with filters for further analysis or gravimetric monitoring would be required to indicate the source of any future exceedences.

The next quarterly report is due in June 2017.

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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.
PM_{10}	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 $1ug/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

Appendix B –PM_{10} Monitoring Results

DM11 Results

Appendix A: 24-Hour (Daily) Mean µg/m³					
Date	**Day of Week**	**Location 1 (St Stephen in Brannel)**	**Location 2 (Treviscoe)**	**Location 3 (Nanpean)**	**Location 4 (St Dennis)**
1st December 2016	Thursday	26	39	69	35
2nd December 2016	Friday	17	23	29	18
3rd December 2016	Saturday	16	22	41	26
4th December 2016	Sunday	19	39	57	34
5th December 2016	Monday	27	68	94	66
6th December 2016	Tuesday	25	49	68	43
7th December 2016	Wednesday	21	37	47	32
8th December 2016	Thursday	15	8	14	10
9th December 2016	Friday	18	33	52	33
10th December 2016	Saturday	17	39	32	16
11th December 2016	Sunday	16	20	55	18
12th December 2016	Monday	-	12	25	15
13th December 2016	Tuesday	-	21	35	21
14th December 2016	Wednesday	18	30	59	32
15th December 2016	Thursday	13	14	31	16
16th December 2016	Friday	19	26	59	30
17th December 2016	Saturday	20	52	57	22
18th December 2016	Sunday	21	16	60	32
19th December 2016	Monday	20	54	57	31
20th December 2016	Tuesday	17	26	46	28
21st December 2016	Wednesday	28	55	82	54
22nd December 2016	Thursday	31	18	39	39
23rd December 2016	Friday	19	24	37	23
24th December 2016	Saturday	19	36	50	42
25th December 2016	Sunday	11	9	14	18
26th December 2016	Monday	20	30	48	17
27th December 2016	Tuesday	14	13	27	15
28th December 2016	Wednesday	17	31	34	24
29th December 2016	Thursday	26	52	63	48
30th December 2016	Friday	24	20	54	35
31st December 2016	Saturday	28	35	66	-
1st January 2017	Sunday	11	15	18	-
2nd January 2017	Monday	15	10	22	20
3rd January 2017	Tuesday	26	31	35	28
4th January 2017	Wednesday	18	34	48	9
5th January 2017	Thursday	17	17	49	18

6th January 2017	Friday	19	22	37	32
7th January 2017	Saturday	17	16	17	11
8th January 2017	Sunday	15	29	11	7
9th January 2017	Monday	14	18	31	-
10th January 2017	Tuesday	16	39	34	-
11th January 2017	Wednesday	17	40	44	30
12th January 2017	Thursday	12	32	22	14
13th January 2017	Friday	13	16	19	12
14th January 2017	Saturday	14	17	15	13
15th January 2017	Sunday	13	24	22	14
16th January 2017	Monday	11	11	15	7
17th January 2017	Tuesday	17	17	35	18
18th January 2017	Wednesday	25	35	75	40
19th January 2017	Thursday	16	21	41	-
20th January 2017	Friday	25	62	78	-
21st January 2017	Saturday	45	122	182	-
22nd January 2017	Sunday	30	45	107	-
23rd January 2017	Monday	36	53	82	-
24th January 2017	Tuesday	23	18	50	48
25th January 2017	Wednesday	16	21	35	23
26th January 2017	Thursday	44	131	155	104
27th January 2017	Friday	35	91	115	75
28th January 2017	Saturday	17	9	15	17
29th January 2017	Sunday	21	5	21	14
30th January 2017	Monday	11	-	16	8
31st January 2017	Tuesday	17	16	31	17
1st February 2017	Wednesday	15	22	37	19
2nd February 2017	Thursday	17	47	61	41
3rd February 2017	Friday	18	20	40	22
4th February 2017	Saturday	25	10	30	16
5th February 2017	Sunday	13	11	24	8
6th February 2017	Monday	23	28	49	27
7th February 2017	Tuesday	14	15	24	16
8th February 2017	Wednesday	19	26	47	14
9th February 2017	Thursday	26	54	85	48
10th February 2017	Friday	47	154	184	117
11th February 2017	Saturday	21	58	63	40
12th February 2017	Sunday	40	120	147	95
13th February 2017	Monday	38	115	159	93
14th February 2017	Tuesday	26	59	88	47
15th February 2017	Wednesday	14	10	30	30
16th February 2017	Thursday	22	12	34	-
17th February 2017	Friday	20	21	36	-
18th February 2017	Saturday	33	73	97	68
19th February 2017	Sunday	16	23	24	17
20th February 2017	Monday	10	12	8	-
21st February 2017	Tuesday	12	20	-	20

22nd February 2017	Wednesday	13	16	-	14
23rd February 2017	Thursday	15	24	-	19
24th February 2017	Friday	14	15	-	21
25th February 2017	Saturday	12	11	-	17
26th February 2017	Sunday	16	23	-	25
27th February 2017	Monday	12	8	-	13
28th February 2017	Tuesday	13	25	-	14
Number in red indicates exceedence of the 24-hour (daily) mean					