Technical Note

ARUP

The Arup Campus
Blythe Gate
Blythe Valley Park
Solihull B90 8AE
United Kingdom
www.arup.com

SUPERSEDED

t +44 121 213 3000
f +44 121 213 3001

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Subject	Air Quality Study of Brigg Road site, Scunthorpe		

1 Introduction

Ove Arup and Partners Limited (Arup) has been commissioned to undertake an air quality study of a site in Scunthorpe. The site is located on Brigg Road, east Scunthorpe and a planning application has been made for redevelopment as a school.

This technical note summarises the existing air quality at the site, and discusses objections to the planning application and whether they are justified.

2 Proposed Development

An application to redevelop a former retail unit on Brigg Road, Scunthorpe to a Free School was made on 1st April 2014[1]. The site is located at NGR 490072, 411594 in the east of Scunthorpe. There are several industrial sites in the surrounding area, including a large steelworks to the east. There is a residential estate to the south of the proposed site, on the opposite side of Brigg Road.

2.1 Consultation Responses

Consultation responses in relation to air quality have been received from various parties. Public Health, Environmental Health and the Environment Agency all recommended refusal to the planning application on air quality grounds, noting the following concerns:

- Public Health[2] - concerns due to levels of particulate matter (PM_{10}), nitrogen dioxide (NO_2) and polycyclic aromatic hydrocarbons (PAHs);
- Environmental Health[3] – concerns due to NO_2, PM_{10} and PAHs concentrations and odours. Requested in-depth analysis of PM_{10}, accounting for atmospheric conditions. Highlighted the fact that the existing AQMA is based on the location of sensitive receptors, and therefore provision of the

[1] PA/2014/0358 http://www.planning.northlincs.gov.uk/newplanet/planetMain.aspx?refno=PA/2014/0358
[2] Letter from Director of Public Health, North Lincolnshire Council, dated 9th May 2014
[3] Internal Memo from Environmental Health to Development Management, dated 6th May 2014, ref: PLU 01041; Email from Ayan Chakravartty to Helen Cumiskey on 3rd July 2014

school may result in increase to the AQMA. Odour concerns focused on the crude tar processing facility, Koppers, located less than 100m from the site; and

- Environment Agency[4] – PM_{10} concentrations due to vicinity to the steelworks

3 Air Quality Legislation

3.1 European Air Quality Management

In 1996 the European Commission published the Air Quality Framework Directive on ambient air quality assessment and management (96/62/EC). This Directive defined the policy framework for 12 air pollutants known to have harmful effects on human health and the environment. Limit values (pollutant concentrations not to be exceeded by a certain date) for each specified pollutant are set through a series of Daughter Directives, including Directive 1999/30/EC (the 1st Daughter Directive) which sets limit values for sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_X), particulate matter (PM_{10}) and lead in ambient air.

In May 2008 the Directive 2008/50/EC on ambient air quality and cleaner air for Europe came into force. This Directive consolidates the above (apart from the 4th Daughter Directive, which will be brought within the new Directive at a later date), provides a new regulatory framework for $PM_{2.5}$ and makes provision for extended compliance deadlines for NO_2 and PM_{10}.

The Directives were transposed into legislation in England by the Air Quality Standards Regulations 2010. The Secretary of State for the Environment has the duty of ensuring the air quality limit values are complied with.

3.2 Environment Act 1995

Part IV of the Environment Act 1995 places a duty on the Secretary of State for the Environment to develop, implement and maintain an Air Quality Strategy with the aim of reducing atmospheric emissions and improving air quality. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland provides the framework for ensuring the air quality limit values are complied with based on a combination of international, national and local measures to reduce emissions and improve air quality. This includes the statutory duty, also under Part IV of the Environment Act 1995, for local authorities to undergo a process of local air quality management.

3.3 Air Quality Objectives and Limit Values

Air quality limit values and objectives are quality standards for clean air. Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations) and others have standards expressed as 24-hour, one-hour or 15-minute average concentrations due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations. Table 1 sets out these EU air quality limit values and national air quality objectives for the pollutants currently of greatest concern for this development, NO_2 and PM_{10}.

In the majority of cases the air quality limit values and air quality objectives have the same pollutant concentration threshold and date for compliance. The key difference is that the Secretary of State for the Environment is required under European Law to ensure the air quality limit values are complied with

[4] Email from Environment Agency to Planning, dated 2nd May 2014

whereas local authorities are only obliged under national legislation to undertake best efforts to comply with the air quality objectives. To assist local authorities in demonstrating best efforts, the Environment Act 1995 requires that when carrying out their local air quality management functions, local authorities shall have regard to guidance issued by the Secretary of State.

Table 1: Air Quality Objectives

Pollutant	Averaging Period	Limit Value/ Objective	Date for Compliance	Basis
Nitrogen Dioxide (NO_2)	1 hour mean	200µg/m^3, not to be exceeded more than 18 times a year	31 Dec 2005	UK
			1 Jan 2010	EU
	Annual mean	40µg/m^3	31 Dec 2005	UK
			1 Jan 2010	EU
Fine Particulates (PM_{10}) Measurement Technique: Gravimetric	Daily Mean	50µg/m^3, not to be exceeded more than 35 times a year	31 Dec 2004	UK
			None specified	EU
	Annual Mean	40µg/m^3	31 Dec 2004	UK
			None specified	EU
Very Fine Particulates ($PM_{2.5}$)	Annual Mean	25µg/m^3	1st January 2015	UK/EU

4 Policy

4.1 National Planning Policy Framework, 2012

The National Planning Policy Framework (NPPF) was published in March 2012 with the purpose of planning to achieve sustainable development. Paragraph 124 of the NPPF, on air quality, states that:

> *"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."*

4.2 North Lincolnshire Core Strategy

North Lincolnshire Council's Core Strategy is part of the Local Development Framework and sets out the long term vision for North Lincolnshire. The strategy was adopted in June 2011 and provides a blueprint for managing growth and development in the area up to 2026[5].

According to the Core Strategy, '*Opportunities for developing to the east of the town are non-existent due to the steelworks. Much of the town centre and the eastern part of the town is also covered by the Air Quality Management Area (AQMA) for the steelworks, which would make it difficult for residential development to take place in this area…In effect if housing development was located in this area it would create a new*

[5] North Lincolnshire Local Development Framework, Core Strategy Adopted June 2011 http://www.northlincs.gov.uk/planning-and-environment/planning-policy/local-dev-framework/core-strategy/ [July 2014]

settlement requiring its own solutions to infrastructure, services and facilities and would be contrary to the Regional Spatial Strategy for Yorkshire and Humber'.

To the north of the town the location proposed for residential development is adjacent to major industrial developments and is divorced from the main body of the town. This raises issues about how easily any urban extension in this area could be integrated into the wider urban area. It also raises issues about whether placing residential development so close to a busy industrial area would deliver the quality residential environment required. It may be possible to select small areas of housing in small pockets of land, but they would be so isolated well away from the Scunthorpe urban fringe and would not have the critical mass to be viable for the provision of new infrastructure or facilities"

5 Existing Air Quality

5.1 Local Authority Review and Assessment

The latest progress report (April 2013)[6] has been reviewed along with supplementary data sent from North Lincolnshire Council on 16th July[7]. The application site is adjacent to the Air Quality Management Area (AQMA) which was declared in November 2005 due to breach of the daily mean Air Quality Objective for $PM_{10.}$ The boundary of the Integrated Steelworks was used as a guide to zone the boundary of the AQMA.

An Action Plan for Scunthorpe was first presented in 2008, following the declaration of a Scunthorpe wide AQMA. This has been updated in 2012. The aim of the Action Plan is to reduce PM_{10} concentrations within the AQMA, demonstrating compliance with the relevant Air Quality Objectives. There has been a general reduction in exceedance days and continued compliance at most sites within the AQMA, excluding Lower Santon. However, it is noted that the exceedance days are influenced by meteorological conditions and the significant downturn in production at the integrated steelworks due to the recession.

The Action Plan includes zones, which are primarily based on the results of modelling of the emissions from point sources and this does not account for fugitive sources prevalent across the site. Monitoring data has therefore been used to further refine the zones, as follows.

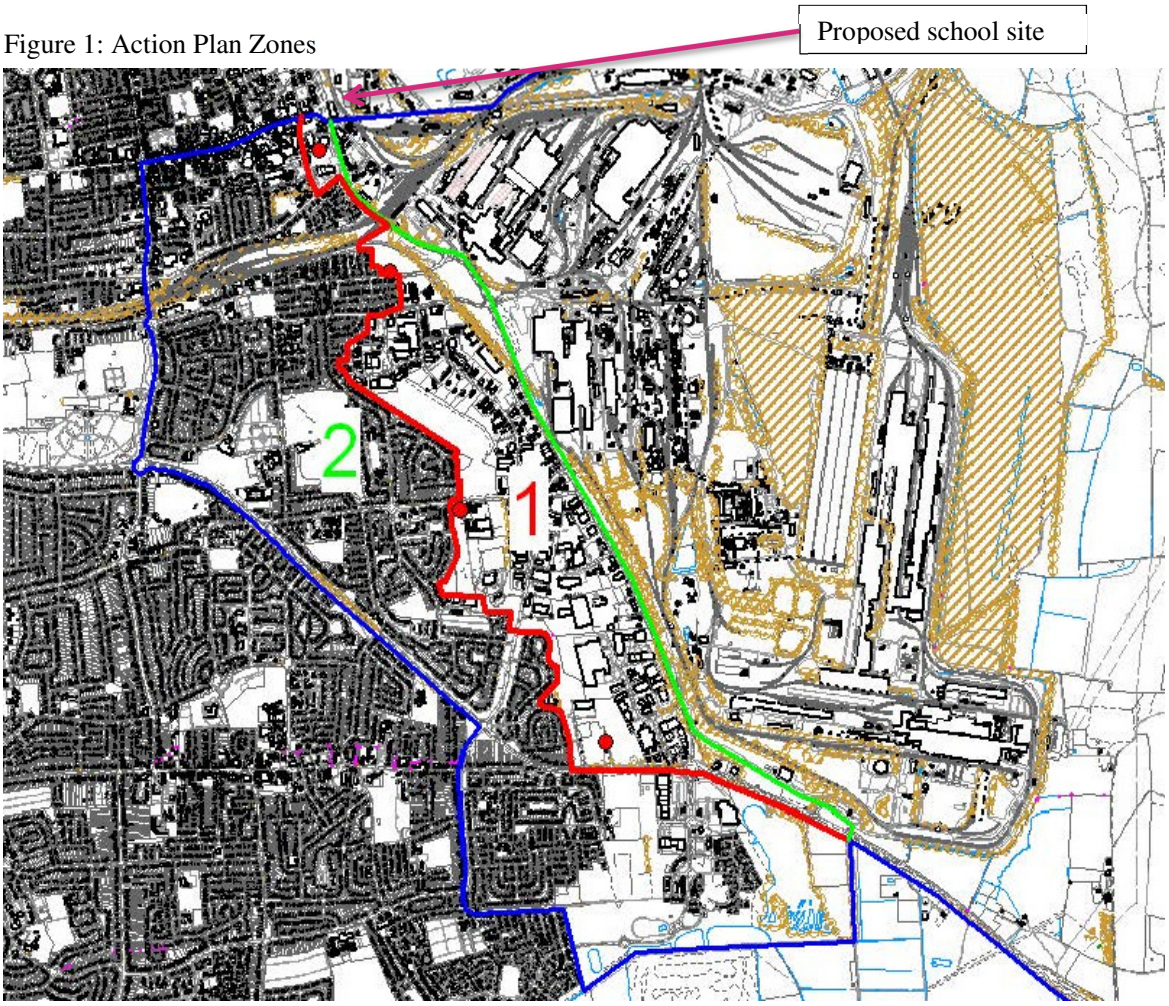
- Zone 1 – No residential development
- Zone 2 – Residential Development possible subject to further investigation

The zones were reviewed and updated in 2012 although this did not include consideration of the data for Church Square monitoring site, which is located to the west of the proposed site and has been monitored from July 2013.

The proposed site is located immediately to the north of the boundary of Zone 1, as shown on Figure 1.

[6] 2013 Air Quality Progress Report for North Lincolnshire Council, April 2013 http://www.nlincsair.info/documents/reports/Progress_Report_2013.pdf [July 2014]
[7] Email from North Lincolnshire Council to Arup, dated 17th July 2014

Figure 1: Action Plan Zones



5.2 Nitrogen Dioxide (NO_2)

Increased traffic flows associated with the school development would necessitate an assessment of the impacts to the school due to potentially increased NO_2 concentrations. However, given the scale of the development, there is very unlikely to be a major impact of nitrogen dioxide concentrations.

North Lincolnshire Council monitors nitrogen dioxide concentrations using both automatic and passive monitoring methods. The locations of automatic and passive monitoring locations within 2km of the proposed site are shown on figures 2 and 3 and the latest results are listed in the following tables.

Figure 2: Automatic Monitoring Locations (not to scale)

Figure 3: NO_2 Diffusion Tube Monitoring Locations (not to scale)

Table 2: Results of automatic monitoring for NO_2

Site Name	OS Grid Ref and distance from Site	Site Type	Site Type	Annual mean NO_2 concentration ($\mu g/m^3$) (% data capture)		
				2010	2011	2012
Rowland Road/ Scunthorpe Town	490320, 410831	Urban Industrial	Annual Mean NO_2 Concentration ($\mu g/m^3$)	19.7	19.9	19.7 (93.4%)
	750m to the south		Number of Hours >200$\mu g/m^3$	0	0	0
Low Santon	492945, 411931	Industrial	Annual Mean NO_2 Concentration ($\mu g/m^3$)	18.9	19.1	18.6 (98.9%)
	3km to the east		Number of Hours >200$\mu g/m^3$	0	0	0

Table 3: Details and Monitoring Data from NO_2 Diffusion Tube Monitoring Locations

Site Name	OS Grid Ref	Site Type	Distance from Site	Data Capture for 2012	Annual mean NO_2 concentration ($\mu g/m^3$)		
					2010*	2011**	2012***
Frodingham Road	489099, 411723	Urban	1km to the north-west	11 months	23.7	25.0	26.7
Britannia Corner	489190, 411285	Urban Roadside	925m to the south-west	12 months	29.5	29.5	30.3
Oswald Road	489209, 411118	Urban Kerbside	1km to the south-west	12 months	26.7	27.0	26.6
Ashby Road	829247, 410355	Urban Kerbside	1.5km to the south-west	12 months	24.2	23.6	25.2
Jct A18/Ashby Road	489172, 409926	Urban Kerbside	1.8km to the south-west	12 months	26.1	26.2	26.9
Rowland Road	490316, 410837	Industrial Roadside	750m to the south	11 months	19.8	18.8	21.0
				12 months	20.0	20.1	19.9
				12 months	19.7	20.2	19.0
Station Road (outside Asda)	490080, 411258	Industrial Roadside	250m to the south-west	11 months	24.1	22.1	20.9

* bias adjustment factor of 0.71 has been applied
** bias adjustment factor of 0.68 has been applied
*** bias adjustment factor of 0.67 has been applied

Results from 2010 to 2012 indicate that annual mean concentrations of NO_2 are consistently well below the annual objective value of 40$\mu g/m^3$. No exceedences of the hourly mean NO_2 objective have been recorded at either of the automatic monitoring sites. However, the council highlighted their concerns[7] relating to the most recent NO_2 concentrations recorded at Rowland Road, 750m to the south of the site. NO_2 concentrations during the winter months peaked to as high as 58$\mu g/m^3$. Winter peak in NO_2 would be related

to shorter daylight hours, but the council are concerned that elevated concentrations recorded are possibly related to increased traffic on Brigg Road.

5.3 Particulate Matter (PM_{10})

Concerns relating to PM_{10} relate to on-going elevated concentrations recorded locally. The main source is believed to be the steelworks, less than 100m to the east of the proposed development. Concentrations have previously been higher to the east of the steelworks, but increasing occurrence of easterly wind episodes has resulted in increased PM_{10} levels close to the proposed site, to the west of the steelworks.

Automatic monitoring stations within the vicinity of the site are listed in the following table and shown on Figure 2.

Table 4: Automatic Monitoring Stations

Site Name	OS Grid Ref	Site Type	Distance from Site	Pollutant Measured
Scunthorpe Town / Rowland Road (AURN)	490320, 410831	Urban Industrial	750m to the south	NO_2, PM_{10}, SO_2
Church Square	489900, 411400	Urban	100m to the south-west	PM_{10}
East Common Lane	490663, 409789	Urban Industrial	1.8km to the south	PM_{10}
Low Santon	492945, 411931	Urban Industrial	3km to the east	NO_2, PM_{10}, SO_2
High Santon	492945, 411931	Urban Industrial	3km to the east	PM_{10}
Redbourn Club	490002, 410069	Urban	1.5km to the south-west	PM_{10}
Dawes Lane	492400, 411900	Urban Industrial	2.3km to the east	PM_{10}
Tarmac	492600, 411600	Urban Industrial	2.5km to the east	PM_{10}

The results of automatic monitoring for PM_{10} are listed in the following table. These are taken from the latest Progress Report[7] and supplemented by more recent monitoring results provided by the Council[8].

Table 5: Results of automatic monitoring for PM_{10}, exceedences of the annual mean PM_{10} objective are highlighted as bold. Percentage data capture listed, where available.

Site Name	**Site Type**	**2010**	**2011**	**2012**	**2013***	**2014****
Church Square	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	-	-	-	22.9	26.1
	Number of Days >50$\mu g/m^3$	-	-	-	4	12
Scunthorpe Town / Rowland Road (AURN) - FDMS	Annual Mean PM_{10} Concentration ($\mu g/m^3$)	23	22.2	20.8 (86.6% data		

[8] Email from Ayan Chakravartty to Arup on 16th July 2014

Site Name	Site Type	2010	2011	2012	2013*	2014**
				capture)		
	Number of Days >50µg/m^3	13 **(39.7)*** **	20	10 (38.12)***		
Scunthorpe Town / Rowland Road (AURN) - TEOM	Annual Mean PM_{10} Concentration (µg/m^3)	21.3	22.5	20.9 (86.6% data capture)	25.6	24.1
	Number of Days >50µg/m^3	6 **(36.9)*** **	24	16	30	14****
East Common Lane	Annual Mean PM_{10} Concentration (µg/m^3)	22.7	24.3	22.3 (99.2% data capture)	28.1	26.6
	Number of Days >50µg/m^3	11	29	19	**47**	25
Redbourne Club	Annual Mean PM_{10} Concentration (µg/m^3)	11	29	19	23.5	24.4
	Number of Days >50µg/m^3	5 (31.1)***	22	10	17	14
Dawes Lane	Annual Mean PM_{10} Concentration (µg/m^3)	-	-	-	**41.6**	31.9
	Number of Days >50µg/m^3	-	-	-	**87**	10
Low Santon - FDMS	Annual Mean PM_{10} Concentration (µg/m^3)	34.3	34.5	26.4	38.6	36.4
	Number of Days >50µg/m^3	**33 (57.5)*** **	**55**	16	**68**	**37**
Low Santon - TEOM	Annual Mean PM_{10} Concentration (µg/m^3)	32.6	38.7	28.5		
	Number of Days >50µg/m^3	**58**	**73 (63.8)*** **	21		
High Santon	Annual Mean PM_{10} Concentration (µg/m^3)	23.7	29.5	4.8		
	Number of Days >50µg/m^3	13 **(38.1)*** **	34	10		
Tarmac	Annual Mean PM_{10} Concentration (µg/m^3)	-	-	-	35.1	31.5
	Number of Days >50µg/m^3	-	-	-	**59**	14

- no data available

* based on data from July to December

** based on data from January to July

*** If data capture for the year is less than 90%, the 90.4th percentile of 24-hour means in included in brackets

**** number of exceedances from half a year's data (to July 15th 2014)

Results from 2010 to 2014 indicate that the annual mean for PM_{10} (40µg/m^3) has not been exceeded at any of the sites, excluding Dawes Lane. An annual mean of 41.6µg/m^3 was recorded at Dawes Lane in 2013. Dawes Lane is located 2.3km to the east of the proposed site, within the industrial area.

Exceedances of the daily mean PM_{10} objective have been recorded at Dawes Lane, Santon, Tarmac, East Common Lane and Rowland Road. Dawes Lane, Santon and Tarmac at located 2.3km to 3km to the east of the proposed site, within the industrial area of the steelworks, and therefore these exceedances are not surprising. Rowland Road and East Common Lane are located within the urban area to the south of the site. Exceedances at these locations were only recorded during one monitoring year between 2010 and 2013. It is likely that the Council will require more monitoring data before an assessment can be made on the impact at these sites. Church Square is located to the west of the site, but closest to the site and likely to be most representative of the conditions there. No exceedances of annual or daily objectives were recorded at Church Square.

Meteorological data has been obtained to further analyse the monitoring data from the Church Square site. The following polar plots demonstrate the strong influence from the steelworks to the east. The polar annulus plot shows the average PM_{10} concentration as a function of wind direction and time of the day. The polar plot shows average PM_{10} concentrations as a function of wind direction and speed. When the wind blows from the east, elevated concentrations of PM_{10} are seen, and these are highest during working hours, indicating that at least some of this relates to activities on site. The polar plot shows the strong influence of wind speed suggesting that strong winds raising dust from the site may be a potential source of some of the PM_{10}. Despite this, PM_{10} monitoring data for Church Square complies with the UK Air Quality Objectives and Limit Values for PM_{10}. It is understood that the integrated steelworks seeks to make improvements to dust control across the site, but time and additional investment is required before these improvements can be realised.

Figure 4: Polar Annulus for PM_{10}

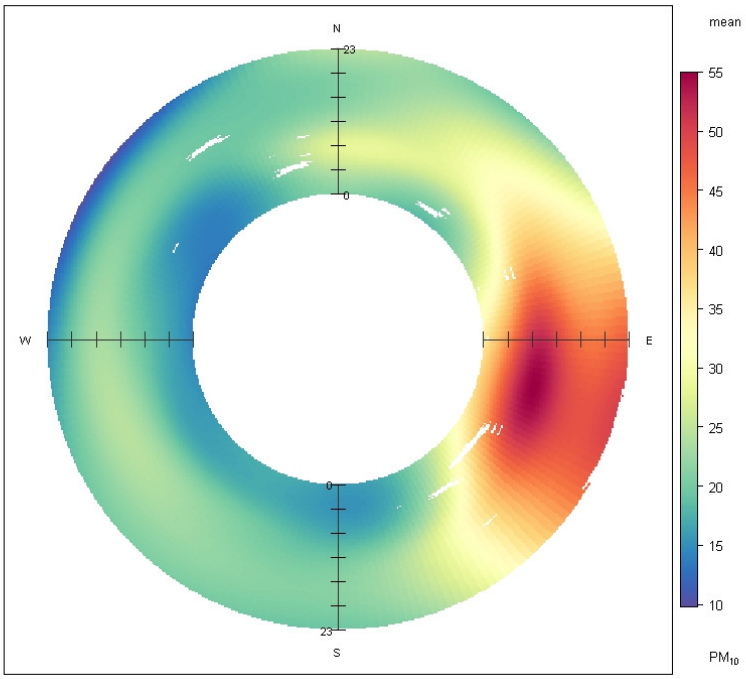
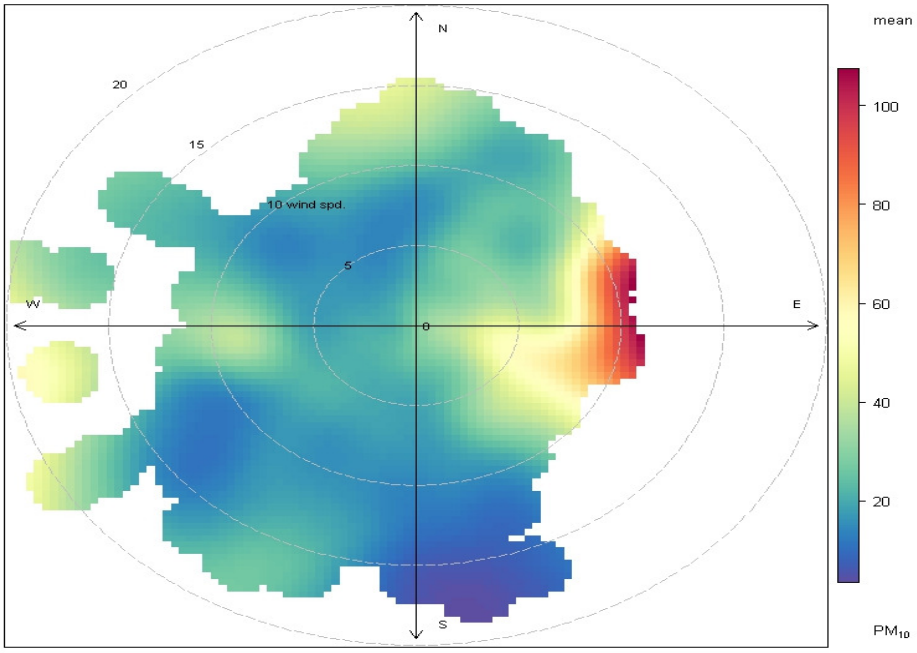


Figure 5: Polar Plot PM_{10}



5.4 Polycyclic Aromatic Hydrocarbons (PAHs)

According to the consultation response from Public Health, PAH levels have been consistently breached in North Lincolnshire, and the source is believed to be the coke ovens at the steel works, approximately 2km to the east of the site.

North Lincolnshire Council operate two PAH monitors are Scunthorpe Town, 750m to the south of the site, and Low Santon, 3km to the east. The latest results, as listed in their 2013 Progress Report, are as follows:

Table 6: Results of PAH monitoring

PAH Compound	Target (calendar year)	2012 Low Santon	2012 Scunthorpe Town
Benzo(a)pyrene	1 ng/m^3	2.8 ng/m^3	1.3 ng/m^3

It is understood from the Progress Report that Tata Steel are working with the Environment Agency to reduce PAHs in the Scunthorpe area.

The issue with PAHs therefore seems to be widespread within the area and would be hard to justify a refusal of planning permission on a specific site unless there was a widespread policy to reject residential and other sensitive uses in the area.

5.5 Odour

It is understood from consultation responses that there are significant odours from the tar processing facility. The addition of a sensitive receptor near to the existing industry would represent a burden to existing environmental controls.

North Lincolnshire Council and the Environment Agency have been consulted to request information on any odour complaints in the area. The Council have advised that the Environment Agency deal with any complaints. A response from the Environment Agency is expected in early August.

6 Conclusions

An assessment of the existing air quality within the area of the proposed site on Brigg Road, east Scunthorpe has been undertaken. This technical note summarises the existing air quality at the site, and discusses objections to the planning application. These objections related to concerns over NO_2, PM_{10} and PAH concentrations and odour levels at the proposed site.

The proposed site is located immediately to the north of the boundary of the AQMA, which was designated due to PM_{10} exceedances associated with the Integrated Steelworks to the east. The AQMA has been divided into zones 1 and 2, where residential development isn't permitted and where it may be permitted subject to more detailed study, respectively. The proposed site is immediately to the north of Zone 1. The zones were updated in 2012 and did not include the nearby Church Square data.

PM_{10} concentrations recorded within the industrial area are high, as would be anticipated. Analysis of meteorological data and the latest monitoring data from the nearby Church Square site demonstrates a strong influence from the steelworks to the east. However, PM_{10} concentrations at the monitoring location closest to the site, Church Square, did not record any exceedances of annual or daily objectives. The council have highlighted that levels may be lower due to a downturn in production at the steelworks due to the recession.

NO_2 concentrations recorded are consistently well below the annual objective value of 40µg/m^3. However, the council have highlighted their concerns[7] relating to the most recent winter NO_2 concentrations recorded at Rowland Road, 750m to the south of the site. It is likely that the council would require an assessment of the impact of the proposed school on nitrogen dioxide concentrations but this is very unlikely to show a significant impact.

PAH concentrations at Scunthorpe Town/Rowland Road (1.3ng/m^3), 750m to the south of the site, were in exceedance of the target value (1ng/m^3). It is understood that elevated PAH is a widespread problem in the area, and Tata Steel are working with the Environment Agency to reduce PAHs in the Scunthorpe area.

Consultation responses indicate that there are significant odours from the industrial area to the east. The Environment Agency has been consulted to request information on any odour complaints in the area, and their response is currently being awaited.

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Jenny Carrington	Michael Bull	Michael Bull
Signature	[redacted]	[redacted]	[redacted]