Suffolk County Council & Ipswich Borough Council

THE ALIGNED LOCAL PLANS FOR SUFFOLK DISTRICTS

Air Quality Screening Study

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Air Quality Screening Study

WSP

4th Floor
6 Devonshire Square
London
EC2M 4YE

Phone: +44 20 7337 1700

Fax: +44 20 7337 1701

WSP.com

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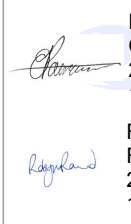
Signature				 Parsons, Oliver 2020.01.15 11:35:05 Rand, Robyn 2020.01.15 11:35:50
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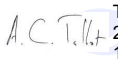
Signature				 Talbot, Andy 2020.01.15 11:37:33
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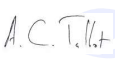
Signature				 Talbot, Andy 2020.01.15 11:38:04
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APPENDICES

1 INTRODUCTION

1.1.1. WSP has been commissioned by Suffolk County Council (SCC) and Ipswich Borough Council (IBC) to provide an assessment of the local air quality impacts of the proposed aligned local plans for the administrative areas of IBC, Babergh District Council (BDC), Mid Suffolk District Council (MSDC) and Suffolk Coastal District Council (SCDC) - which together form the Ipswich Strategic Planning Area (ISPA). The focus of the study is on the impacts of air pollutant levels due to changes in road traffic emissions within the IBC administrative area.

1.1.2. This screening study considers the following scenarios:

- Without the Ipswich Local Plan, but with the assumption of local plan growth in adjacent boroughs; and
- With the Ipswich Local Plan.

1.1.3. These scenarios are considered for the years 2026 and 2036 to enable IBC to understand the implications of the Local Plan on local air quality and to ensure that undertakings to meet Air Quality Standards (AQS) are not compromised.

1.1.4. The changes in road traffic emissions are likely to impact on outdoor (ambient) concentrations of nitrogen dioxide (NO_2) and particulates (PM_{10} and $PM_{2.5}$) at locations where members of the public are likely to be present, and oxides of nitrogen (NO_x), nutrient nitrogen deposition and acid deposition at sensitive ecological sites. Of concern are the effects in terms of compliance with air quality standards which include national objectives and mandatory European Union (EU) limit values for the protection of human health, and potential harm to sensitive ecological resources. **Table 1-1** gives the relevant air quality standards.

Table 1-1 – Relevant Air Quality Standards

Pollutant	Measured as	Concentration (µg/m^3)	Requirement
NO_2	Annual mean	40	Not to be exceeded, as a national objective and as a EU limit value
	1-hour (hourly) mean	200	Not to be exceeded, more than 18 times a year as a national objective and as a EU limit value
PM_{10} (particulate matter less than 10 micrometres in diameter)	Annual mean	40	Not to be exceeded, as a national objective and as a EU limit value
	24-hour (daily) mean	50	Not to be exceeded, more than 35 time a year as a national objective and as a EU limit value
$PM_{2.5}$ (particulate matter less than 2.5 micrometres in diameter)	Annual mean	25	Target value
NO_x	Annual mean	30	Critical level for the protection of vegetation

1.1.5. The study is in two stages:

- Screening; and
- Detailed air quality modelling.

1.1.6. This report presents the methodology and findings of the screening stage of the assessment.

1.1.7. The objective of this screening report is to identify locations where there is risk of non-compliance with one or more ambient air quality standard and where adverse impacts at ecological receptors could occur. These locations will be included in detailed air quality modelling at the next stage.

2 METHODOLOGY

2.1.1. The screening process has involved the following steps:

1. Determination of the 'affected road network' (ARN) using indicative criteria for requiring an air quality assessment given in joint Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) guidance[1]. Roads links that are not within the ARN can be discounted as having changes that are very likely to cause only negligible impacts on local air quality.
2. Review of baseline conditions within 200 metres of the ARN. This has involved collation and review of information that is available to the public and long-term trend analysis of monitoring data using established statistical techniques.
3. Identification of locations where there is a risk of non-compliance with one or more ambient air quality standard, to be taken forward in detailed air quality modelling at the next stage.

2.1.2. The following information has been used in screening:

- Traffic data derived from the Suffolk County Transport Model (SCTM) forecasts for 2026 and 2036 without and with the IBC contribution to the proposed ISPA aligned Local Plans, provided by the WSP Traffic Modelling team. The scenarios in these years comprise an aligned Local Plan growth in all of the ISPA boroughs with the exception of IBC, and an aligned Local Plan growth from all ISPA boroughs and districts including IBC;
- IBC local air quality management reports[2], including monitoring data for 2014 to 2018 inclusive;
- Monitoring data for 2018 provided by IBC;
- Ordnance Survey Open Data products[3];
- Spatial data for IBC Air Quality Management Areas (AQMA)[4];
- Spatial data from the Department of the Environment, Food and Rural Affairs' (Defra) Pollution Climate Mapping (PCM) model[5];
- Spatial data for designated ecological sites[6];
- Spatial data from the SCTM showing volume/capacity percentages and average delay to indicate locations subject to peak hour congestion with local plan growth; and
- Defra's Multi-Agency Geographic Information for the Countryside (MAGIC) web resource[7].

[1] EPUK/IAQM (2017) *Land-Use Planning & Development Control: Planning for Air Quality* [online]. Available at: https://iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf [Accessed May 2019].
[2] Ipswich Borough Council (2019) *2019 Air Quality Annual Status Report (ASR)* [online]. Available at: https://www.ipswich.gov.uk/sites/default/files/annual_status_report_2019.pdf [Accessed November 2019].
[3] Ordnance Survey Open Data Products. Available at: https://www.ordnancesurvey.co.uk/business-and-government/products/opendata.html
[4] Defra *UK-AIR: List of Local Authorities with AQMAs* [online]. Available at: https://uk-air.defra.gov.uk/aqma/list [Accessed May 2019].
[5] Defra (2019) *2019 NO_2 projections data (2017 reference year)* [online]. Available at: https://uk-air.defra.gov.uk/library/no2ten/2019-no2-pm-projections-from-2017-data [Accessed May 2019].
[6] Natural England Open Data Geoportal. Available at https://naturalengland-defra.opendata.arcgis.com/ [Accessed May 2019].
[7] MAGIC [online]. Available at: https://magic.defra.gov.uk/ [Accessed May 2019].

3 THE AFFECTED ROAD NETWORK

3.1.1. EPUK/IAQM criteria have been applied to define the ARNs for 2026 and 2036 (**Table 3-1**) in relation to human receptors. For designated habitats that may be sensitive to changes in air pollution, a threshold of 1,000 Annual Average Daily Traffic (AADT) flow, as referred to in IAQM guidance[8] was applied.

Table 3-1 – Relevant EPUK/IAQM Indicative Criteria for Requiring and Air Quality Assessment

The development will:	Indicative criteria to proceed to an air quality assessment
Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5 tonnes gross vehicle weight).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5 tonnes gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere
Introduce a new junction or remove an existing junction near to relevant receptors.	Applies to junctions that cause traffic to significantly change vehicle accelerate/decelerate, e.g. traffic lights, or roundabouts.

3.1.2. The changes in traffic are illustrated in the following figures (**Appendix A**):

- **Figure 1** shows the changes in total AADT flow in 2026 in the vicinity of IBC AQMAs;
- **Figure 2** shows the changes in total AADT flow in 2026 within the IBC administrative area;
- **Figure 3** shows the changes in total AADT flow in 2026 across the ISPA;
- **Figure 4** shows the changes in HDV AADT flow in 2026 in the vicinity of IBC AQMAs;
- **Figure 5** shows the changes in HDV AADT flow in 2026 within the IBC administrative area;
- **Figure 6** shows the changes in HDV AADT flow in 2026 across the ISPA;
- **Figure 7** shows the changes in LDV AADT flow in 2026 in the vicinity of IBC AQMAs;
- **Figure 8** shows the changes in LDV AADT flow in 2026 within the IBC administrative area;
- **Figure 9** shows the changes in LDV AADT flow in 2026 across the ISPA;
- **Figure 10** shows the changes in total AADT flow in 2036 in the vicinity of IBC AQMAs;
- **Figure 11** shows the changes in total AADT flow in 2036 within the IBC administrative area;
- **Figure 12** shows the changes in total AADT flow in 2036 across the ISPA;
- **Figure 13** shows the changes in daily HDV flow in 2036 in the vicinity of IBC AQMAs;

[8] IAQM (2019) *A guide to the assessment of air quality impacts on designated nature conservation sites* [online]. Available at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2019.pdf [Accessed December 2019].

- **Figure 14** shows the changes in daily HDV flow in 2036 within the IBC administrative area;
- **Figure 15** shows the changes in daily HDV flow in 2036 across the ISPA;
- **Figure 16** shows the changes in daily LDV flow in 2036 in the vicinity of IBC AQMAs;
- **Figure 17** shows the changes in daily LDV flow in 2036 within the IBC administrative area;
- **Figure 18** shows the changes in daily LDV flow in 2036 across the ISPA;
- **Figure 19** illustrates the overall 2026 ARN based on the EPUK / IAQM criteria for the IBC administrative area;
- **Figure 20** illustrates the overall 2036 ARN based on the EPUK / IAQM criteria for the IBC administrative area; and
- **Figure 21** Air Quality Study Area for detailed modelling.

3.2 CHANGES IN TRAFFIC IN 2026

3.2.1. Of the 5,897 SCTM road links included within the 2026 ISPA, 992 meet one or more of the qualifying criteria and can be classified as ARN links. Within the Ipswich borough in 2026 there are predicted to be 802 ARN links.

3.2.2. The aligned local plans bring about increases in traffic – in-particular of LDVs on most roads within the ISPA, including on roads within existing AQMAs. **Table 3-2** includes the most notable changes in AADT flow identified on particular road links when comparing the without the IBC Local Plan scenario and the with IBC Local Plan scenario in 2026 within IBC AQMAs (see **Table 4-1** for AQMA descriptions).

3.2.3. It should be noted that within the traffic model, from which data included in **Table 3-2** have been derived, LDVs and HDVs are set to seek the route with the shortest travel time as opposed to the shortest distance, in avoidance of predicted increased congestion. The traffic flow values in both tables below are presented as a function of morning (08:00-09:00) and evening (17:00-18:00) peak weekday hours. The differences within the modelled peak hours could in fact be relatively small; however, as the flows are presented in daily traffic flows, the differences could appear magnified.

3.2.4. It should also be noted that the traffic model factors in an element of growth when predicting future traffic flows, assumptions are made considering population growth and specific development locations within Ipswich and surrounding local authorities. Therefore, it cannot be reasonably assumed that traffic patterns in 2026 are purely influenced by the IBC Local Plan[9].

[9] WSP (2019) *Ipswich Strategic Planning Area Local Plan Modelling: Forecasting Report – Forecasts with demand adjustments.*

Table 3-2 – Greatest Changes in Traffic Fow within IBC AQMAs for 2026

AQMA	Change in Total AADT Flow	Change in LDV AADT Flow	Change in HDV AADT Flow
AQMA No.1	-369 on Chevallier St (between Waterloo Rd and Providence Ln). -176 on Chevallier St (between Providence Ln and A1156 Norwich Rd). (These negative figures indicate that without the local plan there will be more traffic compared to with the local plan for 2026 on these links)	-313 on Chevallier St (between Waterloo Rd and Providence Ln). -121 on Chevallier St (between Providence Ln and A1156 Norwich Rd).	-56 on Chevallier St (between Waterloo Rd and Providence Ln). -55 on Chevallier St (between Providence Ln and A1156 Norwich Rd). -60 at the junction between A1156 Norwich Rd and A1214 Valley Rd.
AQMA No.2	+3,160 on the A1156 Crown St/ St Margaret's St (between Fonnereau Rd and Northgate St).	+3,187 on the A1156 Crown St/ St Margaret's St (between Fonnereau Rd and Northgate St).	-26 on the A1156 Crown St/ St Margaret's St (between Fonnereau Rd and Northgate St). -31 on the A1156 Crown St/ St Margaret's St (between Neale St and Tower Ramparts).
AQMA No.3	+1,271 on the A1156 Star Ln (between Slade St and Fore St). -1,175 on Key St (between Lower Orwell St and Key St/ Common Quay).	+1,288 on the A1156 Star Ln (between Slade St and Fore St). -1,154 on Key St (between Lower Orwell St and Key St/ Common Quay).	-38 on Grimwade St (between A1156 Fore St and A1156 Star Ln).
AQMA No.4	+396 on Chevallier St (between Bramford Ln and B1067 Bramford Rd). -369 on Chevallier St (between Bramford Ln and Waterloo Rd).	+451 on Chevallier St (between Bramford Ln and B1067 Bramford Rd). -313 on Chevallier St (between Bramford Ln and Waterloo Rd).	-55 on Chevallier St (between Bramford Ln and B1067 Bramford Rd). -56 on Chevallier St (between Bramford Ln and Waterloo Rd).
AQMA No.5	+846 on the A1156 Norwich Rd (between Orford St and B1067 Bramford Rd).	+837 on the A1156 Norwich Rd (between Orford St and B1067 Bramford Rd).	+9 on the A1156 Norwich Rd (between Orford St and B1067 Bramford Rd).

3.2.5. In most cases in the above table, as LDV flow increases, HDV flow decreases. As previously mentioned in **Section 3.2.2**, the traffic model is set up so that vehicles opt for the route with the shortest time, as opposed to the shortest distance. Therefore, HDVs, which are mostly on the A14 around Ipswich, will opt to stay on the A14 and avoid cutting through the centre of Ipswich and more importantly through the AQMAs, to avoid increased congestion at peak weekday hours as a result of the IBC local plan. The reason that LDV flow is increasing where HDV is decreasing, is due to the IBC local plans housing and job growth.

3.2.6. Within AQMA No.4 there are two adjacent links on Chevallier Street that display contrasting total AADT flows when comparing the situation without and with the IBC Local Plan in 2026. This is due

to the increased congestion further down Chevallier Street in 2026 in peak weekday hours as a result of the IBC Local Plan. Within the traffic model, vehicles attempting to join Chevallier Street from Bramford Lane would opt to turn right, away from the congestion, leading to an increase in traffic flow on the link from Bramford Lane to Bramford Road, and a decrease in congestion on the link from Bramford Lane to Waterloo Road.

3.2.7. Another reason for the decrease in traffic flow on this link and others, is due to increased congestion. With increased congestion, the traffic speed is reduced, meaning fewer vehicles can traverse the link within the peak hour.

3.3 CHANGES IN TRAFFIC IN 2036

3.3.1. In 2036, by the time of full implementation of the aligned local plans, changes on 1,476 out of the 5,899 links within the ISPA trigger one or more of the qualifying criteria. Within the Ipswich borough in 2036 there are predicted to be 1,048 ARN links. **Table 3-3** includes the most notable changes in AADT flow identified on particular road links when comparing the without IBC Local Plan scenario and the with IBC Local Plan scenario in 2036 within IBC AQMAs.

3.3.2. It should be noted that within the traffic model, from which data included in **Table 3-3** have been derived, LDVs and HDVs are set to seek the route with the shortest travel time as opposed to the shortest distance, in avoidance of predicted increased congestion. The traffic flow values in both tables below are presented as a function of morning (08:00-09:00) and evening (17:00-18:00) peak weekday hours. The differences within the modelled peak hours could in fact be relatively small; however, as the flows are presented in daily traffic flows, the differences could appear magnified.

3.3.3. It should also be noted that the traffic model factors in an element of growth when predicting future traffic flows, assumptions are made considering population growth and specific development locations within Ipswich and surrounding local authorities. Therefore, it cannot be reasonably assumed that traffic patterns in 2036 are purely influenced by the IBC Local Plan[9].

Table 3-3 - Greatest Changes in Traffic flow within IBC AQMAs for 2036

AQMA	Change in Total AADT Flow	Change in LDV AADT Flow	Change in HDV AADT Flow
AQMA No.1	+483 on Chevallier St (between Waterloo Rd and Providence Ln). +351 on Chevallier St (between Providence Ln and A1156 Norwich Rd). (The above positive figures indicate that without the local plan there will be fewer traffic compared to with the local plan for 2036 on these links) -277 at the junction between A1156 Norwich Rd and A1214 Valley Rd.	+576 on Chevallier St (between Waterloo Rd and Providence Ln). +447 on Chevallier St (between Providence Ln and A1156 Norwich Rd). -138 at the junction between A1156 Norwich Rd and A1214 Valley Rd.	-93 on Chevallier St (between Waterloo Rd and Providence Ln). -96 on Chevallier St (between Providence Ln and A1156 Norwich Rd). -139 at the junction between A1156 Norwich Rd and A1214 Valley Rd.
AQMA No.2	+3,496 on the A1156 Crown St/ St Margaret's St (between Northgate St and Soane St).	+3,589 on the A1156 Crown St/ St Margaret's St (between Northgate St and Soane St).	-138 on the A1156 Crown St/ St Margaret's St (between Fonnereau Rd and Northgate St).
AQMA No.3	+1,217 on the A1156 Star Ln (between Slade St and Fore St). -1,743 on College St (between Foundry Ln and Foundation St).	+1,255 on the A1156 Star Ln (between Slade St and Fore St). -1,705 on College St (between Foundry Ln and Foundation St).	-65 on Grimwade St (between A1156 Fore St and A1156 Star Ln).
AQMA No.4	+881 on Chevallier St (between Bramford Ln and B1067 Bramford Rd). +483 on Chevallier St (between Bramford Ln and Waterloo Rd).	+974 on Chevallier St (between Bramford Ln and B1067 Bramford Rd). +576 on Chevallier St (between Bramford Ln and Waterloo Rd).	-93 on Chevallier St (between B1067 Bramford Rd and Waterloo Rd).
AQMA No.5	+512 on the 1156 Norwich Rd (between Orford St and Barrack Ln).	+552 on the 1156 Norwich Rd (between Orford St and Barrack Ln).	-39 on the 1156 Norwich Rd (between Orford St and Berners Street).

3.3.4. Within AQMA No.1, total AADT when comparing the without IBC Local Plan scenario to the with IBC Local Plan scenario display a decrease for the year 2026, but an increase for the year 2036. The decrease in traffic flow for 2026 is due to the increased congestion at peak hours predicted on main roads, such as Chevallier Street. As vehicles are set up to prioritise routes with the shortest time as opposed to the shortest distance within the traffic model, vehicles will choose to avoid areas of congestion and opt to turn off earlier down side roads, commonly known as 'rat running', which reduces total AADT. The following increase for 2036 is also related to increased congestion, though for 2036 congestion at peak hours is predicted for side roads, such as those leading onto Chevallier Street, as well as Chevallier Street itself. So instead of opting to turn off Chevallier Street early, vehicles in the model would opt to remain on Chevallier Street, causing the increase in AADT.

3.3.5. Within AQMA No.3, where there is an increase in total AADT along the A1156 Star Lane heading eastbound out of Ipswich town centre there is also a decrease in total AADT along College Street heading westbound into Ipswich town centre. This is due to vehicles in the traffic model opting for alternative routes to avoid congestion in Ipswich town centre and heading out along Star Lane. The decrease on College Street is due to the same reason; vehicles in the traffic model avoiding congestion and choosing alternative routes to the town centre. It's also due to congestion in the centre causing vehicles to travel slower and leading to fewer vehicles traversing the link for the peak hours used in this assessment.

3.3.6. In addition to considering the changes in traffic conditions on the network, locations within the IBC area that are forecast by the SCTM to experience peak hour traffic congestion have also been considered. Links experiencing congestion include:

- Sections of main radial routes within Ipswich connecting to the town centre, including on the B1067 Bramford Road and the A1156 Norwich Road;
- Sections of orbital routes, including the A1214 Valley Road;
- Roads connecting with the A14, including Sproughton Road and the A1156 Bury Road;
- A14 Orwell Bridge to junction 57; and
- A14 between junctions 52 and 54.

4 BASELINE CONDITIONS

4.1 IPSWICH BOROUGH COUNCIL: LOCAL AIR QUALITY MANAGEMENT

4.1.1. IBC has declared five AQMAs due to measured exceedances of the AQS for annual mean NO_2. Details are given in **Table 4-1**.

Table 4-1 – Ipswich Borough Council Air Quality Management Areas

Name	Air Quality Criteria Exceeded	Description	Date Declared
AQMA No.1	Annual Mean NO_2	An area encompassing the land in and around the junction of Norwich Road, Chevallier Street and Valley Road, extending along Chevallier Street to beyond the junction with Waterloo Road.	11th April 2006 (Amended 12th September 2017)
AQMA No.2	Annual Mean NO_2	An area from the junction with Peel Street, extending along Crown Street, St. Margarets Street and St. Helens Street to the junction with Palmerston Road, and from St. Margarets Street extending up Woodbridge Road to just beyond the junction with Argyle Street.	11th April 2006 (Amended 12th September 2017)
AQMA No.3	Annual Mean NO_2	An area following the route of the Star Lane / Key Street / College Street gyratory clockwise from the junction with Lower Orwell Street, extending along Start lane, Grimwade Street, Fore Street, Salthouse Street, Key Street and College Street, terminating at the junction with Bridge Street.	11th April 2006 (Amended 12th September 2017)
AQMA No.4	Annual Mean NO_2	An area incorporating the Bramford Road / Yarmouth Road / Chevallier Street junction and part of Chevallier Street.	14th December 2010
AQMA No.5	Annual Mean NO_2	An area incorporating the land in or around St. Matthews Street / Norwich Road between the Civic Drive roundabout and Bramford Road.	12th September 2017

4.1.2. All the AQMA's – shown in in **Figure 22** and **Figure 23** (**Appendix A**) relate to road vehicle exhaust emissions of NO_x at, or near busy road junctions.

4.1.3. An Air Quality Action Plan (AQAP) was published by IBC in 2008[10] to address poor air quality within the borough, focussing on measures to achieve a reduction in NO_2 concentrations within AQMAs. In

[10] Ipswich Borough Council (2008) *Local Air Quality Management: Ipswich Air Quality Action* Plan [online]. Available at: https://www.ipswich.gov.uk/sites/www.ipswich.gov.uk/files/Air_Quality_Action_Plan_1_.pdf [Accessed May 2019].

2019 IBC published an updated AQAP[11] to replace the 2008 AQAP. The 2019 AQAP outlines actions IBC must to deliver, between 2019 and 2024, to improve air quality in the IBC administrative area. The 2019 AQAP states that NO_2 emitted from road transport is *"the major pollutant of concern, and hence primary focus of [the] action plan".*

4.1.4. The IBC 2019 AQAP outlines the following priority actions to improve air quality by reducing pollutant concentrations and exposure to pollutants between 2019 and 2024:

- *"Priority 1: Public health, behaviours and awareness – Facilitating a model shift away from private vehicles towards public transport and active travel, to improve air quality and create a healthy community.*
- *Priority 2: Transport – Incentivise switching to cleaner vehicles, developing effective yet realistic renewal strategies for the town's bus fleet, taxis and corporate fleets, to reduce poor air quality and to create a more sustainable environment.*
- *Priority 3: Policy, planning and infrastructure – By embedding air quality measures into policy development, planning applications and major developments, to bring future improvements to air quality and create an enjoyable and sustainable place to live and work, and build a strong Ipswich economy.*
- *Priority 4: Wider strategic approach – Reducing exposure to air pollution by tackling the sources of pollution from further transport initiatives and domestic sources".*

4.2 LOCAL AUTHORITY AIR QUALITY MONITORING DATA

CONTINUOUS MONITORING DATA

4.2.1. IBC currently operates two roadside Continuous Monitoring Stations (CMS) within its administrative area which measure NO_2 concentrations on an hourly basis. One of these (site ID 'IPS3') is located within AQMA No.1 on Chevallier Street, which is shown in **Figure 23** (**Appendix A**). Here, there have been no recorded exceedances of the NO_2 annual mean AQS of 40µg/m^3 between 2014 and 2018 inclusive. A second roadside CMS was commissioned in July 2019 outside of the boundary of AQMA No.5 on St Matthew's Street. Ratified data for 2019 should be available by the release of the 2020 ASR.

Table 4-2 – CMS Annual Mean NO_2 Concentrations

Site ID	Site Name	Site Type	X, Y	Annual Mean NO_2 Concentrations (µg/m^3)				
				2014	2015	2016	2017	2018
IPS3	Chevallier Street	Roadside	615261, 245350	29	N/A	N/A	29	28

N/A = monitoring data not available.

Data obtained from the IBC's 2019 Annual Status Report and directly from the council.

[11] Ipswich Borough Council (2019) *Ipswich Borough Council Air Quality Action Plan 2019 – 2024* [online]. Available at: https://www.ipswich.gov.uk/sites/default/files/air_quality_action_plan_2019_-_executive_approved_pdf_version.pdf [Accessed May 2019].

PASSIVE MONITORING DATA

4.2.2. IBC also operate a network of passive diffusion tubes for monitoring of NO_2. Diffusion tube sites are shown in **Figure 22** and **Figure 23** (**Appendix A**) with details given in **Appendix B**. Of the diffusion tube sites operated by IBC in 2018, 34 of the 85 were located within an AQMA.

4.2.3. In 2018 the annual mean NO_2 concentrations were greater than the 40µg/m^3 AQS level at 21 kerbside sites. Seventeen of these sites are located within an AQMA. Four of these sites, 17, 30, 31 and 61, are not within an AQMA. Sites 17, 30 and 61 have nearby relevant exposure, whereas site 31 does not.

4.2.4. Kerbside Site 14, located within the boundary of AQMA No.1, has consistently recorded exceedances of the NO_2 annual mean AQS between 2014 and 2018 inclusive. However, Site 14 has recorded a general decrease in NO_2 concentrations over the same five-year period.

4.2.5. There are 15 diffusion tube sites within AQMA No.2, seven of which (Sites 11, 12, 19, 24, 27, 66 and 68) recorded an exceedance of the NO_2 annual mean AQS in 2018. Of those same seven sites, two (Sites 24 and 68) showed a general decrease in NO_2 concentrations since 2014 whilst the rest showed a general increase.

4.2.6. Site 5, 33, 34 and 39 are all located within the boundary of AQMA No.3 and both Site 5 and 39 recorded exceedances of the NO_2 annual mean AQS in 2018. It is notable that Site 33 has consistently measured NO_2 concentrations below 40µg/m^3 since 2014 and Site 34 has measured a general decrease in annual mean NO_2 concentrations between 2014 and 2018.

4.2.7. There are three diffusion tube sites located within AQMA No.4 (Sites 2, 28 and 43). Since 2016, only Site 2 has recorded any exceedance of the annual mean AQS for NO_2. In 2018 only, Site 2 recorded an annual mean concentration of 42µg/m^3.

4.2.8. Six out of the eight diffusion tube sites located within the boundary of AQMA No.5 (Sites 49, 51, 52, 53, 64 and 65) recorded exceedances of the annual mean AQS for NO_2 in 2018. It is notable that kerbside Site 50 has not recorded an exceedance of the annual mean AQS for NO_2 between 2014 and 2018 and kerbside Site 42 has not recorded an exceedance since 2016.

4.2.9. For hourly mean NO_2 concentrations, Defra's Technical Guidance LAQM.TG(16)[12] suggests that if annual mean NO_2 concentrations do not exceed 60µg/m^3 then it is unlikely that hourly mean concentrations would exceed the criterion set for the hourly mean. The highest annual mean monitored NO_2 concentration in 2018 was 55µg/m^3, measured at kerbside Sites 64 and 65 on Norwich Road, suggesting that concentrations of NO_2 are unlikely to exceed the 1-hour mean AQS.

[12] DEFRA (2016) *Local Air Quality Management Technical Guidance (TG16)* [online]. Available at: https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf [Accessed May 2019].

4.3 TREND ANALYSIS FOR ANNUAL MEAN NITROGEN DIOXIDE

4.3.1. Analysis of trends in annual mean NO_2 has been undertaken using the Finnish Meteorological Institute MAKESENS (v1) workbook[13] using the annual mean time series data for CMS and diffusion tube sites. The analysis of long-term trends seeks to determine if annual mean NO_2 concentrations are falling, increasing or stable – or whether there is no clear trend.

4.3.2. The statistical analysis includes a Sen's slope[14] estimate of the linear trend, residual concentrations[15] which indicate the variation in the data year on year and the Mann-Kendall test statistic (S) to indicate the significance of any trend. To conduct a Mann-Kendall test, five or more series of data must be presented for each site. The Mann-Kendall test statistic is expressed as a whole number. For the null hypothesis of a random distribution of the data to be rejected, the S value must equal or be greater than an absolute value determined from the number of data points (equivalent to a probability of less than 0.1 or 10%)[16].

4.3.3. A recent decision was made by IBC to bias correct 2018 diffusion tube data using the local bias adjustment factor. The 2018 data has also been adjusted using the national bias adjustment factor so that it is comparable with previous years' data for trend analysis purposes.

4.3.4. **Appendix C** summarises the statistical analysis for each diffusion tube site (shown in **Figure 22** and **Figure 23** (**Appendix A**) and listed in **Appendix B**). When the national bias adjustment factor is applied to 2018 data, the analysis indicates that there is a statistically significant upwards trend at:

- Site 31, Star Lane (a kerbside site approximately 2 metres north of the ARN); and
- Site 61, Valley Road (a kerbside site approximately 1.4 metres north of the ARN).

4.3.5. Statistical analysis also indicates that there is a statistically significant downwards trend in annual mean NO_2 concentrations at:

- Site 3, Duke Street (a kerbside site approximately 9 metres west of the ARN);
- Site 18, Yarmouth Road (a kerbside site approximately 8 metres east of the ARN);
- Site 22, Northgate Street (a kerbside site approximately 2 metres east of the ARN);
- Site 24, St Margaret's Street (a kerbside site approximately 3 metres west of the ARN);
- Site 45, Chevallier Street (a kerbside site approximately 6 metres south east of the ARN);
- Site 46, Chevallier Street (a kerbside site approximately 6 metres south east of the ARN);
- Site 47, Chevallier Street (a kerbside site approximately 6 metres south east of the ARN);
- Site 53, St Matthew's Street (a kerbside site approximately 2 metres south of the ARN);
- Site 55, Berners Street (a kerbside site approximately 6.4 metres north of the ARN); and
- Site 85, Old Foundry Road (a kerbside site approximately 25 metres south west of the ARN).

[13] Finnish Meteorological Institute (2002) *MAKESENS – application for trend calculation* [online]. Available at: https://en.ilmatieteenlaitos.fi/makesens [Accessed December 2019].

[14] The "Sen Slope" refers to the equation of the linear trend line and gives the rate of change per year.

[15] The difference in the actual monitored concentration compared to the concentration indicated by the trend line.

[16] Nielsen, D. M. (Ed.). (2005). Practical handbook of environmental site characterization and ground-water monitoring. CRC press.

4.3.6. Only 11 out of the 85 diffusion tube monitoring sites available recorded data with a statistically significant trend. Whilst some of the 11 sites are located within IBC AQMAs, other sites within the same AQMAs did not demonstrate a statistically significant trend. As such it is not possible to infer from this trend analysis whether concentrations of NO_2 are improving or deteriorating within the IBC administrative area.

4.4 DEFRA'S POLLUTION CLIMATE MAPPING (PCM) MODEL

4.4.1. Defra's PCM model is used in combination with monitoring data, for the UK's annual assessment of compliance with EU limit values. The PCM model provides estimates of roadside concentrations of annual mean NO_2. Approximately 18,000 links in 406 UK local authorities are included in the PCM model, of which 33 are within the IBC administrative; these are shown in **Figure 22** (**Appendix A**). The model provides projected roadside concentrations of pollutants for the years 2017 to 2030 inclusive, omitting 2018, based on a 2017 reference year; after which year on year reductions in concentrations are generally predicted. Defra PCM mapping indicates that annual mean roadside NO_2 concentrations were well below the annual mean EU limit value of 40µg/m^3 in the most recent year (2019) and opening year (2026) on all PCM links within the IBC administrative area. The highest 2019 and 2026 estimated concentrations, of 32.8µg/m^3 and 22.2µg/m^3 respectively, were on the A1214, between the A1071 Woodbridge Road East and Playford Road, and on Colchester Road between the A1214 Woodbridge Road East and Kingsgate Drive. This is somewhat in disagreement with IBC monitoring data for 2018 which show that roadside concentrations at some locations against PCM links exceeded the limit value. This disagreement is due to the PCM model providing measured concentrations from a model of the whole of the UK, which makes various assumptions about real world conditions. Whereas diffusion tubes provide actual, measured concentrations with real world conditions. Diffusion tubes also have an associated error in the results, which can be up to +/- 10%, so it is not surprising to have some disagreement between the two.

4.5 SENSITIVE RECEPTORS

4.5.1. Sensitive receptors for human health effects include residential properties and locations where there are, or are likely to be, vulnerable occupants such as hospitals, care home and schools. Designated ecological sites may also be sensitive to the effects of changes in local air quality. The following sensitive receptors are relevant:

- Residential properties within 200 metres of the ARN;
- Schools within 200 metres of the ARN;
- Hospitals within 200 metres of the ARN;
- Care homes within 200 metres of the ARN; and
- Designated ecological sites of local, national and international importance within 200 metres of the ARN.

4.5.2. Statutory ecological designations include Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPA), Special Areas of Conservation (SAC), Local Nature Reserves (LNR), Ramsar sites, Local Wildlife Sites (LWS), Nature Improvement Areas (NIA) and ancient woodlands. There are currently nine LNRs, three SSSIs, one SPA, one Ramsar one ancient woodland and fourteen LWSs within the IBC administrative area. Designated sites are shown in **Figure 21** (**Appendix A**). Those within the study area include:

- Stoke Tunnel Cutting SSSI;

- Orwell Estuary SSSI;
- Bixley Heath SSSI / LNR;
- Stour and Orwell Estuaries SPA / Ramsar;
- The Dales Open Space LNR;
- Alderman Canal East LNR;
- Alderman Canal West LNR;
- Pipers Vale LNR;
- LWS south of the A1214 Valley Road, Ipswich;
- LWS south of Ipswich train station and north west of Belstead Road, Ipswich;
- LWS south of Cavendish Street, Ipswich;
- LWS south west of Sandyhill Lane, Ipswich; and
- LWS east of the A1150 Felixstowe Road and west of St Augustine's Gardens, Ipswich.

4.5.3. All the sites listed above are located within 200 metres of the ARN. Stoke Tunnel Cutting SSSI however, was designated due to its geological features and therefore will not be sensitive to changes in air quality and will not be considered further in this assessment.

5 STUDY AREA FOR DETAILED AIR QUALITY MODELLING

5.1.1. The screening assessment shows that the ARNs for 2026 and 2036 due to the aligned local plans are similar in extent and both are extensive. However, from a review of baseline conditions, it is likely that only some locations within 200 metres of the ARN will be at risk of non-compliance with one or more ambient AQS in 2026. By 2036, the risk of non-compliance is likely to be low everywhere even though traffic levels are forecast to substantially grow between 2026 and 2036 with the aligned local plans. This assumption is reliant on vehicle emissions of NO_x, PM_{10} and $PM_{2.5}$ decreasing each year after 2026 in line with Defra forecasts (which currently extend only to 2030), with the proportions of low and zero emissions vehicles increasingly dominating the vehicle fleet in line with the Government's 'Road to Zero' aspirations[17].

5.1.2. The locations with high risk, and therefore most sensitive to changes in air pollutant concentrations, are within the central area of Ipswich where the public is likely to be present. High risk locations include residential premises and schools within the five AQMA's and within 200 metres of the radial and orbital routes with forecast congestion. Having considered the available information, within Ipswich the pollutant with greatest risk of non-compliance is annual mean NO_2. For PM_{10} or $PM_{2.5}$, it is not certain that there are no locations with exceedances of the standards as there is no monitoring of these pollutants; although the PCM data indicate that roadside concentrations will be well below the limit values for years 2019 and thereafter. Historical modelling carried out for the Council also indicated that levels of PM_{10} were well below AQS levels. Locations in the suburbs of Ipswich are likely to have low risk of non-compliance.

5.1.3. Also at risk of adverse impacts due to increases in traffic and congestion on the A14, are ecological resources within the Orwell Estuary SSSI, and Stour and Orwell Estuaries SPA and Ramsar.

5.1.4. The study area where it is proposed that detailed modelling is undertaken, incorporate the locations highlighted within Ipswich and designated sites, as shown in **Figure 21** (**Appendix A**). The study area was defined based on the analysis of monitoring data available and the ARNs determined through this screening assessment. Monitoring data indicates that the risk of exceedances is greatest in the central area of Ipswich, with the risk diminishing as distance away from the centre of the borough increases. Areas of the borough that have not been included within the study area are considered to be low risk in their future potential to experience exceedances of the AQS.

[17] HM Government, The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy (July 2018). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf

Appendix A

FIGURES

Figures 1 to 23 are provided separately.

Appendix B

IBC NO2 DIFFUSION TUBE MONITORING DATA

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
1	Civic Drive	Kerbside	615992, 244412	No	28	26	24	27	26	24
2	Chevallier Street	Kerbside	615144, 245245	Yes	**43**	**41**	39	40	**42**	39
3	Coprolite Street / Duke Street	Kerbside	617070, 244039	No	29	27	27	26	27	25
4	Berners Street	Kerbside	615929, 244927	No	33	34	32	36	33	30
5	Fore Street	Kerbside	616887, 244128	Yes	**40**	**42**	**41**	**44**	**42**	39
6	Kings Avenue	Urban Background	617286, 244420	No	16	16	17	18	17	16
7	Bramford Road	Kerbside	615007, 245239	No	32	33	30	32	31	29
8	Bramford Road	Kerbside	615125, 245209	No	33	34	35	35	34	31
9	Bramford Road	Kerbside	615125, 245209	No	33	34	35	35	34	31

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
10	Bramford Road	Kerbside	615125, 245209	No	33	34	34	35	34	31
11	St Margaret's Street / Piper's Court	Kerbside	616593, 244753	Yes	**44**	**47**	**45**	**50**	**48**	**44**
12	St Margaret's Street / Piper's Court	Kerbside	616593, 244753	Yes	**43**	**49**	**47**	**50**	**48**	**44**
13	Bramford Lane	Kerbside	615117, 245305	No	35	22	24	25	24	22
14	Chevallier Street	Kerbside	615285, 245393	Yes	**47**	**48**	**47**	**45**	**45**	**41**
15	Tavern Street	Urban Background	616282, 244643	No	25	24	23	24	26	24
16	Valley Road / Westwood Court	Kerbside	615362, 245437	No	33	36	35	37	35	32
17	Woodbridge Road	Kerbside	616993, 244659	No	**47**	**43**	**42**	**46**	**46**	**42**
18	Yarmouth Road	Kerbside	615095, 245175	No	30	29	28	27	28	26

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
19	St Margaret's Street / Piper's Court	Kerbside	616593, 244753	Yes	**41**	**48**	**45**	**50**	**48**	**44**
20	Fonnereau Road	Kerbside	616458, 244829	No	33	33	29	34	33	30
21	St Margaret's Plain	Kerbside	616494, 244807	Yes	36	37	36	37	38	34
22	St Margaret's Plain / Northgate Street	Kerbside	616489, 244785	Yes	38	38	36	36	39	35
23	St Margaret's Green	Kerbside	616645, 244784	No	23	23	21	23	21	20
24	St Margaret's Street	Kerbside	616663, 244692	Yes	**42**	**40**	38	37	**40**	37
25	St Helen's Street	Kerbside	616753, 244582	Yes	**41**	**40**	36	38	39	36
26	St Helen's Street / Grimwade Street	Kerbside	616971, 244511	No	32	31	30	32	36	33
27	Argyle Street	Kerbside	616965, 244546	Yes	37	35	39	**42**	**43**	39

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
28	Chevallier Street	Kerbside	615194, 245292	Yes	35	37	36	36	38	35
29	Fore Hamlet	Kerbside	617118, 244074	No	30	31	32	33	32	29
30	Fore Street	Kerbside	616939, 244114	No	29	**47**	**46**	**51**	**49**	**45**
31	Star Lane	Kerbside	616332, 244149	No	32	34	36	**43*** **	**45*** **	**42*** **
32	Spring Road	Kerbside	617398, 244573	No	31	32	30	34	31	29
33	Key Street	Kerbside	616666, 244114	Yes	33	33	33	33	34	31
34	College Street	Kerbside	616467, 244072	Yes	**42**	38	37	**40**	39	35
35	Cobden Place	Kerbside	616746, 244696	No	28	27	24	27	27	25
36	Valley Road	Kerbside	616820, 246158	No	28	30	30	33	31	29

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
37	Lower Brook Street	Kerbside	616483, 244165	No	24	25	24	25	25	23
38	Civic Drive	Kerbside	615904, 244805	No	35	33	33	34	35	32
39	Star Lane / Fore Star	Kerbside	616731, 244245	Yes	39	**42**	**41**	**43**	**43**	39
40	Norwich Road	Kerbside	615460, 245148	No	27	27	27	31	30	27
41	Bramford Road / Norwich Road	Kerbside	615564, 245010	No	37	37	34	35	37	34
42	Norwich Road	Kerbside	615744, 244901	Yes	34	34	**41**	33	38	35
43	Bramford Road / Yarmouth Road	Kerbside	615109, 245200	Yes	37	**40**	37	39	38	35
44	Bramford Road	Kerbside	615052, 245237	No	37	37	37	38	38	34
45	Chevallier Street	Kerbside	615261, 245350	Yes	30	29	27	27	28	25

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
46	Chevallier Street	Kerbside	615261, 245350	Yes	29	28	27	27	28	25
47	Chevallier Street	Kerbside	615261, 245350	Yes	29	28	28	27	28	25
48	Valley Road	Kerbside	615425, 245486	No	27	27	27	29	27	24
49	St Matthew's Street	Kerbside	615792, 244876	Yes	**42**	**42**	**41**	**41**	**46**	**42**
50	Barrack Lane	Kerbside	615773, 244890	Yes	25	28	26	28	27	25
51	St Matthew's Street	Kerbside	615769, 244866	Yes	36	38	38	37	**42**	38
52	St Matthew's Street	Kerbside	615826, 244871	Yes	**45**	**47**	**47**	**47**	**46**	**43**
53	St Matthew's Street	Kerbside	615820, 244858	Yes	**49**	**46**	**45**	**42**	**46**	**42**
54	St Matthew's Street Roundabout	Kerbside	615893, 244855	No	31	31	31	36	37	34

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
55	Berners Street	Kerbside	615917, 244898	No	30	31	29	28	29	26
56	Berners Street	Kerbside	615931, 244911	No	27	28	29	29	29	27
57	Berners Street	Kerbside	615941, 244981	No	25	26	25	27	25	23
58	Berners Street	Kerbside	615978, 245042	No	25	27	23	25	25	23
59	St Matthew's Street Roundabout	Kerbside	615926, 244837	No	32	34	32	33	32	29
60	Colchester Road	Kerbside	617438, 246168	No	36	34	36	31	29	27
61	Valley Road	Kerbside	616099, 246105	No	33	34	36	**42**	**40**	37
62	St Matthew's Street	Kerbside	615935, 244803	No	38	38	33	37	36	33
63	St Matthew's Street	Kerbside	615950, 244790	No	37	38	35	37	36	33

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
64	Norwich Road	Kerbside	615688, 244939	Yes	**52**	**55**	**50**	**56**	**55**	**49**
65	Norwich Road	Kerbside	615688, 244939	Yes	**51**	**51**	**51**	**56**	**55**	**49**
66	Woodbridge Road	Kerbside	616807, 244669	Yes	38	38	35	**40**	**42**	38
67	Blanche Street	Kerbside	616890, 244676	No	30	27	26	26	28	26
68	Woodbridge Road	Kerbside	616905, 244657	Yes	**46**	**43**	**41**	**45**	**44**	**41**
69	Argyle Street	Kerbside	616978, 244590	No	27	26	26	26	27	25
70	Argyle Street	Kerbside	616965, 244583	No	33	33	33	36	38	35
71	St Helen's Street	Kerbside	617032, 244537	No	24	27	24	24	25	23
72	St Helen's Street	Kerbside	617123, 244535	Yes	38	36	36	38	38	35

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
73	Regent Street	Kerbside	617124, 244517	No	22	23	23	23	23	21
74	Grimwade Street	Kerbside	616953, 244443	No	26	27	26	27	27	24
75	Grimwade Street	Kerbside	616932, 244362	No	23	25	25	25	26	24
76	St Helen's Street	Kerbside	616951, 244521	Yes	37	37	34	36	37	33
77	St Helen's Street	Kerbside	616902, 244542	No	27	28	28	28	29	26
78	Orchard Street	Kerbside	616870, 244586	No	23	24	25	25	24	22
79	Woodbridge Road	Kerbside	617052, 244677	No	23	30	37	36	36	33
80	St Helen's Street	Kerbside	616821, 244546	Yes	34	35	32	36	38	34
81	St Helen's Street	Kerbside	616821, 244546	Yes	35	35	33	36	38	34

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
82	St Helen's Street	Kerbside	616821, 244546	Yes	36	35	33	36	38	34
83	Bond Street	Kerbside	616792, 244498	No	31	30	27	29	31	29
84	Carr Street / Major's Corner	Kerbside	616702, 244601	No	27	26	24	25	26	24
85	Old Foundry Road	Kerbside	616681, 244623	No	32	32	29	31	32	29
SP1	Belstead Road o/s No. 14	Kerbside	616029, 243694	No	-	-	-	36	-	-
SP2	Belstead Road o/s No. 47 (TP DP1127)	Kerbside	615925, 243619	No	-	-	-	38	-	-
SP3	Burrell Road o/s No. 62	Kerbside	616150, 243834	No	-	-	-	28	-	-
SP4	Vernon Street by Old Bell Inn	Kerbside	616372, 243868	No	-	-	-	31	-	-
SP5	Vernon Street by Co Op Store	Kerbside	616471, 243679	No	-	-	-	**45**	-	-

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
SP6	Hawes St junc Purplett St	Kerbside	616593, 243568	No	-	-	-	28	-	-
SP7	Hawes Street junc Station St	Kerbside	616572, 243469	No	-	-	-	28	-	-
SP8	Station Street o/s No. 66	Kerbside	616454, 243433	No	-	-	-	28	-	-
SP9	Hawes St junc Wherstead Rd	Kerbside	616487, 243259	No	-	-	-	27	-	-
SP10	Wherstead Road o/s No. 208	Kerbside	616379, 243152	No	-	-	-	30	-	-
SP11	Wherstead Road o/s No. 221 (LP N928 - Orwell View)	Kerbside	616147, 242101	No	-	-	-	32	-	-
SP12	Wherstead Road o/s No. 545 (LP N91 - new block of flats)	Kerbside	616160, 242204	No	-	-	-	24	-	-
SP13	Wherstead Road o/s No. 568a (TP DP1395)	Kerbside	616176, 242223	No	-	-	-	33	-	-

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
SP14	Wherstead Road o/s No. 522 (TP DP1392)	Kerbside	616317, 242883	No	-	-	-	24	-	-
SP15	Duke St in layby o/s shop 9	Kerbside	617153, 243847	No	-	-	-	29	-	-
SP16	Cliff Lane o/s Primary School	Kerbside	617476, 243199	No	-	-	-	22	-	-
SP17	Cliff Lane entrance Holywells	Kerbside	617227, 243223	No	-	-	-	21	-	-
SP18	Landseer Road opp V-Pack	Kerbside	617185, 243068	No	-	-	-	26	-	-
SP19	Landseer Road o/s No. 348	Kerbside	618285, 242280	No	-	-	-	29	-	-
SP20	Nacton Road o/s No. 471	Kerbside	618989, 242308	No	-	-	-	31	-	-
SP21	Landseer Rd/Nacton Rd	Kerbside	618792, 242479	No	-	-	-	29	-	-
SP22	Nacton Road opposite No. 270	Kerbside	618497, 242888	No	-	-	-	27	-	-

Site ID	Site Name	Site Type	X, Y	Within AQMA?	Annual Mean NO_2 Concentrations ($\mu g/m^3$)					
					2014	2015	2016	2017	2018 (with Local Bias Adjustment Factor)*	2018 (with National Bias Adjustment Factor)**
SP23	Felixstowe Road o/s No. 391	Kerbside	618842, 243286	No	-	-	-	24	-	-
SP24	Felixstowe Road o/s No. 13	Kerbside	617725, 243754	No	-	-	-	36	-	-
SP25	Bishops Hill/Myrtle Road	Kerbside	617406, 243885	No	-	-	-	**44**	-	-
SP26	Cliff Road o/s No. 2A	Kerbside	617112, 243355	No	-	-	-	23	-	-

N/A indicates that monitoring data was not available.

* Concentration adjusted using a local bias adjustment factor of 0.83 derived by IBC.

** Concentration adjusted using a national bias adjustment factor of 0.76 published by Defra.

*** Site 31 was not classed as an exceedance by IBC as there is no relevant receptor in its vicinity.

- indicates that the monitoring site was not operation (either before commissioning or after de-commissioning).

Bold text indicates an exceedance of the annual mean NO_2 AQS of $40\mu g/m^3$.

Data from IBC were obtained from the 2019 Annual Status Report and directly from the IBC.

Appendix C

LONG-TERM TRENDS: ANNUAL MEAN NO2

The table below summarises the statistical analysis for each IBC diffusion tube site. A negative 'S value' and 'Sen's slope' (of the best fit line) indicates a downward trend but a positive value indicates an upward trend. If the absolute 'S value' is equal to or greater than the 'required S value' then there is a statistically significant downward or upward trend.

The figures below the table show the trends in annual mean NO_2 concentrations at sites where there is a significant trend. CMS site IPS3 has been excluded as there were not enough data points. The vertical axis indicates annual mean concentration ($\mu g/m^3$) and confidence intervals for data are only plotted where there are ten or more data points available (there are insufficient data points to do this). The linear trend is shown in each graph as a solid black line and residual concentrations are illustrated as a solid, light blue line.

Site ID	Site Type	Number of Data Points	Required S Value	National Bias Adjustment Factor			Local Bias Adjustment Factor		
				S value	Sen's Slope	Statistically Significant?	S value	Sen's Slope	Statistically Significant?
1	Kerbside	5	≥8	-5	-0.833	No (apparent downward)	-4	-0.437	No (apparent downward)
2	Kerbside	5	≥8	-7	-1.000	No (apparent downward)	-2	-0.360	No (apparent downward)
3	Kerbside	5	≥8	-9	-1.000	**Yes (downward)**	-7	-0.507	No (apparent downward)
4	Kerbside	5	≥8	-2	-0.625	No (apparent downward)	2	0.315	No (apparent upward)
5	Kerbside	5	≥8	0	0.125	No (apparent upward)	6	0.542	No (apparent upward)
6	Urban Background	5	≥8	3	0.250	No (apparent upward)	7	0.438	No (apparent upward)
7	Kerbside	5	≥8	-5	-0.625	No (apparent downward)	-3	-0.359	No (apparent downward)
8	Kerbside	5	≥8	1	0.250	No (apparent upward)	3	0.324	No (apparent upward)
9	Kerbside	5	≥8	1	0.250	No (apparent upward)	3	0.324	No (apparent upward)

Site ID	Site Type	Number of Data Points	Required S Value	National Bias Adjustment Factor			Local Bias Adjustment Factor		
				S value	Sen's Slope	Statistically Significant?	S value	Sen's Slope	Statistically Significant?
10	Kerbside	5	≥8	1	0.250	No (apparent upward)	3	0.324	No (apparent upward)
11	Kerbside	5	≥8	1	0.250	No (apparent upward)	6	1.268	No (apparent upward)
12	Kerbside	5	≥8	2	0.375	No (apparent upward)	4	0.928	No (apparent upward)
13	Kerbside	5	≥8	-3	-2.000	No (apparent downward)	0	-0.385	No (apparent downward)
14	Kerbside	5	≥8	-7	-1.500	No (apparent downward)	-7	-0.833	No (apparent downward)
15	Urban Background	5	≥8	-3	-0.125	No (apparent downward)	1	0.179	No (apparent upward)
16	Kerbside	5	≥8	0	0.125	No (apparent upward)	4	0.540	No (apparent upward)
17	Kerbside	5	≥8	-5	-0.667	No (apparent downward)	0	-0.037	No (apparent downward)
18	Kerbside	5	≥8	-10	-1.000	**Yes (downward)**	-6	-1.000	No (apparent downward)
19	Kerbside	5	≥8	2	0.875	No (apparent upward)	6	1.678	No (apparent upward)
20	Kerbside	5	≥8	-1	-0.375	No (apparent downward)	-1	-0.060	No (apparent downward)
21	Kerbside	5	≥8	-2	-0.250	No (apparent downward)	6	0.362	No (apparent upward)
22	Kerbside	5	≥8	-8	-0.875	**Yes (downward)**	0	0.000	No significant trend
23	Kerbside	5	≥8	-5	-0.625	No (apparent downward)	-3	-0.216	No (apparent downward)
24	Kerbside	5	≥8	-9	-1.375	**Yes (downward)**	-4	-1.250	No (apparent downward)

Site ID	Site Type	Number of Data Points	Required S Value	National Bias Adjustment Factor			Local Bias Adjustment Factor		
				S value	Sen's Slope	Statistically Significant?	S value	Sen's Slope	Statistically Significant?
25	Kerbside	5	≥8	-7	-1.125	No (apparent downward)	-4	-0.725	No (apparent downward)
26	Kerbside	5	≥8	3	0.375	No (apparent upward)	3	0.750	No (apparent upward)
27	Kerbside	5	≥8	5	1.167	No (apparent upward)	8	1.833	**Yes (upward)**
28	Kerbside	5	≥8	-2	-0.250	No (apparent downward)	5	0.462	No (apparent upward)
29	Kerbside	5	≥8	2	1.000	No (apparent upward)	8	1.000	**Yes (upward)**
30	Kerbside	5	≥8	2	3.000	No (apparent upward)	6	3.461	No (apparent upward)
31	Kerbside	5	≥8	8	2.583	Yes (upward)	10	3.494	**Yes (upward)**
32	Kerbside	5	≥8	-2	-0.500	No (apparent downward)	2	0.385	No (apparent upward)
33	Kerbside	5	≥8	-4	0.000	No significant trend	4	0.000	No significant trend
34	Kerbside	5	≥8	-6	-1.000	No (apparent downward)	-2	-0.753	No (apparent downward)
35	Kerbside	5	≥8	-5	-0.708	No (apparent downward)	-5	-0.240	No (apparent downward)
36	Kerbside	5	≥8	3	0.625	No (apparent upward)	7	0.911	No (apparent upward)
37	Kerbside	5	≥8	-2	-0.125	No (apparent downward)	6	0.140	No (apparent upward)

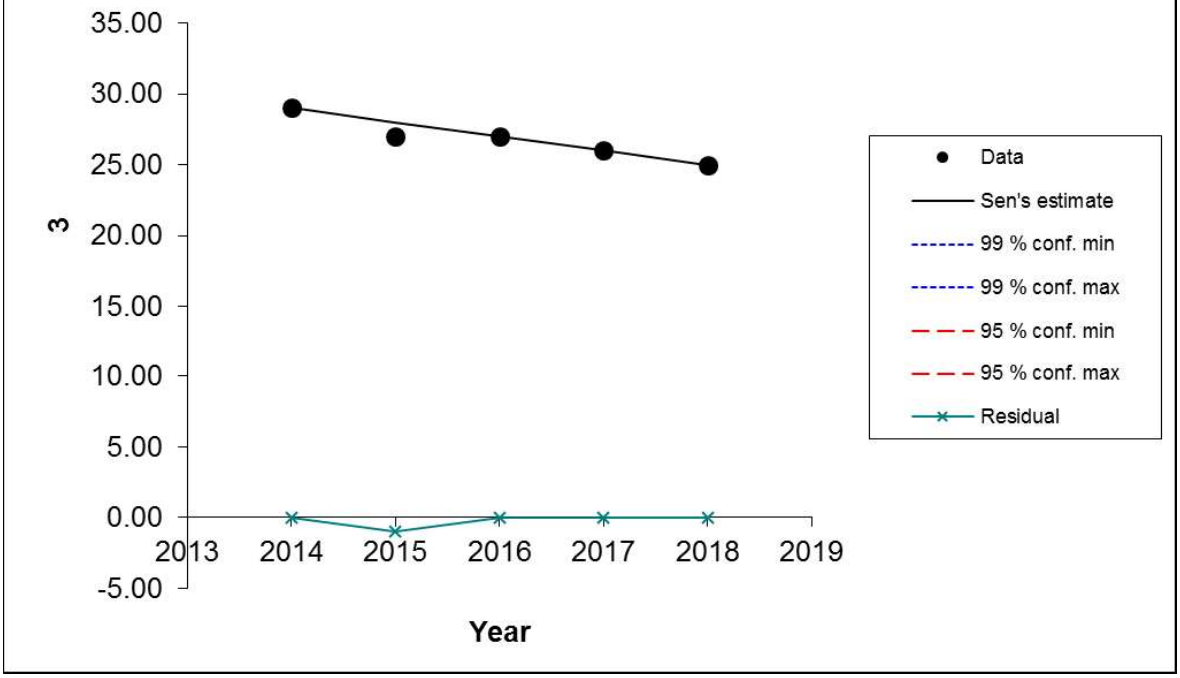
Site ID	Site Type	Number of Data Points	Required S Value	National Bias Adjustment Factor			Local Bias Adjustment Factor		
				S value	Sen's Slope	Statistically Significant?	S value	Sen's Slope	Statistically Significant?
38	Kerbside	5	≥8	-5	-0.417	No (apparent downward)	3	0.270	No (apparent upward)
39	Kerbside	5	≥8	1	0.250	No (apparent upward)	6	0.855	No (apparent upward)
40	Kerbside	5	≥8	7	2.000	No (apparent upward)	5	0.834	No (apparent upward)
41	Kerbside	5	≥8	-6	-0.875	No (apparent downward)	1	0.001	No (apparent upward)
42	Kerbside	5	≥8	1	0.125	No (apparent upward)	1	0.522	No (apparent upward)
43	Kerbside	5	≥8	-3	-0.500	No (apparent downward)	1	0.152	No (apparent upward)
44	Kerbside	5	≥8	-1	0.000	No significant trend	5	0.161	No (apparent upward)
45	Kerbside	5	≥8	-9	-1.125	**Yes (downward)**	-5	-0.716	No (apparent downward)
46	Kerbside	5	≥8	-9	-1.000	**Yes (downward)**	-3	-0.341	No (apparent downward)
47	Kerbside	5	≥8	-9	-1.000	**Yes (downward)**	-3	-0.341	No (apparent downward)
48	Kerbside	5	≥8	-1	0.000	No significant trend	-1	0.000	No significant trend
49	Kerbside	5	≥8	-2	0.000	No significant trend	0	0.000	No significant trend
50	Kerbside	5	≥8	0	0.000	No significant trend	3	0.423	No (apparent upward)

Site ID	Site Type	Number of Data Points	Required S Value	National Bias Adjustment Factor			Local Bias Adjustment Factor		
				S value	Sen's Slope	Statistically Significant?	S value	Sen's Slope	Statistically Significant?
51	Kerbside	5	≥8	3	0.167	No (apparent upward)	5	1.119	No (apparent upward)
52	Kerbside	5	≥8	-1	0.000	No significant trend	1	0.000	No significant trend
53	Kerbside	5	≥8	-9	-1.875	**Yes (downward)**	-6	-1.500	No (apparent downward)
54	Kerbside	5	≥8	5	0.875	No (apparent upward)	7	1.584	No (apparent upward)
55	Kerbside	5	≥8	-8	-1.250	**Yes (downward)**	-6	-0.583	No (apparent downward)
56	Kerbside	5	≥8	2	0.250	No (apparent upward)	9	0.549	**Yes (upward)**
57	Kerbside	5	≥8	-1	-0.250	No (apparent downward)	-1	-0.044	No (apparent downward)
58	Kerbside	5	≥8	-4	-0.750	No (apparent downward)	1	0.045	No (apparent upward)
59	Kerbside	5	≥8	-3	-0.625	No (apparent downward)	1	0.008	No (apparent upward)
60	Kerbside	5	≥8	-7	-2.125	No (apparent downward)	-7	-1.728	No (apparent downward)
61	Kerbside	5	≥8	8	1.250	**Yes (upward)**	8	1.989	**Yes (upward)**
62	Kerbside	5	≥8	-6	-0.875	No (apparent downward)	-5	-0.489	No (apparent downward)
63	Kerbside	5	≥8	-5	-1.000	No (apparent downward)	-3	-0.360	No (apparent downward)

Site ID	Site Type	Number of Data Points	Required S Value	National Bias Adjustment Factor			Local Bias Adjustment Factor		
				S value	Sen's Slope	Statistically Significant?	S value	Sen's Slope	Statistically Significant?
64	Kerbside	5	≥8	-2	-0.625	No (apparent downward)	2	0.569	No (apparent upward)
65	Kerbside	5	≥8	-1	0.000	No significant trend	5	1.035	No (apparent upward)
66	Kerbside	5	≥8	1	0.000	No significant trend	5	0.958	No (apparent upward)
67	Kerbside	5	≥8	-7	-0.750	No (apparent downward)	-3	-0.459	No (apparent downward)
68	Kerbside	5	≥8	-5	-0.958	No (apparent downward)	-2	-0.392	No (apparent downward)
69	Kerbside	5	≥8	-7	-0.417	No (apparent downward)	-1	0.000	No significant trend
70	Kerbside	5	≥8	5	0.583	No (apparent upward)	7	1.359	No (apparent upward)
71	Kerbside	5	≥8	-5	-0.375	No (apparent downward)	1	0.000	No significant trend
72	Kerbside	5	≥8	-4	-0.417	No (apparent downward)	4	0.013	No (apparent upward)
73	Kerbside	5	≥8	-1	0.000	No significant trend	1	0.000	No significant trend
74	Kerbside	5	≥8	-2	-0.250	No (apparent downward)	4	0.125	No (apparent upward)
75	Kerbside	5	≥8	1	0.000	No significant trend	7	0.490	No (apparent upward)
76	Kerbside	5	≥8	-7	-0.750	No (apparent downward)	-1	0.000	No significant trend

Site ID	Site Type	Number of Data Points	Required S Value	National Bias Adjustment Factor			Local Bias Adjustment Factor		
				S value	Sen's Slope	Statistically Significant?	S value	Sen's Slope	Statistically Significant?
77	Kerbside	5	≥8	-1	0.000	No significant trend	7	0.417	No (apparent upward)
78	Kerbside	5	≥8	1	0.250	No (apparent upward)	5	0.412	No (apparent upward)
79	Kerbside	5	≥8	4	2.750	No (apparent upward)	4	3.100	No (apparent upward)
80	Kerbside	5	≥8	1	0.250	No (apparent upward)	6	1.031	No (apparent upward)
81	Kerbside	5	≥8	-1	-0.125	No (apparent downward)	6	1.031	No (apparent upward)
82	Kerbside	5	≥8	-3	-0.417	No (apparent downward)	3	0.531	No (apparent upward)
83	Kerbside	5	≥8	-5	-0.500	No (apparent downward)	0	-0.226	No (apparent downward)
84	Kerbside	5	≥8	-7	-0.708	No (apparent downward)	-2	-0.340	No (apparent downward)
85	Kerbside	5	≥8	-6	-0.625	No (apparent downward)	-3	-0.048	No (apparent downward)

Site 3 - Mann-Kendall Test and Sen's Estimate of Annual Mean NO_2 Trend

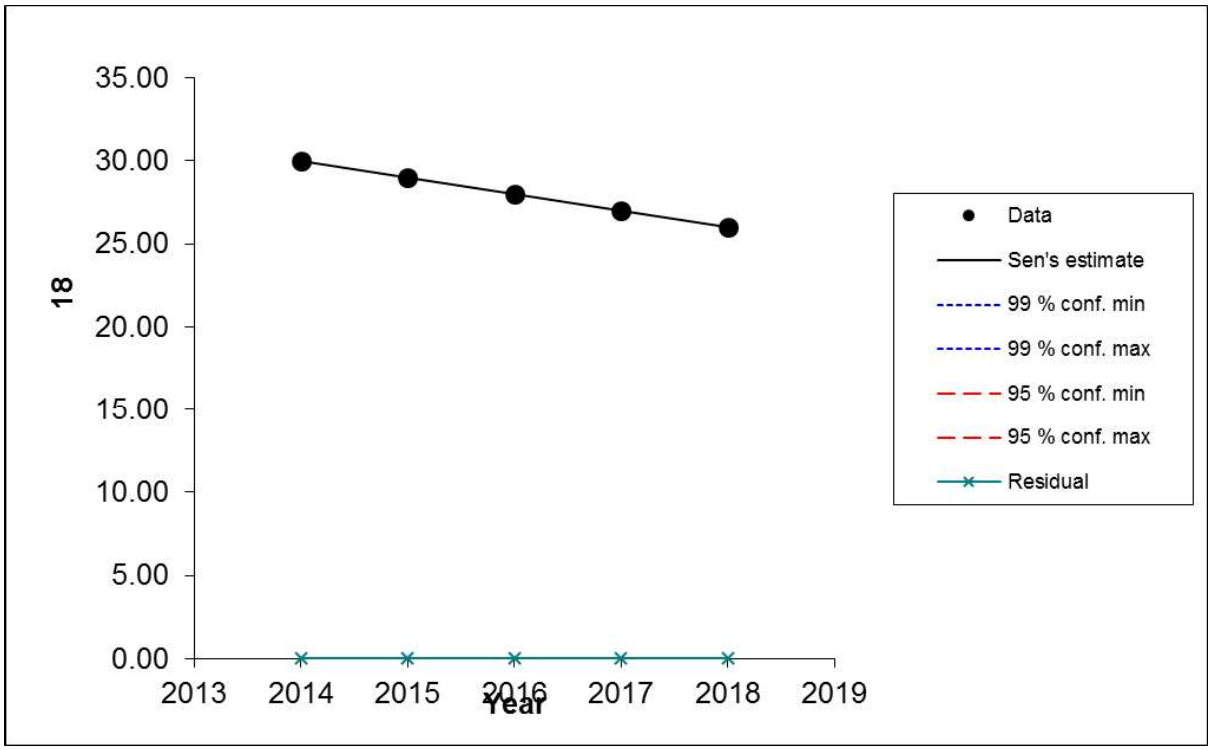


*Note: Y axis represents annual mean NO_2 concentrations in µg/m^3.

Diffusion tube Site 3 (Duke Street) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -1.000 which suggests that there was a general decrease in NO_2 concentration of 1µg/m^3 per year over the five-year period. The plot of residual concentrations shows that there was little variation year on year.

The Mann-Kendall test statistic (S) is expressed as a whole number; for Site 3 this is -9. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). For five data points, only S values of eight or more give a reasonably robust indication of a significant monotonic trend. Consequently, there is evidence of a statistically significant monotonic trend for diffusion tube Site 3.

Site 18 - Mann-Kendall Test and Sen's Estimate of Annual Mean NO_2 Trend

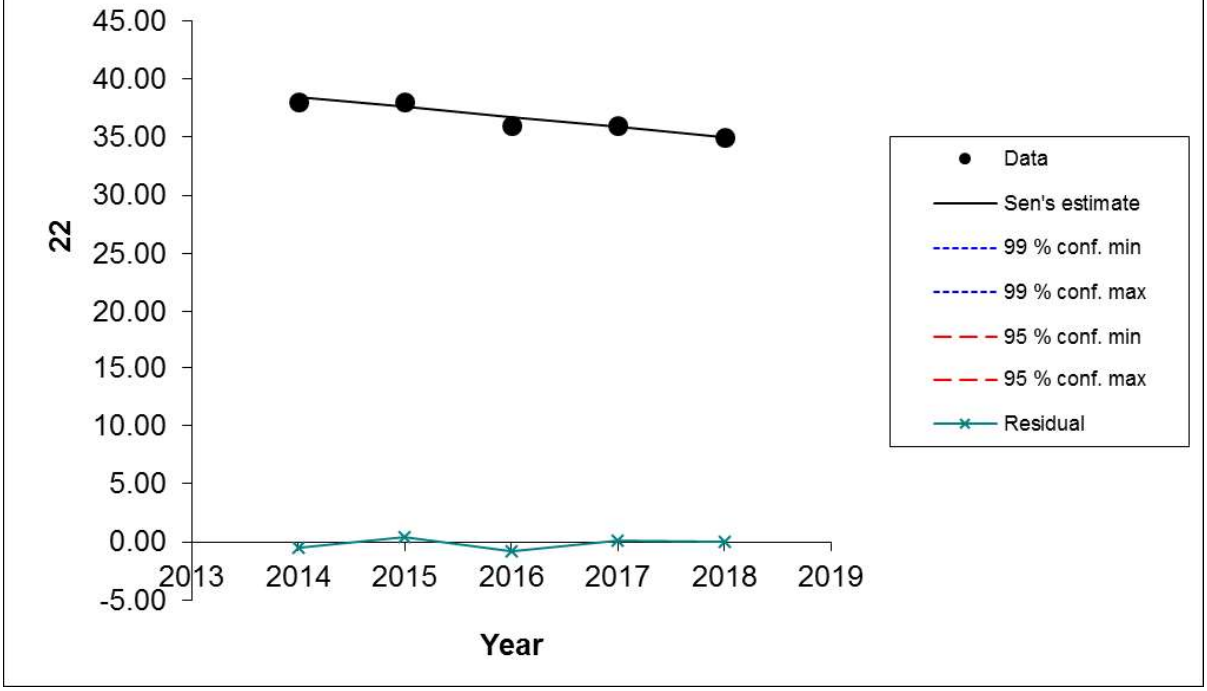


*Note: Y axis represents annual mean NO_2 concentrations in $\mu g/m^3$.

Site 18 (Yarmouth Road) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -1.000 which suggests that there was a general decrease in NO_2 concentration by $1\mu g/m^3$ each year for this time series. The plot of residual concentrations shows that there was little variation year on year.

The Mann-Kendal test statistic (S) is expressed as a whole number; for Site 18 this is -10. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). For five data points, only S values of eight or more give a reasonably robust indication of a significant monotonic trend. Consequently, there is evidence of a statistically significant monitonic trend for Site 18.

Site 22 - Mann-Kendall Test and Sen's Estimate of Annual Mean NO_2 Trend

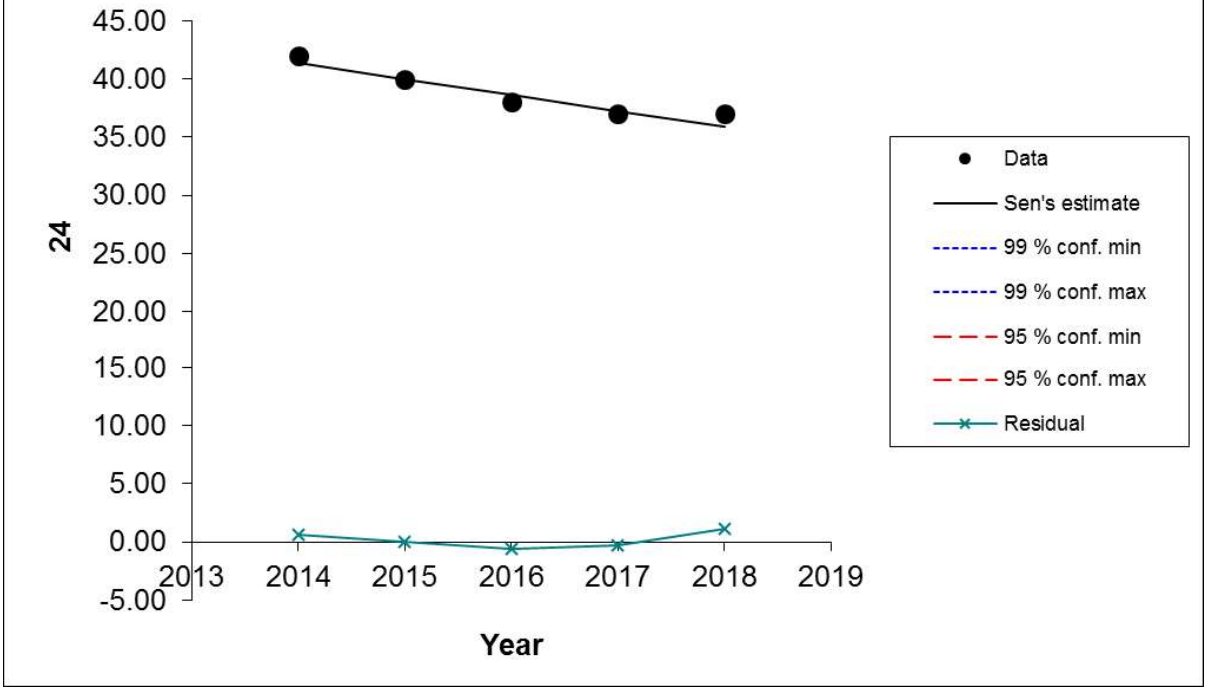


*Note: Y axis represents annual mean NO_2 concentrations in $\mu g/m^3$.

Site 22 (Northgate Street) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -0.875 which suggests that there was a general decrease in NO_2 concentration by $0.875 \mu g/m^3$ each year for this time series. The plot of residual concentrations shows that there was little variation year on year.

The Mann-Kendal test statistic (S) is expressed as a whole number; for Site 22 this is -8. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). Consequently, there is evidence of a statistically significant monitonic trend for Site 22.

Site 24 - Mann-Kendall Test and Sen's Estimate of Annual Mean NO_2 Trend

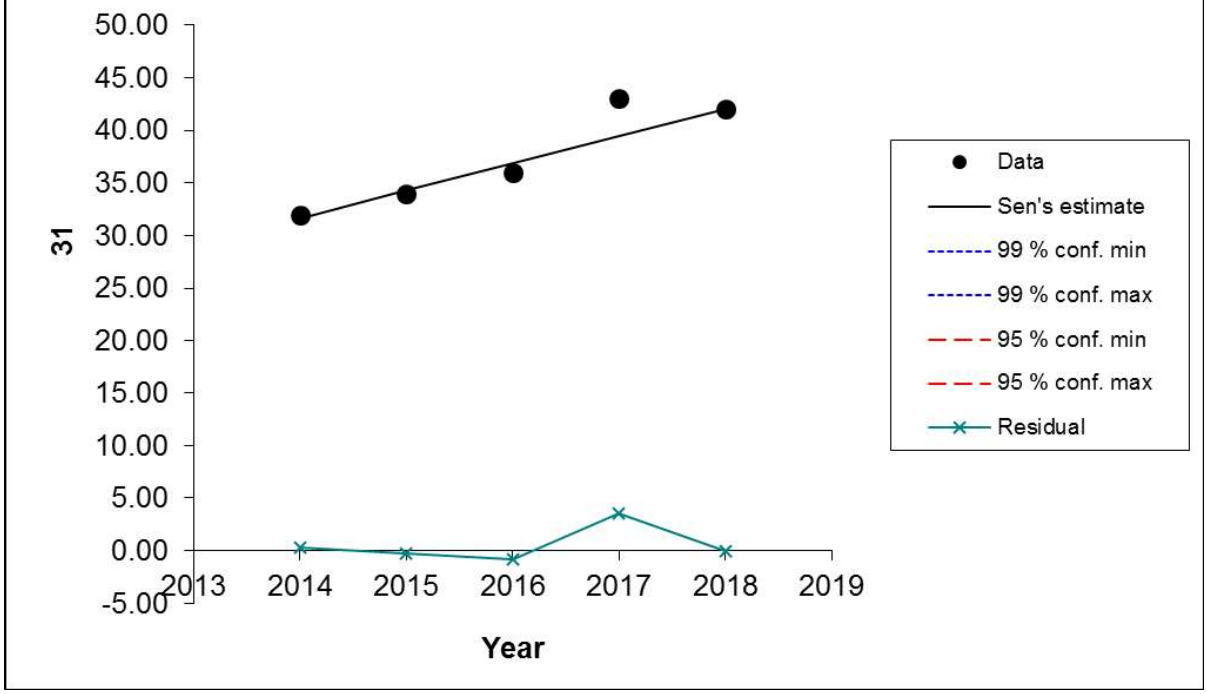


*Note: Y axis represents annual mean NO_2 concentrations in $\mu g/m^3$.

Site 24 (St Margaret's Street) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -1.375 which suggests that there was a general decrease in NO_2 concentration by 1.375$\mu g/m^3$ each year for this time series. The plot of residual concentrations shows that there was little variation year on year.

The Mann-Kendal test statistic (S) is expressed as a whole number; for Site 24 this is -9. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). Consequently, there is evidence of a statistically significant monitonic trend for Site 24.

Site 31 - Mann-Kendall Test and Sen's Estimate of Annual Mean NO_2 Trend

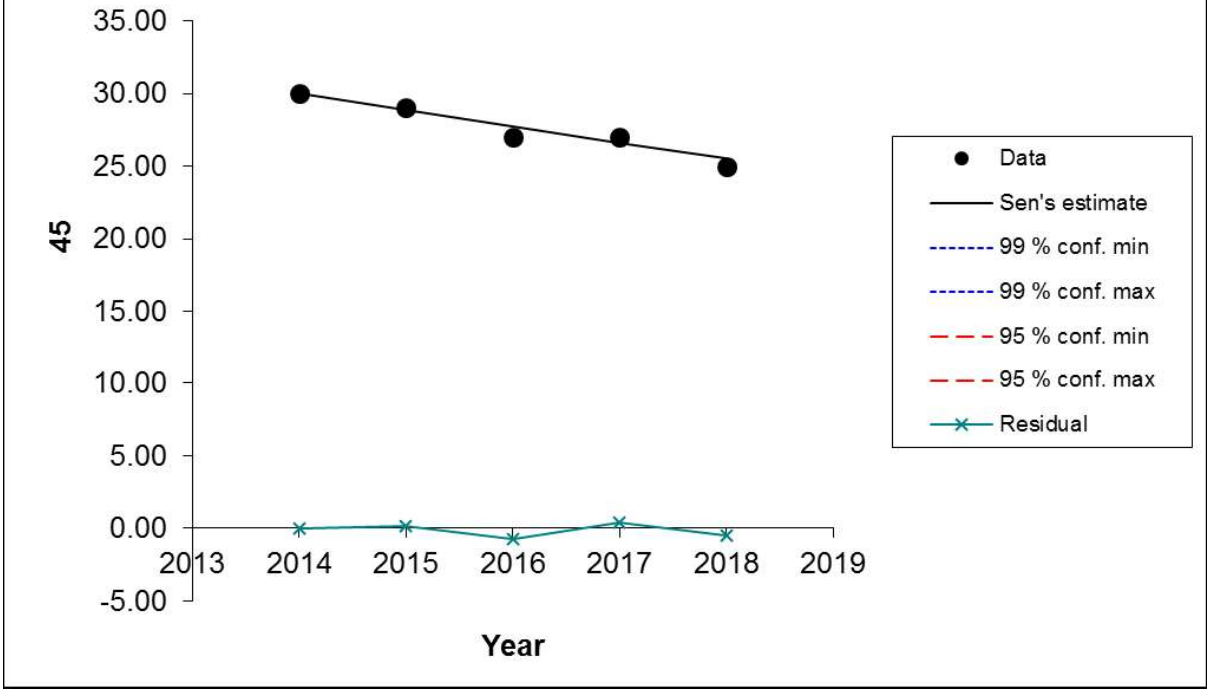


*Note: Y axis represents annual mean NO_2 concentrations in µg/m^3.

Diffusion tube Site 31 (Star Lane) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is 2.583 which suggests that there was a general increase in NO_2 concentration of 2.583µg/m^3 per year over the five-year period. The plot of residual concentrations shows that there was little variation year on year with the exception of in 2017.

The Mann-Kendal test statistic (S) is expressed as a whole number; for Site 31 this is 8. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). Consequently, there is evidence of a statistically significant monotonic trend.

Site 45 - Mann-Kendall Test and Sen's Estimate of Annual Mean NO_2 Trend

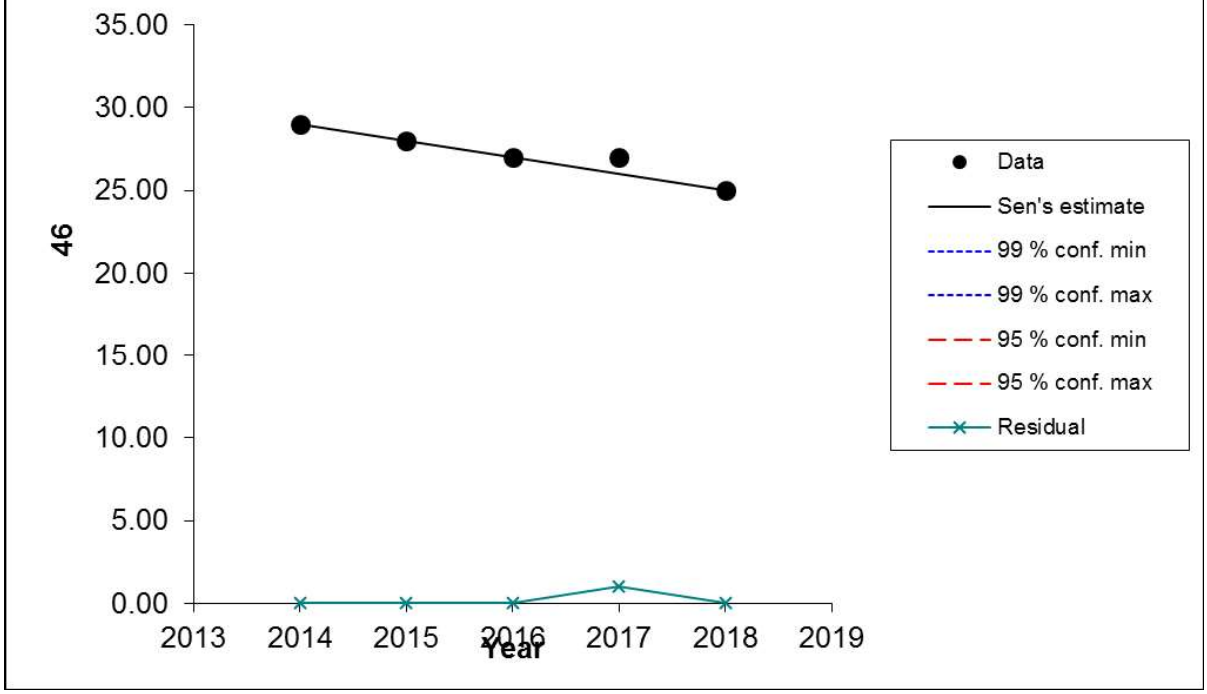


*Note: Y axis represents annual mean NO_2 concentrations in $\mu g/m^3$.

Diffusion tube Site 45 (Chevallier Street) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -1.125 which suggests that there was a general decrease in NO_2 concentration of 1.125$\mu g/m^3$ per year over the five-year period. The plot of residual concentrations shows that there was little variation year on year.

The Mann-Kendal test statistic (S) is expressed as a whole number; for diffusion tube Site 45 this is -9. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). Consequently, there is evidence of a statistically significant monotonic trend.

Site 46 - Mann-Kendall and Sen Estimate of Annual Mean NO_2 Trend

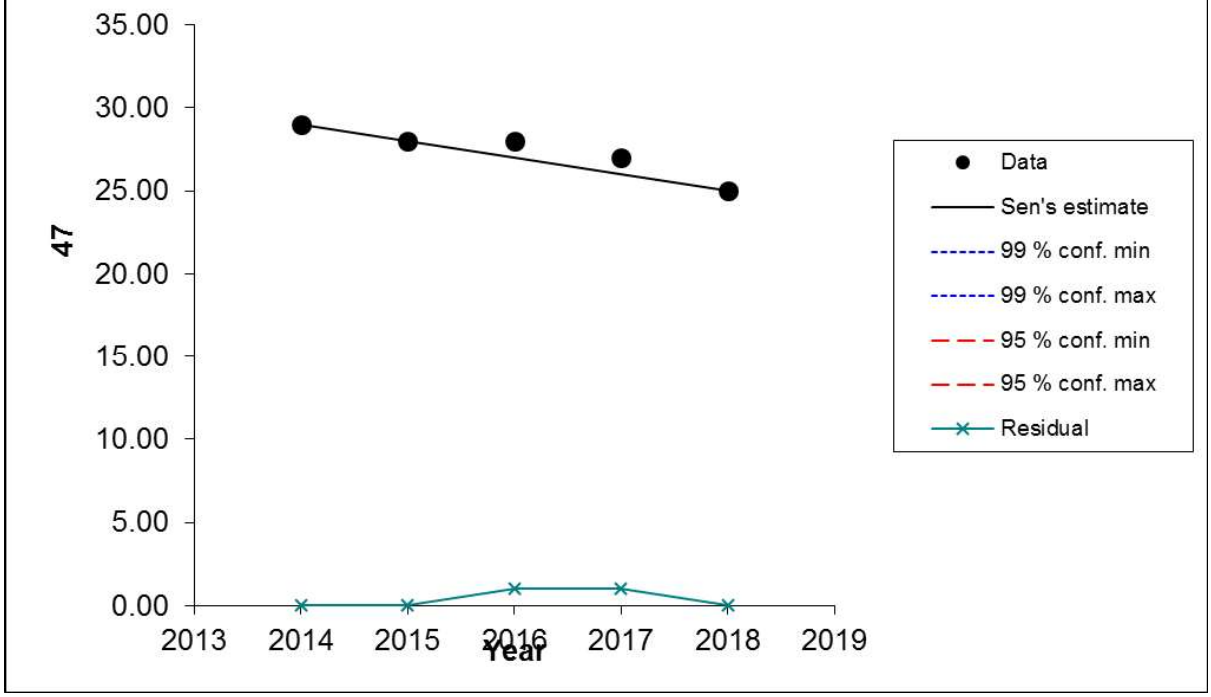


*Note: Y axis represents annual mean NO_2 concentrations in µg/m^3.

Diffusion tube Site 46 (Chevallier Street) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -1.000 which suggests that there was a general decrease in NO_2 concentration of 1µg/m^3 per year over the five-year period. The plot of residual concentrations shows that there was little variation year on year.

The Mann-Kendal test statistic (S) is expressed as a whole number; for Site 46 this is -9. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). Consequently, there is evidence of a statistically significant monotonic trend.

Site 47 - Mann-Kendall and Sen Estimate of Annual Mean NO_2 Trend

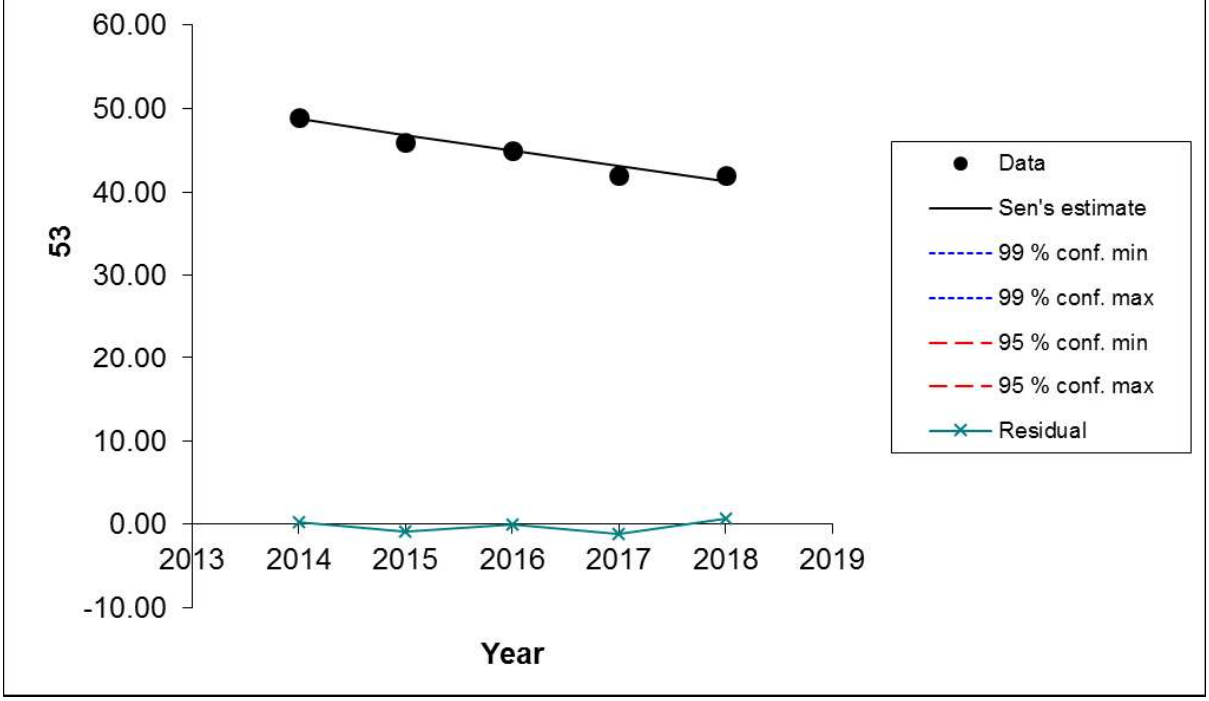


*Note: Y axis represents annual mean NO_2 concentrations in µg/m^3.

Diffusion tube Site 47 (Chevallier Street) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -1.000 which suggests that there was a general decrease in NO_2 concentration of 1µg/m^3 per year over the five-year period. The plot of residual concentrations shows that there was little variation year on year.

The Mann-Kendal test statistic (S) is expressed as a whole number; for Site 47 this is -9. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). Consequently, there is evidence of a statistically significant monotonic trend.

Site 53 - Mann-Kendall and Sen Estimate of Annual Mean NO_2 Trend

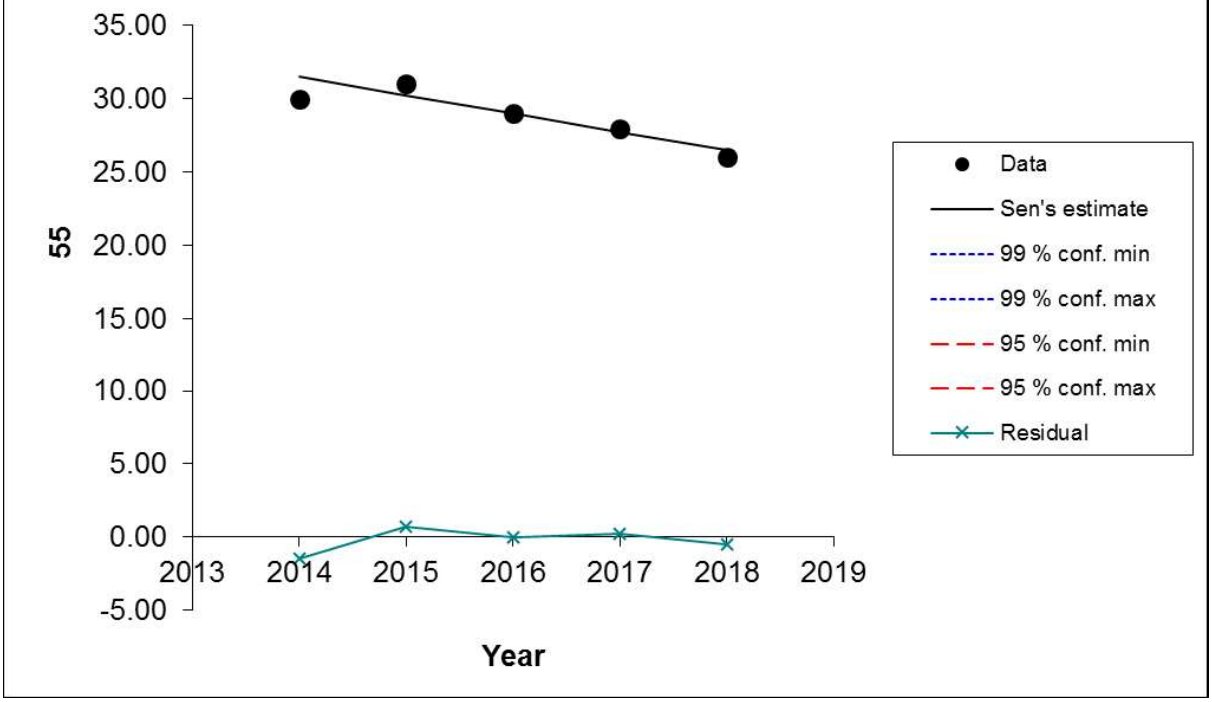


*Note: Y axis represents annual mean NO_2 concentrations in $\mu g/m^3$.

Diffusion tube Site 53 (St Matthew's Street) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -1.875 which suggests that there was a general decrease in NO_2 concentration of $1.875 \mu g/m^3$ per year over the five-year period. The plot of residual concentrations shows that there was little variation year on year.

The Mann-Kendal test statistic (S) is expressed as a whole number; for Site 53 this is -9. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). Consequently, there is evidence of a statistically significant monotonic trend.

Site 55 - Mann-Kendall and Sen Estimate of Annual Mean NO_2 Trend

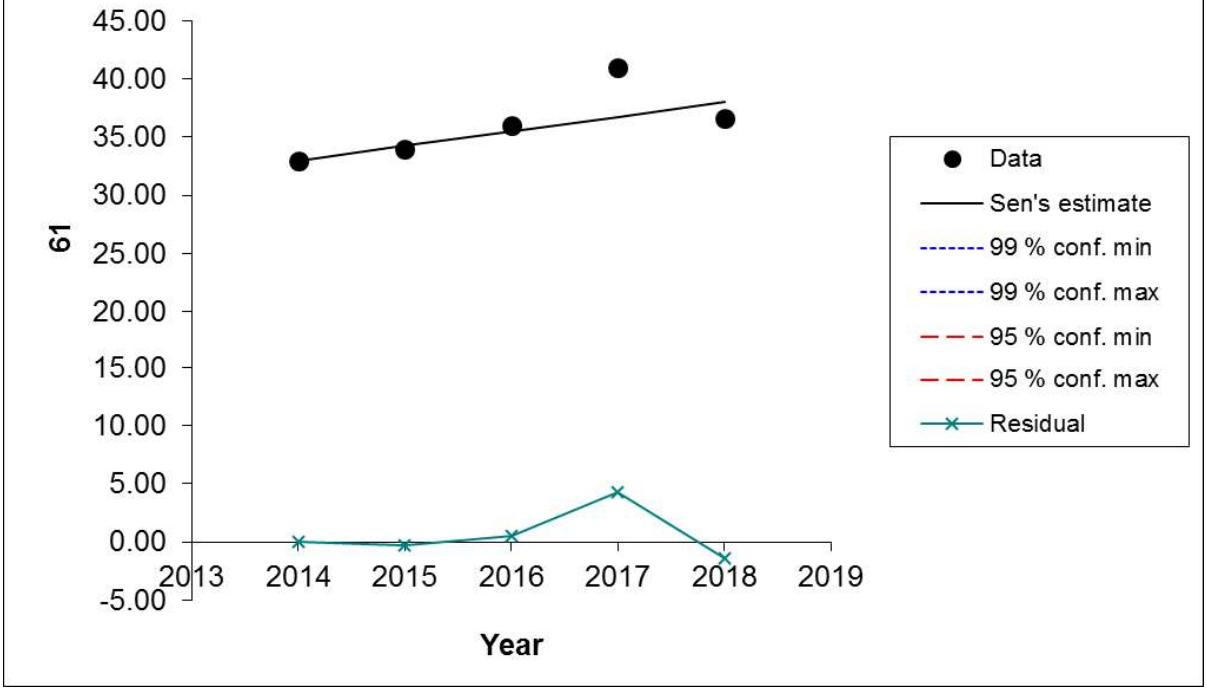


*Note: Y axis represents annual mean NO_2 concentrations in $\mu g/m^3$.

Site 55 (Berners Street) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is -1.250 which suggests that there was a general decrease in NO_2 concentration of $1.25\mu g/m^3$ per year over the five-year period. The plot of residual concentrations shows that there was little variation year on year with the exception of the year 2014.

The Mann-Kendal test statistic (S) is expressed as a whole number, for Site 55 this is -8. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). For five data points, only S values of eight or more give a reasonably robust indication of a significant monotonic trend. Consequently, there is evidence of a statistically significant monotonic trend.

Site 61 - Mann-Kendall and Sen Estimate of Annual Mean NO_2 Trend



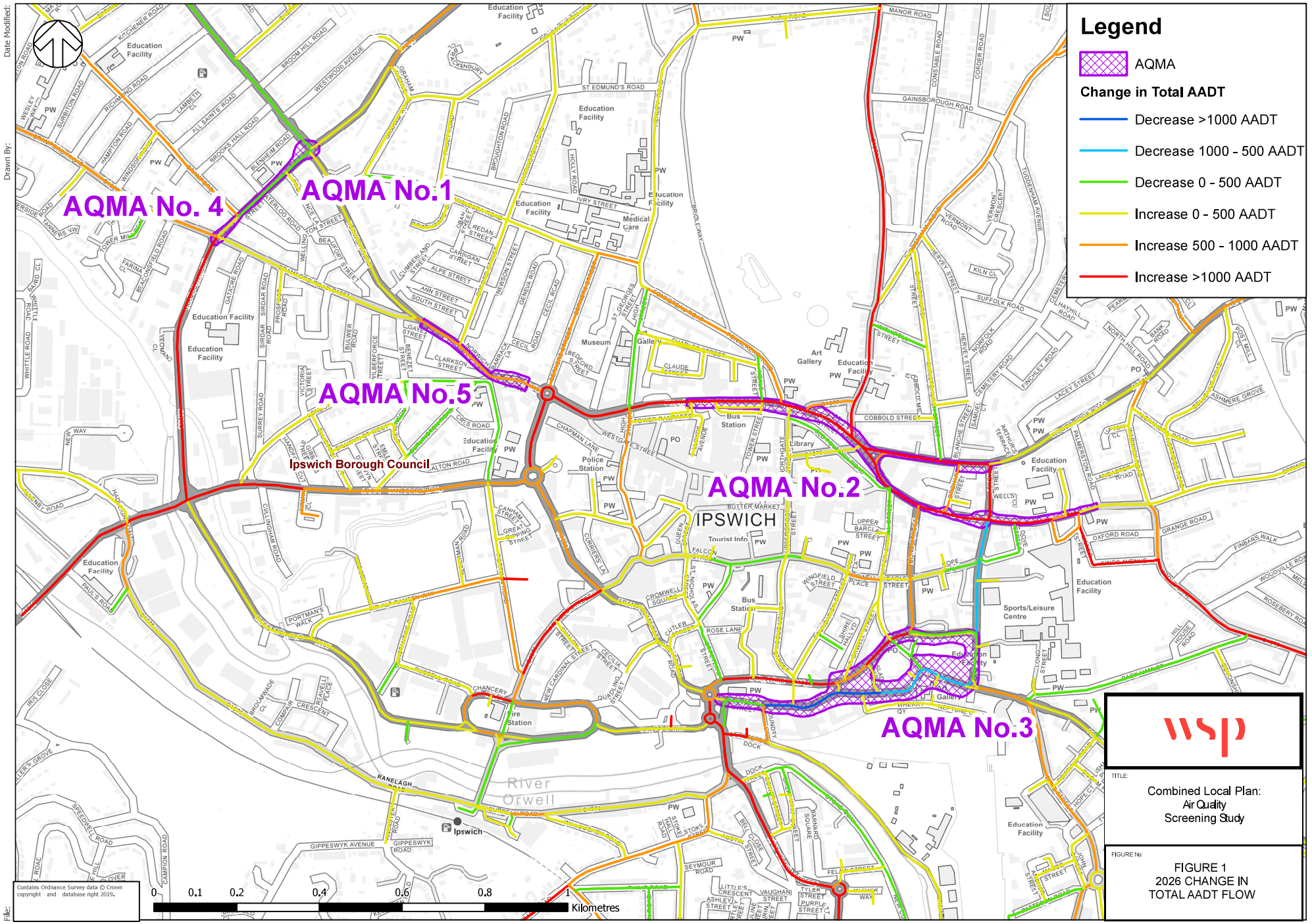
*Note: Y axis represents annual mean NO_2 concentrations in µg/m^3.

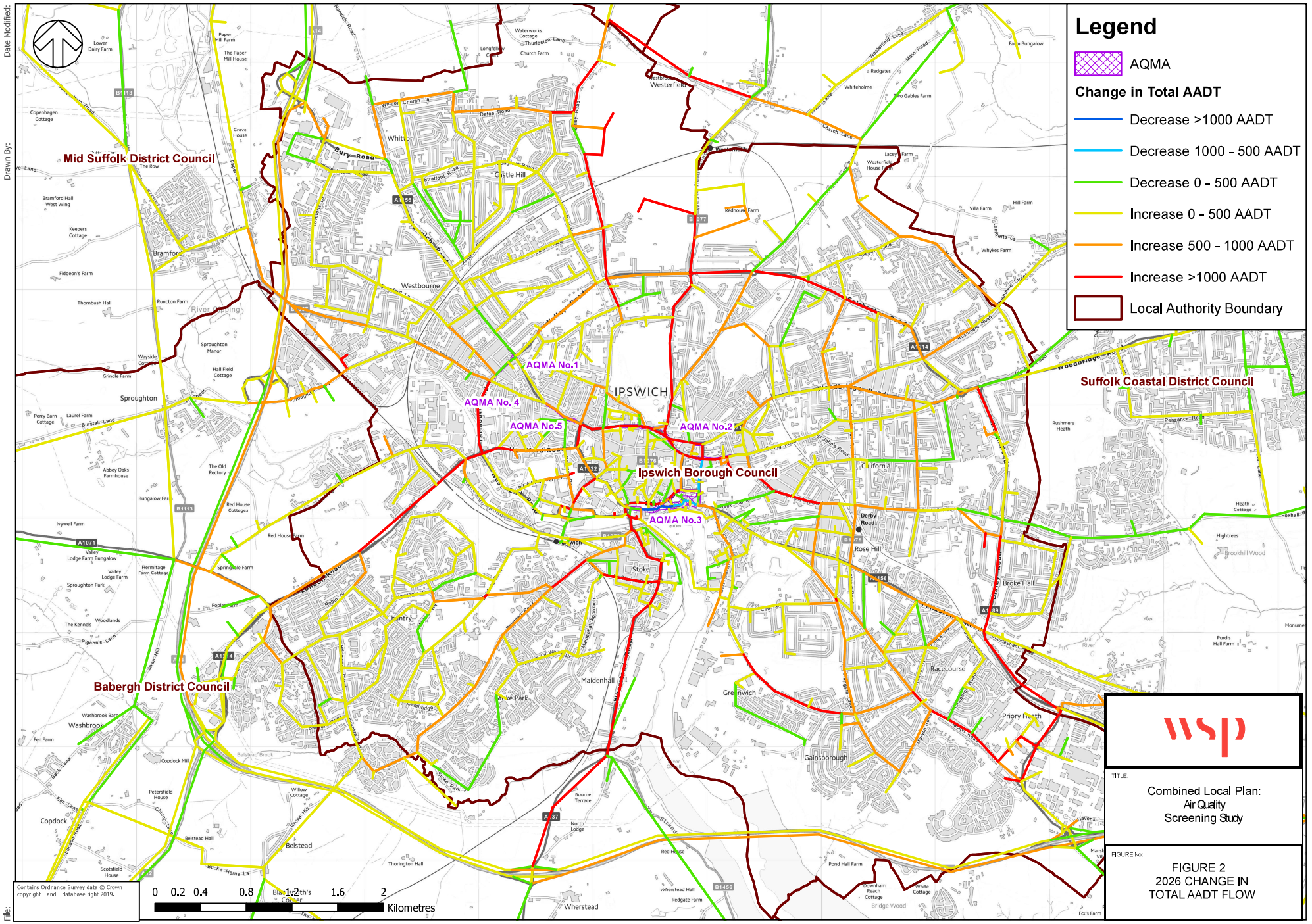
Site 61 (Valley Road) has five data points. The Sen's slope estimate, illustrated by the solid black line in the figure above, is 1.25 which suggests that there was a general increase in NO_2 concentration of 1.25µg/m^3 per year over the five-year period. The plot of residual concentrations shows that there was little variation year on year with the exception of in 2017.

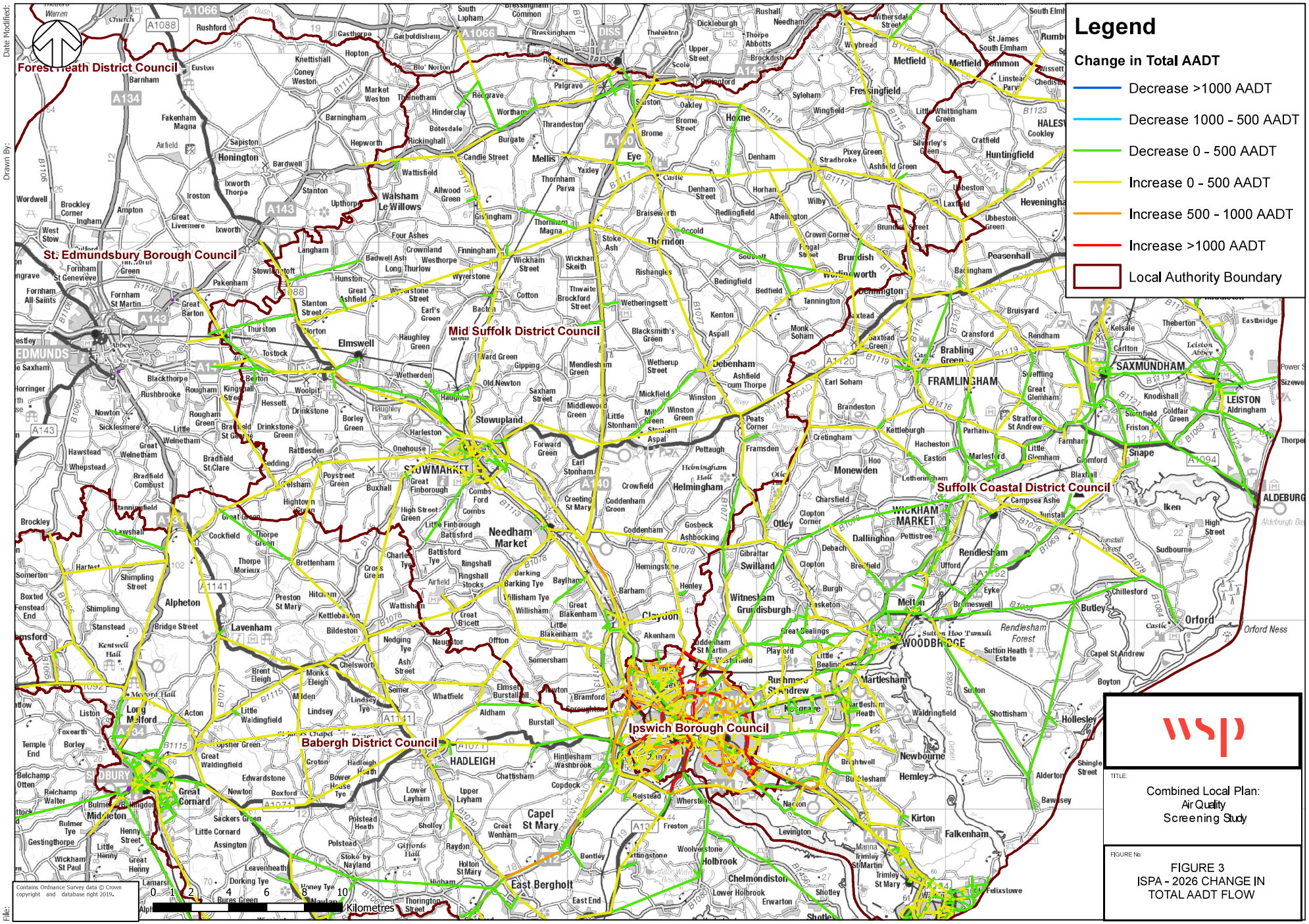
The Mann-Kendal test statistic (S) is expressed as a whole number; for Site 61 this is 8. For the null hypothesis of a random distribution of the data to be rejected, where the number of data is five, the value of S would have to be equal to or greater than an absolute value of eight (equivalent to a probability of less than 0.1 or 10%). Consequently, there is evidence of a statistically significant monotonic trend.

4th Floor
6 Devonshire Square
London
EC2M 4YE

wsp.com


Legend
AQMA
Change in Total AADT
Decrease >1000 AADT
Decrease 1000 - 500 AADT
Decrease 0 - 500 AADT
Increase 0 - 500 AADT
Increase 500 - 1000 AADT
Increase >1000 AADT
AQMA No. 4
AQMA No.1
AQMA No.5
AQMA No.2
AQMA No.3
Ipswich Borough Council
IPSWICH
River Orwell
Ipswich
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.1 0.2 0.4 0.6 0.8 1 Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 1
2026 CHANGE IN
TOTAL AADT FLOW


Legend
AQMA
Change in Total AADT
Decrease >1000 AADT
Decrease 1000 - 500 AADT
Decrease 0 - 500 AADT
Increase 0 - 500 AADT
Increase 500 - 1000 AADT
Increase >1000 AADT
Local Authority Boundary
Mid Suffolk District Council
Babergh District Council
Ipswich Borough Council
Suffolk Coastal District Council
AQMA No.1
AQMA No.2
AQMA No.3
AQMA No. 4
AQMA No.5
IPSWICH
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 2
2026 CHANGE IN
TOTAL AADT FLOW



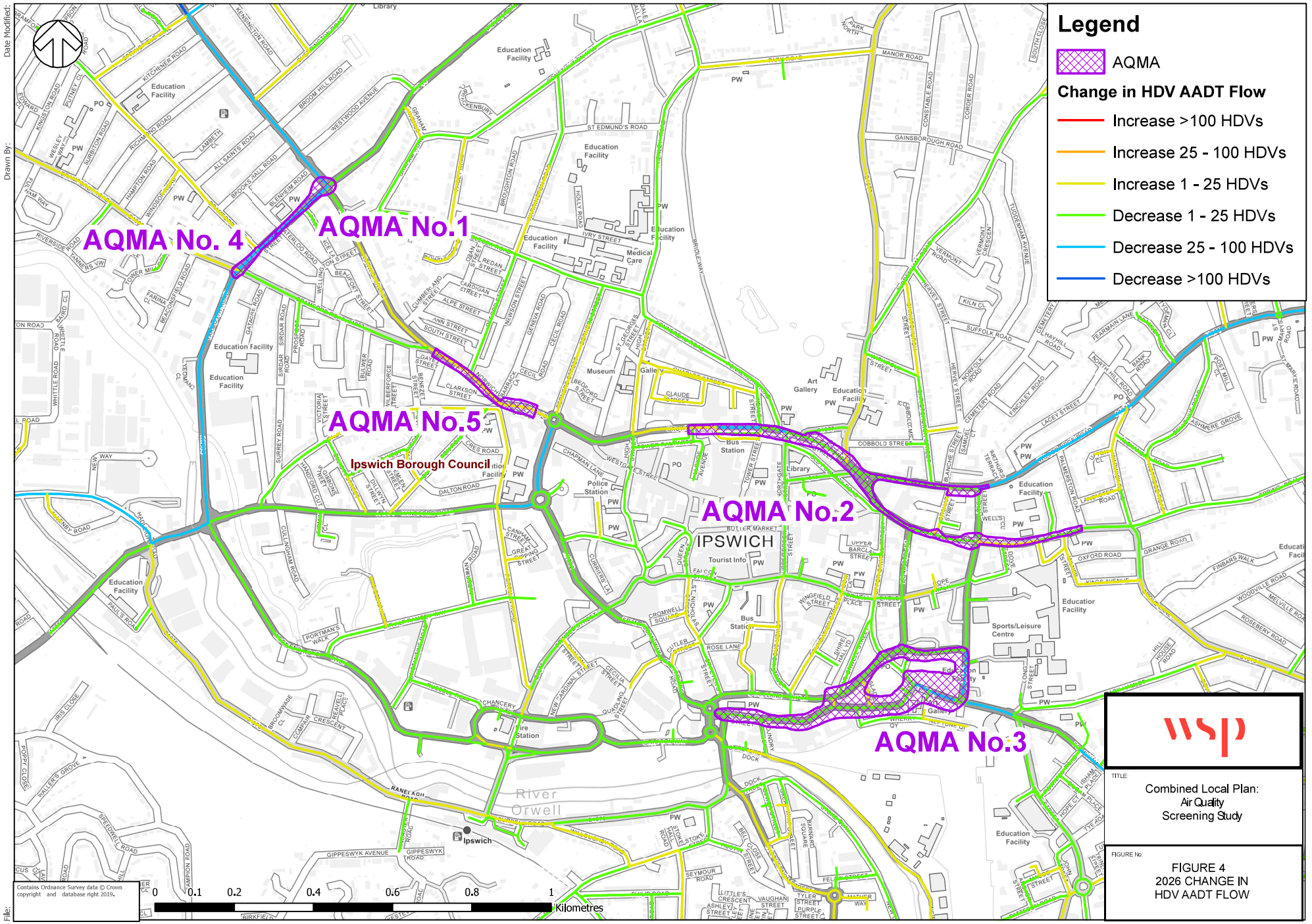
wsp

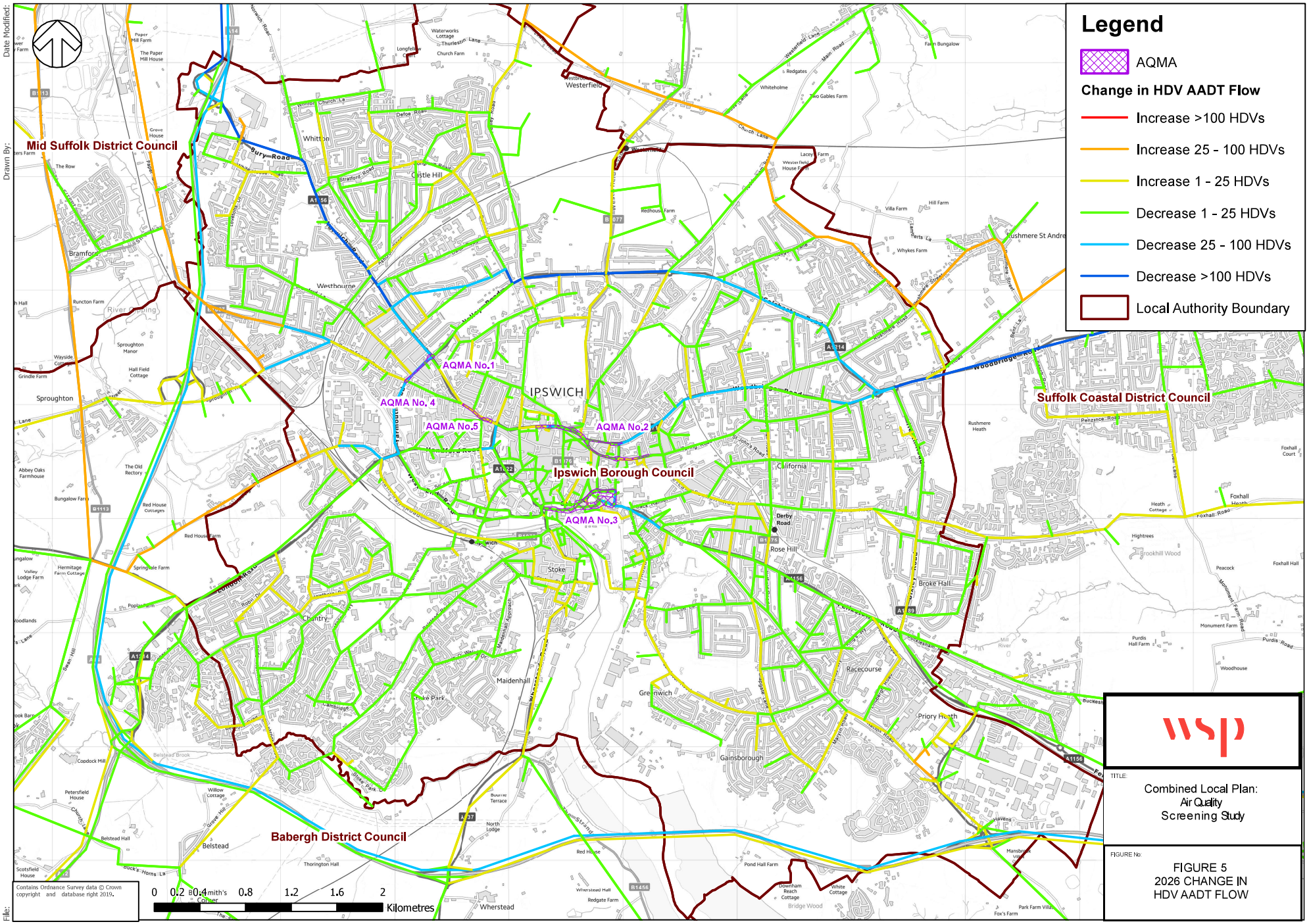
TITLE:

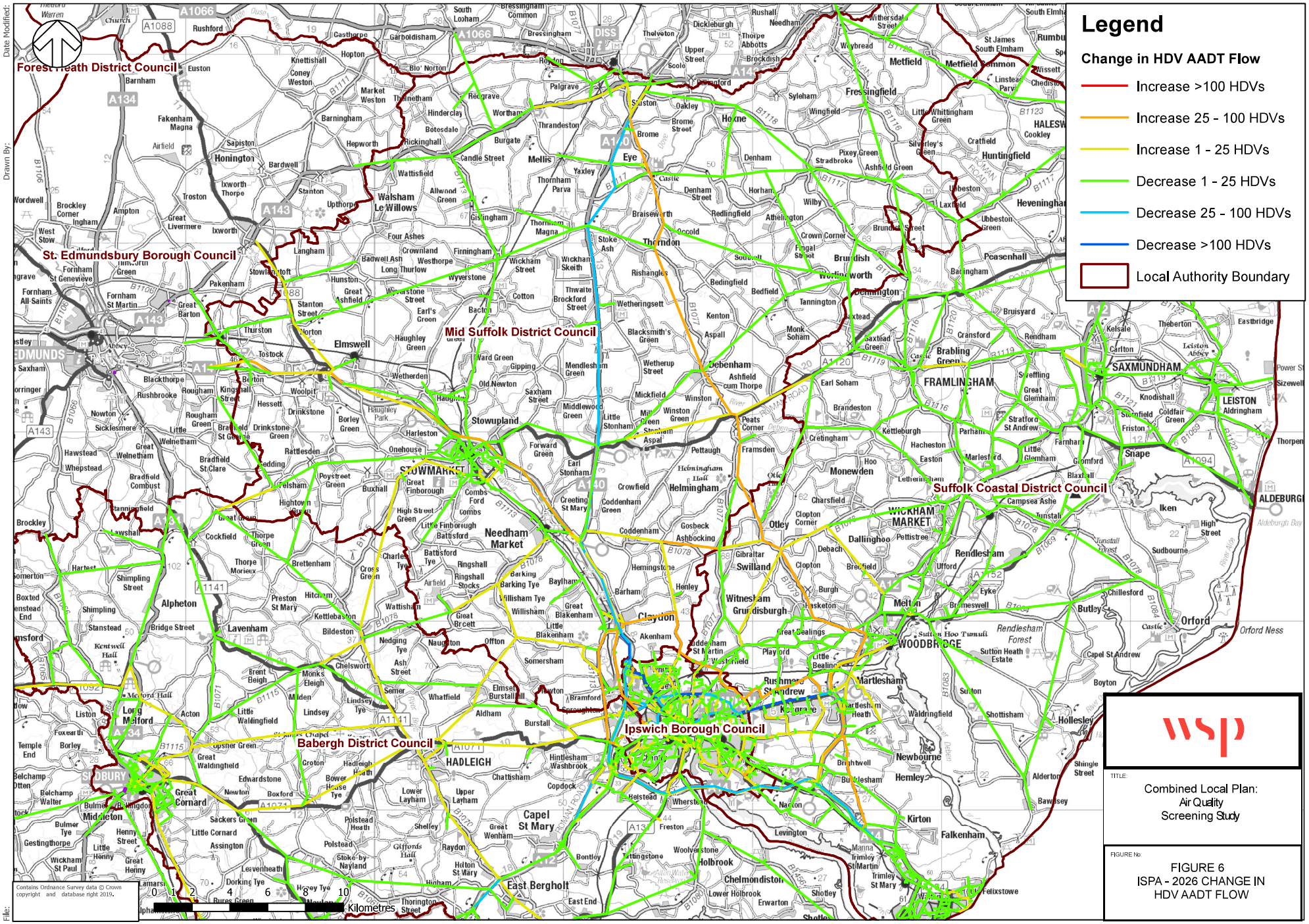
Combined Local Plan:
Air Quality
Screening Study

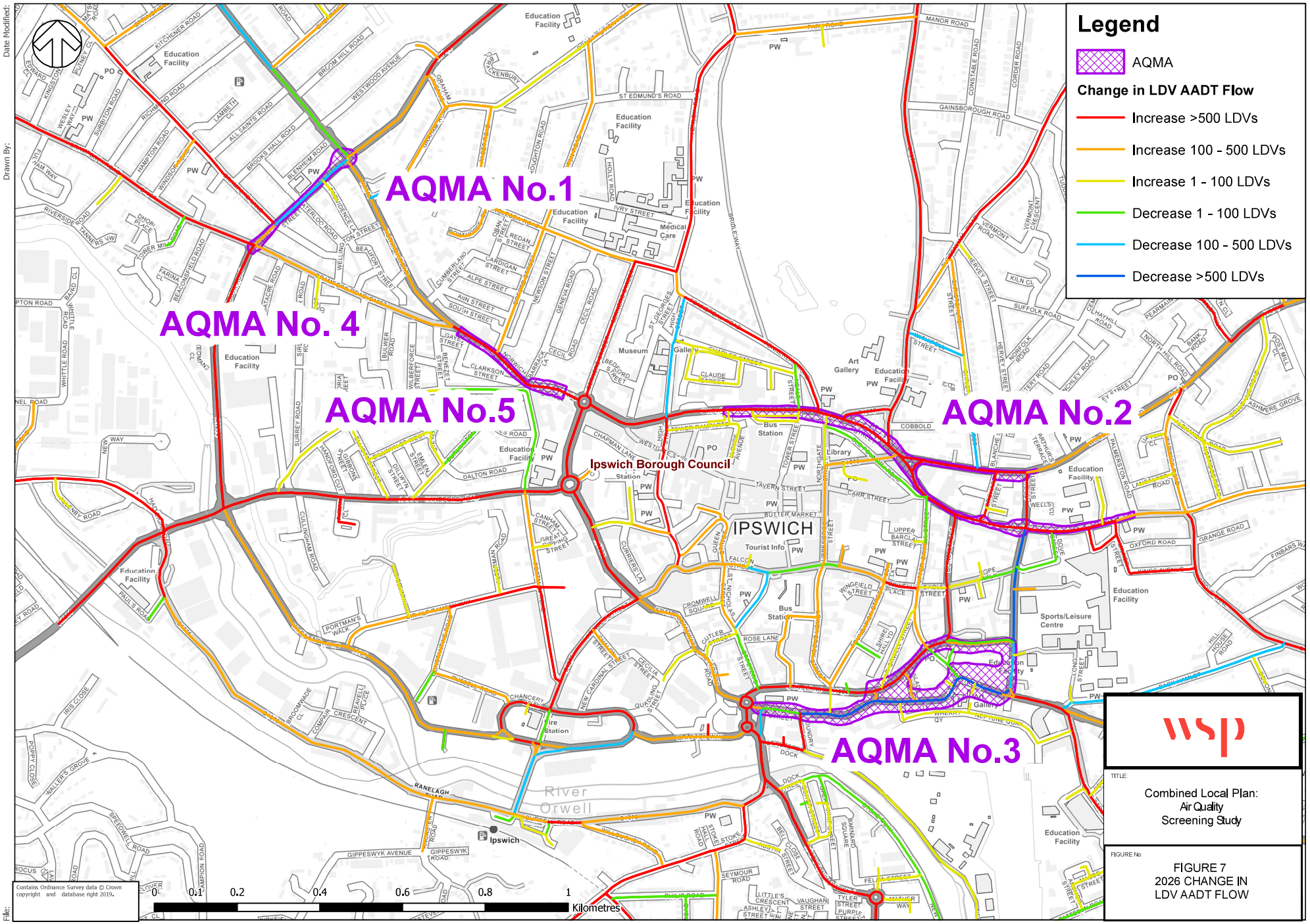
FIGURE No:

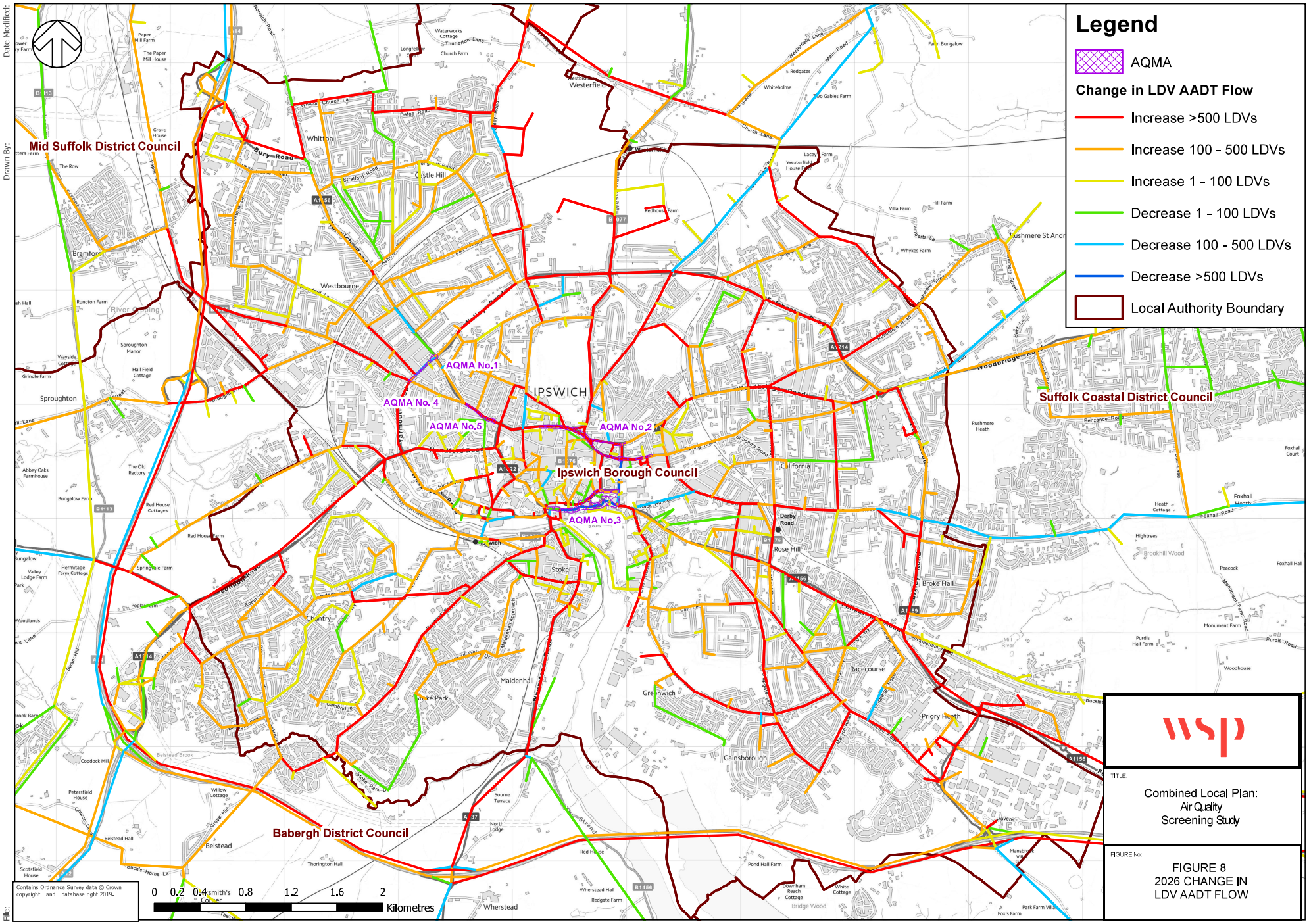
FIGURE 3
ISPA - 2026 CHANGE IN
TOTAL AADT FLOW

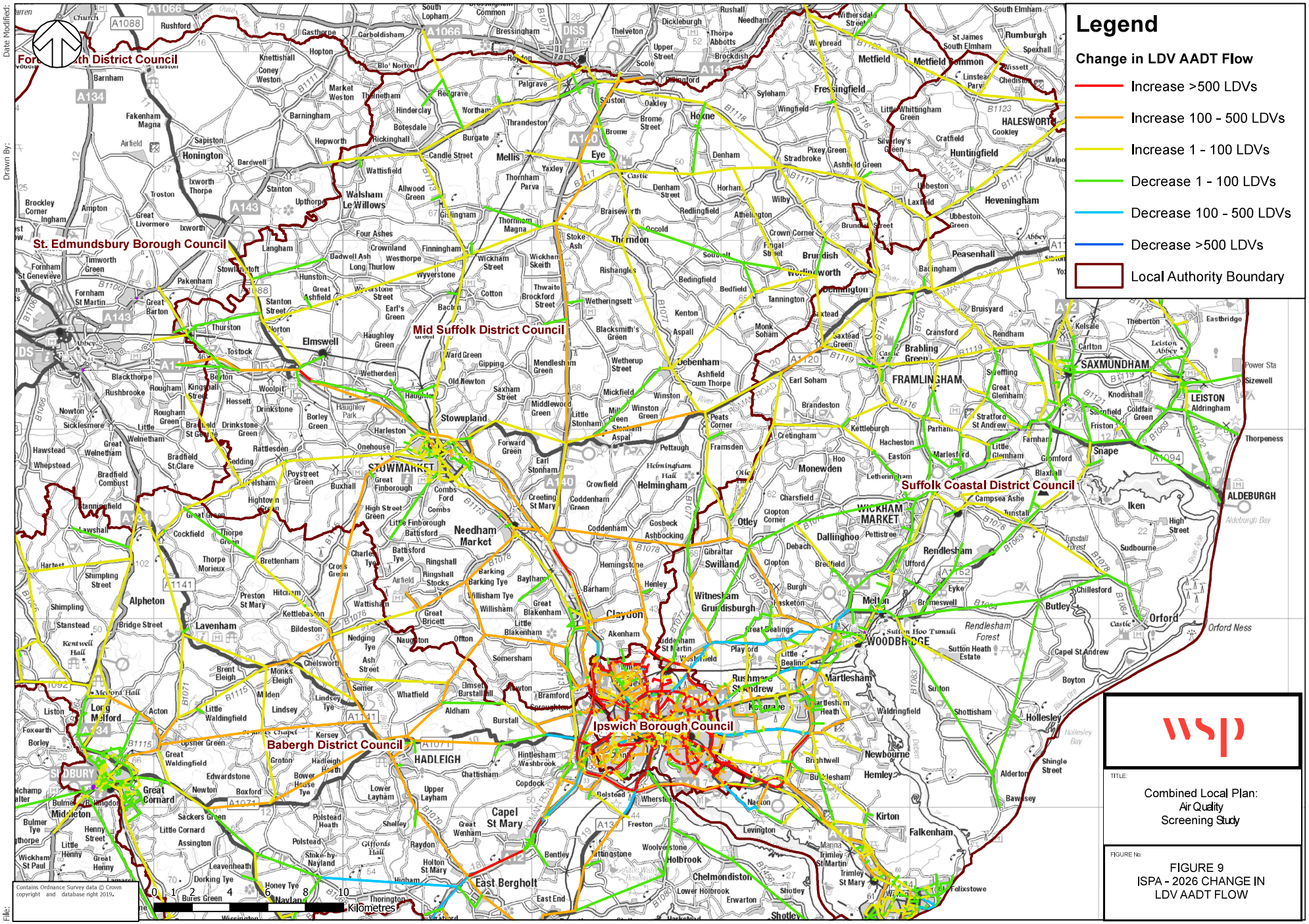

Legend
AQMA
Change in HDV AADT Flow
Increase >100 HDVs
Increase 25 - 100 HDVs
Increase 1 - 25 HDVs
Decrease 1 - 25 HDVs
Decrease 25 - 100 HDVs
Decrease >100 HDVs
AQMA No. 4
AQMA No.1
AQMA No.5
AQMA No.2
AQMA No.3
Ipswich Borough Council
IPSWICH
River Orwell
Ipswich
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.1 0.2 0.4 0.6 0.8 1 Kilometres
Date Modified:
Drawn By:
File:
TITLE:
Combined Local Plan: Air Quality Screening Study
FIGURE No:
FIGURE 4
2026 CHANGE IN HDV AADT FLOW

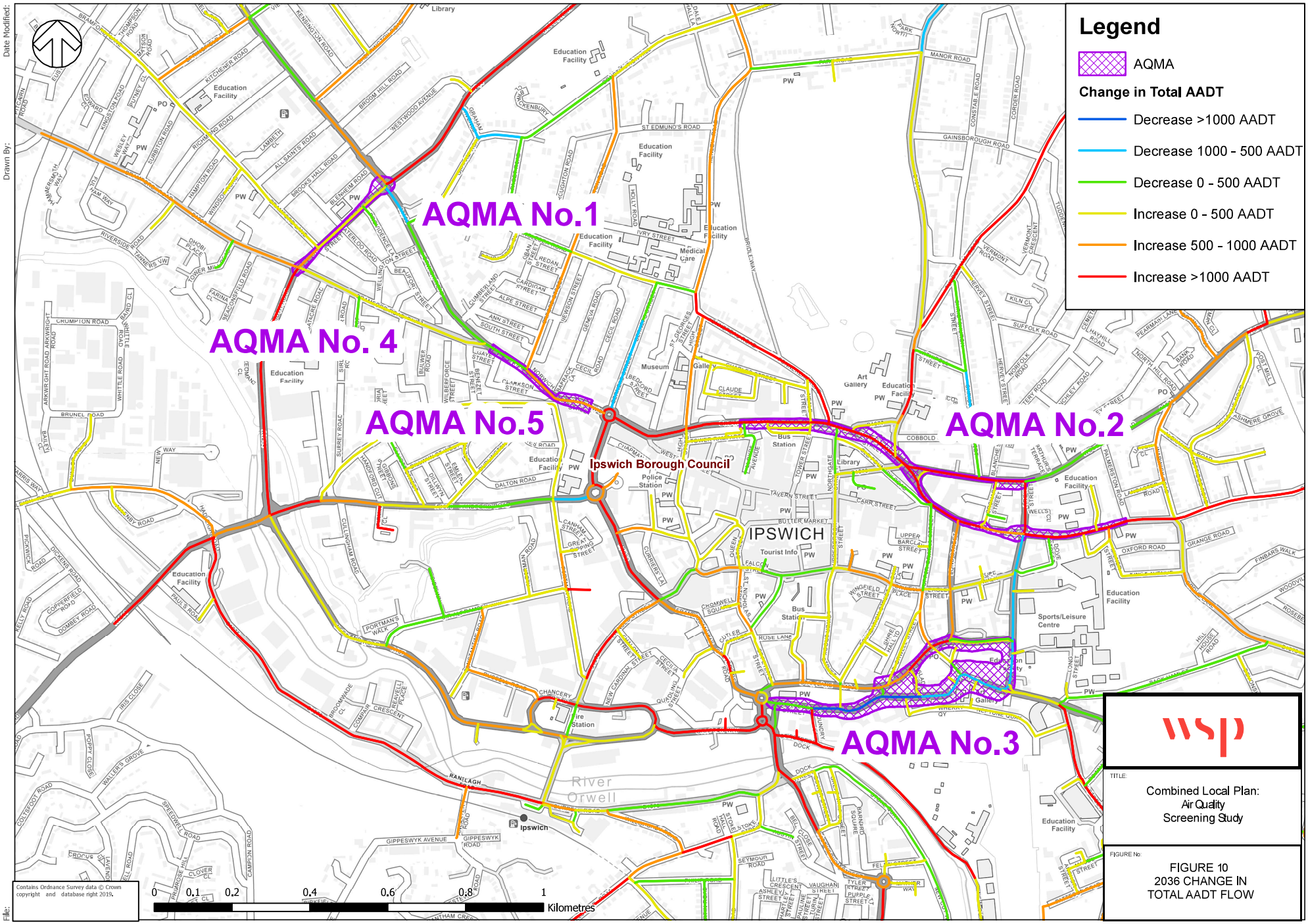

Legend
AQMA
Change in HDV AADT Flow
Increase >100 HDVs
Increase 25 - 100 HDVs
Increase 1 - 25 HDVs
Decrease 1 - 25 HDVs
Decrease 25 - 100 HDVs
Decrease >100 HDVs
Local Authority Boundary
Mid Suffolk District Council
Babergh District Council
Ipswich Borough Council
Suffolk Coastal District Council
AQMA No.1
AQMA No. 4
AQMA No.5
AQMA No.2
AQMA No.3
IPSWICH
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 5
2026 CHANGE IN
HDV AADT FLOW

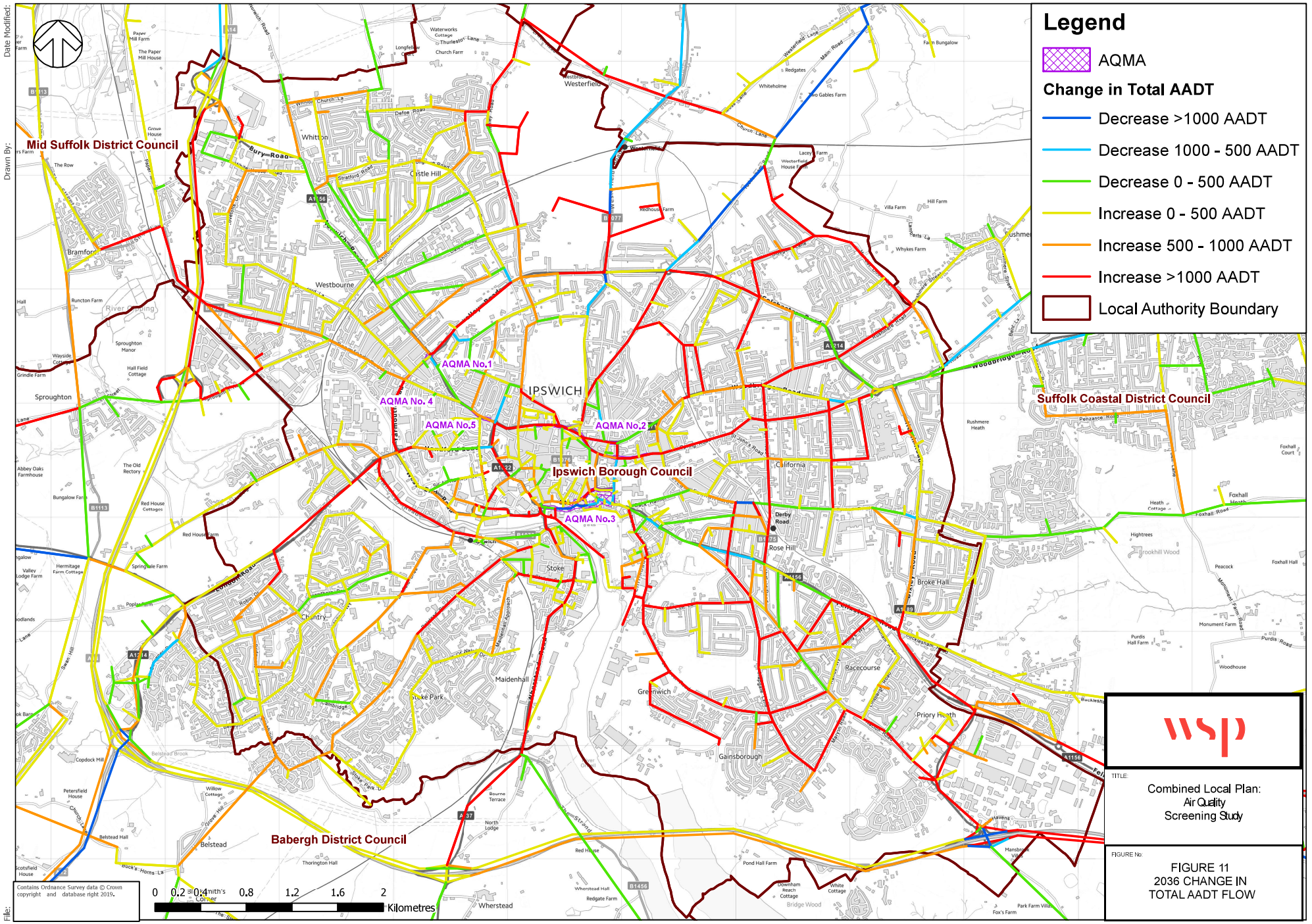

Legend
Change in HDV AADT Flow
Increase >100 HDVs
Increase 25 - 100 HDVs
Increase 1 - 25 HDVs
Decrease 1 - 25 HDVs
Decrease 25 - 100 HDVs
Decrease >100 HDVs
Local Authority Boundary
Forest Heath District Council
St. Edmundsbury Borough Council
Mid Suffolk District Council
Suffolk Coastal District Council
Ipswich Borough Council
Babergh District Council
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 1 2 4 6 8 10
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 6
ISPA - 2026 CHANGE IN
HDV AADT FLOW

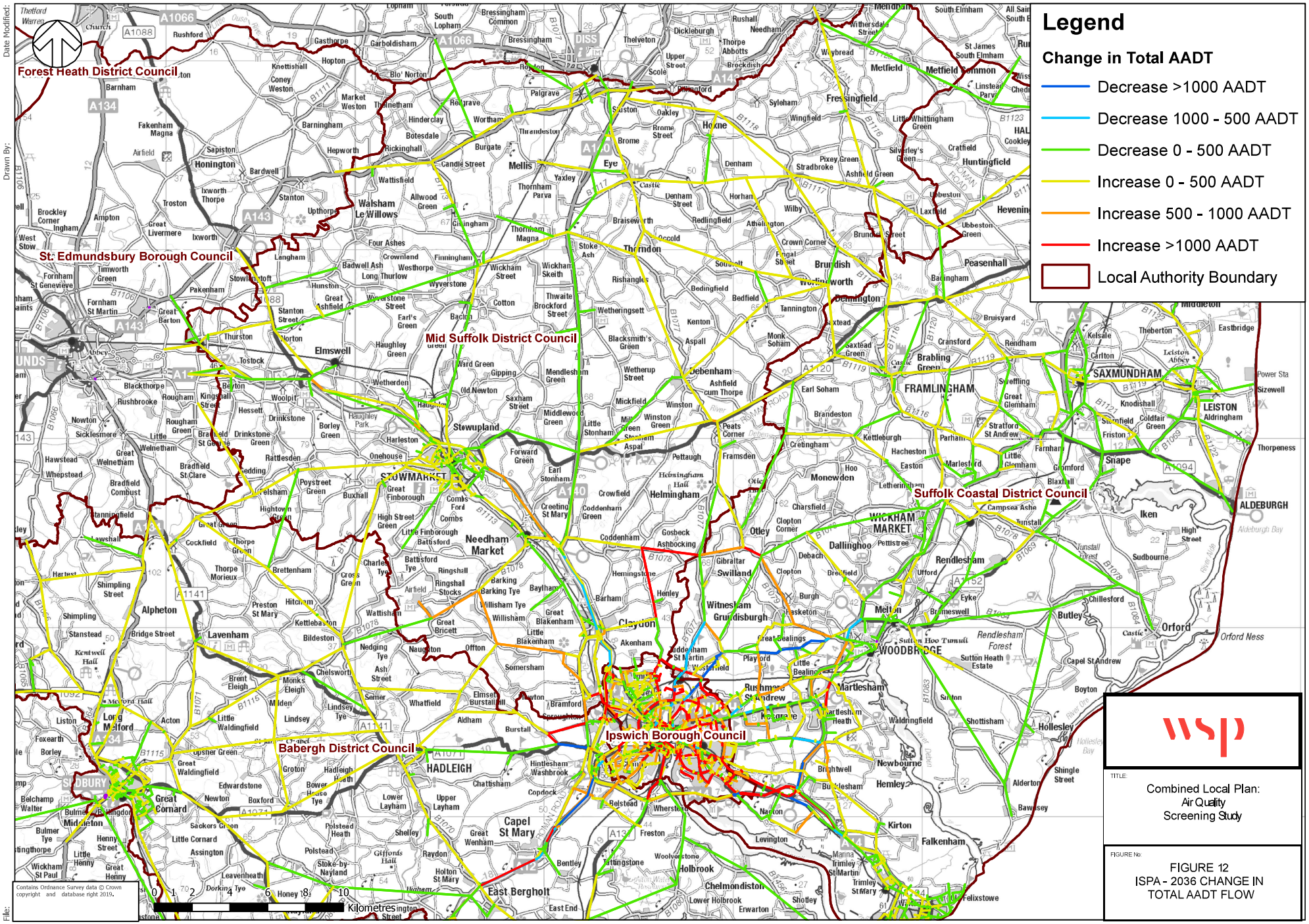

Legend
AQMA
Change in LDV AADT Flow
Increase >500 LDVs
Increase 100 - 500 LDVs
Increase 1 - 100 LDVs
Decrease 1 - 100 LDVs
Decrease 100 - 500 LDVs
Decrease >500 LDVs
AQMA No.1
AQMA No. 4
AQMA No.5
AQMA No.2
AQMA No.3
Ipswich Borough Council
IPSWICH
River Orwell
Ipswich
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.1 0.2 0.4 0.6 0.8 1
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 7
2026 CHANGE IN
LDV AADT FLOW

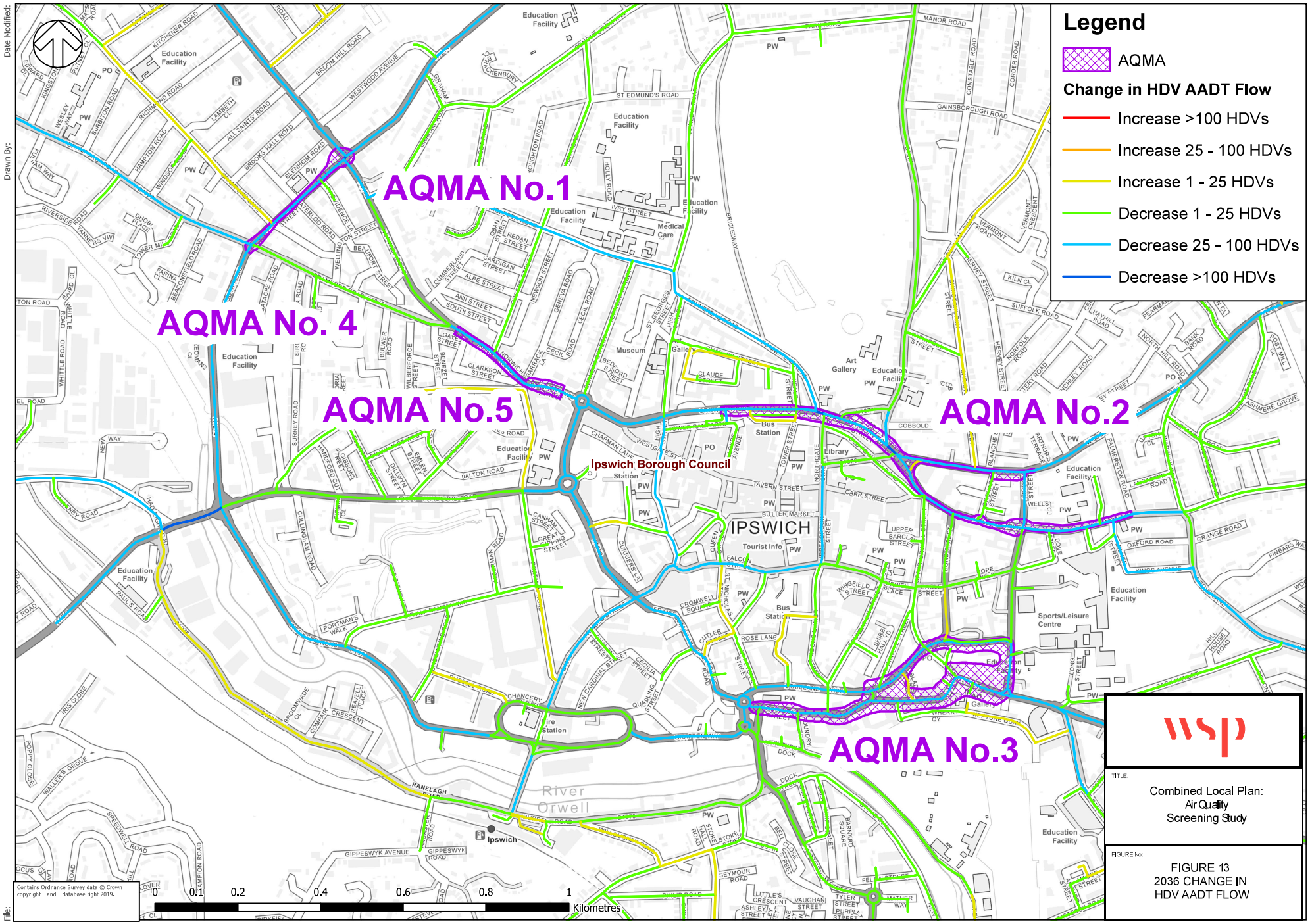

Date Modified:
Drawn By:
File:
Mid Suffolk District Council
Babergh District Council
Ipswich Borough Council
Suffolk Coastal District Council
AQMA No.1
AQMA No.2
AQMA No.3
AQMA No. 4
AQMA No.5
IPSWICH
Legend
AQMA
Change in LDV AADT Flow
Increase >500 LDVs
Increase 100 - 500 LDVs
Increase 1 - 100 LDVs
Decrease 1 - 100 LDVs
Decrease 100 - 500 LDVs
Decrease >500 LDVs
Local Authority Boundary
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2
Kilometres
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 8
2026 CHANGE IN
LDV AADT FLOW

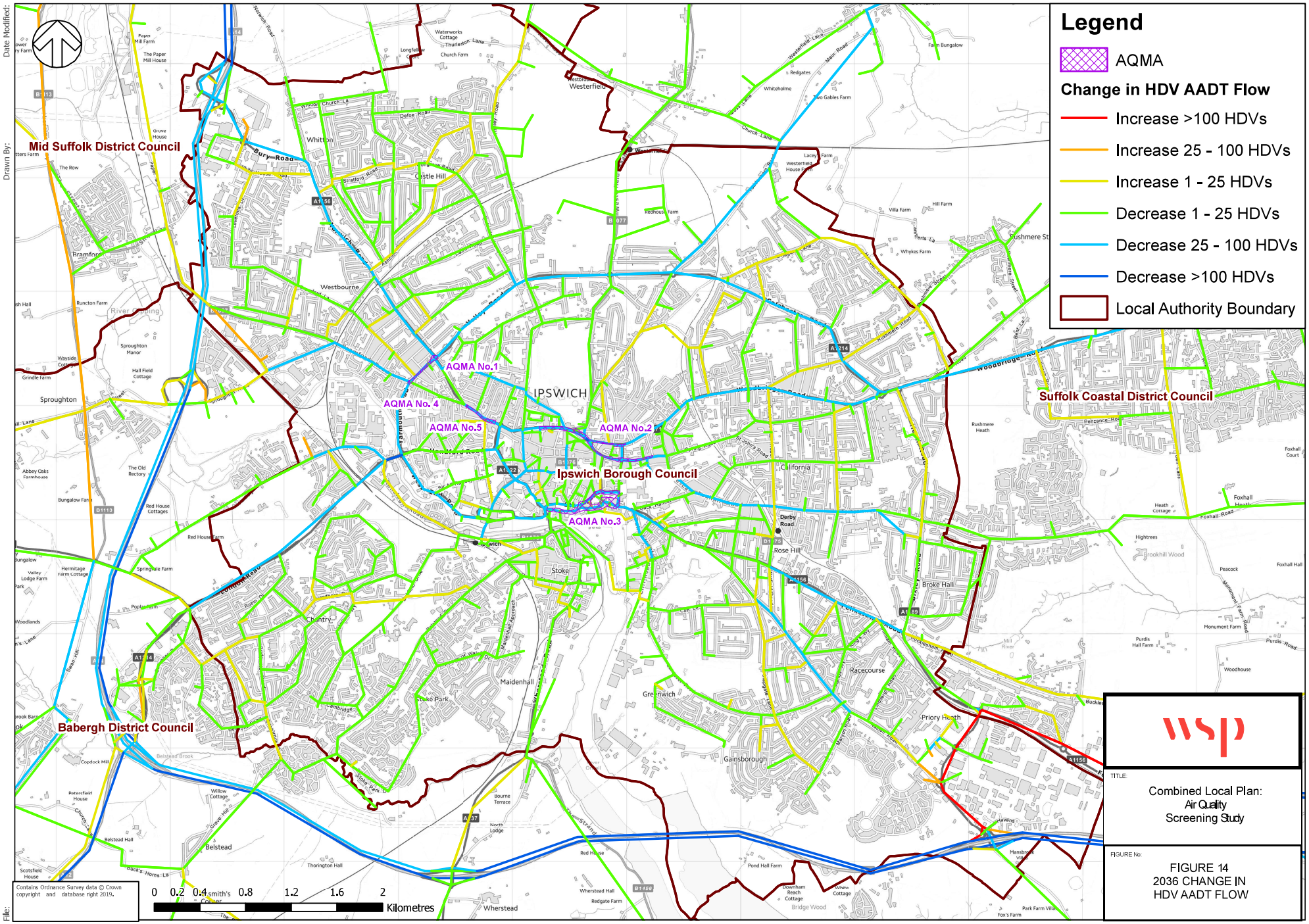

Legend
Change in LDV AADT Flow
Increase >500 LDVs
Increase 100 - 500 LDVs
Increase 1 - 100 LDVs
Decrease 1 - 100 LDVs
Decrease 100 - 500 LDVs
Decrease >500 LDVs
Local Authority Boundary
Forest Heath District Council
St. Edmundsbury Borough Council
Mid Suffolk District Council
Babergh District Council
Ipswich Borough Council
Suffolk Coastal District Council
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 1 2 4 6 8 10
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 9
ISPA - 2026 CHANGE IN
LDV AADT FLOW

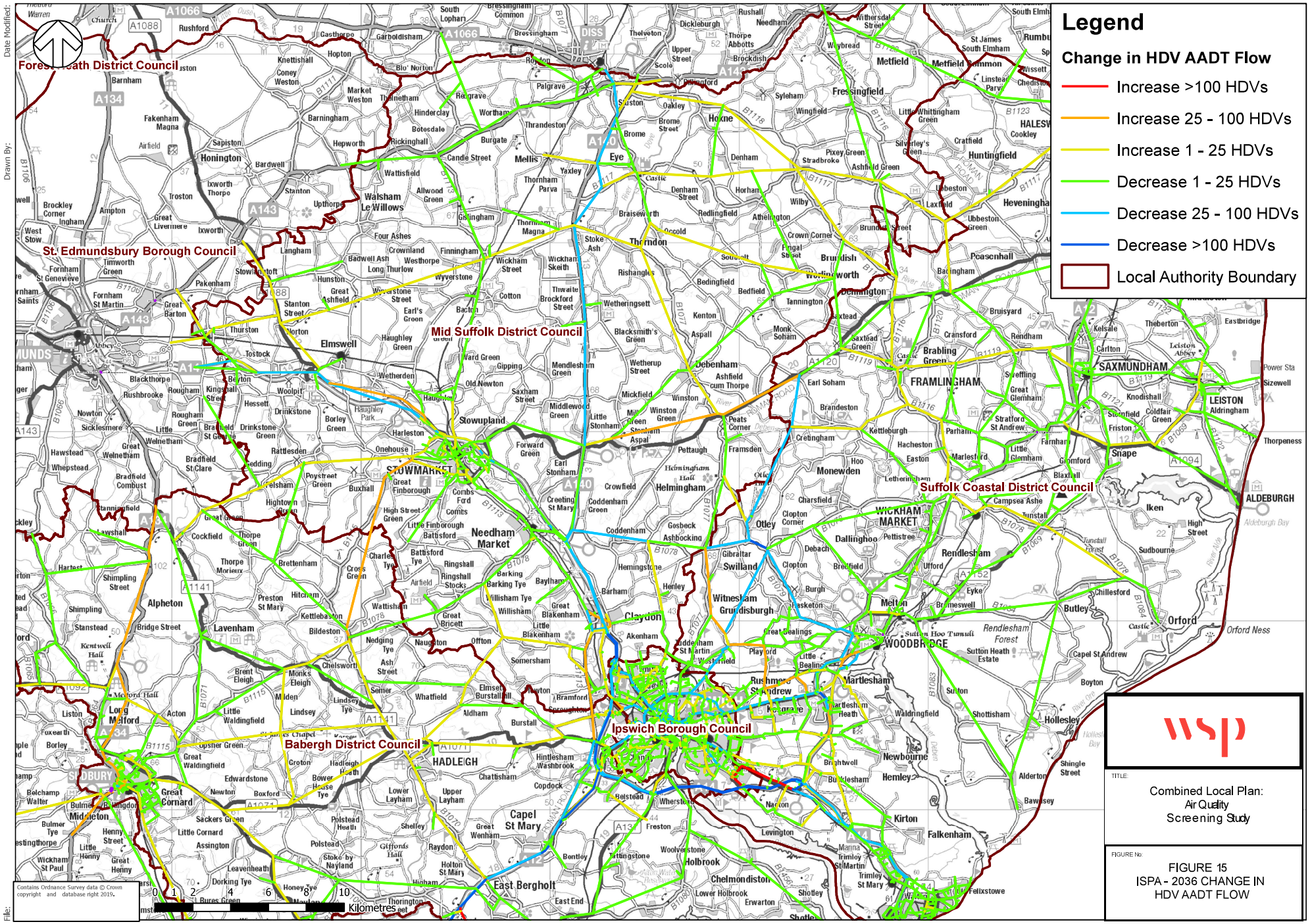

Legend
AQMA
Change in Total AADT
Decrease >1000 AADT
Decrease 1000 - 500 AADT
Decrease 0 - 500 AADT
Increase 0 - 500 AADT
Increase 500 - 1000 AADT
Increase >1000 AADT
AQMA No.1
AQMA No. 4
AQMA No.5
AQMA No.2
AQMA No.3
Ipswich Borough Council
IPSWICH
River Orwell
Ipswich
Kilometres
0
0.1
0.2
0.4
0.6
0.8
1
Contains Ordnance Survey data © Crown copyright and database right 2019.
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 10
2036 CHANGE IN
TOTAL AADT FLOW

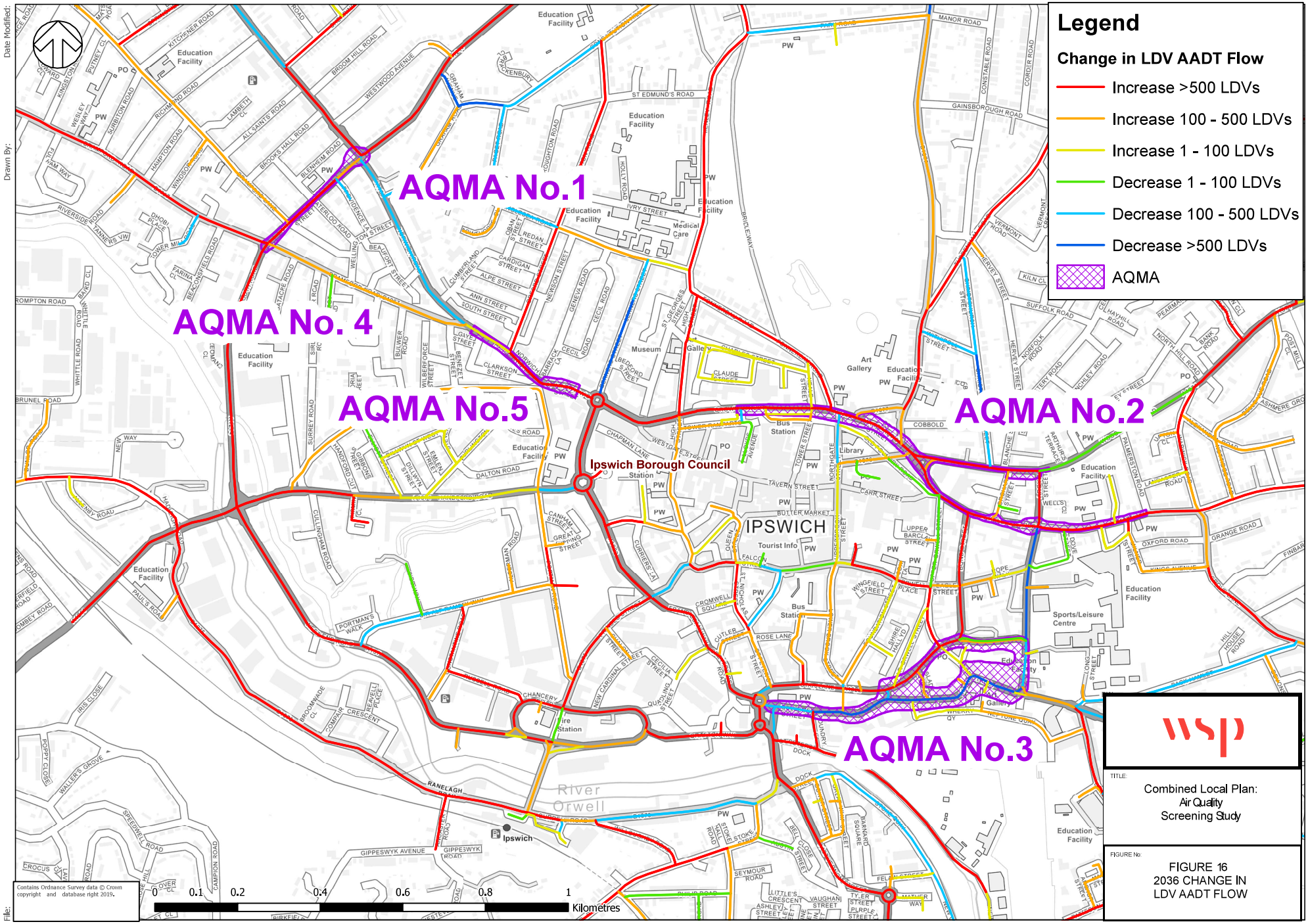

Legend
AQMA
Change in Total AADT
Decrease >1000 AADT
Decrease 1000 - 500 AADT
Decrease 0 - 500 AADT
Increase 0 - 500 AADT
Increase 500 - 1000 AADT
Increase >1000 AADT
Local Authority Boundary
Mid Suffolk District Council
Suffolk Coastal District Council
Ipswich Borough Council
Babergh District Council
AQMA No.1
AQMA No.2
AQMA No.3
AQMA No. 4
AQMA No.5
IPSWICH
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2 Kilometres
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 11
2036 CHANGE IN
TOTAL AADT FLOW

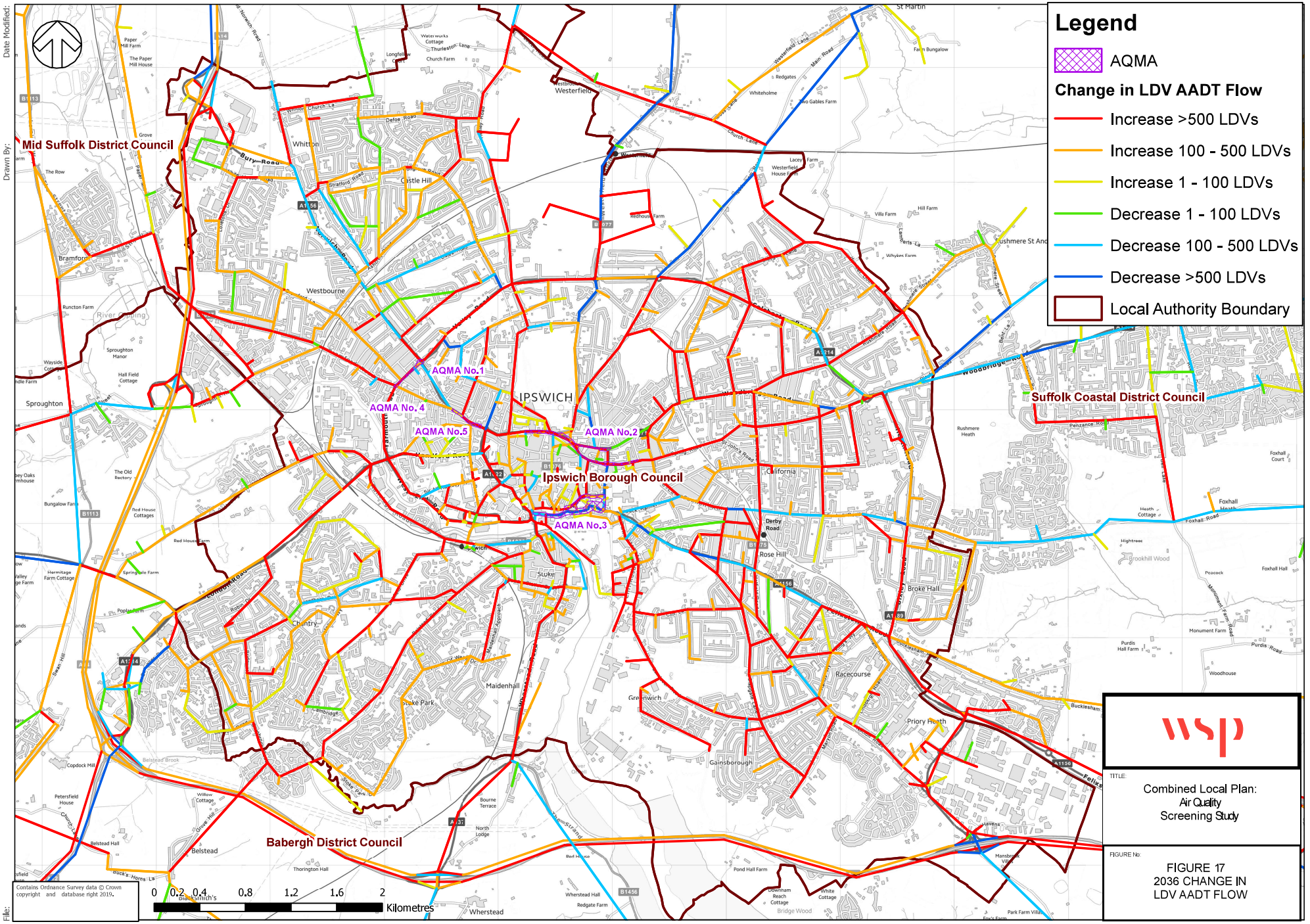

Forest Heath District Council
St Edmundsbury Borough Council
Mid Suffolk District Council
Babergh District Council
Ipswich Borough Council
Suffolk Coastal District Council
Legend
Change in Total AADT
Decrease >1000 AADT
Decrease 1000 - 500 AADT
Decrease 0 - 500 AADT
Increase 0 - 500 AADT
Increase 500 - 1000 AADT
Increase >1000 AADT
Local Authority Boundary
Kilometres
Contains Ordnance Survey data © Crown copyright and database right 2019.
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan: Air Quality Screening Study
FIGURE No:
FIGURE 12
ISPA - 2036 CHANGE IN TOTAL AADT FLOW

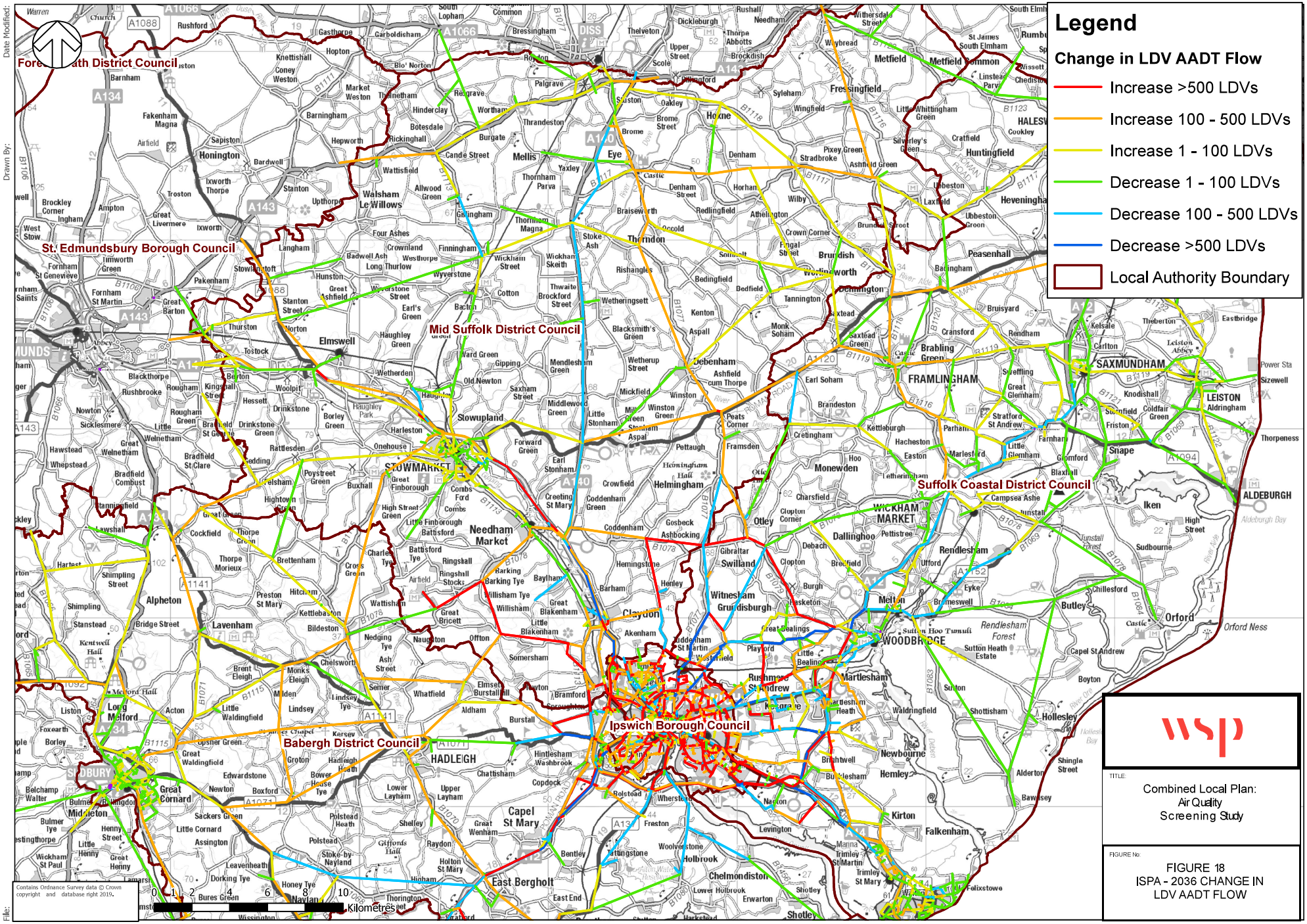

Legend
AQMA
Change in HDV AADT Flow
Increase >100 HDVs
Increase 25 - 100 HDVs
Increase 1 - 25 HDVs
Decrease 1 - 25 HDVs
Decrease 25 - 100 HDVs
Decrease >100 HDVs
AQMA No.1
AQMA No. 4
AQMA No.5
AQMA No.2
AQMA No.3
Ipswich Borough Council
IPSWICH
River Orwell
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.1 0.2 0.4 0.6 0.8 1
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 13
2036 CHANGE IN
HDV AADT FLOW

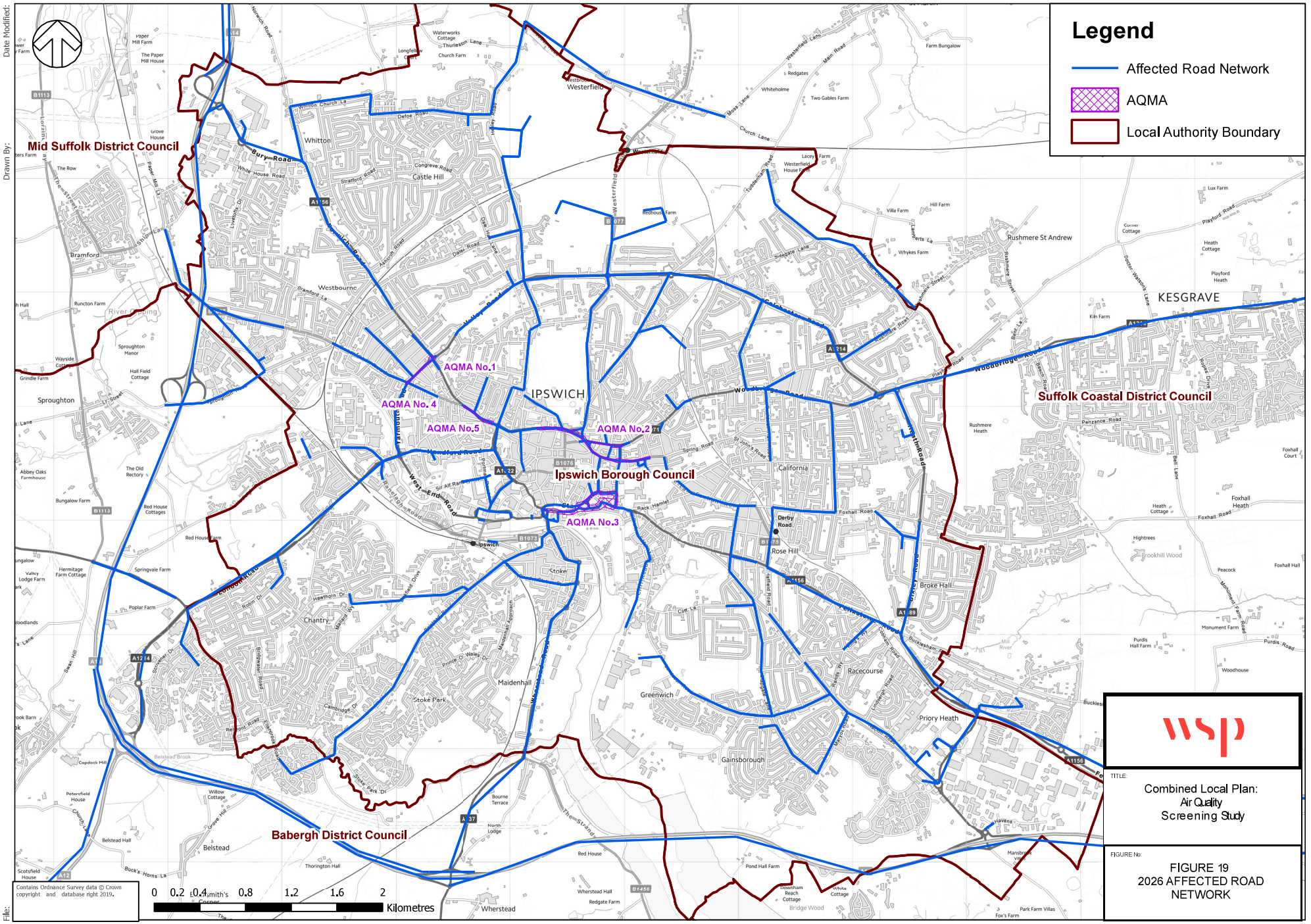

Legend
AQMA
Change in HDV AADT Flow
Increase >100 HDVs
Increase 25 - 100 HDVs
Increase 1 - 25 HDVs
Decrease 1 - 25 HDVs
Decrease 25 - 100 HDVs
Decrease >100 HDVs
Local Authority Boundary
Mid Suffolk District Council
Babergh District Council
Ipswich Borough Council
Suffolk Coastal District Council
AQMA No.1
AQMA No.2
AQMA No.3
AQMA No. 4
AQMA No.5
IPSWICH
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 14
2036 CHANGE IN
HDV AADT FLOW

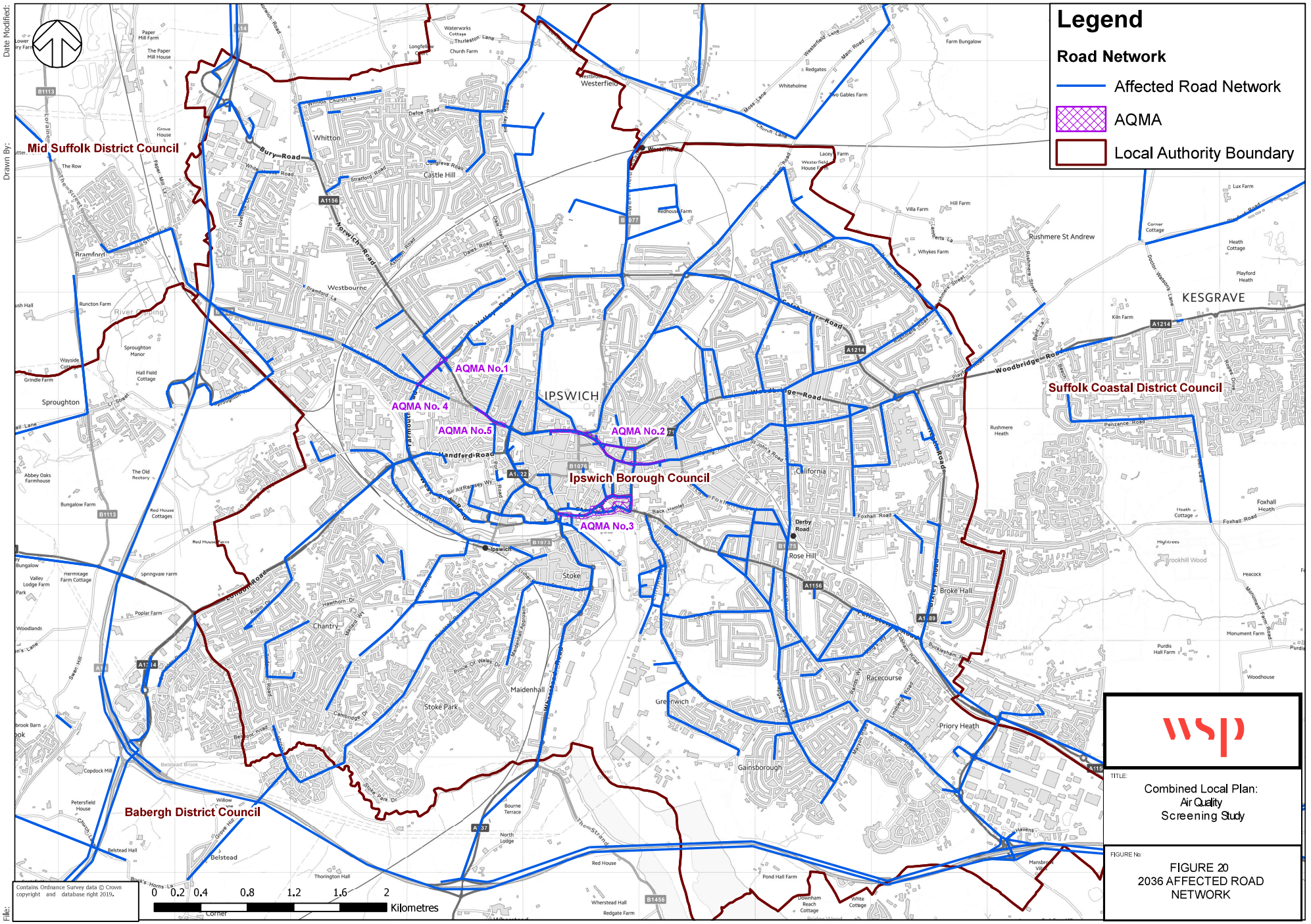

Legend
Change in HDV AADT Flow
Increase >100 HDVs
Increase 25 - 100 HDVs
Increase 1 - 25 HDVs
Decrease 1 - 25 HDVs
Decrease 25 - 100 HDVs
Decrease >100 HDVs
Local Authority Boundary
Forest Heath District Council
St. Edmundsbury Borough Council
Mid Suffolk District Council
Suffolk Coastal District Council
Ipswich Borough Council
Babergh District Council
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 1 2 4 6 8 10
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 15
ISPA - 2036 CHANGE IN
HDV AADT FLOW

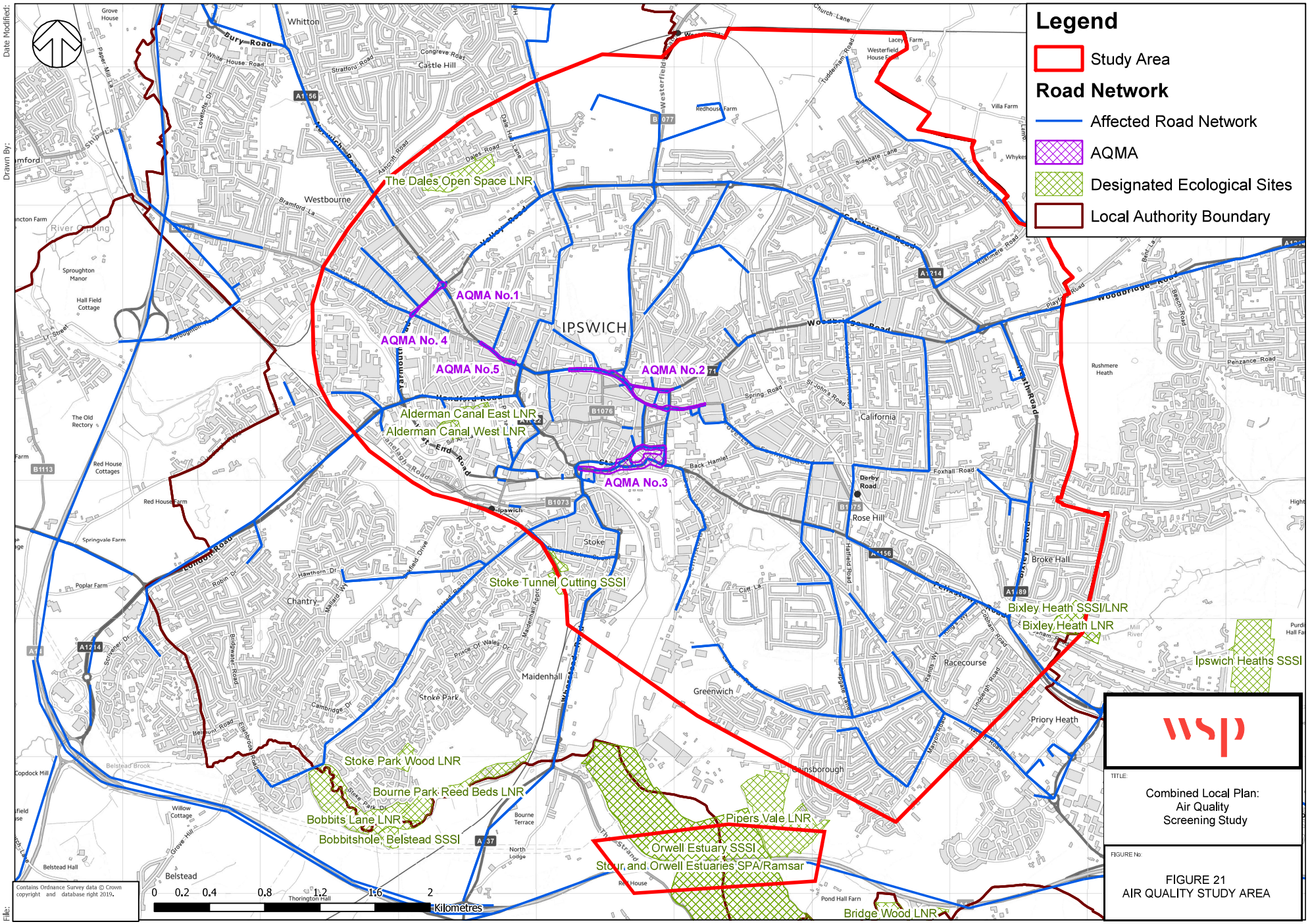

Legend
Change in LDV AADT Flow
Increase >500 LDVs
Increase 100 - 500 LDVs
Increase 1 - 100 LDVs
Decrease 1 - 100 LDVs
Decrease 100 - 500 LDVs
Decrease >500 LDVs
AQMA
AQMA No.1
AQMA No. 4
AQMA No.5
AQMA No.2
AQMA No.3
Ipswich Borough Council
IPSWICH
River Orwell
Ipswich
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.1 0.2 0.4 0.6 0.8 1
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 16
2036 CHANGE IN
LDV AADT FLOW

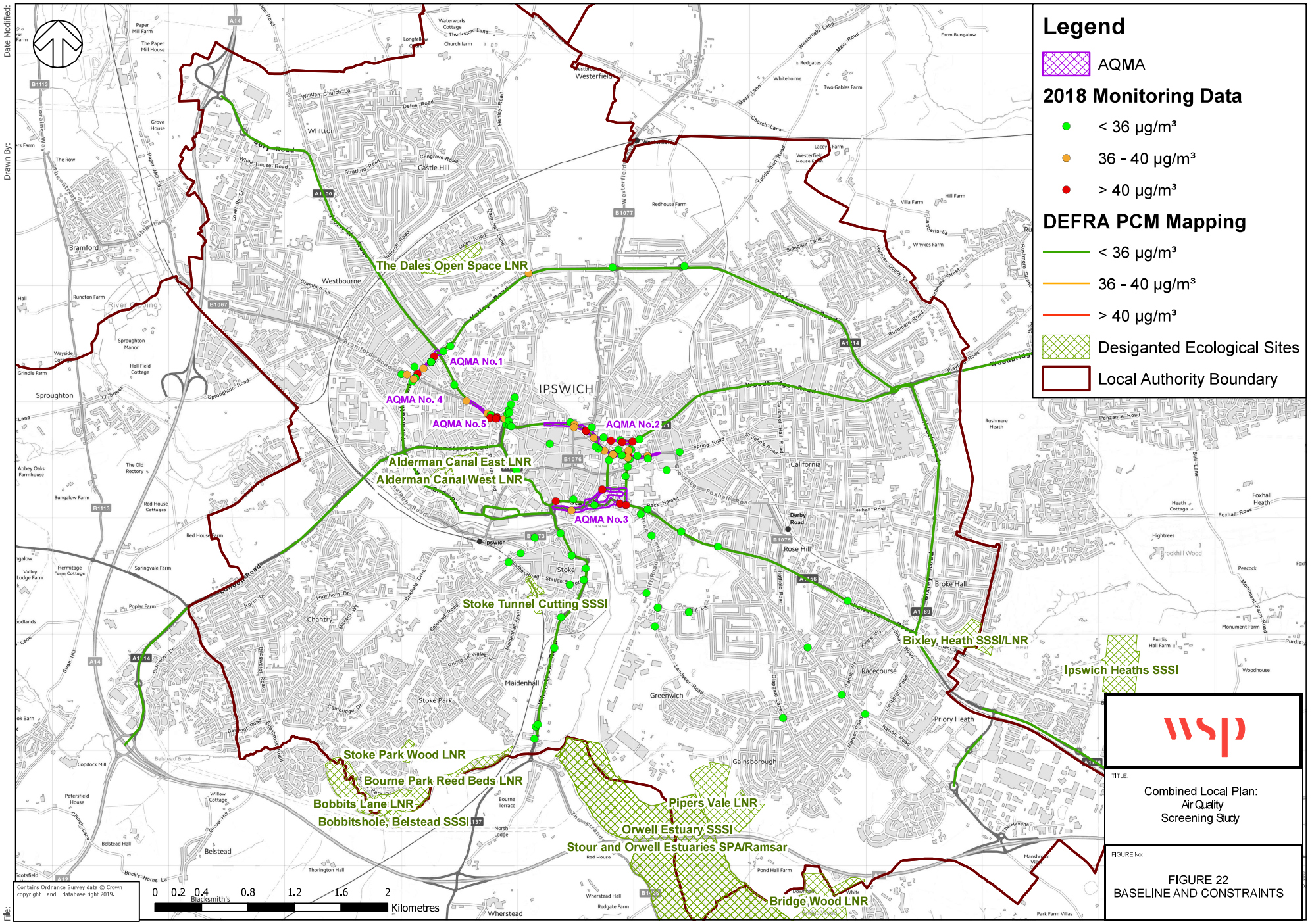

Legend
AQMA
Change in LDV AADT Flow
Increase >500 LDVs
Increase 100 - 500 LDVs
Increase 1 - 100 LDVs
Decrease 1 - 100 LDVs
Decrease 100 - 500 LDVs
Decrease >500 LDVs
Local Authority Boundary
Mid Suffolk District Council
Suffolk Coastal District Council
Ipswich Borough Council
Babergh District Council
AQMA No.1
AQMA No.2
AQMA No.3
AQMA No.4
AQMA No.5
IPSWICH
Date Modified:
Drawn By:
File:
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2
Kilometres
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 17
2036 CHANGE IN
LDV AADT FLOW


Legend
Change in LDV AADT Flow
Increase >500 LDVs
Increase 100 - 500 LDVs
Increase 1 - 100 LDVs
Decrease 1 - 100 LDVs
Decrease 100 - 500 LDVs
Decrease >500 LDVs
Local Authority Boundary
Forest Heath District Council
St. Edmundsbury Borough Council
Mid Suffolk District Council
Suffolk Coastal District Council
Babergh District Council
Ipswich Borough Council
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 1 2 4 6 8 10
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 18
ISPA - 2036 CHANGE IN
LDV AADT FLOW


Legend
Affected Road Network
AQMA
Local Authority Boundary
Mid Suffolk District Council
Babergh District Council
Ipswich Borough Council
Suffolk Coastal District Council
AQMA No.1
AQMA No.2
AQMA No.3
AQMA No. 4
AQMA No.5
IPSWICH
KESGRAVE
Whitton
Castle Hill
Westbourne
Bramford
Sproughton
Chantry
Maidenhall
Stoke Park
Greenwich
Gainsborough
Priory Heath
Broke Hall
Rose Hill
California
Rushmere St Andrew
Rushmere Heath
Foxhall Heath
Belstead
Wherstead
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2
Kilometres
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 19
2026 AFFECTED ROAD
NETWORK
Date Modified:
Drawn By:
File:


Legend
Road Network
Affected Road Network
AQMA
Local Authority Boundary
Mid Suffolk District Council
Babergh District Council
Ipswich Borough Council
Suffolk Coastal District Council
AQMA No.1
AQMA No.2
AQMA No.3
AQMA No. 4
AQMA No.5
IPSWICH
KESGRAVE
Bramford
Sproughton
Whitton
Castle Hill
Westbourne
Westerfield
Rushmere St Andrew
Rose Hill
Broke Hall
Stoke
Chantry
Maidenhall
Stoke Park
Greenwich
Gainsborough
Priory Heath
Belstead
Woodbridge Road
Norwich Road
Bury Road
London Road
Handford Road
Foxhall Road
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2
Kilometres
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 20
2036 AFFECTED ROAD NETWORK
Date Modified:
Drawn By:
File:


Legend
Study Area
Road Network
Affected Road Network
AQMA
Designated Ecological Sites
Local Authority Boundary
AQMA No.1
AQMA No. 4
AQMA No.5
AQMA No.2
AQMA No.3
IPSWICH
The Dales Open Space LNR
Alderman Canal East LNR
Alderman Canal West LNR
Stoke Tunnel Cutting SSSI
Bixley Heath SSSI/LNR
Bixley Heath LNR
Ipswich Heaths SSSI
Stoke Park Wood LNR
Bourne Park Reed Beds LNR
Bobbits Lane LNR
Bobbitshole, Belstead SSSI
Pipers Vale LNR
Orwell Estuary SSSI
Stour and Orwell Estuaries SPA/Ramsar
Bridge Wood LNR
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.2 0.4 0.8 1.2 1.6 2 Kilometres
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 21
AIR QUALITY STUDY AREA
Date Modified:
Drawn By:
File:


Legend
AQMA
2018 Monitoring Data
< 36 µg/m³
36 - 40 µg/m³
> 40 µg/m³
DEFRA PCM Mapping
< 36 µg/m³
36 - 40 µg/m³
> 40 µg/m³
Desiganted Ecological Sites
Local Authority Boundary
AQMA No.1
AQMA No. 4
AQMA No.5
AQMA No.2
AQMA No.3
The Dales Open Space LNR
Alderman Canal East LNR
Alderman Canal West LNR
Stoke Tunnel Cutting SSSI
Stoke Park Wood LNR
Bourne Park Reed Beds LNR
Bobbits Lane LNR
Bobbitshole, Belstead SSSI
Pipers Vale LNR
Orwell Estuary SSSI
Stour and Orwell Estuaries SPA/Ramsar
Bridge Wood LNR
Bixley, Heath SSSI/LNR
Ipswich Heaths SSSI
IPSWICH
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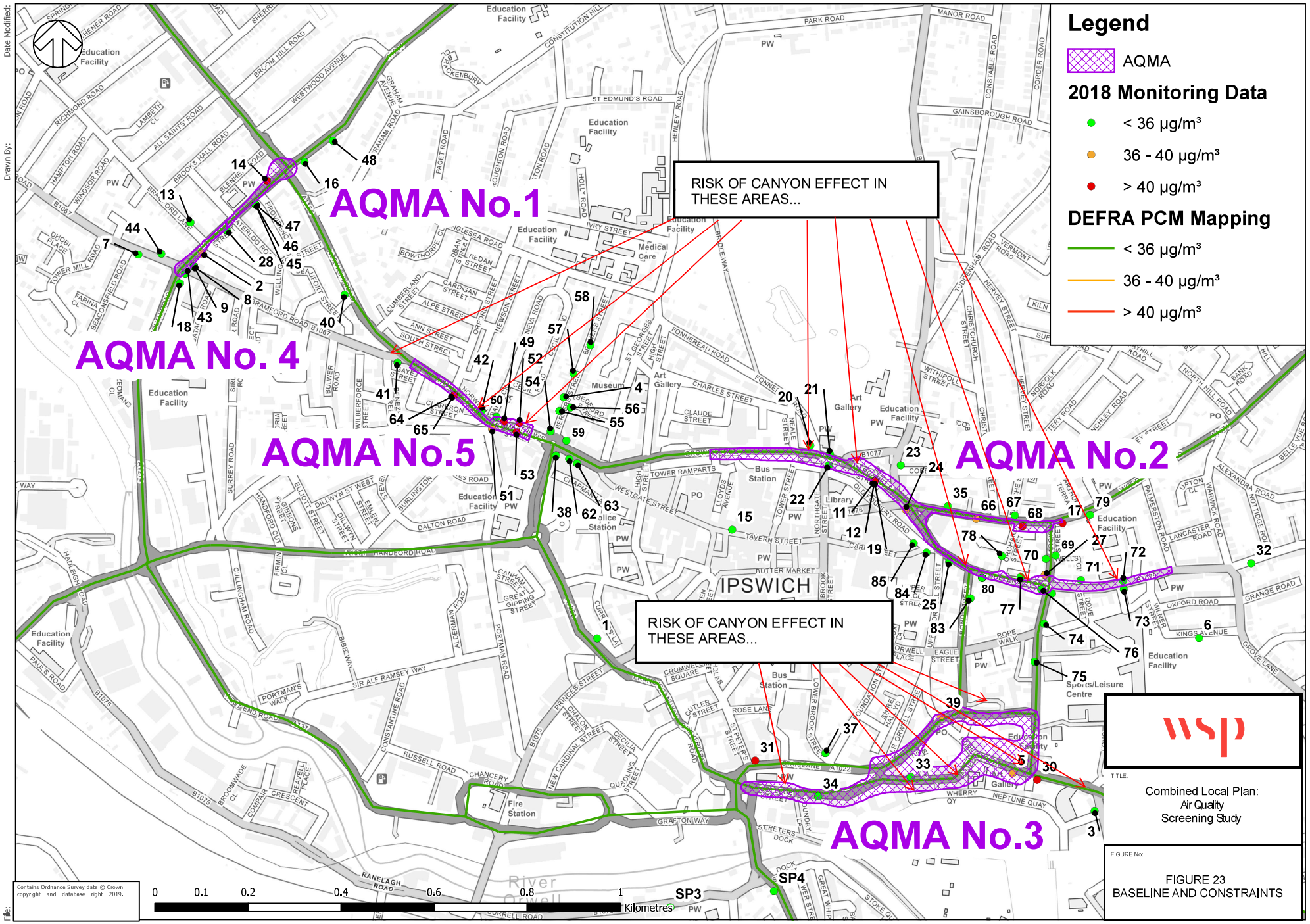
0 0.2 0.4 0.8 1.2 1.6 2
Kilometres
Date Modified:
Drawn By:
File:
wsp
TITLE:
Combined Local Plan:
Air Quality
Screening Study
FIGURE No:
FIGURE 22
BASELINE AND CONSTRAINTS


Legend
AQMA
2018 Monitoring Data
< 36 µg/m³
36 - 40 µg/m³
> 40 µg/m³
DEFRA PCM Mapping
< 36 µg/m³
36 - 40 µg/m³
> 40 µg/m³
AQMA No.1
AQMA No. 4
AQMA No.5
AQMA No.2
AQMA No.3
RISK OF CANYON EFFECT IN THESE AREAS...
RISK OF CANYON EFFECT IN THESE AREAS...
IPSWICH
Contains Ordnance Survey data © Crown copyright and database right 2019.
0 0.1 0.2 0.4 0.6 0.8 1 Kilometres
Date Modified:
Drawn By:
File:
TITLE:
Combined Local Plan: Air Quality Screening Study
FIGURE No:
FIGURE 23
BASELINE AND CONSTRAINTS