A35 Chideock Air Quality

Assessment of Platooning Alternate Direction Single-Lane Traffic Flows

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1.0	31.07.18	Report on the assessment of vehicle platooning	JM/PS/DL/PCS	SW/PCS	JM
1.1	16.08.18	Report incorporates client comments from AR/AB/SN, additional air quality data, additional mapping and commentary on micro-simulation and air quality modelling	JM/PS/PCS/UT	JM	JM
1.2	07.09.18	Minor revision deleting reference to Investment Decision Committee in August 2018 and referring to speed limit on A35	JM	JM	JM
1.3	30.10.18	Revised report incorporating client comments received 12 October 2018	PS	MH	MH
1.4	05.04.19	Final version	PS	MH	MH

Contents

Important Note

- The report be read in full with no excerpts to be representative of the findings
- The report has been prepared exclusively for Jacobs' client and no liability is accepted for any use or reliance on the report by third parties

1. Introduction

Air quality observations on the A35 at Chideock in Dorset have been shown to exceed the UK Air Quality Strategy annual mean objective for Nitrogen dioxide (NO_2). The location is a single carriageway road through the village of Chideock and forms part of the Strategic Road Network. It is likely that the proximity of the houses to the road, together with the volume of traffic and possibly the gradient are localised factors causing the high concentrations and exceedance of NO_2 thresholds at the property facades. Recorded annual mean values from dispersion tubes are above the 40µg/m^3 threshold range and range up to 58.9µg/m^3.

Local community leaders are now promoting the potential establishment of a Clean Air Zone and the Chideock By-pass Working Group (CBWG) are putting forward the case for a bypass. Highways England is engaging with the communities and elected leaders and requires evidence to inform the discussion and exploration of air quality mitigation options.

It is understood that the local authority has considered various options to address this complex air quality issue. These range from promoting alternatives to road transport, road traffic management, reducing vehicle emissions and using statutory powers to limit the impact of air pollution. Highways England has asked Jacobs to undertake initial work in relation to one specific option to address air quality, specifically, an approach for platooning alternate direction single-lane traffic flows. This option could potentially smooth traffic flow and by changing the carriageway to a single lane moves the source of pollutants a greater distance away from the properties.

The scope of work is as follows:

i. Review background information and data regarding the air quality issue at A35 Chideock. This includes a brief explanation of the context, leading to the designation of the AQMA and what actions have been done since

ii. Assess this solution from a traffic engineering perspective, particularly in terms of capacity and safety

iii. Review traffic data and re-run an existing micro-simulation model to assess the impact of platooning single-lane vehicle flows through traffic signalling in Chideock

iv. Summarise the outcome from the study and next steps

2. Background

Location

The village of Chideock is situated in a valley with steep inclines at both ends of the village, particularly Chideock Hill, as illustrated in Figure 2.1. It is bi-sected by the A35 trunk road, a single carriageway road, which links the towns of Honiton, Bridport and Dorchester. It is the main route along the Dorset coast for local trips, commuters, long distance journeys and tourist traffic.

Figure 2.1: Chideock Hill

A traffic count undertaken in 2007 showed that there were approximately 16,000 vehicles per day travelling on the A35 trunk road. The recent two-way Annual Average Daily Traffic (AADT) volume from sites at Morecombelake to the west of the village was 16,609 vehicles and the 2017 AADT for London Inn to the east was 16,463 vehicles.

The route is used by heavy goods vehicles. Data from the site at London Inn shows 16% of vehicular movements are HGVs. There are speed restriction cameras that reduce vehicle speeds to 30mph at both ends of the village.

AQMA Designation

This section includes a brief explanation of the context, leading to the designation of the AQMA and describes the subsequent action plan.

The village of Chideock has a long-standing problem related to air pollution. An Air Quality Management Area (AQMA) was declared in Chideock along the A35 in May 2007 (refer to Figure 2.2). The NO_2 annual mean objective, set by the government for the protection of health, was exceeded at homes along this trunk road. The results illustrated a significant problem on the incline of the road going west out of the village. The results showed an annual mean nitrogen dioxide value of 42 ug/m^3 at Duck Street in 2007, which is not compliant with the 40 ug/m^3 threshold for NO_2. Current levels are discussed in chapter 3 of this report.

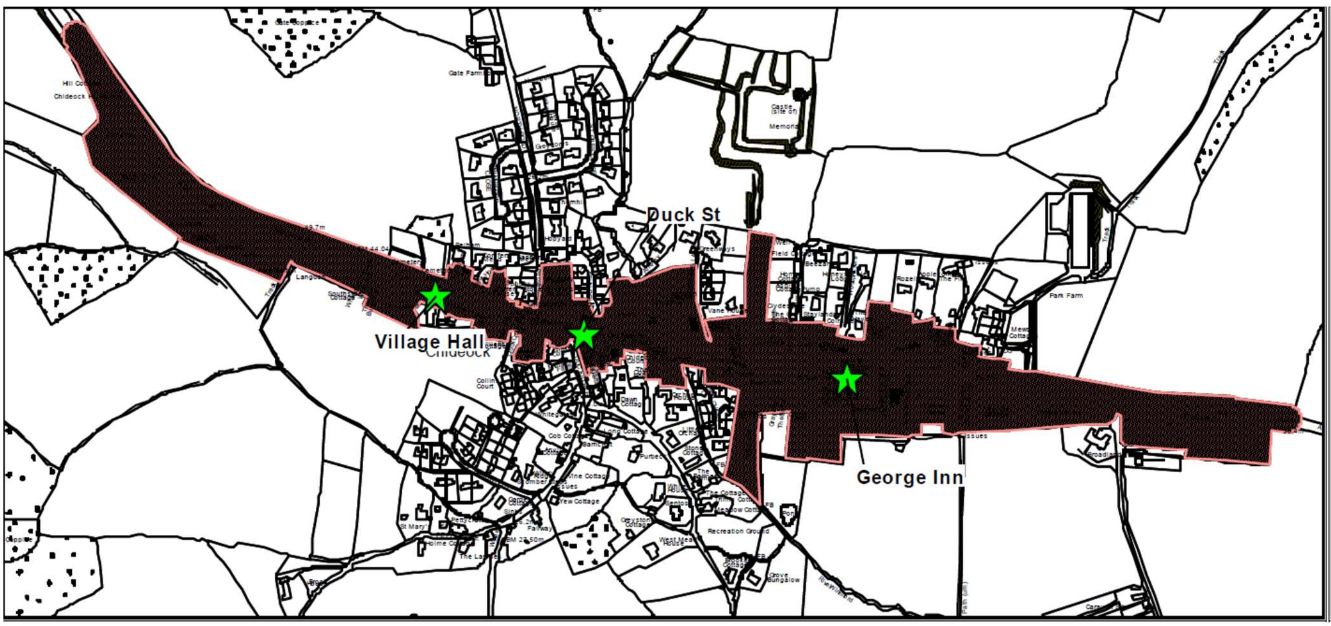


Figure 2.2: Air Quality Management Area and Monitoring Points

Air Quality Action Plan

West Dorset District Council undertook further assessment of air quality in Chideock in 2008 following the designation of the AQMA. This was to quantify the source of emissions and to develop an action plan. West Dorset District Council published the Local Air Quality Management: Chideock Air Quality Action Plan in December 2008. The report notes that ‘the cause of the air quality exceedances in Chideock has been attributed to the traffic levels in that area. There are no significant contributions from industrial or point sources within the District, therefore the options investigated to improve air quality have centred on those that target traffic levels and emissions’ (paragraph 1.3).

The plan involved preparing a package of options to help improve air quality in Chideock, whilst balancing the economic and social costs and benefits. An extract from the Air Quality Action Plan for Chideock AQMA is tabulated in Appendix A of the report. Some of the measures are certainly worth further consideration, for example, measures to smooth traffic flows and ensuring cars, HGVs and buses meet appropriate Euro standards.

West Dorset consulted on options and the diagram overleaf illustrates options preferred by the residents. The report noted that Highways England does not have any major schemes proposed for the A35, as a result of the cost and feasibility.

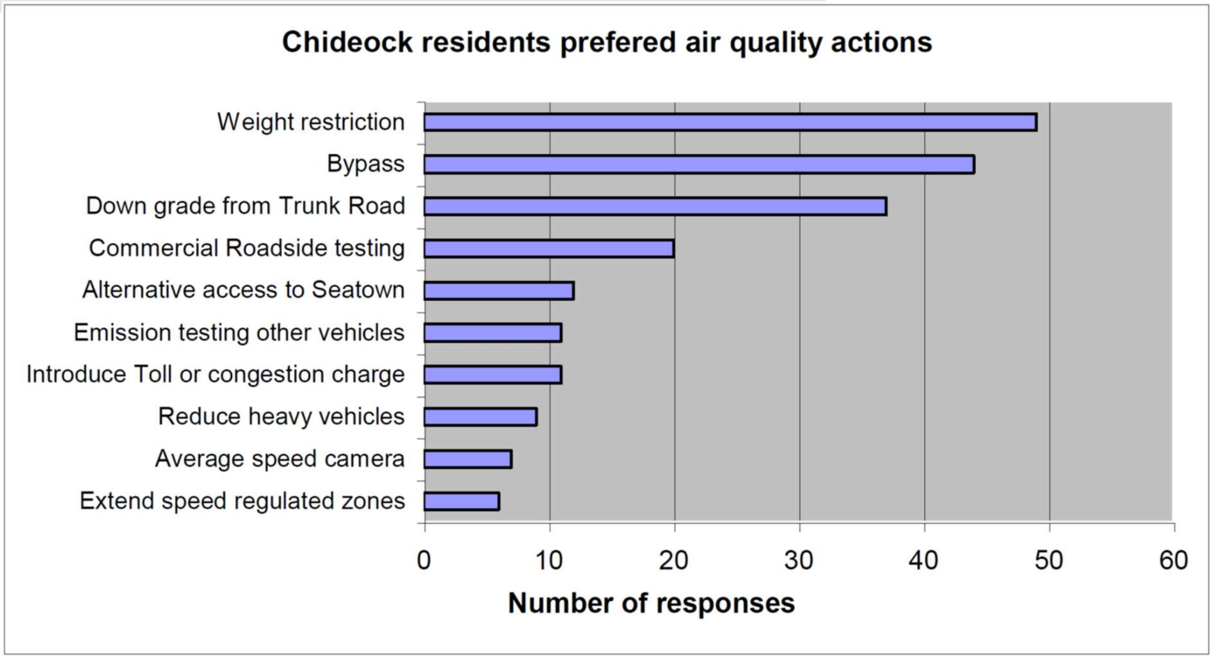


Figure 2.3: Results from Consultation with Residents

Ongoing Monitoring

Given the level of measured pollutants in Chideock, West Dorset District Council has continued to monitor pollutant levels. The overall programme was reviewed in January 2010 and further sites were added to the diffusion tube survey, as illustrated by the blue symbols in Figure 2.4 below.

Figure 2.4 NO_2 Monitoring Locations in 2010

Progress on Air Quality Action Plan

West Dorset District Council published a report on progress on the Air Quality Action Plan for Chideock in January 2011. An extract of the details is included in Appendix A. A few options were considered in terms of traffic management. For example, the report notes that consultants were commissioned to undertake a feasibility study towards smoothing the traffic flows in Chideock. The study recommended installing a mini-roundabout at the Duck Street junction, although there was some concern this may not improve pollution levels and air quality modelling was required. An alternative access to the caravan parks in Seatown was also recommended.

It was observed at the site visit that the junction of Chideock Hill with Duck Street is very constrained due to the proximity of buildings and that the road does not have separate ghost island for right turns into Duck Street. These traffic movements impede the flow of eastbound traffic on the A35 trunk road, which leads to queueing and potentially increased emissions.

Observations of traffic data from google maps illustrate that there is an apparent problem with queueing in the inter-peak period, although, interestingly, not in the am and pm peak periods. CCTV surveys have been arranged to examine traffic behaviour at this junction and on Chideock Hill.

AQMA Boundary Revision

The AQMA in Chideock was reduced in size in 2012. The revised AQMA can be seen in Figure 2.5 below.

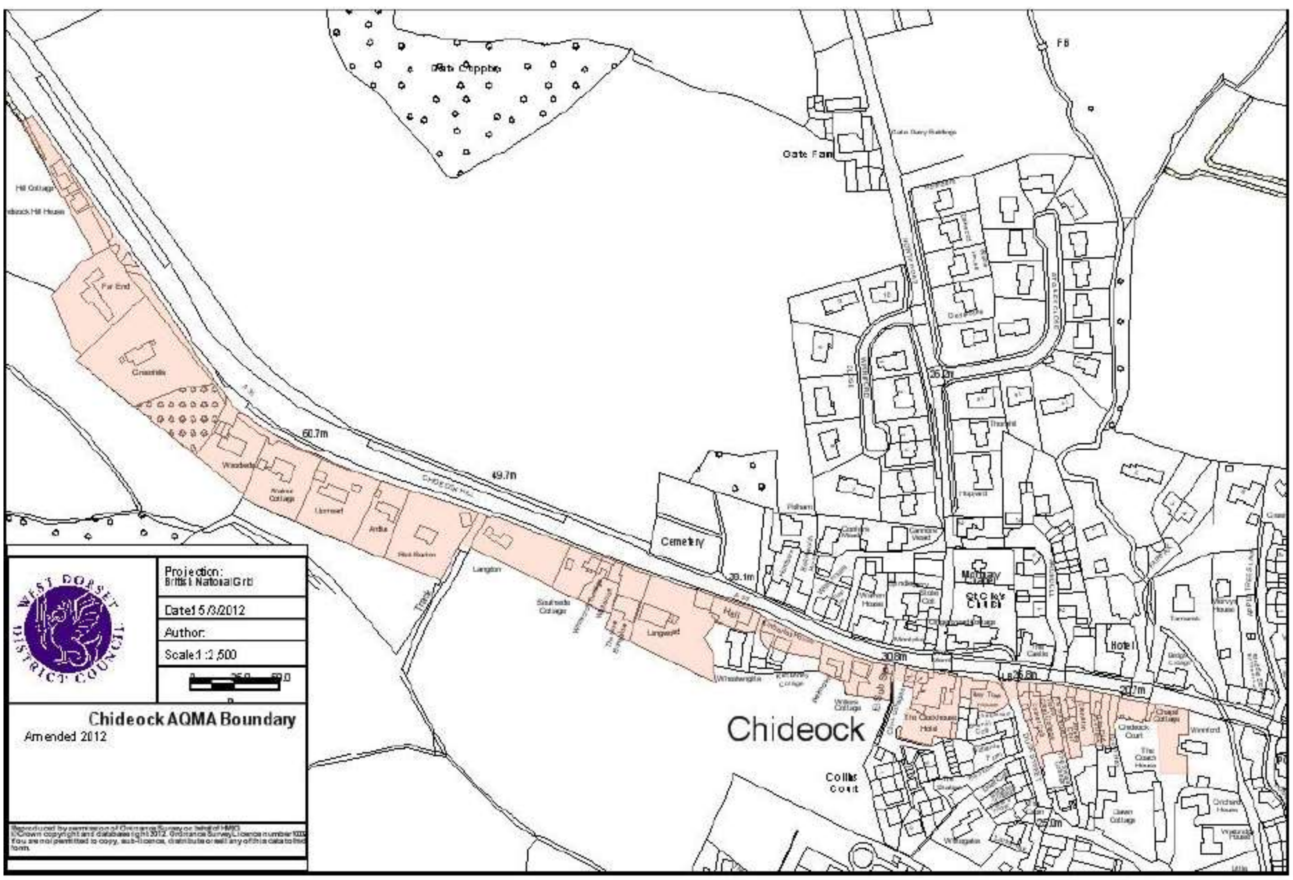
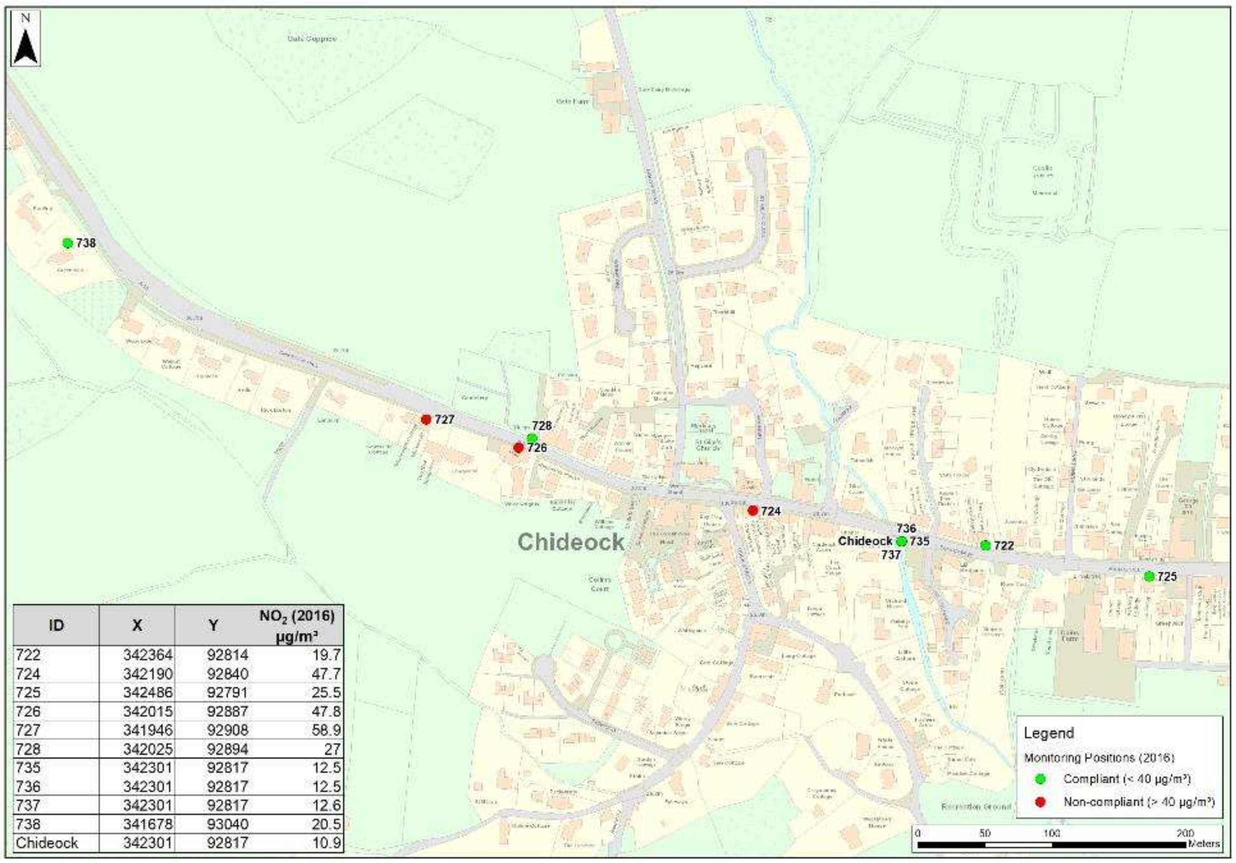


Figure 2.5: 2012 Revised Air Quality Management Area

3. Air Quality and Traffic Data

Current NO_2 Levels

Current air quality data held by Defra has been reviewed to determine the exceedances of European air quality limits for annual levels of nitrogen dioxide, NO_2. The NO_2 levels in 2017 are illustrated in Figure 3.1 below.



ID	X	Y	NO_2 (2016) µg/m³
722	342364	92814	19.7
724	342190	92840	47.7
725	342486	92791	25.5
726	342015	92887	47.8
727	341946	92908	58.9
728	342025	92894	27
735	342301	92817	12.5
736	342301	92817	12.5
737	342301	92817	12.6
738	341678	93040	20.5
Chideock	342301	92817	10.9

Figure 3.1: Monitoring data for A35 Chideock

The diagram illustrates that the exceedances are found at three sites on the ‘uphill’ side of the A35, which confirms that the gradient is the main factor at Chideock. Road gradient can have a significant effect on vehicle emissions. Even hills with slight gradients can increase the power demanded from the vehicle engine, particularly for HGVs. As the power-demand increases, emissions increase (Defra, 2018). For vehicles going down the hill, the opposite occurs, and emissions decrease. However, for a road with a gradient greater than 2.5%, the decrease associated with downhill emissions does not compensate for the uphill increase and, therefore, the overall emissions from a two-way link on >2.5% slope will be increased. Figure 3.2 shows the relationship between NOx emissions and slope that is obtained by applying the methodology described in the TG16 guidance (Defra, 2018)[1]. Data used in the example below are from an air quality study conducted for the city of Bristol (Confidential, 2018).

[1] Data have been sourced from an ongoing study and are purely aimed to provide an example of the effect of gradient on NOx emissions from HGVs.

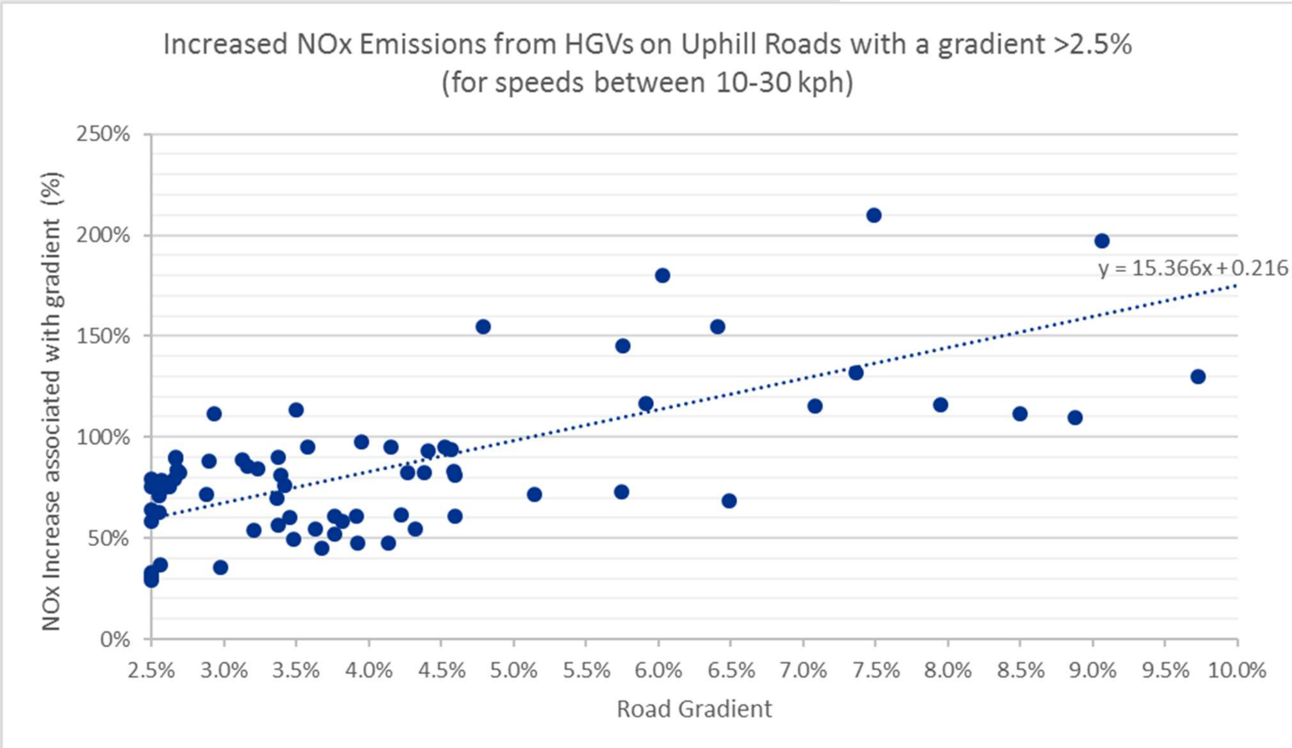


Figure 3.2: Example of the correlation between NOx emissions and road gradient

Chideock Hill has a gradient in places of 15%. Extrapolating the graph above, with a 15% gradient, concentrations of NOx increase by an enormous 230%.

Figure 3.3 shows the annual mean NO_2 concentrations at the various sites in Chideock. There is no obvious overall change in NO_2 concentrations in Chideock over the 2005 to 2016 period. The site with the highest concentration, site 715, fluctuates, but does seem to show an overall increase from 2010 to 2016.

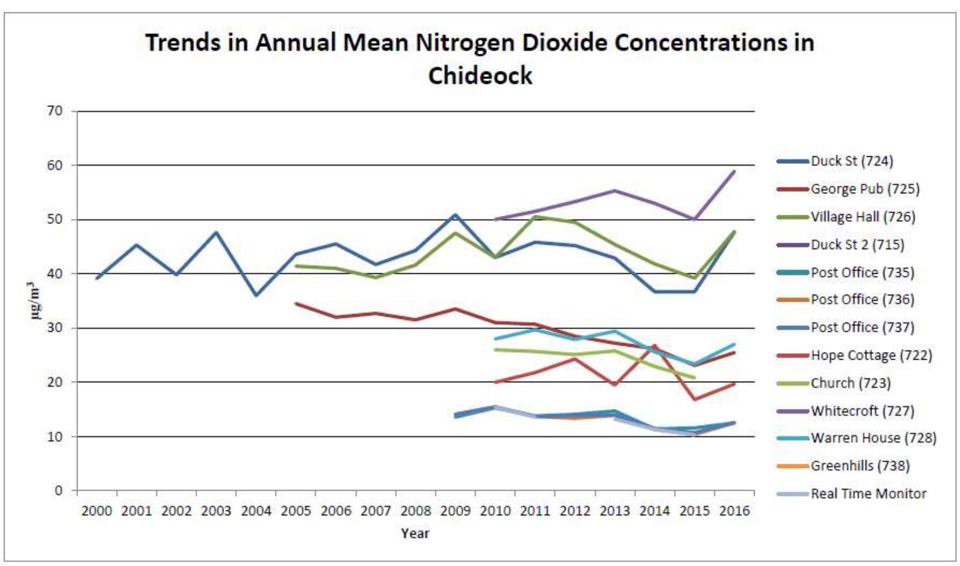


Figure 3.3: Trends in Annual Mean Nitrogen Dioxide Concentrations in Chideock

Figure 3.4 below shows the monthly mean NO_2 concentrations at the various sites in Chideock in 2016. The sites with the highest NO_2 concentrations are 724, 726 and 727. Figure 3.1 shows that these sites are all on the uphill section of the A35 to the west of Chideock. The sites with the lowest NO_2 concentrations are 735, 736 and 737 which are all located in the valley towards the centre of Chideock. This does suggest that the steep gradient of the A35 to the west of Chideock is contributing to the air quality problems. For the three sites with the highest NO_2 concentrations, levels are highest from June to September. This requires further investigation to ascertain whether this is related to traffic or meteorological conditions.

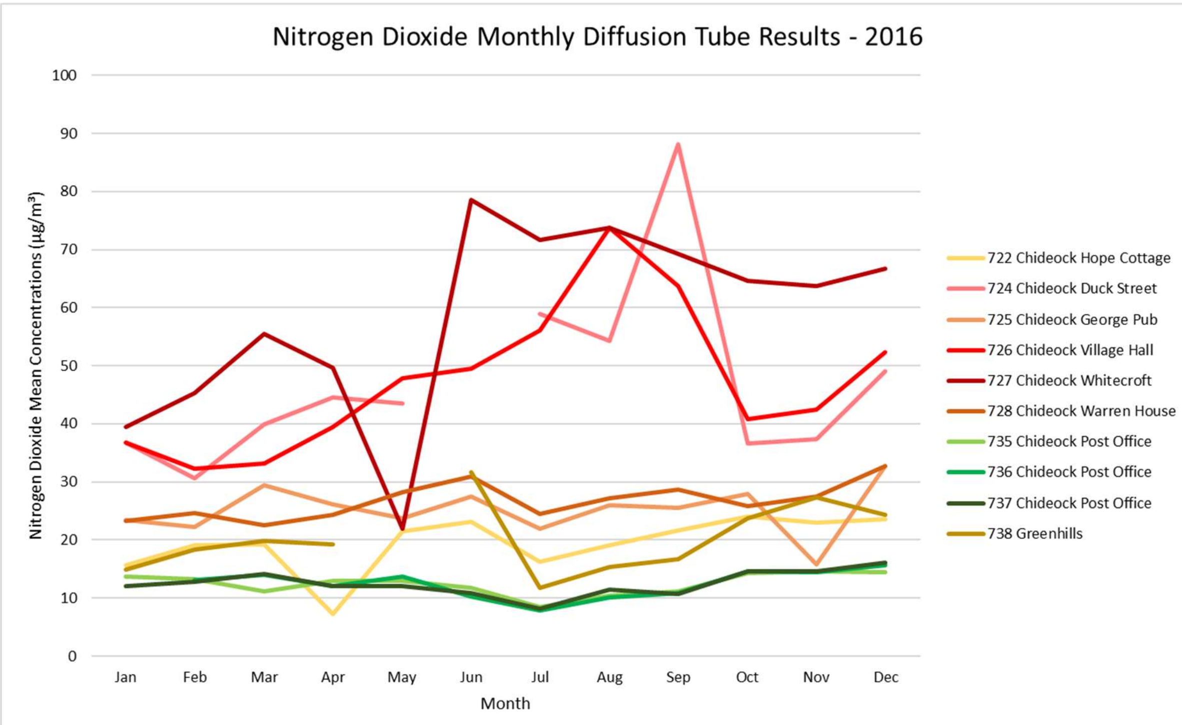


Figure 3.4: Trends in 2016 Monthly Mean Nitrogen Dioxide Concentrations in Chideock

Traffic Data

Traffic data has been obtained from Highways England’s web-based Traffic Information System (webTRIS) to determine the traffic volumes on this section of the A35 trunk road. There are two sites to the west of Morecombelake, the next village west of Chideock. These are appropriate to understand the volume of traffic on the A35, as there are no major intersections between Morecombelake and Chideock.

For the site at Morecombelake, 2017 data was available in the westbound direction only. For the eastbound direction, the latest available data was for 2015. Therefore, NTM factors were used to calculate a 2017 forecast Annual Average Daily Traffic (AADT) and Annual Average Week-day Traffic (AAWT) for the eastbound direction.

Direction	Year	Annual Average Daily Traffic (AADT)	Annual Average Weekday Traffic (AAWT)
A35 Morecombelake (Eastbound)	2015 webTRIS	7845	7869
	2017 NTM Forecast	8130	8155
A35 Morecombelake (Westbound)	2017 webTRIS	8226	8383
Total	**2017**	**16,356**	**16,538**

Source: webTRIS

Table 3.1: webTRIS data for Automatic Traffic Count (ATC) site west of Morecombelake

Direction	Year	Annual Average Daily Traffic (AADT)
A35 London Inn (Eastbound)	2017	8224
A35 London Inn (Westbound)	2017	8239
Total	**2017**	**16,463**

Source: Connect Roads

Table 3.2: DfT data for Automatic Traffic Count (ATC) site at London Inn east of Chideock

A traffic count undertaken in 2007 showed that there were approximately 16,000 vehicles per day travelling on the A35 trunk road. The Annual Average Daily Traffic (AADT) in 2017 from a site at Morecombelake to the west of the village was 16,356 vehicles and the AADT for London Inn to the east was 16,463 vehicles. This illustrates that there has been no traffic growth over the ten-year period.

Annual traffic volume data between 2004 - 2005 and 2015 - 2016 (illustrated in Figure 3.5) also shows very little growth over this period. The annual traffic flow through Chideock in 2004-2005 was 5,597,206 and in 2015-2016 was 5,878,850. This is an increase of just 5% in 11 years.

However, annual traffic data also shows a much larger increase in heavy goods vehicles (HGVs) between 2004 - 2005 and 2015 - 2016. In 2004 - 2005 the HGV annual traffic flow through Chideock was 605,109. By 2015 - 2016, this had increased to 825,320, representing a percentage increase in HGVs of 36% over these 11 years. This means that the proportion of HGVs of the annual traffic through Chideock has increased from 11% to 14% over this time period. Despite this growth in HGVs, Figure 3.3 above does not show that this has caused an increase in NO_2 concentration. Figure 3.6 below shows the growth in HGV annual traffic flow.

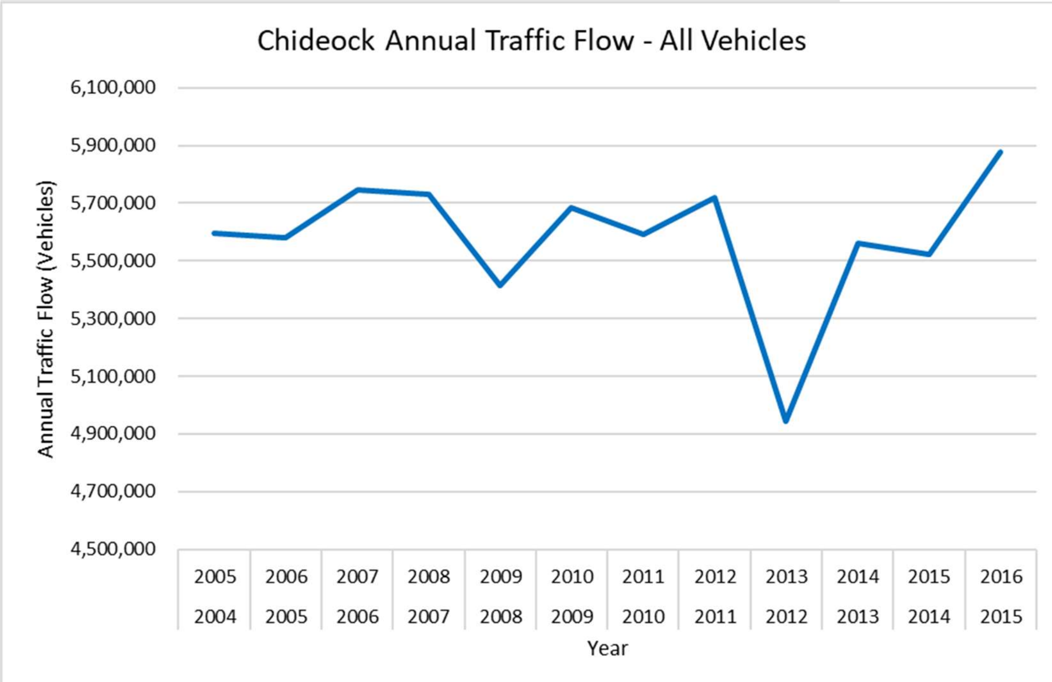


Figure 3.5: Chideock Annual Traffic Flow

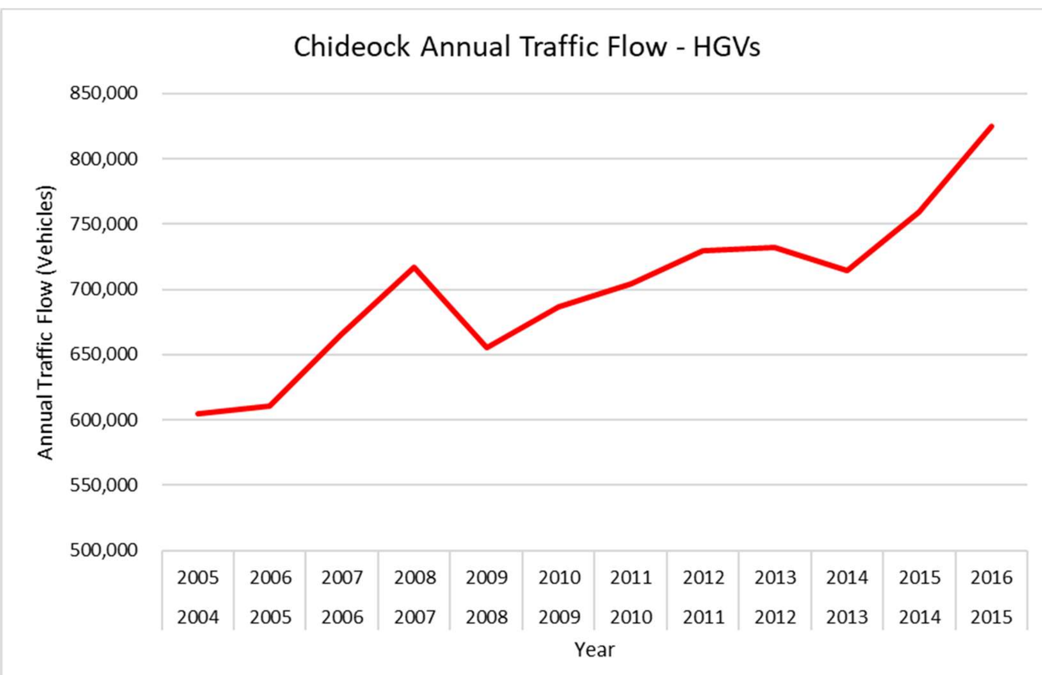


Figure 3.6: Chideock Annual HGV %

Figure 3.7 below shows the monthly traffic flow through Chideock in 2017. It shows that the traffic flow begins to increase from June, peaking in August. This correlates with the monthly NO_2 concentrations shown in Figure 3.4 above which shows that NO_2 concentrations are higher when traffic flows are higher during the summer months.

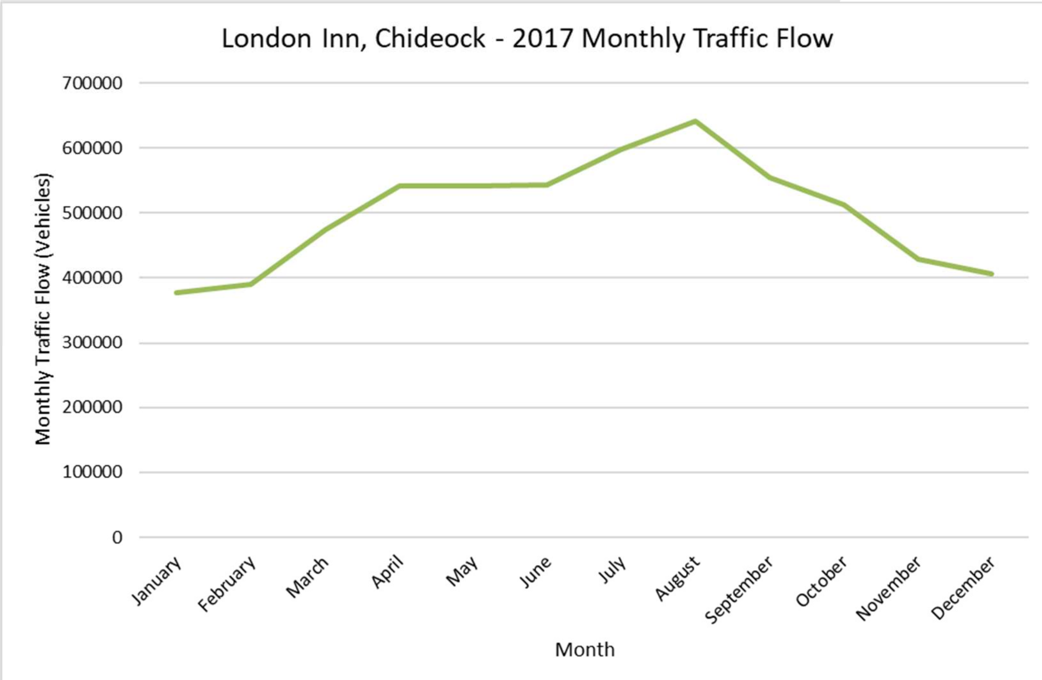


Figure 3.7: Chideock 2017 Monthly Traffic Flow

4. Safety and Capacity

Jacobs has been asked by Highways England to specifically test the impact of the proposed single lane alternating one-way traffic signal-controlled flow on the section of the A35 running through the village of Chideock. It has initially been assessed from a capacity and safety perspective.

Chideock is a long village on the A35 trunk road and therefore this option requires a controlled section of circa 1,300 metres. This option requires an inter-green time to accommodate a 'tidal' movement of A35 traffic. The timing will be between 2 and 3 minutes as a result of the length of the village. This is the clearance time between the green period terminating on a traffic signal phase at the 'gating' point on the west end of the village, which is losing right of way and the start of the green period on the phase gaining right of way on the 'gate' east of Chideock. This will result in significant lost time and capacity reduction on the A35 in this location.

The 'gating' point at the west of Chideock would need to be located on Chideock Hill. The highway is derestricted and has a steep downgrade towards Chideock in the eastbound direction (see Figure 2.1). With this possible solution, there is a high risk of sharp braking and shunt accidents, as a result of high approach speeds and the down grade approach to the signals. There a further safety issues related to the right-hand bend at the top of Chideock Hill and queuing on the hill. The proposed location for the traffic signals is therefore illustrated closer to the village, although not ideally positioned within the periphery of the Air Quality Management Area. The proposed locations of the signals can be seen in Figure 4.1. The proposals would need a Variable Message Sign to warn of the queues ahead linked to in-carriageway queue detection.

The road through Chideock has a high number of public road and private accesses. The junction with Duck Street is illustrated in Figure 4.2. This is a significant highway safety concern, as drivers joining the main road may have no idea which direction has the present 'right of way'. As such, they could turn onto the A35(T) in a conflicting direction to the tidal flow with right of way. This is a big risk in the long inter-green periods following the termination of the green phase for A35(T) traffic in each direction. The road will appear 'clear' in each direction allowing easy egress from side roads or private accesses. Despite the necessary setting of a very high clearance times, there will be inevitable conflicts between local access movements joining the A35(T) in these periods and the traffic on the SRN with right of way.

It should not be assumed that all drivers turning onto the A35(T) within Chideock are 'local', in that they could be expected to become familiar with the operation of the tidal flow system in operation over time. The A35(T) is a key recreational route serving the UNESCO World Heritage Coast, with the beach at Seatown to the south (accessed via Duck Street) used by a significant number of visitors to this part of West Dorset over the summer months.

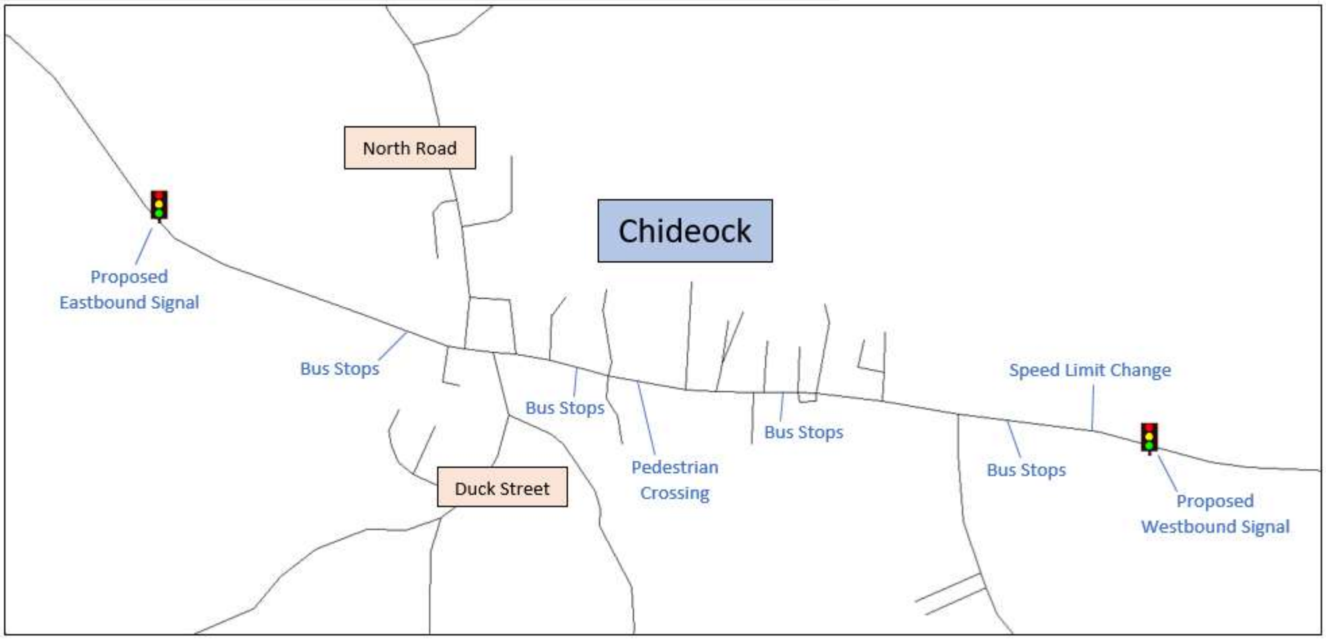


Figure 4.1: Assumed Shuttle Signal Head Locations

Figure 4.2: Junction with Duck Street

5. Micro-simulation Modelling

Jacobs has undertaken a test for one-way single controlled flow using an existing VISSIM micro-simulation model to ascertain the level of delay.

Model Background

Jacobs was provided with a A35 Chideock VISSIM model and associated report, produced by WSP in March 2017. This model was previously developed to ascertain the impact on road network operation through shuttle working while highway works were being carried out in the village i.e. to understand the queues and delays. The traffic management plan included a pair of temporary traffic signals with 300m of highway section in between. It was developed for a May 2017 base.

Whilst there are major limitations with the model for the purposes of this particular task, it provides a useful comparative tool in the absence of anything else. A more detailed model would be required to correctly test this potential air quality solution or derivatives of it, in due course.

Jacobs review of the model and WSP report to assess whether the model is fit for purpose is described below.

Model Specification

- The model covers an approximately 2.6km stretch of the A35 through Chideock;
- The model represents a weekday (Monday to Thursday) inter-peak hour (11:00-12:00). WSP selected this hour, as it was found to be the hour with the highest two-way vehicle count; and
- Vehicle types: cars and HGVs have been used in the model.

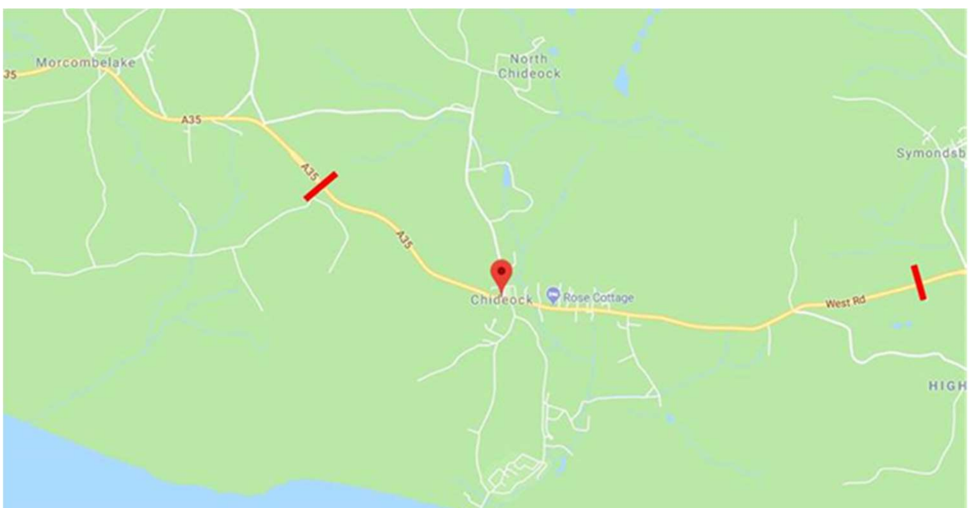


Figure 5.1: Geographical Extent of VISSIM Model

Model Limitations

A number of issues were raised in the model review which could impact on the model's ability to test the proposed scheme:

- **Model calibration and validation was not included in the report** – it is therefore not known how well the model reflects the operation of traffic in the area;
- **No traffic on side road accesses has been included in the model** – any delays caused by vehicles turning into and out of these roads will not be reflected in the model;
- **The geographical extent of the model** to reflect true queue lengths;

- **The model has no morning and evening peak hours** – count data indicates volumes are just slightly below the 11.00 – 12.00 modelled hour.

Changes to Model

Jacobs has made a number of changes to the WSP model before using it to test the proposed traffic signals. These changes were:

- Updating the traffic flows to 2018 levels. This was done by factoring observed data for 2016 to 2018 using NTEM factors;
- Including bus services running through the village; and
- Including the gradient on the section of the road on the west of Chideock, where there is a particular air quality problem.

Option Testing

Jacobs produced two modelled scenarios for the 2018 inter-peak (11:00-12:00). These two scenarios are:

- **Without Signals** – this is the present-day network, without the proposed signals
- **With Signals** – This scenario included the proposed single lane traffic, alternating one-way traffic signals

Model Outputs

Model Runs

The inter-peak (11:00-12:00) model for the 2018 With and Without Signals scenarios were each run 10 times, with each run having a different random seed in order to represent daily variations in traffic. The outputs derived from the models were queue lengths, journey times and network performance statistics.

Queue Lengths

Average and maximum queue lengths were collected at each of the proposed signal heads in the With Signals model. These results are given in Table 5.1.

Direction	Average Queue Length (m)	Maximum Queue Length (m)
Eastbound	724	755
Westbound	1267	1303

Table 5.1: Average and Maximum Queue Lengths in the With Signals Scenario

As anticipated, the results show extremely heavy queueing at both the eastbound and westbound signal heads. However, the distance from the eastbound signal head to the western extent of the model is approximately 750m and the distance from the westbound signal head to the eastern extent of the model is in the region of 1.3km. Given the geographical extent of the model, it is most probable that the queues extend significantly beyond those reported above and actually extend way beyond the extent of the model.

Journey Times

Average travel times were collected along the A35 through Chideock for the With and Without Signals scenarios. These results are given in Table 5.2.

Direction	Without Signals Travel Time	With Signals Travel Time
Eastbound	00:03:50	00:21:44
Westbound	00:03:57	00:18:40

Table 5.2: Average Travel Times along the A35 through Chideock in the With and Without Signals Scenarios

It can be seen that the introduction of the proposed signals leads to a significant increase in travel times along the A35 through Chideock. In the eastbound direction, the travel time increases from 3 minutes 50 seconds to 21 minutes 44 seconds when the signals are introduced, representing a 467% increase. In the westbound direction, the travel time increases from 3 minutes 57 seconds to 18 minutes 40 seconds, representing a 373% increase.

Vehicle Network Performance Statistics

Vehicle network performance statistics were collected for the modelled scenarios. The key indicators are:

- Average delay time per vehicle (seconds)
- Average speed (km/hour)
- Total delay time (hours)
- Total travel time (hours)
- Latent demand (vehicles) – this is the number of vehicles which were not able to enter the modelled network in the simulated period

The network performance statistics are summarised in Table 5.1.

Parameter	Without Signals	With Signals
Average delay time per vehicle [s]	58.58	1145.47
Average speed [km/h], All Vehicle Types	40.66	5.63
Total delay time [h]	24.69	245.65
Latent delay time [h]	0.09	434.86
Latent demand	0	898
Total travel time [h]	104.46	275.25

Table 5.1: Vehicle Network Performance Statistics in the With and Without Signals Scenarios

It can be seen that the introduction of the proposed signals causes the average delay time per vehicle to increase significantly from 59 seconds to 1145 seconds. The average speed in the network also decreases significantly, from 41km/hr to 6km/hr.

It can also be seen that the latent demand in the With Signals scenario is very high. This means that in the With Signals model there are 898 vehicles queueing to get into the network, meaning that the actual queues at the signals will be higher than those reported above. The total latent delay experienced by these vehicles is 435 hours.

The latent demand was used to estimate the distance which vehicles would be queueing outside of the modelled network, in addition to those reported within the network above. The queues outside of the modelled network were estimated to be 3.39km in the eastbound direction and 3.41km in the westbound direction. When combined with the queues inside the modelled area, these give total queue lengths of 4.14km and 4.71km in the eastbound and westbound directions respectively. The extents of these queues can be seen in Figure 5.2 below. It can clearly be seen that these queues will block back well into neighbouring towns and villages such as Morecombelake to the west of Chideock and Bothenhampton to the east.

Figure 5.2: Forecast Queue Lengths in With Signals Scenario

Summary and Conclusions

The results presented in the sections above clearly show that this proposed scheme would lead to unacceptable levels of congestion along the corridor. Average queue lengths at the proposed signal heads given by the model were 724m and 1.27km for the eastbound and westbound signals respectively. However, these are likely to be even higher in reality due to the high numbers of vehicles queueing outside the modelled area. Estimated values of the actual total queue lengths were 4.14km and 4.71km in the eastbound and westbound directions respectively. The proposed signals lead to incredibly high increases in travel times along the corridor, with an increase of 467% in the eastbound direction and 373% in the westbound direction, when compared to the network without the signals included.

It should also be noted that if an additional stage was incorporated within the model to allow movements from Duck Street and North Lane, there would be additional delays on the A35 trunk road.

As an independent validation, Jacobs undertook a survey of queue lengths during a period of shuttle working for roadworks in Chideock. Relevant screenshots from Google Maps taken in the AM, PM and inter-peak periods are included in Appendix C. The queue lengths are excessive on some days, for example 18 and 23 April 2018.

6. CCTV Footage Survey

CCTV Camera Data Collection

CCTV footage was collected from Monday 20th to Thursday 30th August 2018 for the section of the A35 with the highest concentrations of nitrogen dioxide. The section of the A35 covered by the CCTV cameras can be seen in Figure 5.3.

Figure 5.3: CCTV Footage Coverage Area

The footage was reviewed, and observations recorded in the Chideock AQ – CCTV Survey report, issued in October 2018. Key observations from this report are included in the section below.

Observations

A number of useful observations on potential causes of congestion and air quality issues in Chideock were shown in the CCTV footage captured. These were:

- **HGVs travelling up Chideock Hill** - Initially it was thought that a key cause of air quality issues could be HGVs travelling westbound up Chideock Hill, as this section of the A35 has a very steep gradient. It was thought that these would travel slowly up the hill and that platoons of vehicles would form behind them. Upon reviewing the footage, significant platoons were not seen to form frequently. However, it is difficult to assess the speeds of vehicles from this footage and so vehicles may be travelling up Chideock Hill more slowly than they appear.

- **Vehicles turning right into Duck Street** - Another potential cause of air quality issues identified prior to the CCTV footage survey was vehicles turning right into Duck Street. Upon reviewing the CCTV footage, it was seen that vehicles turning right into both Duck Street and North Road did not cause significant congestion. This is because other vehicles quickly give way to those turning into these roads. Due to this, queues of no more than 5-10 vehicles typically formed behind vehicles waiting to turn right.

- **Buses** – Buses stopping at bus stops were seen to cause significant delay on a regular basis. This is because buses were stopping for approximately 1 minute on average.

- **Unknown Causes** - The causes of the most significant traffic were not captured by the CCTV cameras as they are located further to the east and west than expected.

7. Summary and Next Steps

Summary

The village of Chideock has a long-standing problem related to air pollution. An Air Quality Management Area was designated in May 2007. Various options have been proposed to ameliorate the air pollution issue. These were summarised in the Air Quality Action Plan for Chideock. The plan suggested some possible traffic management measures, although these have not been tested in any detail.

Highways England asked Jacobs to undertake initial work in relation to one specific option to address air quality, specifically, an approach for platooning alternate direction single-lane traffic flows. The team obtained funding through the Investment Decision Committee (IDC) process to undertake feasibility work.

As anticipated, the introduction of this possible solution would result in exceptional queueing and delays on the Strategic Road Network. Chideock is a very long village on the A35 trunk road and therefore this possible solution would require a controlled section of circa 1.3 km. This option requires an exceptionally long inter-green time of 2 to 3 minutes to allow traffic to clear through the village.

The model results show that for a vehicle travelling in the eastbound direction, average travel time through the modelled area increases from almost four minutes to nearly 22 minutes. Through the introduction of the proposed controlled area, the average delay time per vehicle increases significantly from one minute to 19 minutes.

The level of queueing on the Strategic Road Network is excessive. The model indicatively illustrates delays of 1.3km for traffic travelling eastbound, with significant queueing on Chideock/Langdon Hill. This hill is very steep and represents a severe safety concern.

It should also be realised that the geographical scope of this model is limited and that queues would extend beyond the model cordon. This is confirmed through examination of latent demand. In the With Scheme model, there are 898 vehicles queueing to get into the network. The total latent delay experienced by these vehicles is 435 hours. Taking into account latent demand, the overall queue lengths with this proposed solution are estimated to be in the reigon of 4 – 5 km and extend to between Morecambelake and Charmouth to the west and Bothenhampton in the vicinity of Bridport to the east (as illustrated in Figure 6.1).

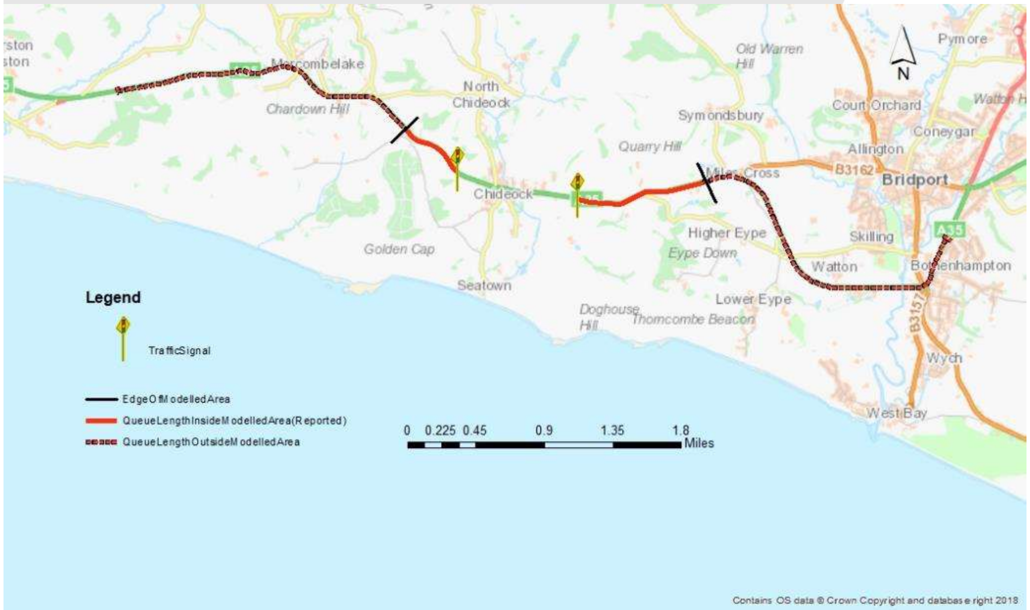


Figure 6.1: Forecast Queue Lengths with traffic signals to platoon single-direction traffic flows in Chideock

It should also be borne in mind that a separate third stage in the model for traffic from Duck Street and North Road would result in further delays.

The 'gating' point at the west of Chideock would need to be located on Chideock Hill. With this possible solution, there is a high risk of shunt accidents, as a result of high approach speeds and the down grade approach to the signals. There are further safety issues related to the right-hand bend at the top of Langdon Hill.

The road through Chideock has a high number of public road and private accesses. Dealing safely with side road traffic entering the controlled length will be a serious issue. Traffic could turn onto the A35(T) in a conflicting direction to the tidal flow with right of way. This is a big risk in the long inter-green periods following the termination of the green phase for A35(T) traffic in each direction.

From the perspective of excessive queueing and delay and the serious safety concern, the approach to platooning alternate traffic flows with traffic signals is not recommended.

Next Steps

Recommendations for further consideration:

- **Explore potential of changing speed limits and the impact on air quality:**
  - This would first require speed surveys to be carried out in order to determine whether a speed limit change would have any effect on vehicle speed. For example, if vehicles travelling up Chideock Hill are already travelling below the speed limit due to the steepness of the hill, a change in speed limit would be unlikely to affect the speed at which they travel.
  - If these speed surveys show that a change in speed limit would affect vehicle speeds, the effect of speed reductions on air quality should be considered.
  - In general, on a slope lower speeds will generate lower emissions.
  - An air quality model could be developed to check if the changes in speed bring about a benefit in terms of air quality.
- **Consider opportunities to smooth traffic flow:**

- Explore whether there are any options to smooth traffic flow that are worth considering, for example, prohibiting right turns.
- If any options are worthy of testing, a micro-simulation model should be developed in order to test these.
- Generally, a reduction in ‘stop/start’ behaviour will reduce emissions.

Appendix A. Additional Information

Air Quality Management Plan for Chideock (2008)

10. Air Quality Action Plan for Chideock AQMA

No	Action	Lead agency	Impacts	By..	Cost/Benefit
Promoting Alternatives to Road Transport					
A1	Publish an Action Plan to reduce road traffic by; • Promoting local buses as commuter buses. • Encouraging use by travellers of the Jurassic Coast bus	DCC	Maximise bus usage. Improve tourism infrastructure	June 2010	Low/Low
A2	Publish a School Travel Plan for Symondsbury and other local schools. Include the investigation of Hell Lane as a Walking Bus route	DCC	Reduce local road traffic to/from schools	April 2010	Low/Low
A3	Publish an Action Plan to reduce road local traffic including; • Promoting Car pool schemes. • Increased promotion of the Car Share Dorset scheme • Discussing solutions with local caravan park	DCC	Reduce local road traffic	June 2010	Low/Low
A4	Bring a feasible scheme providing alternatives to local car travel into the Capital Programme from 2010/11 onwards	DCC	Improve cycling & walking facilities	April 2010	Medium/Low
A5	Lobby at regional level and through the LTP process for an improved Exeter/Weymouth railway route	DCC	Encourage more travellers to use railway to reduce road traffic	July 2010	Low/Medium
A6	Maintain the national concessionary bus scheme for concessionary users	WDDC (EH)	Maximise bus usage	Ongoing	Low/Low
A7	Encourage any proposals for new or improved footways or cycleways, in order to provide safe alternatives to car travel for local people and tourists.	WDDC (PI) /DCC	Reduce local traffic	Ongoing	Low/Low

No	Action	Lead agency	Impacts	By..	Cost/Benefit
Road Traffic Management					
B1	Clarify the Governments current and likely future position on building a by-pass	WDDC (EH)	Move through traffic away from the village. Displace traffic elsewhere	December 2008	Potentially High/High
B2	Maintain a programme of improvements to assist traffic flows on the A30/A35, specifically including bus stop facilities.	HA	Reduce congestion	Ongoing	Medium/Low
B4	Reduce road blockages via the Journey Time Reliability initiative, which ensures road works minimise delay. Contractors and statutory undertakers carry out the majority of their work at night to minimise congestion.	HA	Reduce congestion	Ongoing	Low/Low
B5	Prompt Dorset Road Safe (the camera partnership) to review options to smooth traffic flows, such as; • Remove speed limit and speed camera • Introduce "Average Speed" cameras • Point speed cameras up hill • Introduce a variable speed limit • Extend speed regulated zone	DCC	Reduce congestion. Road safety issues.	April 2009	Low/medium
B6	Work with Somerset CC and other councils to amend SatNav systems to warn motorists (particularly HGV drivers) of steep hills at Chideock	DCC	Move HGV traffic away from the A35. Displace traffic elsewhere	April 2010	Low/Medium
B7	Complete a feasibility study to smooth flows of Seatown traffic turning onto and off the A35 and reduce pollution from queuing traffic, to deal with the seasonal traffic in particular. Submit proposal for inclusion in LTP	DCC DCC	Reduce congestion. Displace traffic elsewhere. Traffic confusion	Oct 2009 Dec 2009	Medium/medium
B8	Work with local businesses and delivery companies to voluntarily re-schedule deliveries that currently cause problems	WDDC (EH)	Reduce problem parking. Delivery problems	March 2009	Low/Low

No	Action	Lead agency	Impacts	By..	Cost/Benefit
B9	Investigate the possibility of re-scheduling refuse collection round to avoid creating additional road congestion	WDDC (WDS)	Reduce road blockages. Scheduling problems	March 2009	Low/Low
B10	Explore the effectiveness of products such as such TiO2 nano-coatings that claim to absorb pollutants when applied to road surface	HA	Absorb pollutants Aesthetic impact	Dependant on trial findings	Potentially Medium/Low

PROGRESS REPORT
AIR QUALITY ACTION PLAN FOR CHIDEOCK AQMA
JANUARY 2011

NO	ACTION REQUIRED BY PLAN	LEAD AGENCY	BY...	ACTION TAKEN/PLANNED
Promoting Alternatives to Road Transport				
A1	Publish an Action Plan to reduce road traffic by; • Promoting local buses as commuter buses. • Encouraging use by travellers of the Jurassic Coast bus	DCC	June 2010	**July 09** - DDC to ask Jurassic Coast working Theme Group for their current plan, or more specific Action Plan **Nov 09** – Action completed
A2	Publish a School Travel Plan for Symondsbury and other local schools. Include the investigation of Hell Lane as a Walking Bus route *Additionally November 2009* *Concern that Hell Lane still not being used as a walking bus route*	DCC	April 2010	**July 09** - DCC to obtain copy of Symondsbury School Travel Plan **Nov 09** – Travel Plan published. Action completed but DCC to investigate why Hell Lane is not being used. **July 10** – *WDDC to contact DCC for update* **Jan 11** – Hell Lane not currently suitable for a walking bus route No Further Action.
A3	Publish an Action Plan to reduce road local traffic including; • Promoting Car pool schemes. • Increased promotion of the Car Share Dorset scheme • Discussing solutions with local caravan park *Additionally November 2009* *No solutions have yet been proposed for alternative access to the caravan Parks in Seatown*	DCC	June 2010	**July 09** - DCC to obtain copy of Action Plan **Nov 09** – Action Plan produced ***July 10*** *– WDDC to contact DCC for update. Any proposals should include air quality modelling.* **Jan 10** – Consultants have been appointed to undertake modelling and will include predicted air quality levels in Chideock if there was an alternative access to caravan parks

NO	ACTION REQUIRED BY PLAN	LEAD AGENCY	BY...	ACTION TAKEN/PLANNED
A4	Bring a feasible scheme providing alternatives to local car travel into the Capital Programme from 2010/11 onwards	DCC	April 2010	**July 09** - DCC to secure an update **Nov 09 –** Waiting for update **July 10** – WDDC to contact DCC for update **Jan 11** – DCC currently consulting on LTP3
A5	Lobby at regional level and through the LTP process for an improved Exeter/Weymouth railway route	DCC	July 2010	**July 09** - DCC currently lobbying for better rail links **Nov 09 –** DCC continue to lobby **July 10** – Ongoing **Jan 11** – Ongoing and included in LTP3
A6	Maintain the national concessionary bus scheme for concessionary users	WDDC	Ongoing	**July 09** - WDDC advises that the concessionary bus scheme is ongoing but may transfer to DCC **Nov 09** –Ongoing unless otherwise stated
A7	Encourage any proposals for new or improved footways or cycleways, in order to provide safe alternatives to car travel for local people and tourists.	WDDC DCC	Ongoing	**July 09** - WDDC (Planning Policy) advise that such proposals continue to be encouraged when opportunities arise **Nov 09** – Ongoing **July 10** - Application for footpath to connect Broadmead to Frogmore farm discussed, funding and ownership problems noted. HA to update. **Jan 11** – Problems with land ownership and monies originally identified for scheme are no longer available. Sceme unlikely to go ahead.
Road Traffic Management				

NO	ACTION REQUIRED BY PLAN	LEAD AGENCY	BY…	ACTION TAKEN/PLANNED
B1	Clarify the Governments current and likely future position on building a by-pass	WDDC	Dec 08	**July 09** - Response back from Government Office for the South West, “It is for the region to identify its priorities.” The scheme does not sit high in regional priorities given the significant obstacles it faces. **Nov 09** – Action completed
B2	Maintain a programme of improvements to assist traffic flows on the A30/A35, specifically including bus stop facilities.	HA	Ongoing	**July 09** - A programme of measures are in place, including Dedicated Incident Support Unit to maintain and improve traffic flow **Nov 09** – HA informed that Bus Stops and proposed pedestrian crossing to be installed by end of March 2010 **July 10** - Upgrade of bus stops (including two shelters) completed. Highways Agency (HA) also has a National Vehicle Recovery Service to recover broken down vehicles on trunk roads to help respond to any congestion problems that develop on trunk roads. **Jan 11** – Action completed
B4	Reduce road blockages via the Journey Time Reliability initiative, which ensures road works minimise delay. Contractors and statutory undertakers carry out the majority of their work at night to minimise congestion.	HA	Ongoing	
B5	Prompt Dorset Road Safe (the camera partnership) to review options to smooth traffic flows, such as; • Remove speed limit and speed camera • Introduce “Average Speed” cameras • Point speed cameras up hill • Introduce a variable speed limit • Extend speed regulated zone	HA DCC	April 2009	**July 09** - DCC to advise of outcome of Dorset Road Safe discussions of camera positioning and use **Nov 09** – This is a low priority as the partnership’s priority is safety, not air quality, however still waiting outcome of speed limit review. **July 10** - Air quality modelling should consider scenario to extend the speed regulated zone. **Jan 11** – Consultants appointed to do modelling. Speed Watch scheme now operating. Replacement of damaged camera unlikely as previously replaced due to vandalism and DCC now moving towards mobile cameras.
B6	Work with Somerset CC and other councils to amend SatNav systems to warn motorists (particularly HGV drivers) of steep hills at Chideock	DCC	April 2010	**July 09** - Not achievable within current legislation **Nov 09** – Completed, not feasible

NO	ACTION REQUIRED BY PLAN	LEAD AGENCY	BY…	ACTION TAKEN/PLANNED
B7	Complete a feasibility study to smooth flows of Seatown traffic turning onto and off the A35 and reduce pollution from queuing traffic, to deal with the seasonal traffic in particular. Submit proposal for inclusion in LTP	HA	Dec 09	**July 09** - HA to prepare brief for DCC to commission a high-level study **Nov 09** –study commissioned. Draft sent to DCC for approval. Report recommended that a mini roundabout be installed at the Duck Street junction. Concerns that this would not improve air quality levels in this area. AQ modelling may be required. **July 10** - Feasibility study drafted and still with DCC for comments. Will need to undertake air quality modelling before final report is produced. HA & WDDC to meet to discuss requirements for air quality modelling and to look at air quality / traffic data. **Jan 11** – Consultants appointed to undertake modelling. Good correlation between monthly traffic levels and NO_2 average concentrations.
B8	Work with local businesses and delivery companies to voluntarily re-schedule deliveries that currently cause problems	WDDC	March 09	**July 09** -Complete. The 3 or 4 local businesses all have car parks and delivery vehicles do not park on the road. Does not have a major impact on traffic flow **Nov 09** – Action complete
B9	Investigate the possibility of re-scheduling refuse collection round to avoid creating additional road congestion	WDDC	March 09	**July 09** -WDDC to explore with flow data **Nov 09** – Collection does not impede on traffic flow due to very early and mid afternoon collections, not seen as a major concern to air pollution.
B10	Explore the effectiveness of products such as such TiO2 nano-coatings that claim to absorb pollutants when applied to road surface	HA	Dependant on trial findings	**July 09** - HA to supply copy of Interim report when available. Not looking promising **Nov 09** –Trials showed that AQ levels did not show a difference in AQ levels when compared to areas without the coating. Not feasible due to cost and study findings.
KEY	**WDDC** = West Dorset District Council, **DCC** = Dorset County Council **CPC** = Chideock Parish Council **HA** = Highways Agency Grey – **Action completed**, Green **On going & within timescale**, Amber, **Fallen behind**, Red – **No Action**			

Appendix B. Queue Monitoring

Friday 13th April 08:40

Friday 13th April 13:55

Friday 13th April 16:50

Monday 16th April 08:35

Monday 16th April 14:05

Monday 16th April 16:35

Monday 16th April 17:00

Tuesday 17th April 08:35

Tuesday 17th April 11:35

Tuesday 17th April 14:00

Tuesday 17th April 16:30

Tuesday 17th April 17:00

Wednesday 18th April 09:00

Wednesday 18th April 10:50

Wednesday 18th April 14:10

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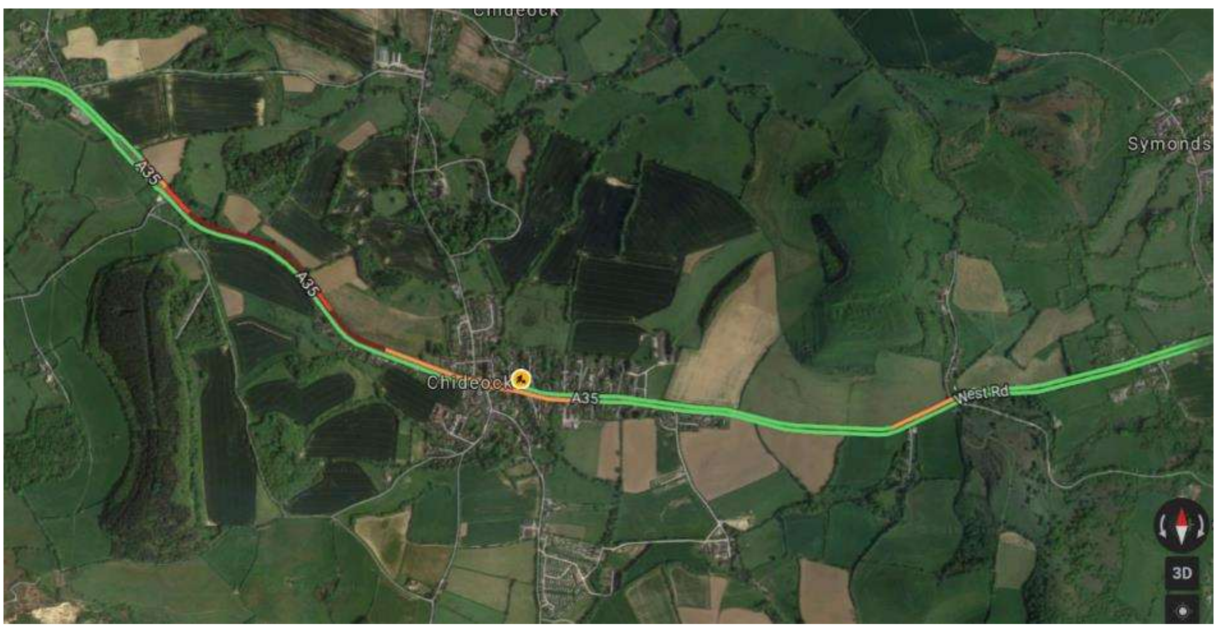
Tuesday 24th 10:30



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Tuesday 24th 17:00

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Wednesday 25th 10:30

Wednesday 25th 14:00

Wednesday 25th 17:00

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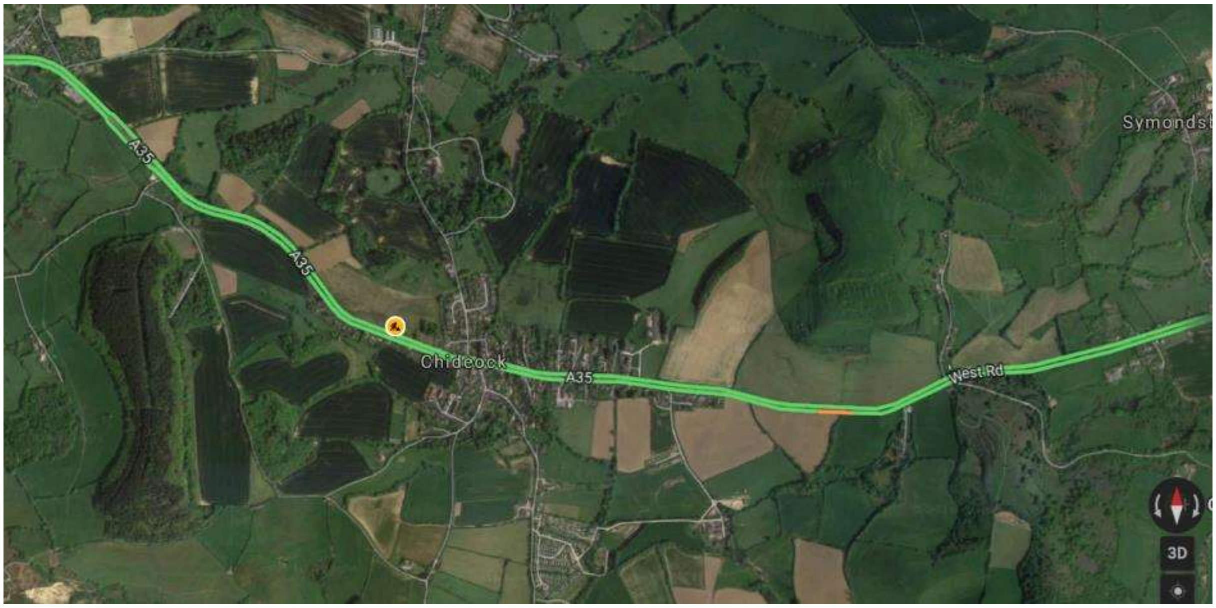
Thursday 26th 14:30



Thursday 26th 17:00