

A194/A184 White Mare Pool – Emerging pressures
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LARGE GREENBELT RELEASE – AIMSUN TESTING



SYSTRA

A194/A184 WHITE MARE POOL – EMERGING PRESSURES

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1. INTRODUCTION

1.1 Background

1.1.1 The South Tyneside Infrastructure Study, undertaken by SYSTRA on behalf of Highways England in 2019, tested the impact of South Tyneside’s Local Plan on the Strategic Road Network (SRN). The model area is shown on Figure 1.1 below.

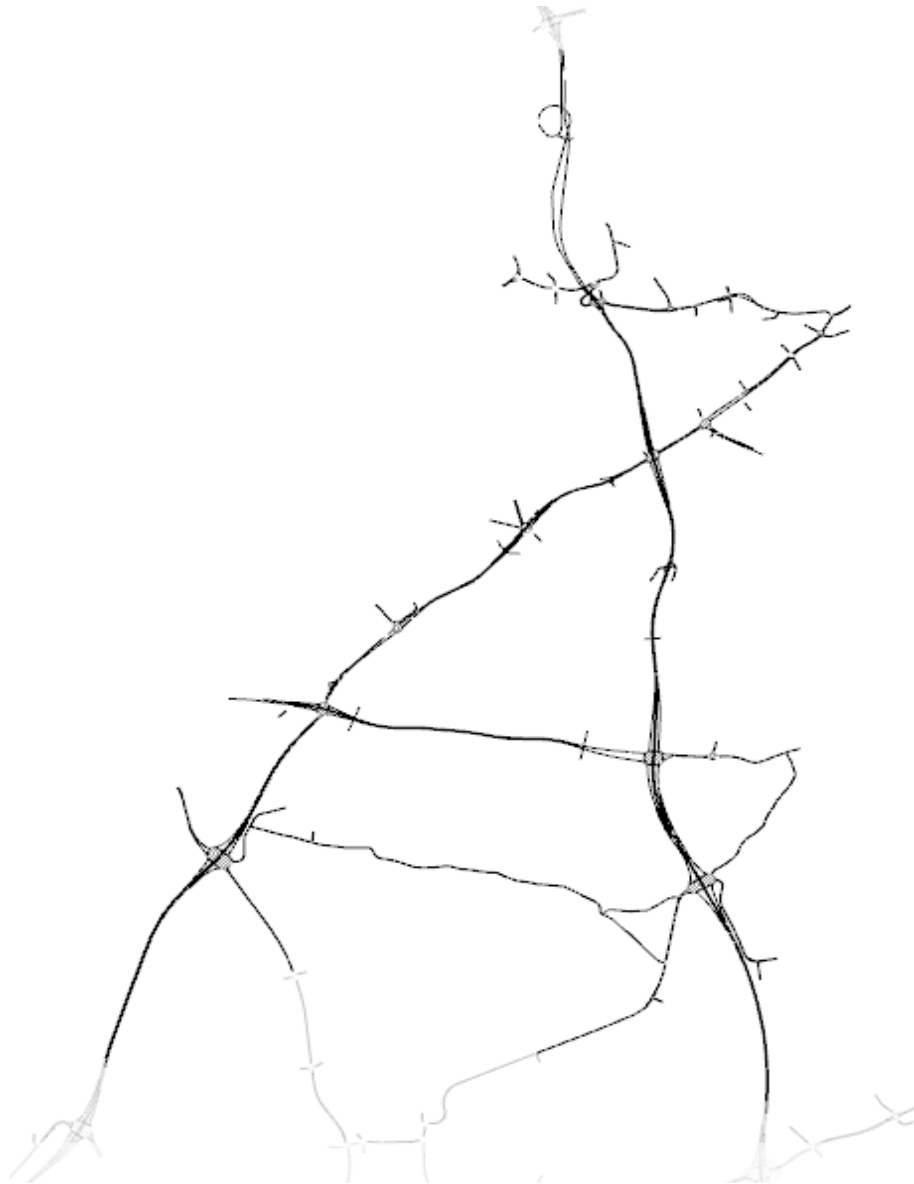


Figure 1.1 South Tyneside Infrastructure Study model network

1.1.2 The study identified schemes to mitigate the impact of the Local Plan in 2023 and 2028. However, the results for 2033 presented significant delays at the A19/A185/Priory Road (Jarrow) junction, and the A194/A184 White Mare Pool. Therefore, as part of a later study (A19/A185 Jarrow Junction Study) potential schemes at Jarrow were developed, concluding that solutions were available to address these delays.

1.1.3 The A194/A184 White Mare Pool – Emerging Pressures study aims to identify solutions to existing and future congestion at White Mare Pool junction.

- 1.1.4 The purpose of this first phase of work is to identify whether the impacts of a potential Large Greenbelt Release site (sometimes called Land south of Fellgate) can be accommodated on the SRN. This development did not form part of the Local Plan tested in previous assessments.
- 1.1.5 This study will use the South Tyneside Infrastructure Study model and includes one of the proposed schemes at Jarrow tested in the A19/A185 Jarrow Junction Study. This model is referred to as STsHy18.

1.2 Model area

- 1.2.1 The study area covers the A19 from north of Tyne Tunnel to south of the Downhill Lane junction along the A19 and south of the Follingsby junction along the A194. It also includes the Arches (A185 and Newcastle Road) and the A184 from east of Testo's to west of White Mare Pool.

1.3 Approach

- 1.3.1 STsHy18 was developed using the Aimsun Next software package, version 8.3.1. The model was built as a hybrid subnetwork of the Tyne and Wear A19 model built in 2018. Most of the model is at mesoscopic level, with a microscopic area at Jarrow.

2. MODELLING METHODOLOGY

2.1 Future demand scenarios

2.1.1 2033 has been adopted for testing the Greenbelt Release as this was the last year tested for the South Tyneside Infrastructure Study which considered the impacts of the Local Plan.

2.1.2 The model scenarios are as follows:

- 2033 Do Minimum (Local Plan)
- 2033 Do Something (includes Local Plan and Large Greenbelt Release)

2.2 Infrastructure schemes

2.2.1 In addition to the schemes which formed part of the Local Plan testing (free flow tolls at the Tyne Tunnel northbound, and A19 northbound lane gain from Lindisfarne) two infrastructure schemes are included in this modelling work.

1. Option C scheme at Jarrow + Port of Tyne Dualling

2.2.2 The scheme includes:

- Elongated northern A19/A185 roundabout
- Link between the two A19/A185 roundabouts to be widened to two full lanes in each direction
- Filter lane for A185 east traffic to enter A19 southbound
- Signalisation of B1297 Priory Road/Church Bank junction
- Port of Tyne dualling along the A185

2.2.3 The scheme was tested in March 2021 for the A19/A185 Jarrow Junction Study and was identified as one of several potential solutions to congestion in the 2033 test scenarios. Therefore, both Do Minimum and Do Something scenarios include "Option C + Port of Tyne Dualling" scheme to accommodate 2033 Local Plan traffic. The indicative scheme drawing is provided in Figure 2.1 below.

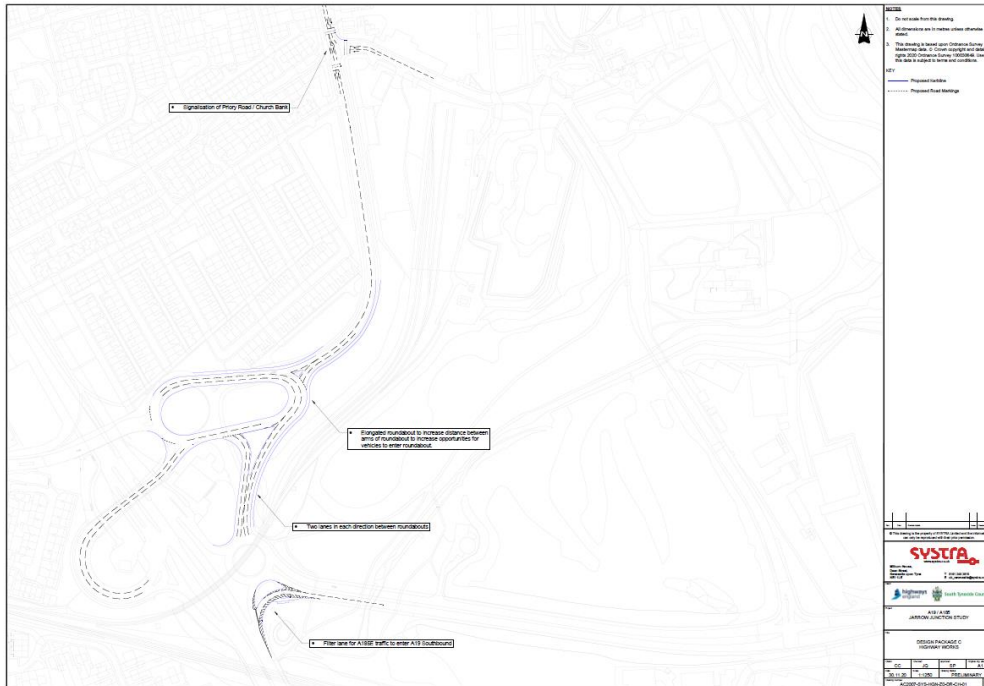


Figure 2.1 Option C scheme at Jarrow.

2. Elongated roundabout at White Mare Pool

2.2.4 An elongated roundabout at White Mare Pool with a new access to the Large Greenbelt Release site scheme was included in the Do Something scenario. The scheme is shown in Figure 2.2 below.



Figure 2.2 Elongated roundabout at White Mare Pool

2.2.5 It should be stressed that this scheme has not been discussed or agreed with Highways England. It therefore only seeks to demonstrate the principle of a scheme at this location.

2.3 Future demand

2033 Local Plan demand

- 2.3.1 The 2033 Local Plan traffic demand was taken directly from the South Tyneside Infrastructure Study model. The Local Plan demand was applied for both Do Minimum and Do Something scenarios. The demand includes full Local Plan traffic, based on the 2019 allocations.
- 2.3.2 The modelled time periods are:
- Morning period: 06:00 to 10:00
 - Evening period: 15:00 to 19:00

Large Greenbelt Release development demand

- 2.3.3 For the Large Greenbelt Release, development traffic was ascertained from a further Greenbelt Release Study undertaken on behalf of South Tyneside Council. This allowed for the development of a separate matrix to be built manually. The development matrix was built as follows:
- Trip distribution of the development was obtained from Highways England’s GraHAM tool
 - Four access points to the modelled network were used (a new access at White Mare Pool, intensification of the existing southeast arm at the A194 Leam Lane / Mill Lane roundabout, the left in / left out junction of Durham Drive with the A194 Leam Lane, and Abingdon Way via Hedworth Lane)
 - Where necessary trips were distributed to the wider modelled area proportionally as for the 2033 Local Plan demand
 - This provided traffic flows for the peak hours only (08:00-09:00 and 17:00-18:00). Shoulder peak hours were calculated by applying factors obtained from adjacent ATC counters. This was checked against TRICS residential profiles and was similar, but included factors for 06:00-07:00 which were not available from TRICS.
- 2.3.4 The initial model test included the full development content of the Greenbelt Release, with a mode share identified as typical for this area: this was considered to be 3000 houses, with a car mode share of 61%.
- 2.3.5 This test resulted in significant delays on the Strategic Road Network [SRN] and suggested that the full build out with typical mode share would be unacceptable to Highways England.
- 2.3.6 Screenshots of these initial runs are shown in figure 2.3 and 2.4 below. A legend detailing the colour coding is provided later in the report, in Figure 3.1. The screenshots clearly show that particularly in the evening peak there are major delays on both the strategic and local road networks.

Initial results – 3000 houses, 61% car mode share



Figure 2.3 2033 Do Something 3000 houses, morning peak (07:45)



Figure 2.4 2033 Do Something 3000 houses, evening peak (18:00)

- 2.3.7 For the scenario reported in the remainder of this report, 50% of the Large Greenbelt Release demand was used. This could represent 1500 houses with the “typical” mode share, or a higher number of dwellings but a lower proportion of car trips.
- 2.3.8 A summary of the final (50%) matrix totals is provided in Table 1 below.

Table 1. Matrix totals (vehicles)

YEAR	TIME	2033 LOCAL PLAN	LARGE GREENBELT RELEASE DEVELOPMENT (AT 50%)	TOTAL
2033 Do Minimum	AM	80,049	0	80,049
	PM	88,511	0	88,511
2033 Do Something	AM	80,049	1,627	81,676
	PM	88,511	2,570	91,081

3. OUTPUTS

3.1.1 The model was set up to 40 iterations with Dynamic User Equilibrium approach and all the scenarios were converged. Results from each scenario have been compiled from the model and presented here. Results collected include:

- Visual results
- Journey time

3.2 Visual results

3.2.1 Screenshot results showing operation of the network are shown below. Each modelled road link is colour coded according to the delay ratio, with the actual travel time on that section divided by the free flow travel time to provide a measure of delay. Green shows free flowing traffic with very limited delays, and increasing levels of delay through yellow, orange and red to black showing the worst delays.

3.2.2 It should be noted that the delay ratio will always show some delays at junctions where vehicles give way or are controlled by traffic lights.

3.2.3 The legend is shown in Figure 3.1 below.

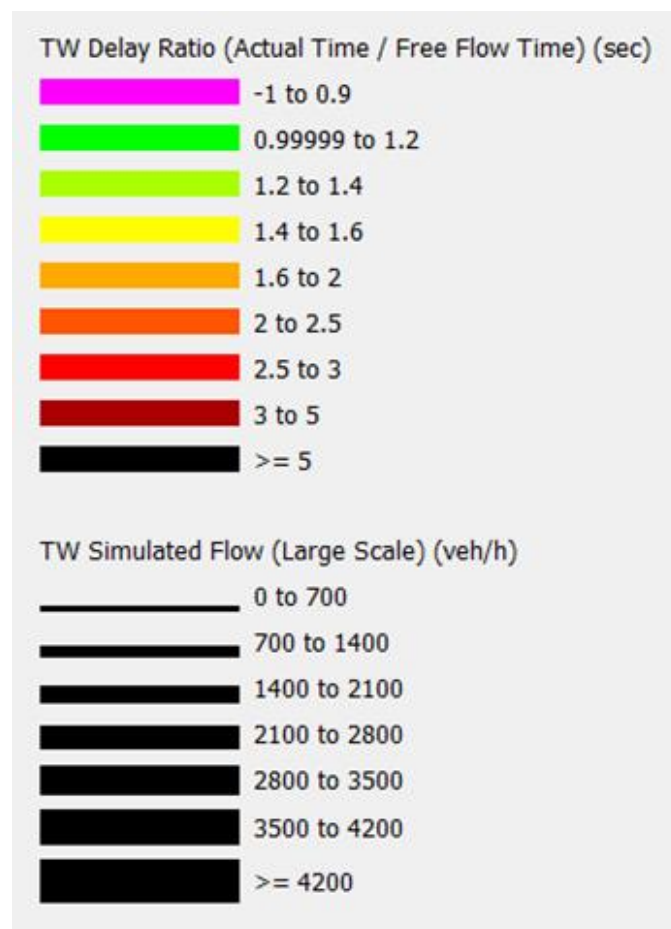


Figure 3.1 Simulated delay ratio with flow width legend

3.2.4 Each screenshot shows the worst 15min time period within the relevant scenario.

Morning period



Figure 3.2 2033 Do Minimum, morning peak (07:45)

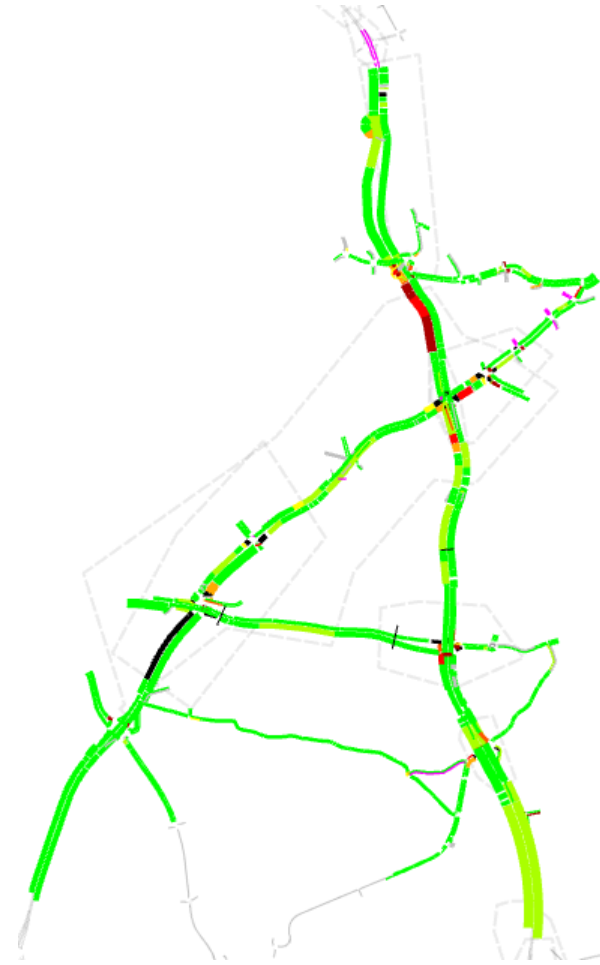


Figure 3.3 2033 Do Something, morning peak (07:45)

Evening period

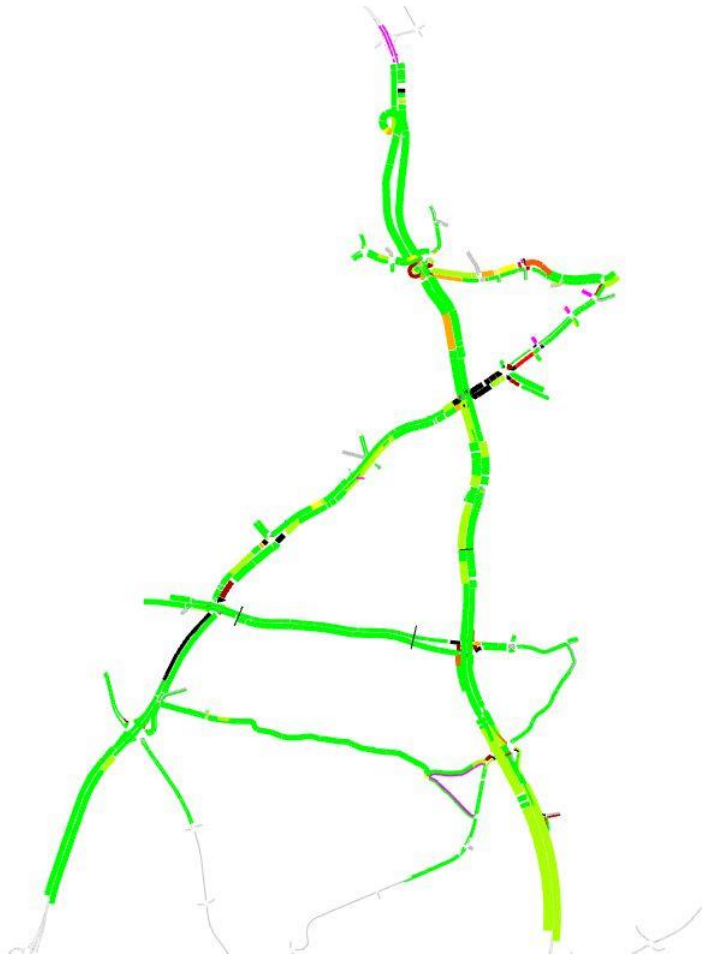


Figure 3.4 2033 Do Minimum, evening peak (18:00)

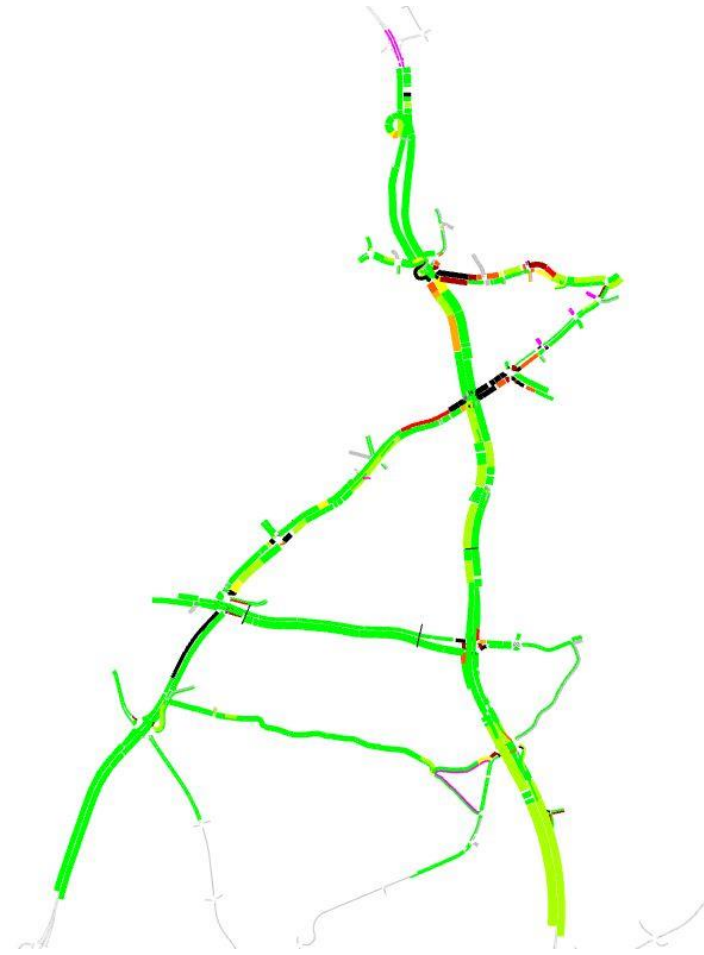


Figure 3.5 2033 Do Something, evening peak (18:00)

- 3.2.5 The elongated roundabout at White Mare Pool results in increased delays on the south SRN arm, and some improvements on the north (local road) arm. It is likely that Highways England will require redistribution of these queues and this can be undertaken using the signals which form part of the scheme.
- 3.2.6 There are also widening schemes on the south and east arms identified as part of the Infrastructure Study which have not been included in the current tests, but will be included in later assessments.

3.3 Journey time

3.3.1 This section provides a summary of the journey times along the A19 northbound for the Do Minimum and Do Something scenarios in both morning and evening period, see Table 2 below. Queues are reported for Lindisfarne to Jarrow, since this is the section of the A19 with the most significant impacts.

Table 2. A19 Journey times, Lindisfarne to Jarrow (mins:secs)

YEAR	TIME	TO MAINLINE	TO JUNCTION
2033 Do Minimum	AM	4:33	1:42
	PM	1:33	2:48
2033 Do Something	AM	5:21	1:37
	PM	1:33	3:48

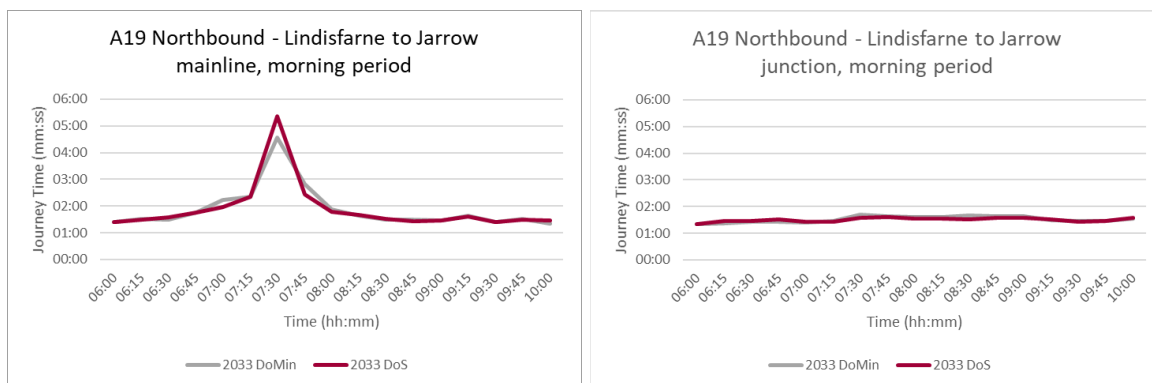


Figure 3.6 A19 journey times, Lindisfarne to Jarrow – morning period

3.3.2 In the morning period there are additional delays on the A19 mainline. At this location a proportion of vehicles travelling on the A19 mainline will slow to allow traffic from Jarrow to join. The increased flow on the A19 northbound, due to the Greenbelt Release site, takes the junction further over capacity and delays propagate along the A19.

3.3.3 There are no significant delays on the slip road in the morning period.

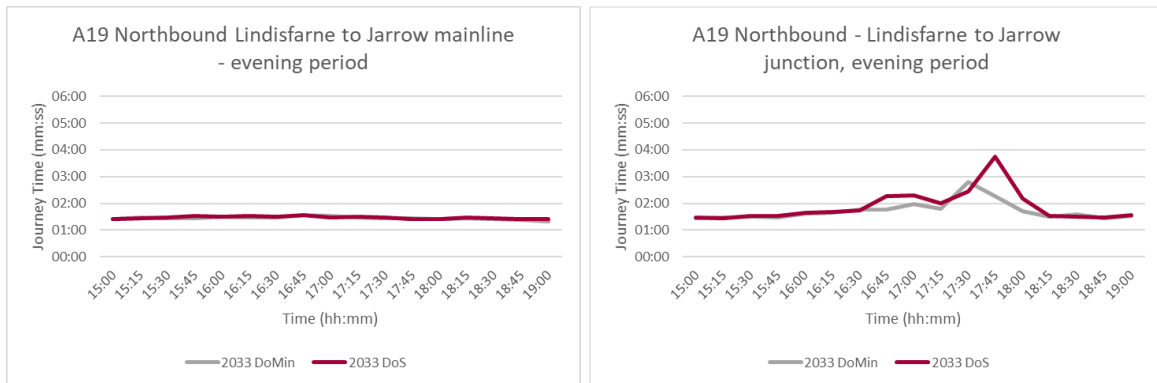


Figure 3.7 A19 journey times, Lindisfarne to Jarrow – evening period

3.3.4 In the evening period the mainline operates satisfactorily with no noticeable difference between Do Minimum and Do Something.

3.3.5 There are some delays on the A19 northbound to Jarrow junction, which are marginally worse with the Greenbelt Release traffic included. These can be seen on the delay plans as queues on the slip road.

4. SUMMARY

- 4.1.1 This technical note has outlined the impact of the Large Greenbelt Release on the SRN within the South Tyneside subnetwork model in 2033.
- 4.1.2 The study includes two scenarios in the morning and in the evening periods:
- 2033 Do Minimum (includes Local Plan)
 - 2033 Do Something (includes Local Plan + Large Greenbelt Release development)
- 4.1.1 The initial model test included the full development content of the Greenbelt Release, with a mode share identified as typical for this area: this was considered to be 3000 houses, with a car mode share of 61%. This test resulted in significant delays on the SRN and suggested that the full build out with typical mode share would be unacceptable to Highways England.
- 4.1.2 A further run was undertaken with 50% of the Large Greenbelt Release demand. The results show that the South Tyneside network experiences some additional congestion at this level of demand. This is particularly relevant at the A19 northbound merge at Jarrow before the Tyne Tunnel and its layout constraints. Operation of the network is considered borderline.
- 4.1.3 The study concludes that between 1000 and 1500 units on the Large Greenbelt Release will be deliverable, dependent on mode share. Modelling of the delays at Jarrow in a more detailed microsimulation model is recommended, and this will form part of the later phases of this project.

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