M27

Southampton Junction 8 Improvement Scheme

Details of highway design changes

PCF stages 3-5

Traffic Impacts

The Highways England (M27 Southampton Junction 8 Improvement Scheme – M27 Junction 8 and Windhover Roundabout) (Special Road) Compulsory Purchase Order 2021

2021

Contents

1. Introduction

1.1. The purpose of this report is to highlight the changes in the design from Project Control Framework (PCF) Stage 3 to PCF Stage 5 for the M27 Southampton Junction 8 Improvement Scheme hereinafter referred to as the 'Scheme', and to set out the traffic and local transport network performance details comparing the following:

- The forecast capacity and queues predicated in the scenario where the improvement Scheme is not progressed (the Do Minimum)
- The forecast capacity and queues predicated in the scenario where the Stage 3 design is constructed (Stage 3 Do Something), and
- The forecast capacity and queues predicated in the scenario where the Stage 5 design is constructed (Stage 5 Do Something).

1.2. The PCF Stage 3 design, also known as the preliminary design, was completed in January 2020. The PCF Stage 5 design, also known as the detailed design, commenced in January 2021 and is ongoing.

1.3. PCF Stage 3 is the development of a preliminary design which forms the basis of the application for Orders. It is not the final design and the design is developed further during PCF Stage 5 detailed design, as such work on the Scheme design has not ceased and is currently ongoing.

1.4. As the PCF Stage 5 design is still ongoing there are some elements of the design which are not yet complete notably the Landscape design, however all other elements of the Scheme are substantially complete pending approval and may be subject to minor changes.

1.5. This report should be read in conjunction with the Stage 3 General Arrangement drawings (Core Document [A.6]) and the draft Stage 5 General Arrangement drawings (Core Document [A.9])

1.6. This report will cover the following:

- Section 2 will cover some of the history and justification for the Scheme
- Section 3 will cover the evolution of the design for the Scheme between Stages 3 and 5
- Section 4 will describe the highways design implications of these changes
- Section 5 will present the results of the SATURN model operational assessments for the Windhover and M27 Junction 8 roundabouts for the Do Minimum and both Do Something scenarios for the 2021, 2036 and 2041 traffic forecasts.
- Section 6 presents conclusions based on the results of the traffic assessments.
- Appendix A presents the results of the operational assessments in table format.

2. The Need for the Scheme

2.1. The need for the Scheme will be covered in detail in evidence. The following, however, sets out the highways need for the Scheme.

2.2. The Scheme objectives have been developed based on the overarching RIS2 objectives. The objectives for this Scheme are:

- Improving safety for all - improve the "whole life" safety record at M27 Junction 8 and Windhover Roundabout.

- Fast and reliable journeys - reduce congestion and journey times along the M27 Junction 8 and Windhover Roundabout. Improve journey time reliability and connectivity between east and west of the M27 Junction 8 - Windhover Roundabout.

- Being environmentally responsible - maintain air quality by reducing congestion and journey times along the M27 Junction 8 and Windhover Roundabout.

- Meeting the needs of all users - deliver capacity enhancements to the Strategic Road Network (SRN), M27 Junction 8 slip roads, whilst supporting the safe, accessible use of active travel modes for pedestrians and cyclists.

2.3. The M27 Junction 8 and A3024 Bursledon Road should serve as one of the main corridors into the city of Southampton. However, due to congestion, within the broader city transport network, a large proportion of traffic uses the M27 between Junction 8 and Junction 5 as an alternative route into the city centre via the A335. This is the current situation. It is likely to degrade further in the future without intervention.

2.4. The Solent to Midlands Route Strategy Study (Highways England, 2015) was a high-level route assessment that identified long-standing congestion hot spots and safety concerns on the SRN. It confirmed the need for improvements along the M27 between Junction 8 and Junction 5. Subsequently, the M27 Southampton Junctions Scheme was included in the RIS1 for the 2015/16 - 2019/20 Road Period (2015).

2.5. The M27 between Junction 8 and Junction 5 forms part of the key strategic network in the area. This stretch of road suffers from congestion and delays. Both junctions are in the top 10% of the Motorway road network congestion problems as reported in the Solent to Midlands Route Strategy Evidence Report (2014) (Core Document [B.18]). National Highways predict that substantial growth in trade at the Port of Southampton will increase heavy goods vehicle traffic on the M27 and routes into and out of Southampton over the next 10 years. A large quantity of residential development is also being planned for Southampton and the surrounding areas of Hampshire. If these are not managed sustainably the increases in traffic will add further congestion pressure onto the M27.

2.6. Congestion at Windhover Roundabout is currently caused by a combination of localised peak time traffic (7am to 10am and 4pm to 7pm) and rat-running to avoid M27 Junction 8 tailbacks. If traffic congestion is not addressed on the M27 between junctions 8 and 5, as well as in and around M27 Junction 8, then service provision along the M27 will deteriorate, and local growth in housing and employment may be negatively affected. National Highways, SCC, HCC and EBC have identified that improvements are necessary to reduce congestion at this vital arterial connection, so that delays do not compromise potential future economic growth in the subregion.

2.7. By improving M27 Junction 8 and Windhover Roundabout, the proposed Scheme aims to encourage city centre bound traffic from the east of Southampton to use the shorter signposted routes via M27 Junction 8/A3024. This in turn will improve traffic flow and reliability on the M27 between Junctions 8 and 5. The Scheme improvements will help alleviate traffic congestion which will benefit the community in terms of freer flowing traffic and by supporting the economy by providing improved journey times for local businesses using the route, as well as aiding better traffic movement to support planned developments in the subregion. Traffic should be encouraged to use the improved routes, complimented by other local highway authority sub-Schemes when they become implemented, offering traffic relief to other of the M27 Junctions between 5 and 8 from other local traffic seeking access to and around Southampton city.

2.8. Research has also shown that the M27 Junction 8 has had a significant number of casualties, with the junction being in the top 50 sites for casualties on the strategic road network from counts taken between 2009 and 2011. 43 recorded incidents occurred at the M27 Junction 8 between 2011 and 2015.

2.9. The traffic modelling undertaken through Stages 3 and 5 present the comparison of the Do Minimum and Do Something scenarios, and this will be explored further in Section 5 and Appendix A.

3. Summary of highway design changes

3.1. As the Scheme design developed during PCF Stage 5 a number of changes to the design were made. Those that relate to highways design are summarised in Table 3-1 and a detailed description of each change has been provided in section 4 of this report. The design changes as a whole are detailed in the note submitted on 8 October 2021 called “Details of design changes PCF stages 3-5”.

Table 3-1 – Summary of highways design changes

Change reference	Stage 3 General Arrangement drawing (Core Document A.6)	Objection reference	Stage 3 proposal	Stage 5 General Arrangement drawing (Core Document [A.9])	Stage 5 proposal
S/B Diverge	HE551514-JAC-HGN-PCF3_SS1-DR-CH-0004 Sheet 4 of 5	11.39 to 11.49	4 lanes + a splitter island on the S/B M27 J8 diverge slip road	HE551514-SWE-HGN-ZZ-DR-CH-50003 Sheet 3 of 5	3 lanes with no splitter island on the S/B M27 J8 diverge slip road
Splitter Island	HE551514-JAC-HGN-PCF3_SS1-DR-CH-0004 Sheet 4 of 5	10.6.8 to 10.6.11	Unconventional splitter island on Dodwell Lane	HE551514-SWE-HGN-ZZ-DR-CH-50003 Sheet 3 of 5	Splitter island re-designed to a more conventional layout with an extension of the physical island along Dodwell Lane.
Bert Betts Way E/B approach to J8	HE551514-JAC-HGN-PCF3_SS1-DR-CH-0003 Sheet 3 of 5 & HE551514-JAC-HGN-PCF3_SS1-DR-CH-0004 Sheet 4 of 5	N/A	4 lanes on the approach to the M27 J8 roundabout	HE551514-SWE-HGN-ZZ-DR-CH-50002 Sheet 2 of 5 & HE551514-SWE-HGN-ZZ-DR-CH-50003 Sheet 3 of 5	3 lanes on the approach to the M27 J8 roundabout

4. Details of design changes

4.1. This section of the report provides details of the changes between the Stage 3 design and the Stage 5 design.

S/B Diverge

Stage 3 design

4.2. The M27 junction 8 southbound diverge runs parallel with plots 11a & 11b as indicated on figure 4-1 below. The existing layout is two lanes on the approach to the junction 8 circulatory carriageway.

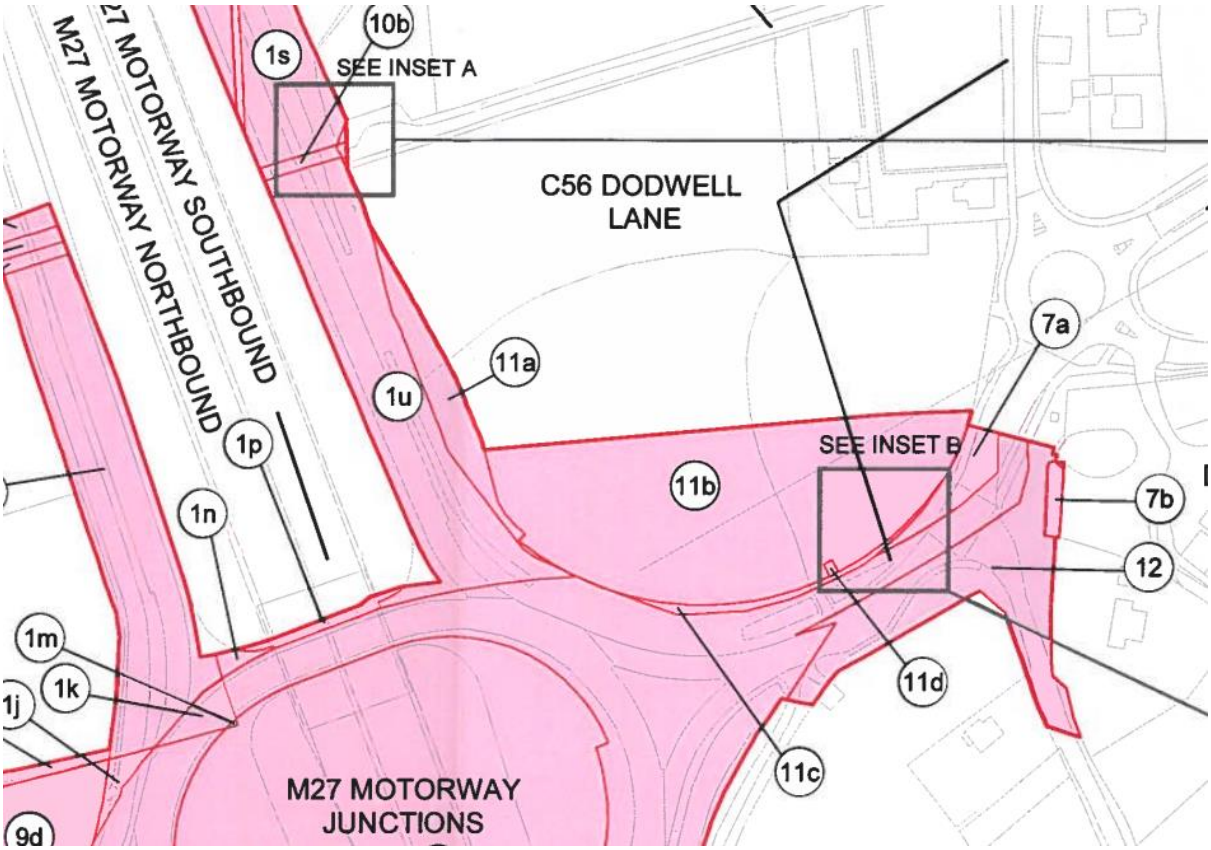

Figure 4-1 – Lane reference plan

4.3. The Stage 3 design included widening of the carriageway into the nearside verge to create an additional two lanes. This resulted in four lanes on the approach to the junction 8 circulatory carriageway.

4.4. A splitter island between lanes two and three was also proposed to provide separation between the two lanes dedicated for Dodwell Lane and the two lanes entering the roundabout circulatory carriageway.

4.5. Figure 4-2 below demonstrates this layout.

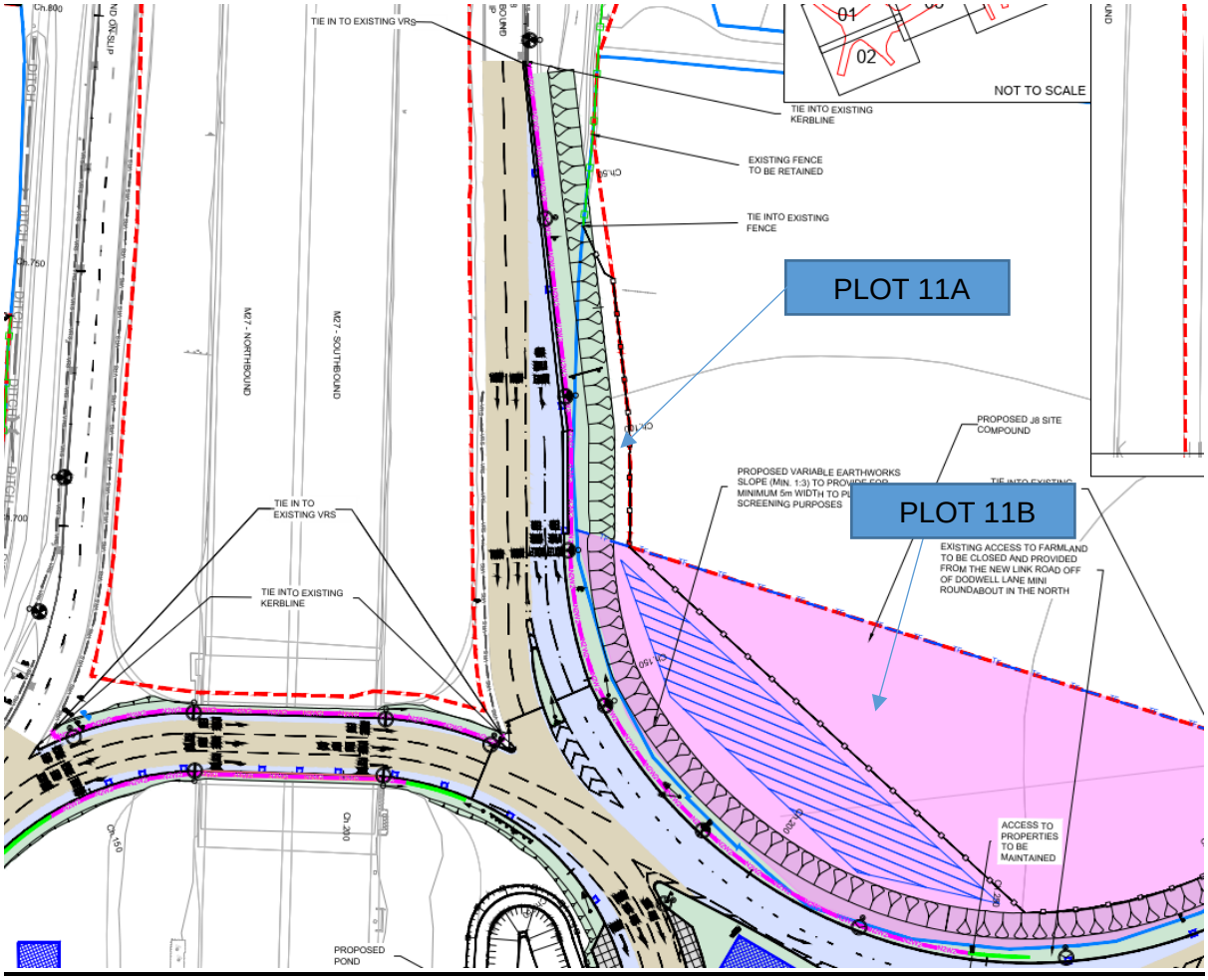

Figure 4-2 – Stage 3 layout

Stage 5 design

4.6. In PCF Stage 5 the Stage 5 delivery team inherited the design with four lanes on the approach to the roundabout. As part of the design development, the team tested reducing the number of lanes from four to three in the traffic model which confirmed that there was sufficient capacity within the three lanes for the forecast traffic flows.

4.7. The reduction from four lanes to three lanes was taken forward and implemented in PCF Stage 5. The current design now provides three lanes on the approach to the junction 8 roundabout. The splitter island between lanes two and three has also been removed. This has reduced the amount of carriageway widening required in the nearside verge providing more room for the watercourse diversion, flood compensation area and mitigation planting.

4.8. Figure 4-3 below demonstrates this revised layout.

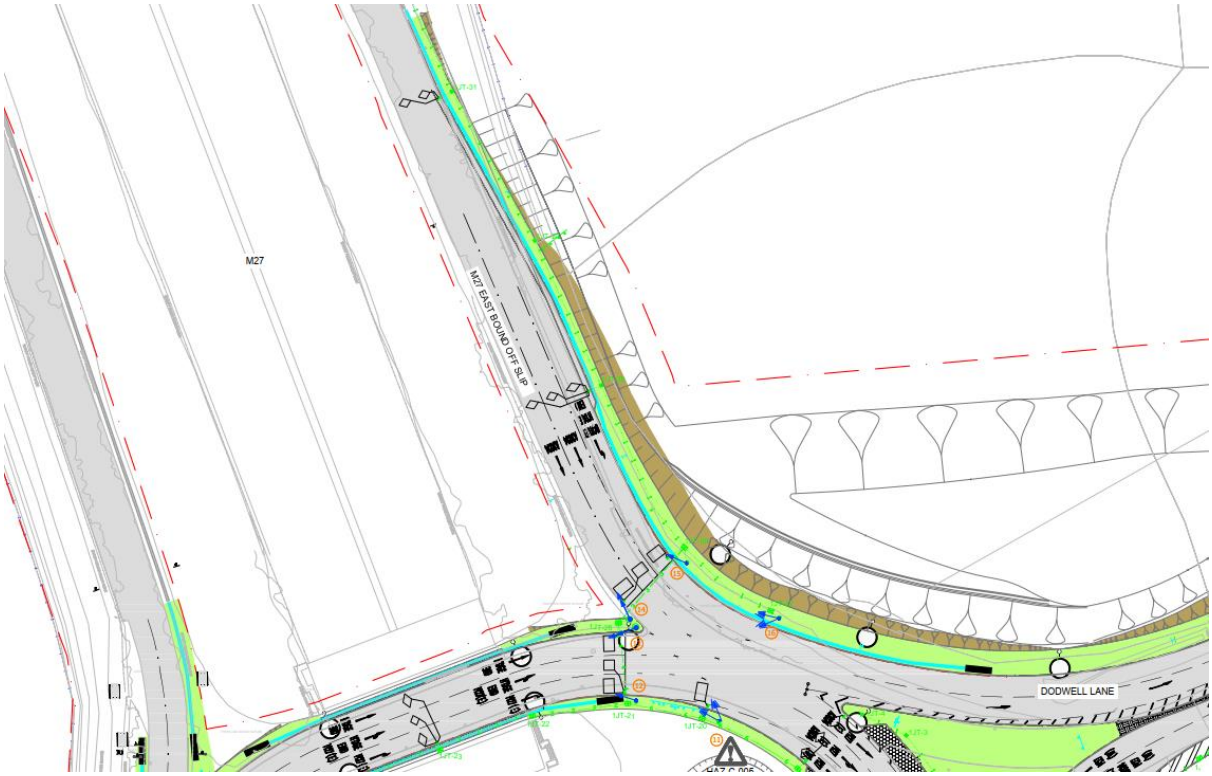

Figure 4-3 – Stage 5 layout

Splitter Island

Stage 3 design

4.9. The splitter island on Dodwell Lane was designed to standard albeit a slightly unconventional shape as it was required to accommodate a drainage attenuation tank.

4.10. The stage 3 design provided hatched road markings from the end of the splitter island along Dodwell Lane to tie into the existing hatched road markings.

4.11. Figure 4-4 below demonstrates this layout.

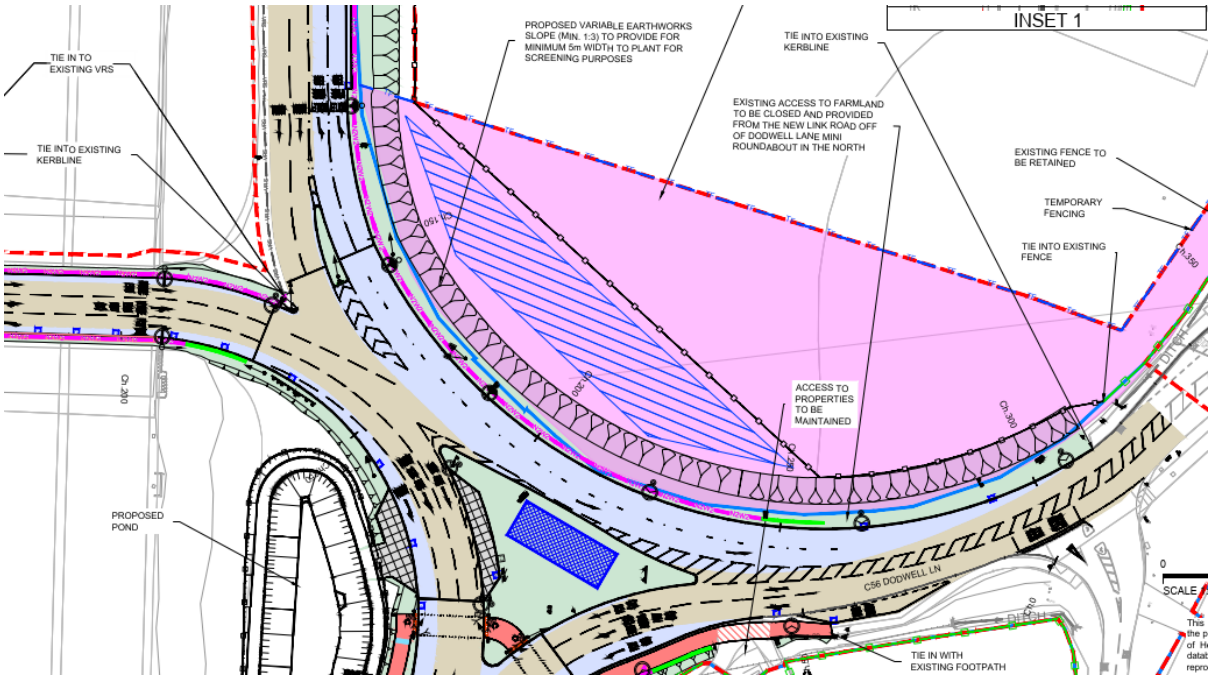

Figure 4-4 – Stage 3 layout

4.12. During Stage 5 the drainage attenuation tank was removed from the design as not required. In Stage 3, the proposed splitter island was aligned in such a way as to accommodate the tanks – this shown in Figure 4-4.

4.13. Therefore with the removal of the need for this tank, this has enabled the splitter island has been realigned to a more conventional layout.

4.14. The splitter island has been extended down Dodwell Lane beyond the Dodwell Lane side road junction. This was at the request of Hampshire Country Council to provide physical segregation to enforce the prohibition of right turn movements in and out of Dodwell Lane side road

4.15. Figure 4-5 below demonstrates this layout.

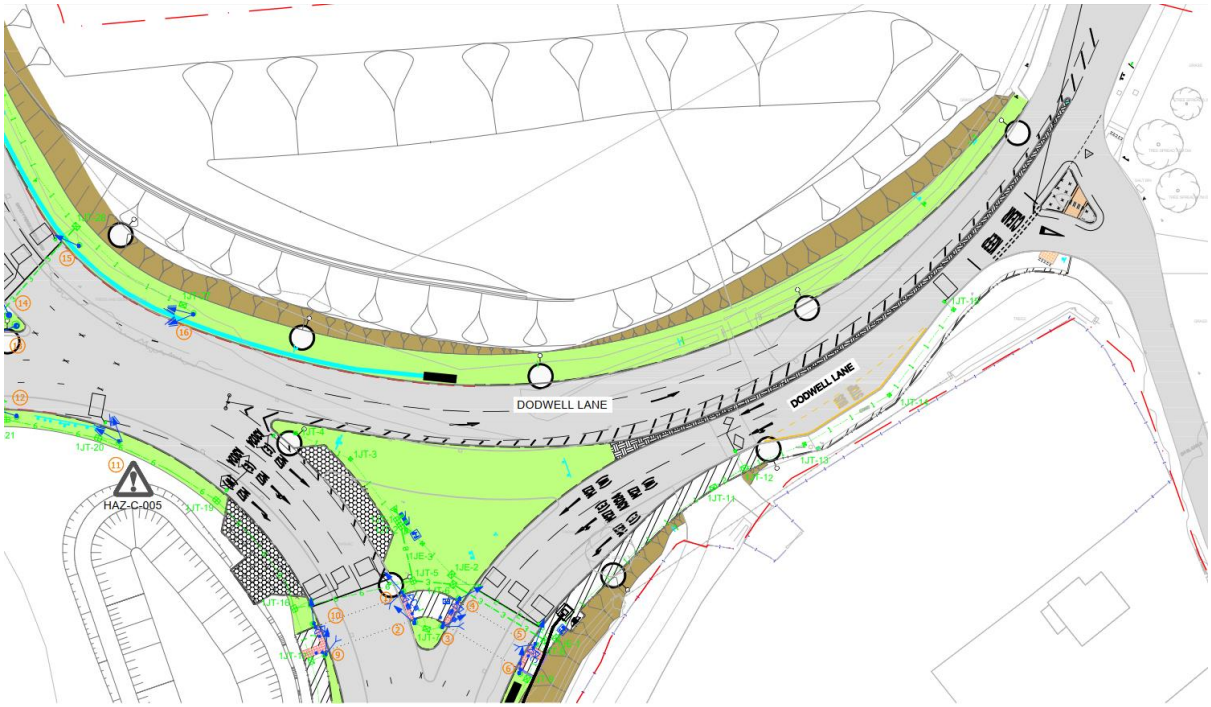

Figure 4-5 – Stage 5 layout

Bert Betts Way E/B approach to J8

Stage 3 design

4.16. The Bert Betts Way east bound approach to the M27 junction 8 roundabout is currently two lanes and the PCF Stage 3 design included widening of the carriageway into the nearside verge to create an additional two lanes. Resulting in four lanes on the approach to the junction 8 circulatory carriageway.

4.17. Figure 4-6 below demonstrates this layout.

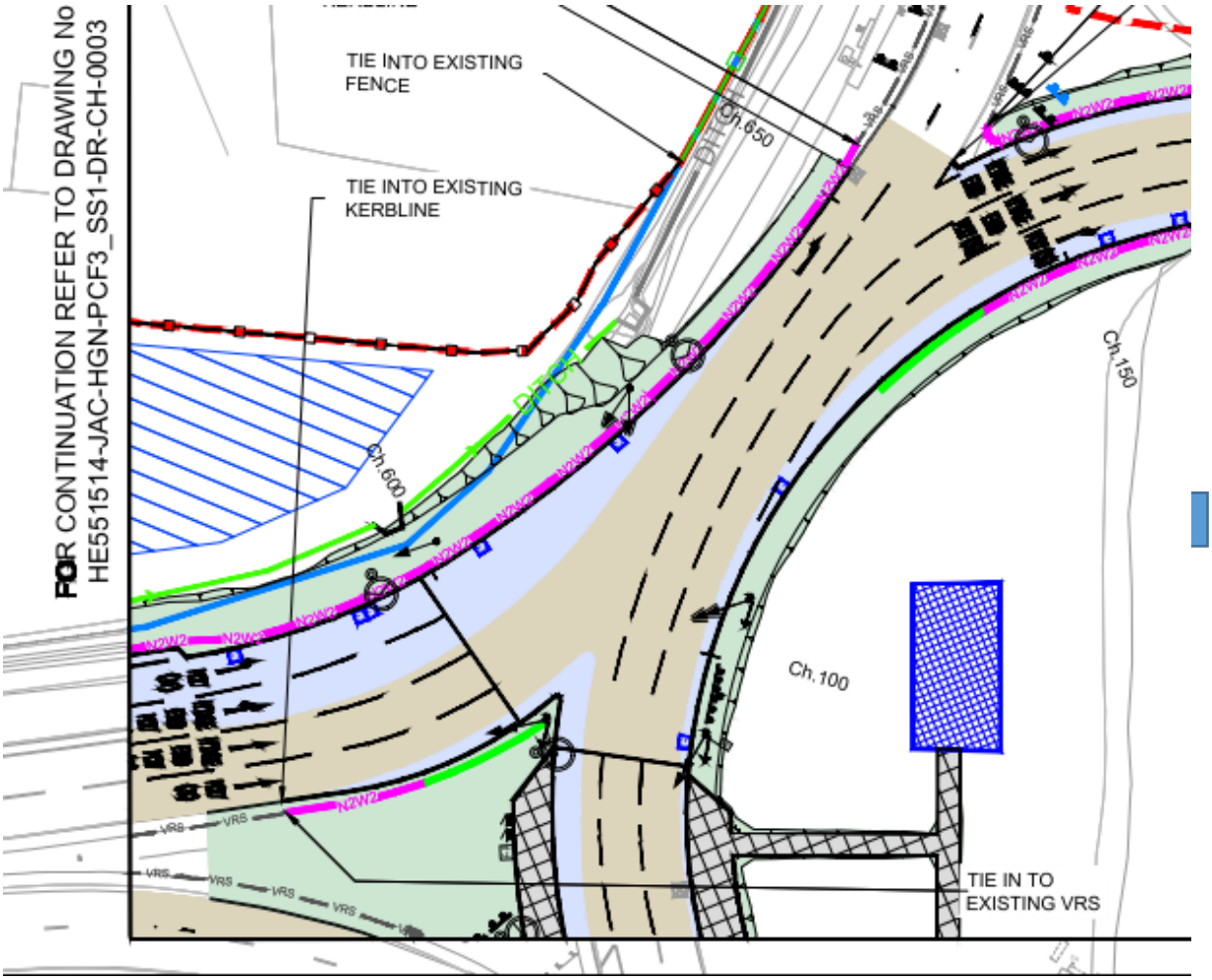

Figure 4-6 – Stage 3 layout

Stage 5 design

4.18. In PCF Stage 5 the design and delivery team inherited the design with four lanes on the approach to the roundabout. As part of the design development, we tested reducing the number of lanes from four to three in the traffic model which confirmed that there was sufficient capacity within the three lanes for the forecast traffic flows.

4.19. The reduction from four lanes to three lanes was taken forward and implemented in PCF Stage 5. The current design now provides three lanes on the approach to the junction 8 roundabout. This has reduced the amount of carriageway widening required in the nearside verge.

4.20. Figure 4-7 below demonstrates this revised layout.

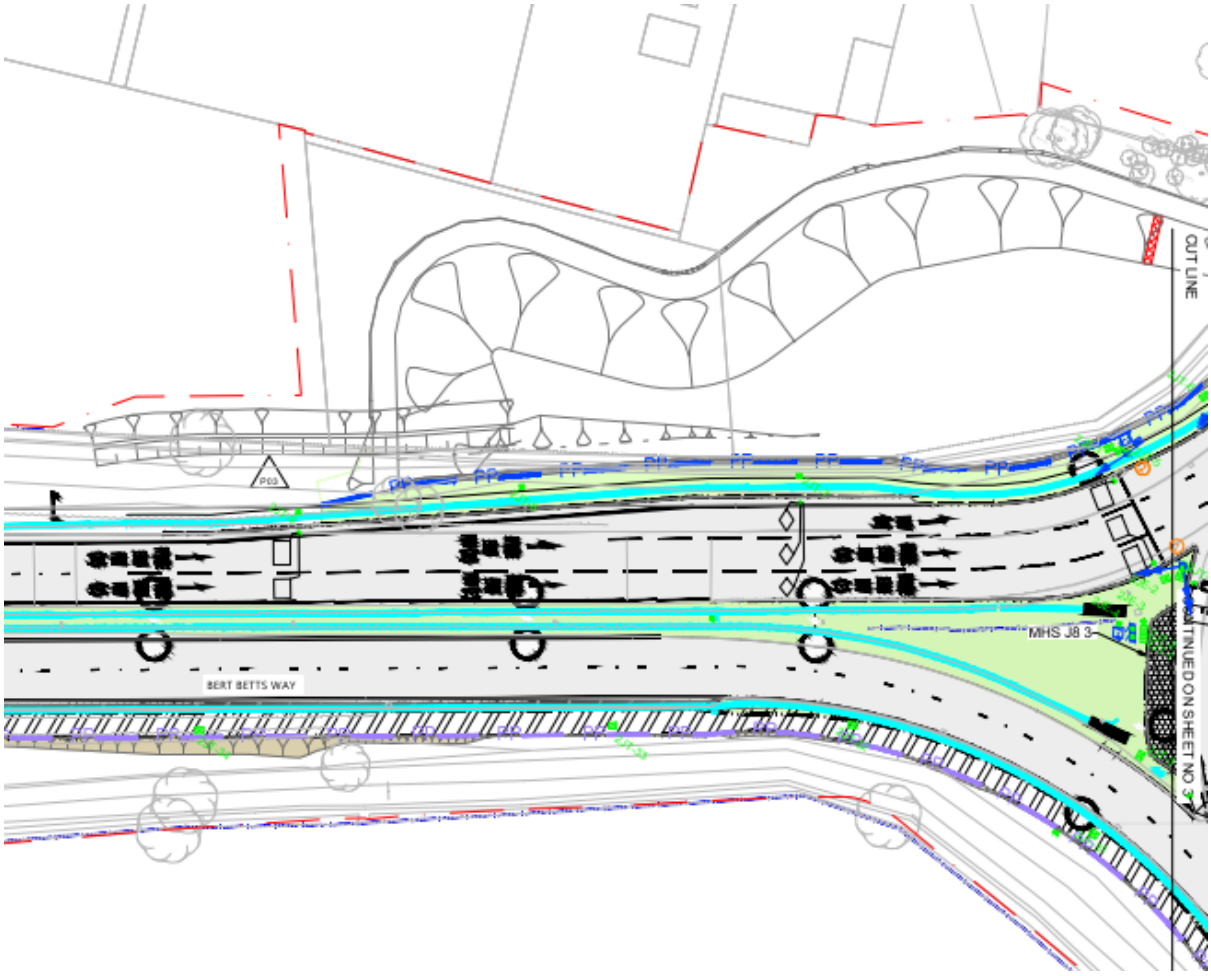

Figure 4-7 – Stage 5 layout

5. Traffic impact on local transport system

Stage 3 Operational Assessment

5.1. During Project Control Framework (PCF) Stage 3 of the M27 J8 Scheme, the Highways England M3M27 Smart Motorway Intervention model (M3M27 SMI model) has been used to undertake the forecasting and operational assessment of the Scheme. The M3M27 SMI model is a SATURN based strategic highway assignment model, and capable of determining forecast operational performance estimates of junction capacity and queue length between the various scenarios tested including with and without the Scheme.

Appendix A.

The results of the operational assessment of Do Minimum (without the Scheme) and Do Something (with the Scheme) scenarios on both approaches and circulations of the two junctions (M27 J8 and Windhover Roundabout) with respect to Volume over Capacity (V/C) and Average Queue Length across all three forecast years (2021, 2036 and 2041) are presented in Appendix A Traffic Modelling Operational Assessment results

5.2. Table 1 and Table 2.

5.3. In general, a V/C value higher than 85% provides an indicator that an approach (or circulation) arm is operating close to its available capacity limitation. Therefore, for ease of interpretation, all V/C values greater than 85% are highlighted in red.

5.4. It can be seen that the Stage 3 Scheme significantly reduces the queue length on Bert Betts Way due to prioritising the main traffic through the two junctions, with almost all of the approaches and circulations forecasted to operate within the available capacity under Do Something as compared to Do Minimum.

5.5. The operational outputs presented in Appendix A indicate that in the absence of intervention, then it is likely that the congestion and delay currently experienced in the vicinity of the M27 Junction 8, will worsen over time, which will lead to increasingly significant impacts on the efficient passage of people and goods.

Stage 5 Operational Assessment

5.6. In Stage 5, the design changes described above have been made to M27 J8, and these have been tested in the SATURN model.

5.7. On the M27 southbound diverge, the number of lanes on the approach to the junction 8 circulatory carriageway was reduced from four lanes to three lanes. On Bert Betts Way eastbound approach, the number of lanes was also reduced from four to three.

5.8. These two design changes have been incorporated in the Stage 5 Do Something traffic model and the two junctions have been assessed in the same manner as per Stage 3. Table 3 and Table 4 in Appendix A show the corresponding Stage 5 results in terms of V/C and Average Queue Length.

5.9. Overall, analysis of the Stage 5 results shows consistent reduction of average queue length between Do Minimum and Do Something on Bert Betts Way as compared to Stage 3 results, with almost all of the approaches and circulation lanes on both roundabouts still forecasted to operate within the available capacity under the Do Something Scenario with the two design changes in place.

5.10. As for the Stage 3 design proposals, the operational outputs presented in Appendix A Tables 3 and 4 also indicate that in the absence of intervention, then it is likely that the congestion and delay currently experienced in the vicinity of the M27 Junction 8, will worsen over time, which will lead to increasingly significant impacts on the efficient passage of people and goods.

Road Safety Improvements

5.11. The Scheme, upon completion of Stage 3 Preliminary Design was forecast to reduce the number of casualties by; 2 fatal, 35 serious, and 281 slight.

5.12. The Scheme, upon completion of Stage 5 Detailed Design is forecast to reduce the number of casualties compared to the Do Minimum by 3 fatal, 51 serious, and 373 slight. This represented an improved level of accident savings than that identified in the Stage 3 assessment, and therefore lending further support to the progress of the Stage 5 design Scheme into construction.

5.13. The introduction of traffic signals at both the M27 Junction 8 and Windhover Roundabouts manages traffic in more controlled manner, and with the reduction

in lane capacity at the Betts Way approach and at the M27 off-slip compared to Stage 3, this means lower speeds and fewer lane changes, translating to improved road safety performance between the Stage 3 and Stage 5 designs.

Traffic Flow Comparisons

5.14. Having established that the Stage 5 design proposal meets the criteria of improved performance and safety against the Do Minimum, and provides for a design layout that adds efficiencies with regard to physical construction requirements but not to the detriment of operations or safety when compared to the Stage 3 design, some key observations arising from the forecasting are as follows:

- It can be observed that there are large increases in flow along Bert Betts Way between Windhover roundabout and M27 Junction 8 compared to the Do Minimum. The scheme prioritises the main traffic flow through the two junctions, which is traffic to and from the M27, and therefore the large delays experienced by the main traffic when trying to join Windhover and Junction 8 are significantly reduced. Increases in flow in the AM & PM peak periods (of up to 1000 vehicles in the PM peak period) are seen as a result of the introduction of the scheme.

- In the inter-peak period, when traffic is lower, the signal control causes more delay compared to the delay incurred in the Do Minimum non-signalised roundabout scenario. This causes a reduction in traffic flow along Bert Betts Way.

- The scheme also has an impact on Charles Watt Way, the access road to M27 Junction 7. In the AM and PM peak periods traffic flows fall as some traffic moves away from Junction 7 to Junction 8. However, in the inter-peak period traffic flows increase as traffic moves from Junction 8 due to the additional delays caused by the signals introduced by the scheme. This also impacts the A27 (Kane Hill) which runs parallel to the M27, as it experiences additional traffic travelling to Junction 8.

- The A27 to the east of the scheme (Providence Hill) experiences changes in flow due to the reduction in delay introduced by the scheme. Traffic travelling eastbound from the Portsmouth, Gosport and Fareham area to the east of Southampton previously used the A27, avoiding large delays on the M27 at junction 8 and Windhover Roundabout. The reduction in delays between Junction 8 and Windhover Roundabout encourages traffic to stay on the M27 and access Southampton via junction 8 instead of using the A27.

- In the eastbound direction on the A27 east of the scheme there is an increase in flow. This is also due to the reduction in delays introduced by the scheme, which attract some motorway traffic. Traffic travelling eastbound to the Gosport and Fareham area on the M27 is encouraged to leave the M27 at junction 8 and transfer to the parallel A27 route.

- The scheme is successful in reducing the large delays at Windhover Roundabout in the PM peak period. This has the effect of also increasing flows on exit roads from Windhover Roundabout, particularly in the PM peak period, along A3024 Bursledon Road and Botley Road by approximately 100 vehicles. Hamble Lane also experiences increases in flow, but they are

smaller due to capacity restrictions along this road, particularly at the roundabout which provides access to Tesco.

- There are small flow changes on the M27 for the reasons explained above. The scheme leads to changes in M27 entry and exit points with traffic switching between Junction 7 ,8 and 9 in the range of 2-3% of total flow. There are also some changes further along the M27 close to Junction 5, where the number of lanes in the Westbound direction reduces from 4 to 3 lanes over the Junction 5 flyover. The small increase in flow caused by an improved access to the motorway (less than 1%), has a relatively significant impact on journey times for all M27 westbound traffic as the capacity number design of the Smart Motorway scheme narrows at this point.

6 Conclusions

6.1. The premise for National Highways to consider intervention at the M27 Junction 8 was based upon the need to reduce congestion in the area and bring about improvements in road safety within the context of the local transport system. This case was established on the basis of observed data and recorded evidence.

6.2. Consideration to how to most effectively identify the form, scale and nature of addressing these issues has been given throughout the PCF process.

6.3. The preliminary design Stage 3 design has now been further developed and refined. The Stage 5 design incorporates changes driven by safety improvements and efficiencies that would not be at the detriment of operational performance. This has resulted in a design which meets the Scheme requirements whilst being safer, more efficient and cost effective.

6.4. The changes made between PCF Stage 3 and PCF Stage 5 do not require any modifications to the published Orders and the PCF Stage 5 design remains deliverable within the Order land.

6.5. The traffic assessment presented during Stage 5 has been undertaken in full cognisance of the TAG guidance using modelling tools (SATURN) acknowledged in the industry for this this purpose.

6.6. Comparisons of operational performance (in terms of Volume/Capacity ratio and queue length) for the years 2021, 2036 and 2041 as presented in Appendix A for the Do Minimum and Do Something scenarios demonstrate that in the absence of intervention at M27 Junction 8, then congestion will increase over time and safety in the area will degrade.

6.7. The results of the traffic assessment confirm that both the Stage 3 and Stage 5 design proposals would be expected the provide increased capacity for road users and well as bring about improvements in road safety in the area. There is no material difference in operational performance of the junctions as between the Stage 3 and Stage 5 design, and in fact the Stage 5 design provides for improved road safety due to less conflicting traffic movements between lanes generated by the Scheme.

6.8. Given the safety and cost benefits of the Stage 5 design, it is concluded to be the preferred design solution.

Appendix B.

Traffic Modelling Operational Assessment results

Table 1. Stage 3 Operational Assessment - Average Queue Length (PCU) Results

Average Queue per Lane by sections (Unit PCU)		2021DM			2021DS			2021DS - 2021DM		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	1	0	1	1	1	1	0	1	0
	Dodwell Lane	1	0	0	2	1	1	0	1	1
	M27 Off Slip S	0	0	0	1	1	2	1	1	2
	A3024 Bert Betts Way	5	0	0	1	0	1	-4	0	0
	Circulation N	0	0	0	1	1	1	1	1	1
	Circulation E	0	0	0	1	1	1	1	1	1
	Circulation S	0	0	0	1	0	1	1	0	1
	Circulation W	0	0	0	1	0	0	1	0	0
Windhover Roundabout	A27 W End Rd	1	1	2	1	1	1	0	0	-2
	A3024 Bert Betts Way	6	4	23	1	1	2	-5	-4	-21
	A27 Providence Hill	1	0	0	1	1	1	0	0	0
	A3025 Hamble Ln	3	2	3	2	2	3	-1	-1	0
	A3024 Bursledon Rd	1	2	2	5	4	4	4	2	2
	Circulation between A27 W End Rd entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 W End Rd and A3024	0	0	0	0	0	0	0	0	0
	Circulation between A3024 entry and exit	0	0	0	2	2	2	2	2	2
	Circulation between A3024 and A27 Providence Hill	0	0	0	0	0	0	0	0	0
	Circulation between A27 Providence Hill entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 Providence Hill entry and Hamble Ln	0	0	0	0	0	0	0	0	0
	Circulation between Hamble Lane entry and exit	2	2	1	1	1	1	0	0	0
	Circulation between A3024 Bursledon Rd entry and exit	2	1	2	1	1	1	0	-1	-1
	Circulation between A3024 Bursledon Rd and A27 W End Rd	0	0	0	0	0	0	0	0	0

Average Queue per Lane by sections (Unit PCU)		2036DM			2036DS			2036DS - 2036DM		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	1	0	2	1	1	2	1	1	-1
	Dodwell Lane	2	0	0	2	1	2	1	1	1
	M27 Off Slip S	0	0	0	2	1	2	1	1	2
	A3024 Bert Betts Way	12	0	0	1	0	1	-11	0	0
	Circulation N	0	0	0	1	1	2	1	1	2
	Circulation E	0	0	0	2	1	1	2	1	1
	Circulation S	0	0	0	1	1	1	1	1	1
	Circulation W	0	0	0	1	0	0	1	0	0
Windhover Roundabout	A27 W End Rd	2	2	5	1	1	1	0	-1	-4
	A3024 Bert Betts Way	13	10	23	1	1	1	-12	-9	-21
	A27 Providence Hill	1	0	0	1	1	1	0	0	0
	A3025 Hamble Ln	3	2	3	3	3	4	0	0	1
	A3024 Bursledon Rd	1	1	2	5	4	4	3	3	2
	Circulation between A27 W End Rd entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 W End Rd and A3024	0	0	0	0	0	0	0	0	0
	Circulation between A3024 entry and exit	0	0	0	2	2	3	2	2	3
	Circulation between A3024 and A27 Providence Hill	0	0	0	0	0	0	0	0	0
	Circulation between A27 Providence Hill entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 Providence Hill entry and Hamble Ln	0	0	0	0	0	0	0	0	0
	Circulation between Hamble Lane entry and exit	2	2	2	2	2	1	0	0	0
	Circulation between A3024 Bursledon Rd entry and exit	1	3	2	1	1	1	0	-2	-1
	Circulation between A3024 Bursledon Rd and A27 W End Rd	0	0	0	0	0	0	0	0	0

Average Queue per Lane by sections (Unit PCU)		2041DM			2041DS			2041DS - 2041DM		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	1	0	3	2	1	2	1	1	-1
	Dodwell Lane	2	0	0	2	1	2	1	1	1
	M27 Off Slip S	0	0	0	2	2	2	1	1	2
	A3024 Bert Betts Way	14	0	0	1	0	1	-13	0	0
	Circulation N	0	0	0	1	1	2	1	1	2
	Circulation E	0	0	0	2	1	1	2	1	1
	Circulation S	0	0	0	1	1	1	1	1	1
	Circulation W	0	0	0	1	0	0	1	0	0
Windhover Roundabout	A27 W End Rd	2	2	6	2	1	1	0	-1	-5
	A3024 Bert Betts Way	14	11	23	1	1	1	-13	-10	-21
	A27 Providence Hill	1	0	0	1	1	1	0	0	0
	A3025 Hamble Ln	3	2	3	3	3	4	0	0	1
	A3024 Bursledon Rd	1	1	2	5	4	4	3	3	2
	Circulation between A27 W End Rd entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 W End Rd and A3024	0	0	0	0	0	0	0	0	0
	Circulation between A3024 entry and exit	0	0	0	2	2	3	2	2	3
	Circulation between A3024 and A27 Providence Hill	0	0	0	0	0	0	0	0	0
	Circulation between A27 Providence Hill entry and exit	0	0	0	2	1	1	2	1	1
	Circulation between A27 Providence Hill entry and Hamble Ln	0	0	0	0	0	0	0	0	0
	Circulation between Hamble Lane entry and exit	2	2	2	2	2	2	0	0	0
	Circulation between A3024 Bursledon Rd entry and exit	1	3	2	2	1	1	0	-2	-1
	Circulation between A3024 Bursledon Rd and A27 W End Rd	0	0	0	0	0	0	0	0	0

Table 2. Stage 3 Operational Assessment - V/C (%) Results

Volume over Capacity (V/C %)		**2021DM**			**2021DS**		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	81	52	**90**	34	28	43
	Dodwell Lane	**87**	44	33	56	31	43
	M27 Off Slip S	63	38	49	46	43	56
	A3024 Bert Betts Way	**100**	67	75	39	23	28
	Circulation N	33	23	30	28	17	28
	Circulation E	46	33	38	51	35	46
	Circulation S	33	27	26	38	27	42
	Circulation W	14	5	11	30	15	20
Windhover Roundabout	A27 W End Rd	82	76	**95**	41	36	34
	A3024 Bert Betts Way	**100**	**100**	**106**	41	36	57
	A27 Providence Hill	72	52	50	31	25	23
	A3025 Hamble Ln	62	54	62	48	41	55
	A3024 Bursledon Rd	40	39	38	57	44	47
	Circulation between A27 W End Rd entry and exit	50	41	44	49	40	42
	Circulation between A27 W End Rd and A3024	44	40	44	31	25	26
	Circulation between A3024 entry and exit	16	20	25	56	76	63
	Circulation between A3024 and A27 Providence Hill	35	35	36	26	25	34
	Circulation between A27 Providence Hill entry and exit	41	39	39	42	39	50
	Circulation between A27 Providence Hill entry and Hamble Ln	35	32	32	20	18	23
	Circulation between Hamble Lane entry and exit	50	44	40	42	37	41
	Circulation between A3024 Bursledon Rd entry and exit	67	47	56	51	42	52
	Circulation between A3024 Bursledon Rd and A27 W End Rd	42	35	37	31	25	28
Volume over Capacity (V/C %)		**2036DM**			**2036DS**		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	75	53	**95**	42	31	46
	Dodwell Lane	**90**	43	39	66	33	49
	M27 Off Slip S	60	39	61	51	47	64
	A3024 Bert Betts Way	**101**	77	81	44	25	30
	Circulation N	31	26	34	32	18	30
	Circulation E	41	31	35	56	40	48
	Circulation S	34	23	25	41	31	45
	Circulation W	18	7	16	32	22	28
Windhover Roundabout	A27 W End Rd	**89**	**94**	**100**	51	31	36
	A3024 Bert Betts Way	**103**	**102**	**107**	45	45	56
	A27 Providence Hill	77	59	59	29	29	25
	A3025 Hamble Ln	67	56	66	53	48	63
	A3024 Bursledon Rd	44	48	42	54	49	48
	Circulation between A27 W End Rd entry and exit	51	46	47	54	50	47
	Circulation between A27 W End Rd and A3024	45	46	45	35	28	29
	Circulation between A3024 entry and exit	21	25	26	66	69	**86**
	Circulation between A3024 and A27 Providence Hill	35	36	36	29	29	36
	Circulation between A27 Providence Hill entry and exit	41	40	40	50	46	54
	Circulation between A27 Providence Hill entry and Hamble Ln	36	33	33	22	22	24
	Circulation between Hamble Lane entry and exit	54	49	46	50	43	44
	Circulation between A3024 Bursledon Rd entry and exit	68	49	59	62	52	60
	Circulation between A3024 Bursledon Rd and A27 W End Rd	45	39	41	34	29	31
Volume over Capacity (V/C %)		**2041DM**			**2041DS**		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	72	55	**95**	42	31	46
	Dodwell Lane	**91**	43	41	69	35	50
	M27 Off Slip S	60	40	62	54	51	67
	A3024 Bert Betts Way	**102**	78	82	45	26	31
	Circulation N	31	26	35	33	20	32
	Circulation E	40	31	34	57	41	49
	Circulation S	33	23	25	43	32	44
	Circulation W	20	7	17	36	25	28
Windhover Roundabout	A27 W End Rd	**93**	**96**	**100**	53	32	38
	A3024 Bert Betts Way	**103**	**102**	**107**	46	47	57
	A27 Providence Hill	78	61	62	29	30	25
	A3025 Hamble Ln	68	58	67	54	49	65
	A3024 Bursledon Rd	45	49	43	56	50	50
	Circulation between A27 W End Rd entry and exit	51	48	49	55	51	49
	Circulation between A27 W End Rd and A3024	45	47	45	36	29	30
	Circulation between A3024 entry and exit	23	26	27	70	70	**90**
	Circulation between A3024 and A27 Providence Hill	35	36	36	30	30	37
	Circulation between A27 Providence Hill entry and exit	41	41	40	52	48	55
	Circulation between A27 Providence Hill entry and Hamble Ln	36	34	34	23	23	25
	Circulation between Hamble Lane entry and exit	54	50	46	52	46	45
	Circulation between A3024 Bursledon Rd entry and exit	70	51	62	64	54	62
	Circulation between A3024 Bursledon Rd and A27 W End Rd	46	40	42	35	30	33

Table 3. Stage 5 Operational Assessment - Average Queue Length (PCU) Results

Average Queue per Lane by sections (Unit PCU)		2021DM			2021DS			2021DS - 2021DM		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	1	0	1	2	1	2	1	1	1
	Dodwell Lane	1	0	0	2	1	1	0	1	1
	M27 Off Slip S	0	0	0	1	1	2	1	1	2
	A3024 Bert Betts Way	5	0	0	2	0	1	-4	0	1
	Circulation N	0	0	0	1	1	2	1	1	2
	Circulation E	0	0	0	1	1	1	1	1	1
	Circulation S	0	0	0	1	0	2	1	0	2
	Circulation W	0	0	0	1	0	1	1	0	1
Windhover Roundabout	A27 W End Rd	1	1	2	1	1	1	0	0	-2
	A3024 Bert Betts Way	6	4	23	1	1	2	-5	-4	-21
	A27 Providence Hill	1	0	0	1	1	1	0	0	0
	A3025 Hamble Ln	3	2	3	2	2	3	-1	-1	0
	A3024 Bursledon Rd	1	2	2	5	4	4	4	2	2
	Circulation between A27 W End Rd entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 W End Rd and A3024	0	0	0	0	0	0	0	0	0
	Circulation between A3024 entry and exit	0	0	0	2	2	2	2	2	2
	Circulation between A3024 and A27 Providence Hill	0	0	0	0	0	0	0	0	0
	Circulation between A27 Providence Hill entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 Providence Hill entry and Hamble Ln	0	0	0	0	0	0	0	0	0
	Circulation between Hamble Lane entry and exit	2	2	1	1	1	1	0	0	0
	Circulation between A3024 Bursledon Rd entry and exit	2	1	2	1	1	1	0	-1	-1
	Circulation between A3024 Bursledon Rd and A27 W End Rd	0	0	0	0	0	0	0	0	0

Average Queue per Lane by sections (Unit PCU)		2036DM			2036DS			2036DS - 2036DM		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	1	0	2	2	1	2	1	1	0
	Dodwell Lane	2	0	0	2	1	2	1	1	1
	M27 Off Slip S	0	0	0	2	1	2	1	1	2
	A3024 Bert Betts Way	12	0	0	2	0	1	-10	0	0
	Circulation N	0	0	0	1	1	2	1	1	2
	Circulation E	0	0	0	2	1	1	2	1	1
	Circulation S	0	0	0	1	1	1	1	1	1
	Circulation W	0	0	0	1	0	0	1	0	0
Windhover Roundabout	A27 W End Rd	2	2	5	1	1	1	0	-1	-4
	A3024 Bert Betts Way	13	10	23	1	1	1	-12	-9	-21
	A27 Providence Hill	1	0	0	1	1	1	0	0	0
	A3025 Hamble Ln	3	2	3	3	3	4	0	0	1
	A3024 Bursledon Rd	1	1	2	5	4	4	3	3	2
	Circulation between A27 W End Rd entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 W End Rd and A3024	0	0	0	0	0	0	0	0	0
	Circulation between A3024 entry and exit	0	0	0	2	2	3	2	2	3
	Circulation between A3024 and A27 Providence Hill	0	0	0	0	0	0	0	0	0
	Circulation between A27 Providence Hill entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 Providence Hill entry and Hamble Ln	0	0	0	0	0	0	0	0	0
	Circulation between Hamble Lane entry and exit	2	2	2	2	2	1	0	0	0
	Circulation between A3024 Bursledon Rd entry and exit	1	3	2	1	1	1	0	-2	-1
	Circulation between A3024 Bursledon Rd and A27 W End Rd	0	0	0	0	0	0	0	0	0

Average Queue per Lane by sections (Unit PCU)		2041DM			2041DS			2041DS - 2041DM		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	1	0	3	2	1	2	2	1	0
	Dodwell Lane	2	0	0	2	1	2	1	1	1
	M27 Off Slip S	0	0	0	2	2	2	1	1	2
	A3024 Bert Betts Way	14	0	0	2	0	1	-12	0	0
	Circulation N	0	0	0	1	1	2	1	1	2
	Circulation E	0	0	0	2	1	1	2	1	1
	Circulation S	0	0	0	1	1	1	1	1	1
	Circulation W	0	0	0	1	0	0	1	0	0
Windhover Roundabout	A27 W End Rd	2	2	6	2	1	1	0	-1	-5
	A3024 Bert Betts Way	14	11	23	1	1	1	-13	-10	-21
	A27 Providence Hill	1	0	0	1	1	1	0	0	0
	A3025 Hamble Ln	3	2	3	3	3	4	0	0	1
	A3024 Bursledon Rd	1	1	2	5	4	4	3	3	2
	Circulation between A27 W End Rd entry and exit	0	0	0	1	1	1	1	1	1
	Circulation between A27 W End Rd and A3024	0	0	0	0	0	0	0	0	0
	Circulation between A3024 entry and exit	0	0	0	2	2	3	2	2	3
	Circulation between A3024 and A27 Providence Hill	0	0	0	0	0	0	0	0	0
	Circulation between A27 Providence Hill entry and exit	0	0	0	2	1	1	2	1	1
	Circulation between A27 Providence Hill entry and Hamble Ln	0	0	0	0	0	0	0	0	0
	Circulation between Hamble Lane entry and exit	2	2	2	2	2	2	0	0	0
	Circulation between A3024 Bursledon Rd entry and exit	1	3	2	2	1	2	0	-2	-1
	Circulation between A3024 Bursledon Rd and A27 W End Rd	0	0	0	0	0	0	0	0	0

Table 4. Stage 5 Operational Assessment - V/C (%) Results

Volume over Capacity (V/C %)		**2021DM**			**2021DS**		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	81	52	**90**	46	37	58
	Dodwell Lane	**87**	44	33	57	31	43
	M27 Off Slip S	63	38	49	47	43	56
	A3024 Bert Betts Way	**100**	67	75	56	31	39
	Circulation N	33	23	30	28	17	28
	Circulation E	46	33	38	52	35	46
	Circulation S	33	27	26	38	27	42
	Circulation W	14	5	11	31	16	20
Windhover Roundabout	A27 W End Rd	82	76	**95**	42	34	34
	A3024 Bert Betts Way	**100**	**100**	**106**	41	36	57
	A27 Providence Hill	72	52	50	31	25	23
	A3025 Hamble Ln	62	54	62	48	41	55
	A3024 Bursledon Rd	40	39	38	57	44	47
	Circulation between A27 W End Rd entry and exit	50	41	44	49	39	42
	Circulation between A27 W End Rd and A3024	44	40	44	31	25	26
	Circulation between A3024 entry and exit	16	20	25	56	77	63
	Circulation between A3024 and A27 Providence Hill	35	35	36	26	25	34
	Circulation between A27 Providence Hill entry and exit	41	39	39	42	39	50
	Circulation between A27 Providence Hill entry and Hamble Ln	35	32	32	20	18	22
	Circulation between Hamble Lane entry and exit	50	44	40	42	38	41
	Circulation between A3024 Bursledon Rd entry and exit	67	47	56	51	42	51
	Circulation between A3024 Bursledon Rd and A27 W End Rd	42	35	37	31	25	28
Volume over Capacity (V/C %)		**2036DM**			**2036DS**		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	75	53	**95**	56	41	61
	Dodwell Lane	**90**	43	39	66	34	49
	M27 Off Slip S	60	39	61	51	47	64
	A3024 Bert Betts Way	**101**	77	81	61	35	43
	Circulation N	31	26	34	32	18	30
	Circulation E	41	31	35	56	40	48
	Circulation S	34	23	25	41	31	45
	Circulation W	18	7	16	32	23	28
Windhover Roundabout	A27 W End Rd	**89**	**94**	**100**	51	31	36
	A3024 Bert Betts Way	**103**	**102**	**107**	45	45	56
	A27 Providence Hill	77	59	59	29	29	25
	A3025 Hamble Ln	67	56	66	53	48	63
	A3024 Bursledon Rd	44	48	42	54	49	48
	Circulation between A27 W End Rd entry and exit	51	46	47	54	49	47
	Circulation between A27 W End Rd and A3024	45	46	45	35	28	29
	Circulation between A3024 entry and exit	21	25	26	66	69	**86**
	Circulation between A3024 and A27 Providence Hill	35	36	36	29	29	36
	Circulation between A27 Providence Hill entry and exit	41	40	40	50	46	54
	Circulation between A27 Providence Hill entry and Hamble Ln	36	33	33	22	22	24
	Circulation between Hamble Lane entry and exit	54	49	46	50	43	44
	Circulation between A3024 Bursledon Rd entry and exit	68	49	59	62	52	60
	Circulation between A3024 Bursledon Rd and A27 W End Rd	45	39	41	34	29	31
Volume over Capacity (V/C %)		**2041DM**			**2041DS**		
Junction	Approach & Circulation	AM	IP	PM	AM	IP	PM
M27/J8	M27 Off Slip N	72	55	**95**	57	41	60
	Dodwell Lane	**91**	43	41	69	35	50
	M27 Off Slip S	60	40	62	54	51	67
	A3024 Bert Betts Way	**102**	78	82	63	37	44
	Circulation N	31	26	35	33	20	32
	Circulation E	40	31	34	57	41	48
	Circulation S	33	23	25	43	31	44
	Circulation W	20	7	17	36	24	29
Windhover Roundabout	A27 W End Rd	**93**	**96**	**100**	53	32	38
	A3024 Bert Betts Way	**103**	**102**	**107**	46	47	57
	A27 Providence Hill	78	61	62	29	30	25
	A3025 Hamble Ln	68	58	67	54	49	65
	A3024 Bursledon Rd	45	49	43	56	50	50
	Circulation between A27 W End Rd entry and exit	51	48	49	55	51	49
	Circulation between A27 W End Rd and A3024	45	47	45	36	29	30
	Circulation between A3024 entry and exit	23	26	27	70	70	**90**
	Circulation between A3024 and A27 Providence Hill	35	36	36	30	30	37
	Circulation between A27 Providence Hill entry and exit	41	41	40	52	48	55
	Circulation between A27 Providence Hill entry and Hamble Ln	36	34	34	23	23	25
	Circulation between Hamble Lane entry and exit	54	50	46	52	46	46
	Circulation between A3024 Bursledon Rd entry and exit	70	51	62	64	54	63
	Circulation between A3024 Bursledon Rd and A27 W End Rd	46	40	42	35	30	33