



**LAND WEST OF HOOK LANE
PAGHAM
BOGNOR REGIS**

**SUPPLEMENTARY TRANSPORT
ASSESSMENT**

21 March 2017

Our Ref: MAL/adf/JNY8840-04

RPS

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QUALITY MANAGEMENT

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CONTENTS

1	INTRODUCTION	1
2	DEVELOPMENT PROPOSALS	2
3	TRIP GENERATION AND DISTRIBUTION.....	4
4	HIGHWAY IMPACT ASSESSMENT	10
5	REVIEW OF WSCC COMMENTS & SENSITIVITY ASSESSMENT	24
6	SUMMARY AND CONCLUSION.....	28

APPENDICES

APPENDIX A – DEVELOPMENT FLOWS – ALL SITES

APPENDIX B – TEMPRO OUTPUT

APPENDIX C – PROPOSED 2031 TRAFFIC FLOWS & SATURN FLOWS

APPENDIX D – CAPACITY ASSESSMENT OUTPUT

APPENDIX E – OFF SITE MITIGATION MEASURES & DESIGN AUDIT

APPENDIX F – MITIGATION MEASURES CAPACITY RESULTS

APPENDIX G – PROPOSED ACCESS ARRANGEMENT – PAGHAM ROAD & CAPACITY

ANALYSIS OUTPUT

APPENDIX H – SAFETY AUDIT REVIEW

APPENDIX I – SENSITIVITY FLOWS & OUTPUT CAPACITY RESULTS

1 INTRODUCTION

Report Brief

- 1.1 RPS Group has been commissioned by Hallam Land Management to prepare a supplementary Transport Assessment in connection with their proposal for a residential development on land to the west of Hook Lane, Pagham together with the site allocations identified in the Local Plan review in which Arun District Council is proposing to allocate 1200 dwellings within Pagham.
- 1.2 This report has been prepared as additional information to the Transport Assessment already submitted as part of the planning application for the site west of Hook Lane (P/6/17/OUT), providing the local highway authorities with information so that they can determine the cumulative impact of the site allocations on the local highway network.
- 1.3 The site allocations will include for a new single form entry primary school on one of the three sites, the final location of this school will be determined by West Sussex County council however for the purpose of this assessment it is assumed that the school is located on the Land West of Pagham Rd site, which is known to be the County Council's preferred location (Pagham South). This assessment therefore reviews the following:
- Development on Land North of Sefter Road - 250 dwellings
 - Development on Land West of Hook Lane - 300 dwellings, 80 bed Care Home & 1,600sqm of D1 Use.
 - Development on Land West of Pagham Road – 400 dwellings, Single Form Entry Primary School, 70 bed Care Home & Local Facilities
- 1.4 This report also includes for the potential of a further 60 dwellings on the Osborne Site north of Sefter Road and 90 dwellings at the Church Barton Farm which adjoins the Pagham South Site.
- 1.5 This report has been prepared based on scoping discussions with West Sussex County Council in relation to the local road network and Highways England for the Strategic Routes (A27). This report also covers comments raised by WSCC in relation to the Transport Assessment submitted as part of the Hook Lane planning application.
- 1.6 This assessment has also been prepared in liaison with the highway consultants working on other sites within this area to provide a consistent approach.
- 1.7 This report provides details of the sites included as part of this assessment, the trip generation and the capacity assessments. Details in terms of accessibility, planning policy etc., have been covered in the Transport Assessment dated December 2016 submitted as part of the planning application.

2 DEVELOPMENT PROPOSALS

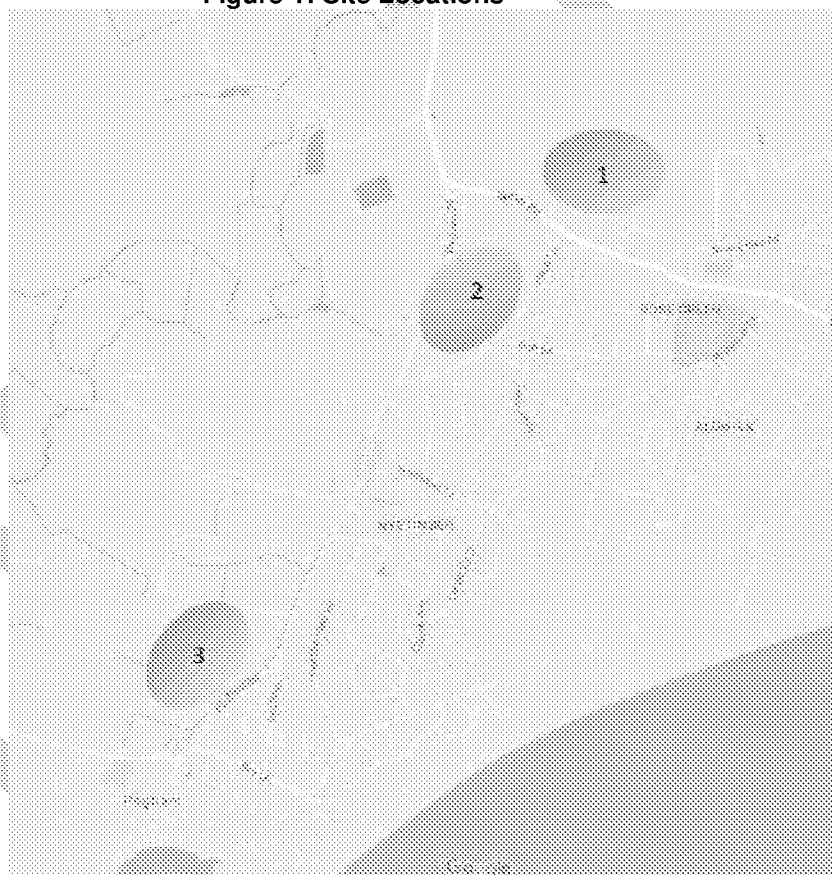
Introduction

- 2.1 This section of the report identifies the sites locations and the level of development being proposed.

Site Locations

- 2.2 As part of the Local Plan Review Arun District Council is proposing to 1200 dwellings within Pagham by 2031. This assessment follows on from the Transport Assessment submitted as part of the site identified on land west of Hook Lane, providing additional information in relation to the cumulative impact of the identified sites within Pagham which are shown in figure below.

Figure 1: Site Locations



Source: Google Maps

- 2.3 The proposal is that a new single form entry primary school will be provided on one of the three sites, the final location of this school will be determined by West Sussex County Council however for the purpose of this assessment it is assumed that the school is located on the site west of Pagham Road. This assessment therefore reviews the following;
- Development on Land North of Sefton Road - 250 dwellings
 - Development on Land West of Hook Lane - 300 dwellings, 80 bed Care Home & 1,600sqm of D1 Use.

- Development on Land West of Pagham Road – 400 dwellings, Single Form Entry, 70 bed Care Home & Local Facilities.

2.4 The above sites have all been reviewed in isolation and different Transport Assessments have been submitted with the relevant planning applications. All of the assessments have however been based on the same trip rates and distribution which was agreed with the highway authority as part of pre-application scoping discussions.

2.5 For this cumulative assessment, the trips identified within the individual transport reports have been used. The trips associated with the site on land west of Pagham Road have been based on more recently adjusted flows following comments received from WSCC.

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3 TRIP GENERATION AND DISTRIBUTION

Introduction

- 3.1 This section of the report sets out the assessment parameter's agreed with West Sussex County Council and Highways England which includes the trip rates, distribution, scope of assessment area and assessment years.

Trip Generation

- 3.2 The trip rates used for the proposed uses are included in the tables below; these are based on information obtained from the TRICS database. The TRICS output was included within Appendix L of the original TA and has been agreed with WSCC.

Table 3.1: TRICS Residential Trip Rates

	AM Peak 08:00-09:00			PM Peak 17:00-18:00		
	Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
Trip Rate	0.144	0.359	0.503	0.299	0.179	0.478

Source: TRICS

Table 3.2: TRICS Care Home Trip Rates

	AM Peak 08:00-09:00			PM Peak 17:00-18:00		
	Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
Trip Rate	0.071	0.045	0.116	0.071	0.115	0.186

Source: TRICS

Table 3.3: TRICS Primary School Trip Rates

	AM Peak 08:00-09:00			PM Peak 17:00-18:00		
	Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
Trip Rate	0.267	0.195	0.462	0.071	0.076	0.147

Source: TRICS

- 3.3 The traffic movements for each of the sites being considered have been obtained from the transport consultants' working on the other sites, details of each of the sites traffic movements is provided in **Appendix A**. In addition to the above traffic movements, trips associated with the Local Facilities located on the Pagham South site have been included, although external to the site these are minimal as they will be primarily trips already on the local road network.

Distribution and Assignment

- 3.4 The distribution / assignment of the residential trips have been based upon the Census database which provides details of where residents within Pagham and Rose Green Ward currently work. Whilst it is accepted that other trips will be made during the peak periods the primary trip purpose will be work place trips, as such it is proposed that this trip distribution is used for all purposes. This has been agreed by WSCC.

- 3.5 Trips from the development and the likely route choice to the above destinations have been established using google maps. The trip assignment is shown in the table below:

Table 3.4: Residential Trip Assignment

Route	%
Pagham Road North	50%
Pagham Road South	10%
Rose Green Road East	40%

Source: Census Database

- 3.6 The above traffic assignment has been agreed with WSCC and HE as part of pre-application scoping discussions. However, it should be noted that the transport consultants working for the site on land north of Sefter Road submitted a slightly different distribution in their Transport Assessment.
- 3.7 The distribution for the Care Home and Primary School has been based on existing traffic movement splits with assumptions made for the Primary School Traffic dispersing into local residential areas.

Assessment Area

- 3.8 The study area has been agreed with West Sussex County Council and Highways England as part of the pre-application scoping discussions, and the junctions to be assessed for this accumulative assessment are as follows:

- Sefter Road / Pagham Road - Priority junction;
- Hook Lane / Pagham Road - Priority junction;
- Hook Lane / Sefter Road - Priority junction;
- Grosvenor Gardens / Rose Green Road / Carlton Avenue – Two priority junctions;
- Nyetimber Lane / Grosvenor Road / Rose Green Road – Staggered signalised junction;
- Gossamer Lane / Aldwick Street / Aldwick Road – Roundabout;
- Pagham Road/ Nyetimber Lane;
- Pagham Road/ Lower Bognor Road;
- B2166 Lagness Road/ Mill Lane/ Vinnetrow Road; and
- B2145/ B2166
- Whyke Roundabout - B2145/A27 Chichester Bypass
- Bognor Rd Roundabout – A27/ A259/ Bognor Road

- 3.9 The site accesses proposed as part of the development proposals are not considered in this report. The analysis of the relevant accesses are identified in the Transport Assessments included as part of the relevant planning submissions which all demonstrate that they will

operate well within their design capacities and have sufficient spare capacity not to be affected by the accumulative traffic movements.

- 3.10 Notwithstanding the above, a sensitivity assessment has been carried out within section 5 of this report for the Hook Lane site accesses following on from comments received from WSCC.

Assessment Years

- 3.11 In accordance with pre-application discussions with WSCC and HE 'with' and 'without' development assessments have been carried out for the future year of 2031.

- 3.12 Arun District Council has provided SATURN data for the area being assessed. The SATURN model has been produced as part of the Arun Transport Study 2016 and includes the site allocations identified in the latest Arun Local Plan up to 2031. The model also includes scenarios based on 'With' and 'Without Mitigation'. The Mitigation identified in the Transport Study includes improvement measures at the following junctions;

- A27/ B2145 (Whyke Roundabout)
- A27/ A259 (Bognor Road Roundabout)
- A27/ B2233 Nyton Road
- A27/ A29 (Fontwell Western Roundabout)
- A27/ A29 (Fontwell Eastern Roundabout)
- A27/ A284 Ford Road, Arundel
- A27/ A280 Pacting Northern Roundabout
- A29/ A259 Rowan Way
- A29/ A259 Felpham Relief Road
- A259/ B2132 (Comet Corner) (*Safety Imp*)
- A259/ B2233 (Oystercatcher) (*Safety Imp*)
- A259/ Church Lane
- A259/ B2187 (Littlehampton West – Tesco)
- A29 Lisey (*Safety Imp*)

- 3.13 The junctions within the Study Area included as part of this assessment include the A27/ B2145 (Whyke Roundabout) and the A27/ A259 (Bognor Road Roundabout). The measures proposed for these junctions have been provided by HE together with the associated models. Further details on these proposals are covered in Section 4.

- 3.14 The SATURN model includes for 1,200 dwellings within Pagham and as such the site allocations identified as part of this report have been included in the SATURN flows provided. To provide a base 2031 assessment without the developments within Pagham it has been agreed with WSCC and HE that the development flows identified as part of this Supplementary TA for the cumulative sites can be removed from the SATURN flows provided.

- 3.15 The SATURN model is a tool used to assess the impact of traffic at key junctions and covers a wide area, as such it does not provide an accurate tool for determining impact at a more local level i.e. roads within Pagham. As such the TEMPRO V7 Growth has been applied to the junctions assessed locally which includes the following;

- Sefter Road / Pagham Road - Priority junction;
- Hook Lane / Pagham Road - Priority junction;
- Hook Lane / Sefter Road - Priority junction;

- Grosvenor Gardens / Rose Green Road / Carlton Avenue – Two priority junctions;
- Nyetimber Lane / Grosvenor Road / Rose Green Road – Staggered signalised junction;
- Gossamer Lane / Aldwick Street / Aldwick Road – Roundabout;
- Pagham Road/ Nyetimber Lane;

3.16 The SATURN flows have therefore been used for the following junction assessments;

- Pagham Road/ Lower Bognor Road;
- B2166 Lagness Road/ Mill Lane/ Vinnetrow Road; and
- B2145/ B2166
- Whyke Roundabout - B2145/A27 Chichester Bypass
- Bognor Rd Roundabout – A27/ A259/ Bognor Road

3.17 The standard TEMPRO growth includes for an allocation of new houses and new jobs to calculate the forecasting growth period. For this cumulative impact assessment the housing growth for the 'with development' scenario has been reduced to 150 dwellings but still includes the 'new jobs' growth. The provision of the 150 dwellings as part of the proposed scenario allows for the potential further local growth in this area including development off Sefter Road North and also Pagham Road south.

3.18 TEMPRO includes the following assumptions in terms of housing growth between 2016 and 2031;

Table 3.5 – Housing Projections TEMPRO v Arun Local Plan

	TEMPRO Growth - Housing	Predicted Pagham Allocated Sites & Committed Dev
2016 – 2031	+708	+1,082 *

(*) Includes 250 Dwellings Sefter Rd North, 300 dwellings Hook Lane, 400 dwellings Pagham South and committed developments 90 Dwellings Summer Lane & 42 Dwellings off Pagham Road).

3.1 For the baseline 'No Development' Scenario, the full TEMPRO growth is applied together with the committed developments. For the 'With Development' Scenarios, partial growth is applied (as explained above) plus the site allocations and committed developments.

3.2 On the basis of the above, the growth factors applied to the local roads are identified in the table below.

Table 3.6: TEMPRO Growth Rates

	Urban Area – Principal Roads
Without Development (Base Scenarios)	
AM Peak 2016 – 2031	1.179377
PM Peak 2016 – 2031	1.181325

With Development (Adjusted Assumptions)	
AM Peak 2016 – 2031	1.108889
PM Peak 2016 – 2031	1.100123

Source: TEMPRO – Arun District 019 area

- 3.3 A copy of the TEMPRO output is included at **Appendix B** of this report.
- 3.4 The committed developments included as part of this assessment work within Pagham are as follows;
- Land at summer Lane (90 Dwellings, P/58/15); and
 - 251 Pagham Road (42 dwellings, P/125/14).
- 3.5 To ensure that the use of TEMPRO is sufficiently robust, the table below identifies the two-way flows on roads within the Pagham area from the SATURN model and also the base observed traffic flows growthed to 2031 using TEMPRO together with the site allocations & committed developments.

Table 3.7: SATURN V Survey Flows + TEMPRO Growth (With Site Allocations) – AM Peak

Road	2031 SATURN Flows – Without Mitigation Total Through Movements	2031 SATURN Flows – With Mitigation Total Through Movements	2031 Traffic Flows using TEMPRO Growth Total Through Movements
Pagham Road/ Seftor Road junction	808	833	1319
Nyetimber Road/ Grosvenor Gardens	691	739	1321
Gossamer Lane/ Aldwick Road	991	958	933

Source: Arun SATURN Model

Table 3.8: SATURN V Survey Flows + TEMPRO Growth (With Site Allocations) – PM Peak

Road	2031 SATURN Flows – Without Mitigation Total Through Movements	2031 SATURN Flows – With Mitigation Total Through Movements	2031 Traffic Flows using TEMPRO Growth Total Through Movements
Pagham Road/ Seftor Road junction	613	617	882
Nyetimber Road/ Grosvenor Gardens	703	694	1293
Gossamer Lane/ Aldwick Road	1221	1235	1682

Source: Arun SATURN Model

- 3.6 The above table shows that in all cases the observed base traffic flows with TEMPRO growth are higher than the SATURN model flows, with the exception of the Gossamer Lane/ Aldwick Road junction in the AM Peak where the flows are comparative to the model. Therefore it is considered acceptable to use the TEMPRO growth rates identified for the local roads. The SATURN flows on the strategic road network are more comparable to the growthed traffic flows.
- 3.7 The 2031 Traffic flows with and without development traffic are included in **Appendix C**.

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4 HIGHWAY IMPACT ASSESSMENT

Introduction

4.1 This section of the report considers the transport impact of the proposed developments on the surrounding highway network. The 'with development' scenario includes;

- Development on Land North of Sefter Lane - 250 dwellings
- Development on Land West of Hook Lane - 300 dwellings, 80 bed Care Home & 1,600sqm of D1 Use.
- Development on Land West of Pagham Road – 400 dwellings, Single Form Entry Primary School, 70 bed Care Home & Local Facilities.

4.2 The 'With Development' Scenario also includes for the committed developments within Pagham (132 Dwellings) and also the potential further growth of a further 150 dwellings.

Assessment Parameters

4.3 The study area has been agreed with West Sussex County Council and Highways England as part of the pre-application scoping discussions, and the junctions to be assessed based on the above are as follows:

- Sefter Road / Pagham Road - Priority junction;
- Hook Lane / Pagham Road - Priority junction;
- Hook Lane / Sefter Road - Priority junction;
- Grosvenor Gardens / Rose Green Road / Carlton Avenue – Two priority junctions;
- Nyetimber Lane / Grosvenor Road / Rose Green Road – Staggered signalised junction;
- Gossamer Lane / Aldwick Street / Aldwick Road – Roundabout;
- Pagham Road/ Nyetimber Lane;
- Pagham Road/ Lower Bognor Road;
- B2166 Lagness Road/ Mill Lane/ Vinnetrow Road; and
- B2145/ B2166.
- A27 Chichester Bypass/ B2145
- A27 Chichester Bypass/ Bognor Road A259

4.4 The site accesses to the various sites have been assessed as part of the relevant independent Transport Assessments which demonstrate that there is sufficient spare capacity to accommodate additional traffic movements associated with the allocated sites, as such only the existing junctions have been modelled.

4.5 However, a sensitivity assessment regarding the potential of traffic diverting through the proposed development off Hook Lane has been carried out following WSCC comments on the original TA, details of which are included in Section 5.

4.6 The above junctions have been tested for the following scenarios during the AM and PM peak periods:

Junctions North of Sefter Lane

SATURN Flows

- 2031 'Without Mitigation' – No Development within Pagham
- 2031 'Without Mitigation' – With Development within Pagham
- 2031 'With Mitigation' – No Development within Pagham
- 2031 'With Mitigation' – With Development within Pagham

Local Junctions within Pagham

Base Traffic Flows + Growth

- 2031 + Committed Development - Without Development within Pagham
- 2031 + Committed Development – With Development within Pagham

4.7 The junction analysis has been undertaken using industry standard 'Junctions 9' for roundabout and priority junctions and LINSIG for the signalised junction. Copies of the analysis output are provided in **Appendix D**.

4.8 The results of the Junctions 9 assessments provide an RFC (Ratio of flow to capacity) figure and a queue length. The RFC determines how the particular arm of the junction is operating and if the RFC is 0.85 or less, the relevant arm of the junction is considered to be operating within its design capacity, with minimal delay. A RFC greater than 0.85 and less than 1.0 shows that the arm of the junction is operating at or close to its design capacity and as such some queues and delay may start to occur. When an RFC is greater than the 1.0 the arm of junction is operating at or exceeding its design capacity and as a result longer delays /queues will start to form.

4.9 LINSIG determines the capacity of a signalised junction by measuring the Degree of Saturation (DoS). The DoS is the ratio of flow to saturation flow on a link and if this value is over 100% the link is operating over capacity. In effect, when the DoS is shown to be over 100%, there is more traffic trying to pass through the junction than can be accommodated.

Sefter Road / Pagham Road – Priority Junction

4.10 This priority junction has been tested using the Junctions 9 computer programme and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.1: Sefter Road / Pagham Road

	B-AC Sefter Road to Pagham Road North and South		C-AB Pagham Road South Right Turn and Ahead	
	RFC	Q	RFC	Q
AM Peak				
2031 Base + Committed	1.19	45	0.01	0
2031 Base + Committed + All Sites	1.35	76	0.01	0
PM Peak				
2031 Base + Committed	0.36	1	0.00	0
2031 Base + Committed + All Sites	0.43	1	0.01	0

- 4.11 The model shows that this junction will exceed its design capacity without the development traffic with long queues on Sefter Road which will increase with the development traffic. The actual queue length should be read with caution when the RFC exceeds 1.0.
- 4.12 Queues currently occur at this junction and vehicles tend to divert along Hook Lane and turn right at the Hook Lane/Pagham Road junction. With the proposed development off Hook Lane, there will be another alternative route that may be used by vehicles accessing onto Pagham Road. A review of this use has been included as part of the sensitivity assessment included in section 5.

Hook Lane / Pagham Road – Priority Junction

- 4.13 The above priority junction has been tested using the Junctions 9 computer programme and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.2: Hook Lane / Pagham Road

	B -C Hook Lane to Packham Road South		B-A Hook Lane to Pagham Road North		C-AB Pagham Road South to Hook Lane and Pagham Road North	
	RFC	Q	RFC	Q	RFC	Q
AM Peak						
2031 Base + Committed	0.20	0	0.54	1	0.26	1
2031 Base + Committed + All Sites	0.26	0	0.56	1	0.35	1
PM Peak						
2031 Base + Committed	0.47	1	0.08	0	0.26	0
2031 Base + Committed + All Sites	0.50	1	0.08	0	0.31	1

- 4.14 The above results show that the junction will operate within its design capacity with minimal delays experienced. It is clear the additional traffic associated with the site allocations will not materially affect the operation of this priority junction and will be imperceptible to other road users.

Hook Lane / Sefter Road – Priority Junction

- 4.15 This junction has been tested using the Junctions 9 computer programme and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.3: Hook Lane / Sefter Road

	B-C Hook Lane to Packham Road South		B-A Hook Lane to Pagham Road North		C-AB Pagham Road South to Hook Lane and Pagham Road North	
	RFC	Q	RFC	Q	RFC	Q
AM Peak						
2031 Base + Committed	0.02	0	0.45	1	0.02	0
2031 Base + Committed + All Sites	0.03	0	0.60	2	0.03	0
PM Peak						
2031 Base + Committed	0.01	0	0.41	1	0.11	0
2031 Base + Committed + All Sites	0.02	0	0.48	1	0.10	0

- 4.16 The above results show that this junction will operate within its design capacity with minimal delays experienced. It is clear the additional traffic associated with the site allocations will not materially affect the operation of the priority junction and will be imperceptible to other road users.

Grosvenor Gardens / Rose Green Road / Carlton Avenue – Staggered Priority Junctions

- 4.17 This staggered priority junction has been tested using the Junctions 9 computer programme and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.4: Grosvenor Gardens / Road Green Road / Carlton Avenue

	B-ACD Carlton Avenue		A-BCD Grosvenor Gardens		D-ABC Rose Green Road North		C-ABD Road Green Road West	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
AM Peak								
2031 Base + Committed	0.74	3	0.01	0	1.08	27	0.12	0
2031 Base + Committed + All Sites	0.71	2	0.01	0	1.08	27	0.12	0

PM Peak								
2031 Base + Committed	0.57	1	0.02	0	1.21	58	0.14	0
2031 Base + Committed + All Sites	0.54	1	0.02	0	1.23	61	0.13	0

- 4.18 The above results show that the junction will operate within its design capacity with the exception of Rose Green Arm which is likely to exceed its design capacity without the site allocations. The impact of the development traffic is not likely to have a material impact; however measures are proposed to improve the operation of this junction which includes a mini roundabout arrangement. The layout is included in **Appendix E** and the results are summarised in the table below.

Table 4.5: Grosvenor Gardens / Road Green Road / Carlton Avenue – Proposed Mini Roundabout

	Rose Green Road (N)		Grosvenor Gardens		Rose Green Road (W)	
	RFC	Q	RFC	Q	RFC	Q
AM Peak						
2031 Base + Committed + All Sites	0.70	2	0.42	1	0.80	4
PM Peak						
2031 Base + Committed + All Sites	0.84	5	0.44	1	0.79	4

- 4.19 The above results show that this arrangement will provide a significant improvement to the traffic movements at this junction without causing any material delay to the through traffic along Grosvenor Gardens. A designer's audit of this proposed arrangement is included in **Appendix E**.

Nyetimber Lane / Grosvenor Road / Rose Green Road – signalised Junction

- 4.20 This signalised junction has been tested using the LINSIG computer programme and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.6: Nyetimber Lane / Grosvenor Road / Rose Green Road

Table 10: Nyetimber Lane / Grosvenor Road / West Green Road							
	Grosvenor Gardens		Gossamer Lane		Nyetimber Lane		PRC (%)
	Deg of Sat	Q	Deg of Sat	Q	Deg of Sat	Q	
AM Peak							
2031 Base + Committed	96.4%	11	103.7%	26	104.4%	31	-16.0
2031 Base + Committed + All Sites	86.1%	8	114.8%	46	115.8%	53	-28.7

PM Peak							
2031 Base + Committed	94.5%	12	95.8%	17	92.1%	12	-6.4
2031 Base + Committed + All Sites	93.5%	11	111.8%	50	108.8%	27	-24.2

4.22 The above assessment has been carried out using the signal timing data provided by WSCC. The model includes for an 'all red' pedestrian phase to allow pedestrians to cross every cycle of lights, this in reality is unlikely to happen given the location of the crossing. When comparing the output results with the queue survey undertaken as part of the 2015 survey, the results showed greater queues than those actually observed on site. As such the above results assume the 'all red' pedestrian phase is called every other cycle of the lights.

4.23 The results with the 2031 assessment scenarios show that the junction will operate above its design capacity with and without the proposed developments with the degree of Saturation exceeding 100%. The provision of MOVA was recommended as a mitigation measure as part of the Hook Lane application and it is considered that this would also be appropriate for the cumulative assessment mitigation.

4.24 Details of Compact MOVA are provided in the Department for Transport's Advisory Leaflet 1/09 and states in part:

"MOVA is extremely effective at all types of isolated signal control junctions. It can also be applied effectively as 'linked' MOVA in small networks....Not only is MOVA effective at minimising delay or maximising capacity, research has shown it to be as safe as VA System D with Speed Assessment or Speed Discrimination Equipment'
'On-street trials helped to confirm the potential benefits of using Compact MOVA, Compact MOVA achieved 13.3% journey time reduction overall at one junction."

4.25 It is considered that the provision of MOVA would mitigate the cumulative developments impact.

Gossamer Lane / Aldwick Street / Aldwick Road – Roundabout Junction

4.26 This roundabout junction has been tested using the Junctions 9 computer programme and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.7: Gossamer Lane / Aldwick Street / Aldwick Road

	Aldwick Road		Aldwick Street		Barrack Lane		Gossamer Lane	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
2031 Base + Committed	0.19	0	0.21	0	0.19	0	0.28	0
2031 Base + Committed + All Sites	0.19	0	0.22	0	0.18	0	0.34	1

AM Peak

2031 Base + Committed	0.19	0	0.21	0	0.19	0	0.28	0
2031 Base + Committed + All Sites	0.19	0	0.22	0	0.18	0	0.34	1

PM Peak								
2031 Base + Committed	0.63	2	0.57	1	0.28	0	0.42	1
2031 Base + Committed + All Sites	0.60	2	0.57	1	0.25	0	0.43	1

- 4.27 The above results show that the junction will operate within its design capacity with minimal delays experienced. It is clear the additional traffic associated with the site allocations will not materially affect the operation of this roundabout junction and will be imperceptible to other road users.

Pagham Road / Nyetimber Lane

- 4.28 The above priority junction has been tested using the Junctions 9 computer programme. The results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.8: Pagham Road / Nyetimber Lane

	Nyetimber Lane		Pagham Road (S) Right into Nyetimber Lane	
	RFC	S	RFC	S

AM Peak				
2031 Base + Committed	0.34	1	0.10	0
2031 Base + Committed + All Sites	0.41	1	0.22	1

PM Peak				
2031 Base + Committed	0.37	1	0.24	1
2031 Base + Committed + All Sites	0.47	1	0.33	1

- 4.29 The above results show that this junction operates well within its design capacity and that the site allocations traffic will not have a material impact on the operation of this junction.

The following junctions have been assessed using the SATURN flows

Pagham Road/ Lower Bognor Road

- 4.30 This priority junction has been tested using the Junctions 9 computer programme and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.9: Pagham Road / Lower Bognor Road

	Lower Bognor Road – B-AC		Pagham Road (S) Right into Lower Bognor Road	
	RFC	Q	RFC	Q
AM Peak				
2031 – No Mitigation – No Development	0.94	9	0.00	0
2031 – No Mitigation – With Development	1.10	29	0.00	0
2031 – With Mitigation – No Development	0.93	9	0.00	0
2031 – With Mitigation – With Development	1.09	27	0.00	0
PM Peak				
2031 – No Mitigation – No Development	1.12	35	0.09	0
2031 – No Mitigation – With Development	1.34	71	0.11	0
2031 – With Mitigation – No Development	0.79	3	0.09	0
2031 – With Mitigation – With Development	0.95	8	0.11	0

- 4.31 The above results show that the existing junction operates at or above its design capacity in the peak periods, the impact of the development traffic is shown to increase the delay for vehicles turning right out of Lower Bognor Road especially with the 'no mitigation' scenario. The queue length however, needs to be treated with caution when the RFC exceeds 1.0.
- 4.32 In the 'with mitigation' scenario the impact is significantly less. This is likely to be as a result of traffic that uses the Bognor Road as a 'rat run' transfers back onto the main 'A' roads as traffic delays reduce with the mitigation measures implemented.
- 4.33 Whilst it is identified that there will be some additional delay to this junction, it is not considered that the impact is severe and as such, not to encourage 'rat running' traffic, no improvements are considered necessary at this junction.

B2166 Lagness Road/ Mill Lane/ Vinnetrow Road

- 4.34 The operation of this junction will be affected by the proposed measures to the A27 Chichester Bypass/ Bognor Road junction which seeks to change Vinnetrow Road to an exit only arm southbound. This junction has been modelled using Junctions 9 computer programme.

Table 4.10: B2166 Lagness Road / Mill Lane / Vinnetrow Road

	Vinnetrow Road		B2166 Lagness Road		Mill Lane		B2166	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
AM Peak								
2031 – No Mitigation – No Development	0.34	1	0.60	2	0.11	0	0.59	1
2031 – No Mitigation – With Development	0.39	1	0.76	3	0.13	0	0.66	2
2031 – With Mitigation – No Development	0.22	0	0.57	1	0.10	0	0.66	2
2031 – With Mitigation – With Development	0.26	0	0.72	3	0.12	0	0.73	3
PM Peak								
2031 – No Mitigation – No Development	0.50	1	0.35	1	0.05	0	1.07	48
2031 – No Mitigation – With Development	0.59	1	0.43	1	0.06	0	1.19	114
2031 – With Mitigation – No Development	0.25	0	0.25	0	0.05	0	1.05	41
2031 – With Mitigation – With Development	0.34	1	0.32	1	0.05	0	1.18	104

- 4.35 The above results show that this junction operates within its design capacity although B2166 Western arm is shown to operate above its design capacity in the PM peak. Measures proposed to improve the operation of this junction include some localised widening on the B2166 Western arm as proposed as part of the Transport Assessment prepared by C & A Consulting (Drawing No. 12-018-037). This arrangement has been re-produced by RPS shown on Drawing No. JNY8840/000 a copy of which is included in **Appendix E**. Applying these measures the results are identified as follows;

Table 4.11: B2166 Lagness Road / Mill Lane / Vinnetrow Road – Proposed Improvements

	Vinnetrow Road		B2166 Lagness Road		Mill Lane		B2166	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q
AM Peak								
2031 – No Mitigation – With Development	0.39	1	0.76	3	0.13	0	0.49	1
2031 – With Mitigation – With Development	0.26	0	0.72	3	0.12	0	0.53	1

PM Peak								
2031 – No Mitigation – With Development	0.70	2	0.43	1	0.06	0	0.88	7
2031 – With Mitigation – With Development	0.40	1	0.32	1	0.05	0	0.87	6

- 4.36 As can be seen, the improvements proposed will mitigate the cumulative developments impact and improve the operation of this junction. The output data is included in **Appendix F** for the Mitigation measures.

B2145/ B2166

- 4.37 This roundabout junction has been tested using the Junctions 9 computer programme and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.12: B2145 / B2166

	B2145 (N)		B2166		B2145 (S)	
	RFC	G	RFC	G	RFC	G

AM Peak

2031 – No Mitigation – No Development	0.51	1	0.92	9	0.81	4
2031 – No Mitigation – With Development	0.56	1	1.09	72	0.88	7
2031 – With Mitigation – No Development	0.63	2	0.79	4	0.78	4
2031 – With Mitigation – With Development	0.68	2	0.97	18	0.88	7

PM Peak

2031 – No Mitigation – No Development	0.91	9	0.69	2	0.60	2
2031 – No Mitigation – With Development	1.00	26	0.78	4	0.64	2
2031 – With Mitigation – No Development	1.03	37	0.55	1	0.56	1
2031 – With Mitigation – With Development	1.13	90	0.64	2	0.60	2

- 4.38 The above results show, that this junction operates close to its design capacity and slightly exceeding capacity on the B2166 arm in the AM Peak in the 'without Mitigation + Development' scenario and in the PM Peak on B2145(N) arm in the 'with Mitigation + Development' scenario. The impact of the development traffic is not considered to be severe, however to improve the operation of this junction, it has been considered appropriate to provide mitigation measures on

the B2145 (N) arm of the junction, these measures are identified in **Appendix E** and include extending the existing two lane approach. The results with this improvement are identified in the table below.

Table 4.13: B2145 / B2166

	B2145 (N)		B2166		B2145 (S)	
	RFC	Q	RFC	Q	RFC	Q
AM Peak						
2031 – No Mitigation – with Development	0.49	1	1.09	72	0.88	7
2031 – With Mitigation – With Development	0.60	2	0.97	18	0.88	7
PM Peak						
2031 – No Mitigation – with Development	0.89	7	0.79	4	0.64	2
2031 – With Mitigation – With Development	1.00	25	0.65	2	0.60	2

- 4.39 The above results show that the proposed measures will improve the operation of this junction and mitigate the cumulative developments impact. The output results of these improvements are provided in **Appendix F**.

A27 Chichester Bypass/ B2145 – Signalised Junction

- 4.40 This junction is currently a roundabout junction arrangement; however Highways England has advised that this junction will be upgraded to a signalised junction arrangement. Highways England has also provided RPS with their LINSIG model which has been used to assess the cumulative impact. The results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.14: A27 Chichester Bypass/ B2145 (Former Whyke Roundabout)

	A27 Chichester Bypass (West)		B2145 (North)		A27 Chichester Bypass (East)		B2145 (South)		PRC (%)
	Deg of Sat	Q	Deg of Sat	Q	Deg of Sat	Q	Deg of Sat	Q	
AM Peak									
2031 – No Mitigation – No Development	96.2	28	23.9%	2	60.5%	12	97.9%	25	-8.8
2031 – No Mitigation – With Development	99.1	33	27.0	2	64.1	12	114.7	120	-27.4
2031 – With Mitigation – No Development	123.9%	124	20.7%	2	74.7%	16	97.7%	31	-37.7

2031 – With Mitigation – With Development	135.0%	190	20.7%	2	76.0%	16	106.9%	104	-50.0
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PM Peak

2031 – No Mitigation – No Development	140.4	169	143.2	166	51.4	8	80.0	7	-59.1
2031 – No Mitigation – With Development	145.4	180	148.9	182	76.1	8	85.9	8	-65.5
2031 – With Mitigation – No Development	78.4%	16	158.8%	195	75.7%	16	66.7%	5	-76.4
2031 – With Mitigation – With Development	80.0%	16	163.9%	209	75.9%	16	75.2%	6	-82.1

- 4.42 The above results show that the proposed signalised junction is likely to operate over its design capacity without the development sites within Pagham, the increase in delay with the proposed sites is not considered to be severe with additional overall junction delay of 1-2mins. However to mitigate the impact of the cumulative sites, it is proposed that MOVA is implemented at this junction to ensure that this junction operates more efficiently.

A27 Chichester Bypass/ Bognor Road A259 Roundabout

- 4.43 Highways England have provided RPS with plans and their Junctions 9 model of the proposed measures to improve the operation of this junction which includes changing Vinnetrow Road to an exit only arm. This roundabout junction has been tested using the Junctions 9 model provided by Highways England and the results are summarised in the tables below for the morning and evening peaks respectively.

Table 4.15: A27 Chichester Bypass/ Bognor Road A259

	Chichester Bypass (North)		Bognor Road A259 (East)		A27 Chichester Bypass (South)		Bognor Road A259 (West)	
	RFC	Q	RFC	Q	RFC	Q	RFC	Q

AM Peak

2031 – No Mitigation – No Development	0.56	1	0.46	1	0.52	1	0.40	1
2031 – No Mitigation – With Development	0.56	1	0.47	1	0.52	1	0.41	1
2031 – With Mitigation – No Development	0.58	2	0.77	4	0.56	1	0.49	1
2031 – With Mitigation – With Development	0.59	2	0.78	4	0.56	1	0.50	1

PM Peak

2031 – No Mitigation – No Development	0.36	1	0.36	1	0.58	2	0.48	1
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2031 – No Mitigation – With Development	0.37	1	0.37	1	0.58	2	0.50	1
2031 – With Mitigation – No Development	0.43	1	0.50	1	0.53	1	0.58	2
2031 – With Mitigation – With Development	0.44	1	0.50	1	0.53	1	0.61	2

4.44 The Model used assumes no traffic accessing onto the roundabout from Vinnetrow Road, as such the SATURN flows for the 'No Mitigation' scenario have been re-distributed onto the A27 Western arm.

4.45 As can be seen the proposed measures at this junction will ensure that the junction operates well within capacity. The results also show that the cumulative developments will not have any material impact on the operation of this junction.

Summary

4.46 The impact assessment undertaken as part of this Transport Assessment considers the impact of the three sites identified in the Arun Local Plan for Pagham. The period assessed is 2031 and the junctions north of Seftor Road have been modelled using the SATURN data provided by Arun District Council. The modelling data has been approved by Highways England and West Sussex County Council. The more local junctions within Pagham have been modelled using base traffic flows growthed to 2031 using TEMPRO growth to provide a more accurate assessment.

4.47 The results of the analysis show that with off-site highway improvement measures the impact of the cumulative development sites can be mitigated.

4.48 The off-site highway improvements include;

- Nyetimber Lane/ Grosvenor Gardens/ Rose Green Road – signalised junction.

Proposed Mitigation: signal upgrade to include MOVA

- Rose Green Road/ Grosvenor Gardens Priority Junction

Proposed Mitigation: Mini Roundabout arrangement (TBC)

- Vinnetrow Road/ B2166/ Mill Lane roundabout junction

Proposed Mitigation: B2166 West approach road widening

- B2145/B2166 roundabout junction.

Proposed Mitigation: B2145 north, approach road widening

- A27 Chichester Bypass/ B2145 – Whyke Hill Proposed Signalised junction

Proposed Mitigation: Provision of MOVA

4.49 The NPPF states the following in paragraph 32:

“All development that generates significant amounts of movements should be supported by a Transport Statement of Transport Assessment. Plans and decisions should take account

of whether improvements can be undertaken within the transport network that cost effectively limits the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of the development are severe.”

- 4.50 The analysis undertaken has demonstrated that the cumulative impact of the developments within Pagham will not have a severe impact on the local or strategic road network.

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5 REVIEW OF WSCC COMMENTS & SENSITIVITY ASSESSMENT

- 5.1 This section of this report covers the points raised by WSCC provided in their initial comments to the Transport Assessment report issued in relation to the proposed development off Hook Lane.
- 5.2 The comments provided by WSCC are identified in ***bold italics*** and RPS' responses follow each comment.

'Investigate the form of vehicular access onto Pagham Road, and determine if a priority junction could be implemented. This should be supported with a PICADY assessment and Stage 1 RSA.'

- 5.3 The provision of the right turn lane was primarily to avoid any right turners blocking the through movement, although it is accepted that the number of predicted movements is low. As such a revised layout removing the ghost island right turn lane has been prepared and a copy of drawing No. JNY8840/12 is included in **Appendix G**.
- 5.4 To provide a robust assessment of this junction layout, the 2031 flows used as part of this cumulative impact assessment have been used. This junction has been assessed using Junctions 9 Software. The capacity assessment results are summarised in the table below and the full output is provided in **Appendix G**.

Table 5.1: Pagham Road/ Site Access junction

	Site Access		Pagham Road (S) Right into Site	
	RFC	Q	RFC	Q
AM Peak				
2031 Base + Committed + All Sites	0.12	0	0.00	0
PM Peak				
2031 Base + Committed + All Sites	0.07	0	0.01	0

- 5.5 The results show that this amended access arrangement without the ghost island right turn lane will operate well within capacity, as such it is proposed that the arrangement shown on Drawing No. JNY8840/12 is adopted for this site access.
- 5.6 This change to the proposed junction arrangement has been issued to the Independent Safety Auditor to seek advice if there are any additional comments to be raised. The only comment received was in relation to the tactile paving which has been rectified on drawing No. JNY8840/12. A copy of this review is included in **Appendix H**. As the right turn lane is no longer being proposed, it is not considered necessary to undertake a design audit.

Investigate the future year growth rate to ensure that this accounts of traffic growth as part of the adopted Chichester Local Plan and that proposed as part of the draft Arun DC Local Plan.

- 5.7 It is considered that the information provided within section 3 of this report covers this point.

Confirm the number of vehicular accesses proposed onto Hook Lane.

- 5.8 The development proposal included for the provision of two accesses off Hook Lane and one off Pagham Road. With the School option, this arrangement changed to include one access off Hook Lane and one off Pagham Road. The capacity assessments undertaken within the TA assessed all traffic entering/ exiting the site via Hook Lane as a single point of access and demonstrated that one access would be sufficient to accommodate the predicted traffic movements. Based on further discussions with WSCC it is agreed that the southern access on Hook Lane will no longer be provided.

Revise the location of pedestrian access points onto Hook Lane, if these are to be approved as part of the current outline permission.

- 5.9 The Development Framework Plan shows the general location of the proposed pedestrian access points but they are not currently fixed and as such will be dealt with as part of a reserved matters application.

Undertake Sensitivity tests upon local junctions given the possible traffic routing resulting from the provision of a through road within the site.

- 5.10 The proposed arrangement with access off Hook Lane and off Pagham Road could result in vehicles other than development traffic using this route to gain access onto Pagham Road. It is considered that this is only likely to occur during the AM Peak period when vehicles queue at the Sefter Road/ Pagham Road junction. As such a sensitivity assessment has been carried out which re-directs 50% of traffic travelling westbound along Sefter Road onto Hook Lane and via the site accesses. Also an assumption has been made that 100% of traffic turning left from Hook Lane onto Sefter Road uses the proposed sites accesses. This in turn reduces the volume of traffic at the Sefter Road junction to levels below the 2016 surveyed flows.

- 5.11 The Sensitivity traffic flows are provided in **Appendix I**.

- 5.12 The following junctions have been re-assessed based on this sensitivity assessment with the 2031 cumulative assessment flows;

- Site Access Hook Lane (Assessed as a single point of access)
- Site Access Pagham Road (No Right Turn Lane)
- Hook Lane/ Sefter Road
- Sefter Road/ Pagham Road

- 5.13 The tables below provide a summary of this sensitivity assessment and the full outputs are provided in **Appendix I**.

Table 5.2: Hook Lane/ Sefter Road junction

	Hook Lane		Sefter Road (W) Right into Hook Lane	
	RFC	Q	RFC	Q
AM Peak				
2031 Base + Committed + All Sites	0.57	1	0.03	0
PM Peak				
2031 Base + Committed + All Sites	0.47	1	0.10	0

5.14 The above results show that this junction will still operate well within its design capacity.

Table 5.3: Sefter Road/ Pagham Road junction

	Sefter Road		Pagham Road (S) Right into Sefter Road	
	RFC	Q	RFC	Q
AM Peak				
2031 Base + Committed + All Sites	0.97	10	0.01	0
PM Peak				
2031 Base + Committed + All Sites	0.27	0	0.01	0

5.15 The above table shows that should vehicles divert away from this junction and use the proposed site access onto Pagham Road, this junction will operate more efficiently although some queues will still form.

Table 5.4: Hook Lane/ Site Access junction

	Site Access		Hook Lane (N) Right into Site	
	RFC	Q	RFC	Q
AM Peak				
2031 Base + Committed + All Sites	0.09	0	0.33	1
PM Peak				
2031 Base + Committed + All Sites	0.05	0	0.22	1

Table 5.5: Pagham Road/ Site Access junction

	Site Access		Pagham Road (S) Right into Site	
	RFC	Q	RFC	Q
AM Peak				
2031 Base + Committed + All Sites	0.52	1	0.00	0
PM Peak				
2031 Base + Committed + All Sites	0.22	0	0.01	0

- 5.16 The above tables show that the proposed site access arrangements will operate well within their design capacity, assuming a single access off Hook Lane and no right turn at the Pagham Road junction.

6 SUMMARY AND CONCLUSION

- 6.1 This report has been prepared by RPS on behalf of Hallam Land Management to provide the Local Highway Authority and Highways England with an assessment that considers the cumulative impact of the site allocations within Pagham.
- 6.2 The site allocations will include for a new single form entry primary school on one of the three sites, the final location of this school will be determined by Arun District council however for the purpose of this assessment it is assumed that the school is located on the Land West of Pagham Rd site. This assessment therefore reviews the following;
- Development on Land North of Sefter Road - 250 dwellings
 - Development on Land West of Hook Lane - 300 dwellings, 80 bed Care Home & 1,600sqm of D1 Use.
 - Development on Land West of Pagham Road – 400 dwellings, Single Form Entry Primary School, 70 bed Care Home & Local Facilities.
- 6.3 This report also includes for the committed developments within Pagham which are as follows;
- Land at summer Lane (90 Dwellings, P/58/15); and
 - 251 Pagham Road (42 dwellings, P/125/14).
- 6.4 The assessments undertaken have been split into two, the junctions north of Sefter Road have been assessed using the 2031 SATURN model data provided by Arun District council, this model includes for a total of 1200 dwellings within Pagham.
- 6.5 For the local junctions, the base traffic flows have been used together with growth added which includes for the potential additional 150 dwellings within Pagham above the three site allocations and the committed development sites, as well as new employment in the local area.
- 6.6 This identifies the following junctions that require mitigation measures as a result of the cumulative developments:
- Nyetimber Lane/ Grosvenor Gardens/ Rose Green Road – signalised junction.
Proposed Mitigation: signal upgrade to include MOVA
 - Rose Green Road/ Grosvenor Gardens Priority Junction
Proposed Mitigation: Mini Roundabout arrangement (TBC)
 - Vinnetrow Road/ B2166/ Mill Lane roundabout junction
Proposed Mitigation: B2166 West approach road widening
 - B2145/B2166 roundabout junction.
Proposed Mitigation: B2145 North, approach road widening
 - A27 Chichester Bypass/ B2145 – Whyke Hill Proposed Signalised junction

Proposed Mitigation: Provision of MOVA

- 6.1 This report also provides additional information in relation to the comments received from West Sussex County Council on the Transport Assessment submitted as part of the Hook Lane application, which includes for the removal of the southern access onto Hook Lane and also a sensitivity test on the site accesses.
- 6.2 The sensitivity assessment assumes a greater increase of traffic using the access road through the development in order to gain access to Pagham Road due to the capacity constraints at the existing Sefter Road/ Pagham Road junction. The assessment shows that even with a greater volume of traffic diverting through the site, the accesses will still operate well within their design capacity.
- 6.1 The results of the analysis show that with offsite highway improvement measures the impact of the cumulative development sites can be mitigated. This report therefore demonstrates that the cumulative impact of the developments within Pagham will not have a 'severe' impact on the local highway or strategic road network conforming to NPPF.

APPENDICES

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APPENDIX A – DEVELOPMENT FLOWS – ALL SITES

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APPENDIX B – TEMPRO OUTPUT

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APPENDIX C – PROPOSED 2031 TRAFFIC FLOWS & SATURN FLOWS

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APPENDIX D – CAPACITY ASSESSMENT OUTPUT

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APPENDIX E – OFF SITE MITIGATION MEASURES & DESIGN AUDIT

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APPENDIX F – MITIGATION MEASURES CAPACITY RESULTS

DRAFT

APPENDIX G – PROPOSED ACCESS ARRANGEMENT – PAGHAM ROAD & CAPACITY ANALYSIS OUTPUT

DRAFT

APPENDIX H – SAFETY AUDIT REVIEW

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**APPENDIX I – SENSITIVITY FLOWS & OUTPUT CAPACITY
RESULTS**

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