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Havant Borough Council

Mainland Transport Assessment Addendum
Southleigh Development Impact – Part 1

For:

Havant BOROUGH COUNCIL

Project Number: 13265

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1.0 EXECUTIVE SUMMARY

1.1. Havant Borough Council (HBC) commissioned CampbellReith (CR) to provide an Addendum to the Havant Borough Council Local Plan 'Mainland' Transport Assessment (HBCLP TA, 2019). This was to assess, in greater detail, the access requirements associated with a significant land allocation for up to 2,100 dwellings, known as the Southleigh strategic development site. Given that the strategic level modelling used for the original TA was unable to determine conclusively whether a direct access onto the A27 from the Strategic Site was needed, this further work, at a local level, has been requested to provide a definitive steer regarding the need for a new link for direct access to/from the A27. If and when a need has been established, further work will be undertaken focussing on local improvement works and most appropriate forms of junction(s).

1.2. All information in the HBCLP TA is relevant and still applies unless specifically updated in this document. The HBCLP TA contains all necessary background information in relation to the wider network, and so it has not been repeated in this Addendum. This report and the original HBCLP TA should be read together; however where the two contradict (through update, extension or clarification) then this document should be taken as the latest version.

1.3. The work in this Addendum has applied the principles established through the strategic modelling (using the Sub Regional Transport Model (SRTM)), but created a more detailed, local road network model to undertake the necessary individual junction analysis in order to understand the direct transport implications of the Southleigh strategic development site.

1.4. 15 junctions surrounding the site were assessed (11 from the original TA, plus 4 additional) using SRTM forecast figures and localised traffic modelling tools including Junctions 9 & Linsig.

1.5. Modelling results show that the surrounding road network cannot accommodate the forecast 2036 Baseline (No Local Plan) and Do Minimum (Local Plan, but no mitigation) figures. Data outputs for the majority of the junctions display issues with the forecast 2036 Baseline figures and when junctions are assessed with 2036 Do Minimum figures, junction operation gets worse with no reserve capacity. Most of the junctions require improvement measures to be able to accommodate the 2036 forecast traffic.

1.6. It is concluded, that a new link road to form a direct connection to the A27 and some improvement measures at the individual junctions are likely to be required to prevent adjacent roads and junctions surrounding the Southleigh development site exceeding their operational capacity and blocking the upstream and downstream road network.

1.7. It is recommended that a second stage of this Addendum work should examine through modelling whether the proposed additional measures, and in particular the direct access onto the A27, would have the desired effect of providing mitigation for the surrounding road network.

2.0 INTRODUCTION

2.1. Havant Borough Council (HBC) have commissioned CampbellReith (CR) to provide an Addendum to the Havant Borough Council Local Plan 'Mainland' Transport Assessment (HBCLP TA). This is to assess, in greater detail, the access requirements associated with a significant land allocation for up to 2,100 dwellings, known as the Southleigh strategic development site, and whether a dedicated access onto the A27 is required from the site.

2.2. CR have carried out a review of the HBCLP TA, dated February 2019, and this Addendum seeks to build on the previous work in order to provide a clear recommendation as to the access requirements necessary to facilitate the Southleigh development site. The Addendum will form part of the Local Plan evidence, together with the original Mainland TA.

2.3. This further work, at a local level, has been requested to provide a definitive steer regarding the need for a new link for direct access to/from the A27. If and when a need has been established, further work will be undertaken focussing on local improvement works and most appropriate forms of junction(s).

2.4. The primary focus of the Addendum (Part 1) has been to understand the existing and future year scenarios of the local road network adjacent to the site and how the identified Local Plan development will impact its operation.

2.5. It is understood that Hampshire County Council (HCC), acting as the local Highway Authority, support HBC undertaking this work and consider that this should inform how the strategic development land allocation will be accessed. Highways England, who are responsible for the Strategic Road Network (SRN), are also key stakeholders in relation to the A27.

3.0 THE ADDENDUM

3.1. The present document forms an Addendum to the original 'Mainland' Transport Assessment (HBCLP TA) published the Council in February 2019. All information in the HBCLP TA is relevant and still applies unless specifically updated in this document. The HBCLP TA contains all necessary background information in relation to the wider network, and so it has not been repeated in this Addendum. This report and the original HBCLP TA should be read together; however where the two contradict (through update, extension or clarification) then this document should be taken as the latest version.

Rationale for the Addendum

3.2. The HBCLP TA describes the availability and operation of transport infrastructure and networks within the Borough, and, using scenarios tested through a sub-regional strategic transport model, reflects on the potential transport related implications of the proposed land allocations within the Local Plan. It also considers the measures that could be employed to mitigate any significant transport impacts resulting specifically from these allocations. The TA considers, but does not necessarily seek to mitigate, background growth in traffic.

3.3. While the HBCLP TA provides a relevant, robust evidence base for the suggested Local Plan development allocations across the Borough, it does not provide a detailed assessments of individual sites. On this basis, larger development sites are often the subject of site specific transport assessments looking at any impact from a local level.

3.4. The summary included within the HBCLP TA, at paragraph 6.3.22, relating specifically to the Southleigh development, does not clearly recommend a preferred approach:

"In summary, whilst the DS (Do Something) scenario shows that the mitigation measure tested within this TA for the A27/Emsworth Road junction will address capacity issues associated with the Local Plan allocations as a whole, the full impact of the Southleigh strategic site requires additional assessment, particularly in respect of its impacts on the town centre, Southleigh Road, and the surrounding local road network. This may require a revised junction arrangement allowing a direct link from the Southleigh site onto the A27 to be considered further, the Borough Council should consider safeguarding land that could deliver junction options as set out on the 'Southleigh – A27 Junction report' that will be published separately to this Transport Assessment."

3.5. The purpose of this Addendum is therefore to provide a detailed assessment of the potential Southleigh strategic site to understand access requirements in order to facilitate future development. This Addendum (Part 1) provides a clear conclusion in terms of likely impact on the local road network and whether appropriate mitigation in the form of direct, strategic access is necessary.

Two-Part Addendum Approach

3.6. This Addendum has been approached in two distinct parts. Part 1, the subject of this report, being the assessment of the need for the direct access to the A27 which will involve key individual junction modelling to understand the limitations of each junction. A further assessment of the likely distribution will occur at these junctions to understand the impact of a new strategic link that will influence wider travel patterns.

3.7. If there is a genuine need for a new link as a result of the proposed development, and the impact of local trips being redistributed along this section of the network can be accommodated, then work will progress on the development of new link options. It is acknowledged that previous work on this has been undertaken and any scheme development will respect potential issues surrounding land ownership, highway design, flood risk and other environmental matters to ensure that it could be deliverable. The results of testing the effectiveness of a new direct link to the A27 would be presented as Part 2 of the Transport Assessment Addendum.

Application of the Strategic Transport Model

3.8. As detailed within Section 4 of the HBCLP TA, a Sub-Regional Transport Model (SRTM) was utilised to model the proposed local plan development to help identify the likely, future transport implications and test appropriate mitigation interventions.

3.9. This Addendum seeks to build on the work undertaken as part of the HBCLP TA and provide an additional layer of detail with regard to the Southleigh strategic development site and predicted impact on the local road network and key junctions.

3.10. In order to provide a level of consistency in terms of predicted traffic and likely distribution with the HBCLP TA, the 2036 baseline traffic data extracted from the SRTM has been used. The three scenarios (described in Section 4.2.2 of the HBCLP TA) have been developed and are presented in the original SRTM Modelling Report.

3.11. This Addendum has applied the principles established through the SRTM but created a more detailed, local road network to undertake the necessary individual junction analysis in order to understand the direct transport implications of the Southleigh strategic development site.

4.0 CONSULTATION TO DATE

4.1. As part of the publication of the HBCLP TA, a number of statutory consultees have made comments on both the potential impact of the Southleigh strategic development site and the wider document. This section summarises the previous comments made by Hampshire County Council and Highways England, who have responsibility for the local and strategic road network respectively.

Hampshire County Council

4.2. Hampshire County Council have reviewed and made comments on the HBCLP TA. The Local Highway Authority (LHA) supports the use of the SRTM to assess the transport impacts of the strategic distribution of proposed development traffic on the wider transport network.

4.3. The LHA have also supported HBC's commitment to undertake further modelling work to finalise the previous assessment and provide further, detailed information on the operation of the local road network in light of the future Local Plan development traffic.

4.4. The LHA has specifically requested a detailed assessment of the impact of the Southleigh development on the local road network and the need for the site to have direct access to the A27 Warblington junction. They have put forward 3 options for consideration:

1. A direct access, new onto the A27;
2. Access via existing A27 junctions via a development link road; or
3. Access via the local road network.

4.5. The primary aim of this Addendum is to be establish what the appropriate access requirements are in order to facilitate the Southleigh strategic development site. If the predicted traffic impact of the Southleigh development site demonstrates a unacceptable increase in traffic on the local road network, in highway capacity terms, then further work will be required to establish site specific mitigation in the form of appropriate access.

Highways England

4.6. Highways England (HE) have previously expressed reservations regarding a new junction onto A27, due to current advice stating that junctions serving under a 10,000-unit threshold will only be entertained where it can be demonstrated that the strategic road network cannot continue to operate safely and that the junction is the only means by which the development can proceed.

4.7. There are various sites being brought forward in Local Plans along the A27 corridor, and although no site contributes 10,000 units in a single location to meet these trigger criteria, there is a significant cumulative impact from future developments within Havant and its neighbouring authorities which do have an impact on the operation of this stretch of the A27.

4.8. It is understood that HE have a preference that future access options are to focus on amendments to an existing junction (in the first instance) and a new link connecting to Southleigh development site and the surrounding road network, rather than a new, direct access onto the A27.

Collaboration with Chichester District Council and West Sussex County Council

4.9. As part of the HBCLP TA review process, West Sussex County Council (WSCC) and Chichester District Council (CDC) have requested further clarity with regard to the development assumptions used in the transport modelling for Mainland HBCLP TA. They suggest that their development aspirations emerging in the Chichester Local Plan Review should be taken into consideration.

4.10. As a result, it has been considered necessary to reflect the levels and locations of growth emerging from other area's emerging local plans in order to fully understand the impact on the highway network, in particular the local road network, the A27 and the A259. Systra, who developed the SRTM, have confirmed that (outside of Havant) all growth at a model wide coverage does not take account of any newly adopted Local Plans or those currently under development and therefore a manual adjustment for the purposes of this Addendum is required.

5.0 ASSESSMENT OF TRANSPORT NEEDS OF THE SOUTHLEIGH STRATEGIC DEVELOPMENT

5.1. This Section of the Transport Addendum provides the relevant assessment in order to establish whether any direct access from the Southleigh Strategic site onto the A27 is necessary, which includes a review of work undertaken to date and local assessment of key individual junctions (Table 1) which will help demonstrate the existing and potential future available capacity of each junction.

5.2. The following methodology has been undertaken to inform the Southleigh strategic developments site's needs, in transport terms:

- Review of existing network and likely distribution of development traffic taking into account the nature of the roads surrounding the site, including the existence of a level crossing at Warblington Station and all the other key junctions (15 number);
- Assessment of background traffic growth, committed developments, emerging allocations (including the Chichester District) and the likely impact of local trips being redistributed along the surrounding network;
- Consideration of the impact of the Southleigh development (2,100 homes);
- Development of traffic models for the key junctions (use of Traffic Modelling Tools, such as Junctions 9 & Linsig);
- Testing local models for three scenarios and as described in paragraph 4.2.2 of the HBCLP TA:
    - Scenario 1: 2036 Baseline;
    - Scenario 2: 2036 Do Minimum - all committed development and background traffic growth and no mitigations measures introduced;
    - Scenario 3: 2036 Something - Do Minimum with addition of mitigation identified at 10 junctions.
- A summary of the results for the three scenarios (identified above) for the peak times;
- Advice on the junction outputs and findings, and whether the 2036 Baseline and Do Minimum traffic is likely to have a significant adverse impact on the existing road network; and
- Recommendations form a basis for discussions with key stakeholders, including Chichester District Council, West Sussex County Council, Hampshire County Council and Highways England.

Southleigh Strategic Development Site Assessment

5.3. The HBC Southleigh development site is included as Policy KP5 of the Pre-Submission Havant Borough Local Plan (January 2019). The Emerging Policy KP5 sets the extent of the red line boundary for the Southleigh development shown in the snapshot below (Figure 1) and included as Appendix 1.

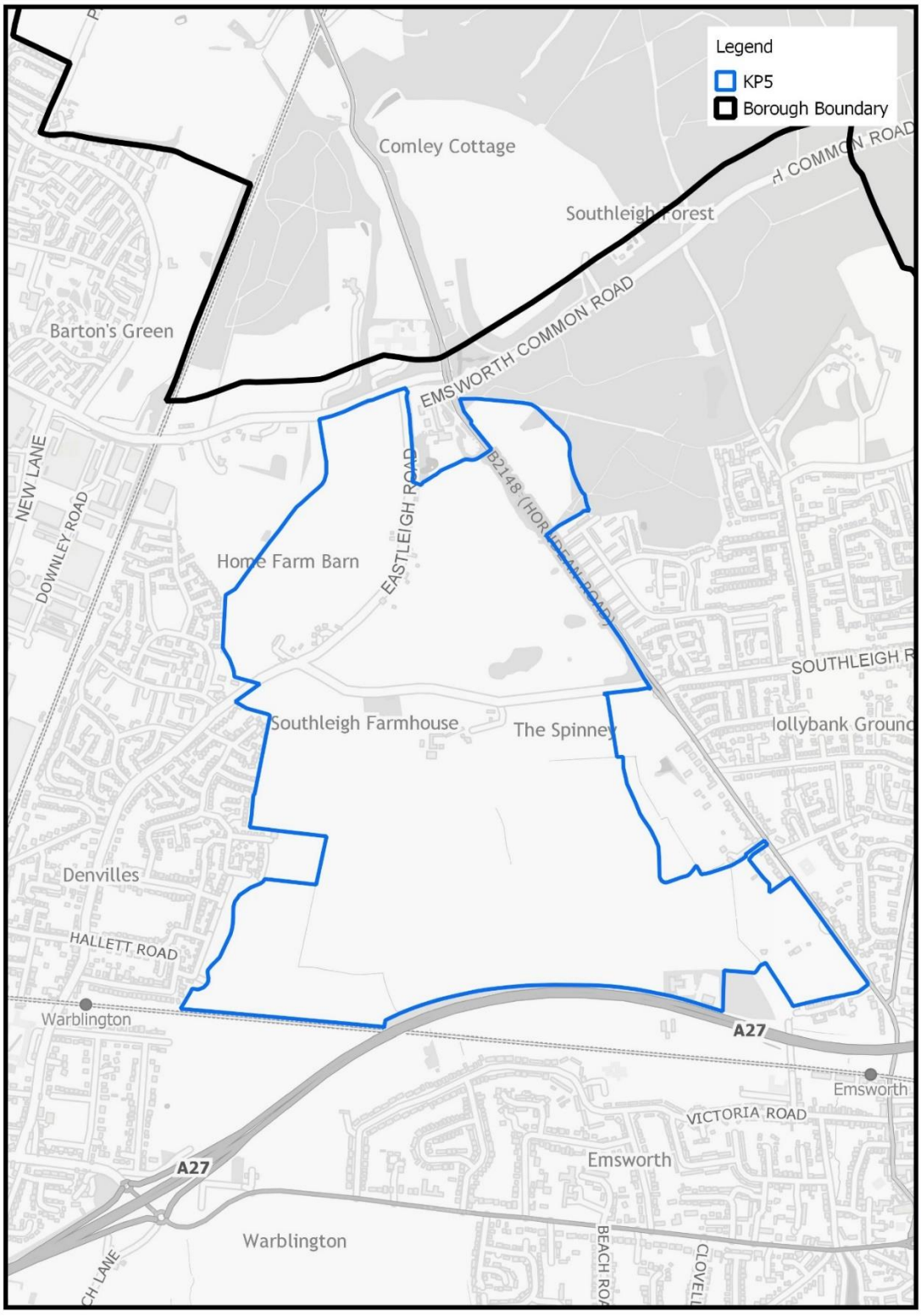


Figure 1 – Southleigh indicative boundary (Policy KP5)

5.4. Table 1 and Figure 2 (below) lists all the junctions surrounding the Southleigh development area with their ID numbers as is referred to within the original HBCLP TA as Appendix L. Four additional junctions (A1, A2, A3 & A4) have been added to the list and are now included within this assessment.

Table 1: List of junctions in the study area (Ref Fig 1)

Junction ID	Junction Name
25	Emsworth Rd/Southleigh Rd-Signalised Junction
26	Emsworth Rd/A27 EB junction-Roundabout
27	A27 merge /diverge west of Emsworth Rd-Merge
28	A27 merge/diverge west of Emsworth Rd-Merge
29	B2148 Horndean Rd /New Brighton Rd – Priority Junction
30	B2148 Horndean Rd /Zone 613 access b (interbridge)-Signalised
31	B2148 Comley Hill/Bartons Rd-Priority
60	Southleigh Rd/Horndean Rd-Priority
61	Southleigh Rd/ Horndean Rd-Priority
62	North Street/A259/High Street-Roundabout
70	A259 Havant Rd/Selangoer Ave-Priority
Additional junction	
A1	Bartons Rd/Eastleigh Rd-Give way Line
A2	Southleigh Rd /Eastleigh Rd-Priority junction
A3	Southleigh Rd/Warblington St Level Crossing-Signalised
A4	Victoria Rd/Horndean Rd Give Way Line

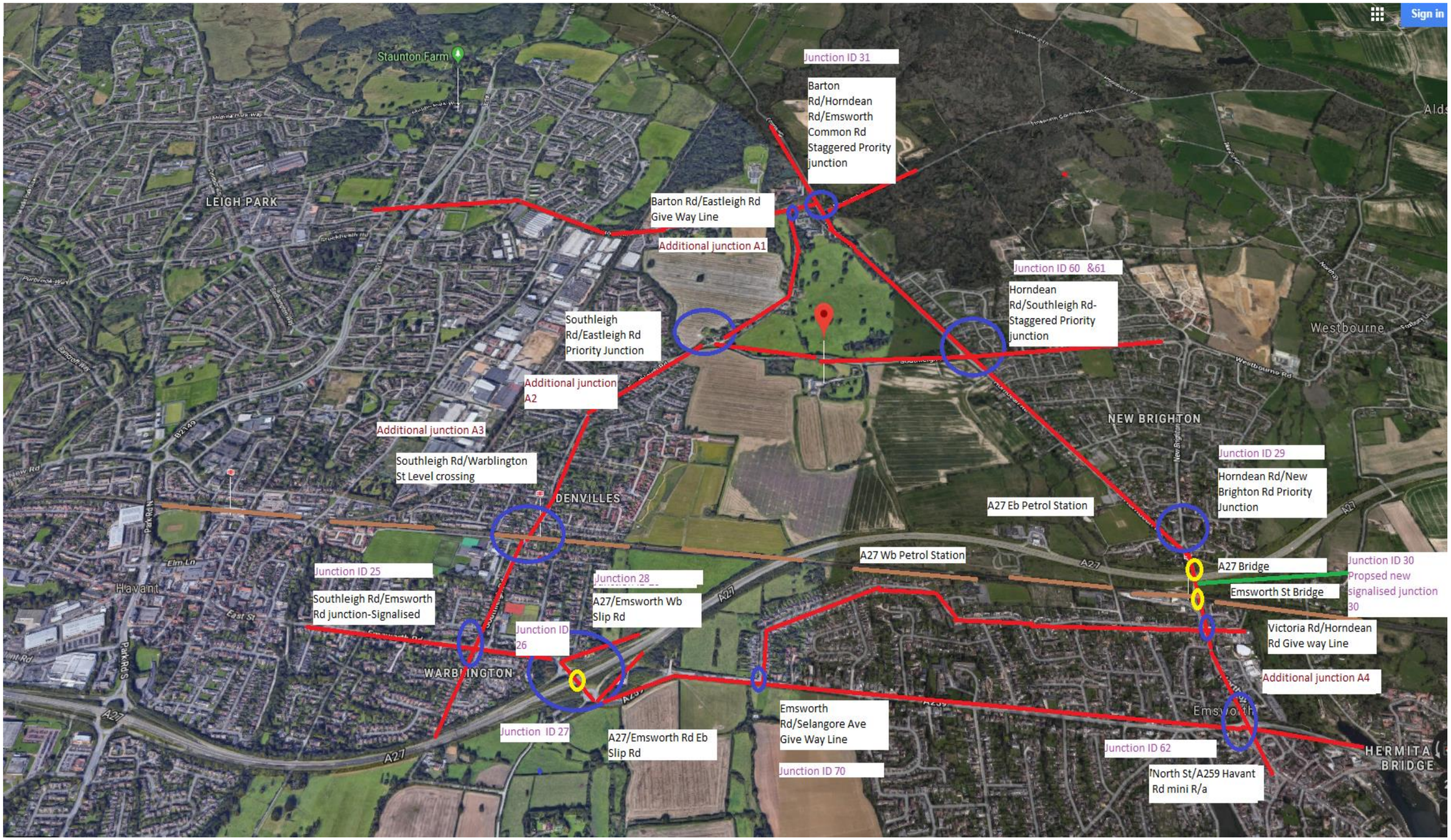


Figure 2: Road Network surrounding Southleigh Development

Establishing the Baseline

5.5. Systra, (who produced the SRTM which informed the HBCLP TA) have provided the turning movements for the three Scenarios for the AM peak and PM peak hour for all the junctions identified above. Plots of individual junction have been provided and presented in Appendix 2.

5.6. The proposed Southleigh Strategic Site, has, an emerging allocation for around 2,100 homes located between Emsworth and Warblington within SRTM model zones 608,609 and 614 (Appendix 3). The housing split in the SRTM to each zone is:

- Zone 608: Up to 1,700 dwellings;
- Zone 609: Up to 200 dwellings;
- Zone 614: Up to 200 dwellings.

5.7. The SRTM has made reasonable assumptions that at strategic, zonal level, each zone has a single loading point to the transport network. Due to the localised nature of this Addendum assessment study, the SRTM 2036 forecast figures have been used and more detailed, localised assumptions have been made where necessary without the need to re-run the SRTM.

5.8. It has been considered appropriate, for the purposes of the Southleigh development to concentrate the required additional modelling (at local level) to build on the wider, strategic model outputs. However, the turning movements for the 2036 Baseline with all Local Plan developments excluding Southleigh development have been used for the purpose of individual, local junction modelling

5.9. The likely distribution of baseline traffic has been taken from the SRTM. The SRTM does not have input assumptions to which route vehicles choose between an origin and destination. These are determined within the model based on the relative attractiveness (essentially journey time) of competing routes and takes account of capacity and forecast delay.

5.10. The SRTM distribution of trips for Zones 608, 609 and 614 have been reviewed to understand the pattern of movements for both existing and future development trips. It is expected that future development trips will have a similar distribution to the existing development of a similar type for a particular zone(s). The assumed distribution for all trips at the zones have been presented in Appendix 4. The Zone distribution plots show the baseline scenario for the AM and PM peak periods.

5.11. Traffic signal timing data (current arrangements) have been provided by Hampshire County Council for Emsworth Rd/Southleigh Rd (Junction ID 25). Site observations, in the form of traffic surveys, have been carried out for the Warblington level crossing (July 2019) while the signal timings used for the SRTM has been maintained for A259 Interbridge Junction (ID 30).

Chichester District Council Traffic

5.12. As mentioned in Section 4, it has been necessary to manually update the traffic assumptions (in terms of volume and likely distribution) with regard to the likely impact of traffic travelling to and from the Chichester District.

5.13. The growth for dwellings in the Chichester District for the period 2015-36 was previously assumed in the SRTM modelling to be 12,900. While this growth assumption used at the time of the original HBLP TA was not directly taken from the emerging Chichester District Local Plan

review, it is considered that the figure provides a robust assessment when compared to the latest available Chichester District Council Local Plan Review figures (The Preferred Approach Plan, December 2018) which refers to 12,478 dwellings.

5.14. In terms of the SRTM set up, Chichester District is within the Marginal model area as opposed to the Core area. This means that the zone structure is coarser (Chichester District is represented by 12 model zones as opposed to 55 zones for Havant District) and the network is limited to the larger strategic routes. Within the model, development is aggregated at a zonal level which in the majority of cases means model zones contain more than one 'development' and this is the case for Chichester District. This aggregate approach means that it is not possible to isolate the behaviour (such as route choice) by development, only by zone.

5.15. The Chichester District emerging Local Plan covers the period 2016-35 which is equivalent to two years less than the 2015-36 growth in the SRTM. Assuming that the additional period would include a proportionate level of traffic growth, this equates to an approximate additional 1200 units when compared to the previously identified 12,478 dwellings. The results would therefore suggest that the current SRTM modelling underrepresents the Chichester District Council emerging Local Plan growth by approximately 800 units.

5.16. For the purpose of our work and local modelling we have added the extra traffic (based on an additional 800 units) manually onto the network (A27 and A259) to reflect a more robust baseline traffic flow along the strategic routes into Havant from the east. The assignment has been based on the distribution split outlined within the SRTM which suggests the following for through traffic:

- A27 WB from Chichester Zones (AM peak) = 65%;
- A259 WB from Chichester Zones (AM peak) = 35%.

6.0 INDIVIDUAL JUNCTION MODELLING

6.1. For all junctions listed in Table 1, (with the exception of Junction ID 27 and 28 - A27 Merge/Diverge) a local traffic model has been developed using the exiting geometric layouts (as shown in Appendix 7) and utilising the turning movements extracted from the SRTM plots. Modelling tests have been carried out for the three previously identified scenarios for both the AM and the PM peak hours.

6.2. It is important to note that test results for Scenario 3 refer to the Do Something in the SRTM. No additional mitigation or enhancement steps have been proposed for local modelling at this stage. The aim of this assessment process is to understand and demonstrate the impact of 2036 traffic figures for the three scenarios on the individual junctions during the AM and PM peak hours. The AM Peak is between 07:00-10:00 and the PM Peak is between 16:00-19:00.

6.3. Individual assessments of each junction have been undertaken using the Junctions 9 assessment suite (PICADY and ARCADY modules) for priority junctions and LinSig for the signalised junctions. The assessments were carried out during the AM and PM peak periods.

6.4. With regard to the signalised junctions, the results below indicate the current Mean Maximum Queue Lengths (MMQ) and Degree of Saturation (DoS). The DoS (%) is a ratio of demand to capacity on each approach to the junction, with a value of 100% meaning that demand and capacity are equal, and no further traffic is able to progress through the junction.

6.5. For existing priority junctions (including priority T junctions and roundabouts), the Junctions 9 suite has been used to assess capacity. The results indicated Maximum Mean Queue (MMQ) Lengths and the Ratio to Flow Capacity (RFC) to understand the current operation of each junction. In terms of the individual junction assessments, any RFC below 0.85 is considered to operate with some spare capacity, whilst a RFC of between 0.85-0.99 suggests that the junction is at capacity and values above 1.0 indicate that queuing and delay is likely to start to occur and that appropriate forms of mitigation should be explored.

6.6. The modelling outputs have been presented in individual results tables and any arm/junction that is considered over capacity has been shown in red. At this stage of study, no specific alterations or improvement measures have been introduced to improve the capacity.

6.7. For comparative and assessment purposes, each table indicates the modelling outputs for all three scenarios:

- Scenario 1 - 2036 Baseline: demand from exiting land uses plus background growth- i.e.no Havant Local Plan development;
- Scenario 2 - 2036 Do Min traffic (DM): which takes account of HBC's Local Plan development (and background traffic growth) but no mitigation measures; and
- Scenario 3 - 2036 Do Something (DS): which includes Do Min scenario with the additional of appropriate mitigation measures as outlined within the SRTM.

6.8. Two Traffic Assignment Network Diagrams have been created which includes all junctions included within this study, which help to visualise the route traffic is predicted to take. These diagrams include all turning movements extracted from SRTM plots and results for all three development scenarios have been presented in black, red and blue respectively (Appendix 5).

Southleigh Rd /Emsworth Rd/Pook Lane (Junction ID 25) - Currently Signalised

6.9. The summary of traffic modelling results for this junction have been presented in Table 2 below. The modelling outputs identify potential problems with capacity and queue lengths during AM & PM peak for this junction. The forecast 2036 Baseline results start identifying capacity issues for this junction which is exacerbated once the development traffic is added (DM) with an increased level of DoS.

6.10. This junction is currently operating under Micro-processor Optimised Vehicle Actuation (MOVA). Details of traffic signal junction (phase and inter-green timings and method of control) have been provided by Hampshire County Council.

Table 1: Southleigh Rd /Emsworth Rd/Pook lane Junction ID 25- Currently Signalised-Linsig Model

		AM Peak						PM Peak					
Cycle Time	**90 secs**	**2036 Baseline**		**2036 Do Minimum**		**2036 Do Something***		**2036 Baseline**		**2036 Do Minimum**		**2036 Do Something***	
Lane Description	**Linsig arm/ lane**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**
Southleigh Rd Right Ahead Left	1/1 + 1/2	92.1	12.9	138.6	130.8	150.1	163.4	109.4	18.8	147.5	62.8	165.0	87.4
Emsworth Rd East Right Ahead Left	2/1 + 2/2	70.6	7.4	88.1	10.2	88.1	13	116.6	44.6	161.0	165.9	157.0	123.8
Pook Lane Ahead Left Right		18.8	0.8	18.80	0.8	18.80	0.8	18.8	0.8	18.8	0.8	18.8	0.8
Emsworth Rd West Left Right Ahead		90.0	11.1	132.90	51.4	149.60	73.5	112.4	50.6	167.6	137.4	164.3	168.2

6.11. The results indicate that the junction is operating over capacity in the Do Minimum and Do Something scenario which has resulted in this junction introducing significant queues and associated delays. This is considered to be a direct result of the mitigation measures modelled at the junction upstream, where additional capacity is added to junctions on the network. These junctions can become more attractive and traffic reassigned from elsewhere on the network. Therefore, these impacts are considered to be an effect of the way the model operates (and is distributed), rather than being expected effects of development, and it would therefore, be difficult to attribute these impacts as a direct result of the local plan allocation.

6.12. It should also be noted that whilst the SRTM includes a number of committed infrastructure schemes, the capacity constraints observed at Junction ID 25 reflect issues that will be arising as a result of mitigation on some junctions in the absence of addressing congestion at other locations on the network.

6.13. As shown in the Baseline model, a large number of junctions are expected to exceed capacity over the local plan period as result of growth in background traffic and already committed developments. It is therefore expected that the Highway Authority will bring forward junction improvements where required, to alleviate congestion on the network prior to the end of the Local Plan period.

6.14. The recommendation of this Addendum for this junction is to review signal timings at the junction to reflect the new balance of flows at this junction. This may resolve the issue. Alternatively, minor alterations to the junction layout may be required, but should be developed with consideration of adjacent junctions such as the Emsworth Rd / A27 Slip off roundabout (ID 26).

Inter-bridges Development Site (Junction ID 30) - Proposed

6.15. The signalised junction has been assessed using the same signal phasing as the SRTM, with an assumed cycle time of 90 seconds. The scheme has been identified with the HBCLP TA – Schemes committed within the SRTM (Table 6, Ref E).

6.16. Modelling results for this junction are presented in Table 3 below. The results suggest that the proposed junction may require some minor adjustments to operate satisfactorily during the Do Minimum scenario, during the AM Peak.

Table 2: Inter-bridge Development Site Junction ID 30- Proposed-Linsig Model

		AM Peak						PM Peak					
Cycle Time	**90 secs**	**2036 Baseline**		**2036 Do Minimum**		**2036 Do Something***		**2036 Baseline**		**2036 Do Minimum**		**2036 Do Something***	
Lane Description	**Linsig arm / lane**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**	**Deg Sat (%)**	**MMQ (pcu)**
Side Road Egress Left	1/1	13.3	1.2	5.2	0.5	5.0	0.5	0.00	0	0	0	0	0
Side Road Egress Right	1/2	80.6	5.4	98.8	9.7	87.8	6.7	72.6	7.1	81.5	8.7	79.1	8.2
Northern Approach Left Ahead	3/1	86.2	22.2	97.8	37.6	93.3	29.1	75.0	15.2	81.4	17.9	82.9	18.6
Southern Approach Ahead	5/1	33.8	3.9	34.4	3.9	35.9	4.1	61.8	11.1	70.3	14.3	72.0	15

6.17. The results suggest that the proposed junction appears to operate satisfactorily with improvements demonstrated in the 2036 Do Something Scenario – which assumes that the SRTM wider transport interventions have been implemented. No further measures are recommended at this stage.

Warblington Level Crossing/Southleigh Rd (Junction ID A3) - Currently Signalised

6.18. For the Southleigh Rd / Warblington level crossing local modelling, the same assumptions were used as in the SRTM; some sensitivity checks were also carried out with the observed traffic survey data obtained in July 2019. The model outputs are presented in Tables 4 and 5 below.

6.19. For the Warblington level crossing the assumption in the SRTM is that the level crossing operates on a 10 minute cycle time with a 50/50 split (i.e. 300 seconds green to traffic followed by 300 seconds red). In addition to the above assumptions the most recent survey data at the level crossing has been used to provide an accurate baseline.

6.20. This data was collected during two working days in July 2019 and level crossing timing details were recorded during AM and PM peak periods. The number of pedestrians crossing at this location and queue lengths in both directions were also collected. The summary of data is presented in Appendix 6.

Table 3: Warblington Level Crossing/Southleigh Rd -Junction ID A3- Currently Signalised-Linsig Model

		AM Peak						PM Peak					
		2036 Baseline		**2036 Do Minimum**		**2036 Do Something***		**2036 Baseline**		**2036 Do Minimum**		**2036 Do Something***	
Cycle Time		**600 (seconds)**		**600 (seconds)**		**600 (seconds)**		**600(seconds)**		**600(seconds)**		**600(seconds)**	
Lane Description	**Linsig arm/lane**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**
Southleigh Rd North Ahead	1/1	32.1	28.5	34.7	13.4	72.2	82.8	17.7	14.5	28.6	24.8	34.8	31.3
Southleigh Rd South Ahead	2/1	14.1	11.4	10.8	3.2	19.7	16.3	37.5	34.2	70.1	79	53.9	54.3

Table 4: Warblington Level Crossing/Southleigh Rd –Sensitivity Tests -Linsig Model

		AM Peak						PM Peak					
		2036 Baseline		**2036 Baseline**		**2036 Do Minimum**		**2036 Baseline**		**2036 Baseline**		**2036 Do Minimum**	
Cycle Time		**524(seconds)**		**1161(seconds)**		**1161(seconds)**		**452(seconds)**		**1001(seconds)**		**1001(seconds)**	
Lane Description	**Linsig arm/lane**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**	**Deg Sat (%)**	**Mean Max Q(pcu)**
Southleigh Rd North Ahead	1/1	24.2%	17.7	24.4	39.7	51.0	102.5	13.8	8.2	12.0	14	19.4	24
Southleigh Rd South Ahead	2/1	10.6%	7.1	10.7	15.8	15.9	24.2	29.3	19.4	25.4	33	47.5	76

6.21. A LinSig model has been developed for this level crossing and traffic signal timings have been fixed in the model. Queue length data collected at the same time, suggest that the queueing at the level crossing can be greater than what was previously presented within the Mainland HBCLP TA in respect of the 2036 Baseline figures.

6.22. Table 12 in the HBCLP TA (2036 Baseline figures in AM peak) indicates that 7 vehicles are queueing in the southbound direction, compared to 23 vehicles observed. In the northbound direction 3 vehicles were predicted compared to 17 vehicles observed.

6.23. It was a similar result during the PM Peak hour 2036 Baseline figures which indicated that 4 vehicles would queue in a southbound direction compared to 13 vehicles which were observed in July 2019. Lastly, the SRTM predicted that 8 vehicles were likely to be queuing in a northbound direction compared to 32 vehicles observed.

6.24. To better reflect the reality on the ground and taking into account the 2019 data survey results, the Linsig model for the 2036 Baseline has been tested with observed minimum and maximum cycle times for the AM and PM Peak. Sensitivity test results for the worst case scenario (longest cycle time 1161 seconds) show very long queue lengths. In summary, test results show problems with the queue lengths during AM and PM peak at this Level crossing.

A27 on/off Slip/Emsworth Rd Roundabout (Junction ID 26) and A27 & Havant Rd/Church Lane Roundabout

6.25. ARCADY models have been developed for both roundabouts and model outputs are presented in Tables 6 and 7 below. The model outputs are shown below as Queue lengths which represent the highest values encountered over all time segments. The most significant indicator of how a junction is operating is summarised by the Ratio to Flow Capacity as outlined in paragraphs 6.5 and 6.6.

Table 5: A27 on/off Slip/Emsworth Rd R/a-Junction ID 26-ARCADY Model

	AM Peak					
	2036 Baseline		2036 Do Minimum		2036 Do something*	
	Queue (PCU)	RFC	Queue (PCU)	RFC	Queue (PCU)	RFC
2 - Emsworth Rd South	0.5	0.33	0.5	0.33	0.8	0.41
3 - A27 Off-Slip	2.2	0.67	2	0.65	2	0.64
4 - Emsworth Rd North	12.4	0.96	107.5	1.3	45.2	1.12
	PM Peak					
	2036 Baseline		2036 Do Minimum		2036 Do something*	
	Queue (PCU)	RFC	Queue (PCU)	RFC	Queue (PCU)	RFC
2 - Emsworth Rd South	0.4	0.3	0.5	0.35	0.3	0.24
3 - A27 Off-Slip	33	1.01	118.3	1.12	4.3	0.81
4 - Emsworth Rd North	120.3	1.61	86.7	1.29	30.5	1.12

Table 6: A27/Havant Rd/Church Lane Roundabout-ARCADY Model

	AM Peak					
	2036 Baseline		2036 Do Minimum		2036 Do something*	
	Queue (PCU)	RFC	Queue (PCU)	RFC	Queue (PCU)	RFC
1 - A27 Off Slip	0.2	0.18	0.3	0.21	0.5	0.3
2 - Havant Rd	17.8	0.96	50.1	1.05	73.5	1.1
3 - Church Lane	0.3	0.2	0.5	0.34	0.7	0.42
5 - Emsworth Rd	5.1	0.83	11.3	0.92	17.1	0.96
	PM Peak					
	2036 Baseline		2036 Do Minimum		2036 Do something*	
	Queue (PCU)	RFC	anQueue (PCU)	RFC	Queue (PCU)	RFC
1 - A27 Off Slip	0.4	0.26	0.5	0.32	0.3	0.21
2 - Havant Rd	3.3	0.76	3.5	0.77	2.9	0.73
3 - Church Lane	0.1	0.1	0.1	0.11	0.1	0.1
5 - Emsworth Rd	134.2	1.13	99.5	1.1	94.7	1.09

6.26. The modelling outputs demonstrate problems with capacity and queue lengths during both the AM and PM peak for this interchange. It is not considered that the SRTM interventions demonstrate any significant improvements and therefore further mitigation is likely to be required, given the desirable route between the Southleigh development site and the SRN.

North St/A259/High St Roundabout -Junction ID 62

6.27. ARCADY modelling test results for this roundabout are presented in Table 8 and show that this roundabout performs satisfactorily during both AM and PM Peak. Baseline 2036 forecast and DM figures do not show any problems with the operation of this roundabout.

Table 7: North St/A259/High St Roundabout -Junction ID 62-ARCADY Model

	AM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
1 - North Street	1.3	0.55	1.7	0.6	1.5	0.59
2 - A259E	1.5	0.57	1.2	0.53	1.4	0.56
3 - High Street	0	0	0	0	0	0
4 - A259 West	0.6	0.36	0.6	0.34	0.6	0.35
	PM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
1 - North Street	1	0.47	1.1	0.5	1.1	0.5
2 - A259E	1.3	0.55	1.4	0.56	1.5	0.58
3 - High Street	0.3	0.19	0.1	0.12	0	0.03
4 - A259 West	1.2	0.53	1	0.48	1	0.49

Horndean Rd/New Brighton Rd-Junction ID 29

6.28. This is a priority junction and a summary of the PICADY modelling is presented in Table 9. The results show that both Horndean Rd South Right Turn and New Brighton Rd Left and Right Turn show problems and are unable to accommodate the traffic forecast creating capacity problems with long queueing approaches.

Table 8: Horndean Rd/New Brighton Rd-Junction ID 29- PICADY Model

	AM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
New Brighton Rd-LT	4.7	0.83	13.2	0.99	11.7	0.98
New Brighton Rd-RT	1.2	0.54	2.1	0.68	2.2	0.69
Horndean Rd South RT	3	0.61	4.5	0.7	4	0.67
	PM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
New Brighton Rd-LT	1.2	0.52	1.4	0.56	1.3	0.54
New Brighton Rd-RT	12	1.35	116.1	High	124.3	High
Horndean Rd South RT	116.1	1.22	364.5	1.62	375.3	1.64

6.29. It is considered likely that transport interventions above and beyond those outlined within the SRTM will be required in order for this junction to operate satisfactorily. At present, the increased level of traffic due to its close proximity of the Southleigh development site and connections to the A259 are creating significant levels of congestion which may only be solved through wider, more strategic interventions to relieve traffic from this section of the network.

Havant Rd/Selangor Avenue-Junction ID 70

6.30. The PICADY simulation summary is presented in Table 10 and results show that the Selangor Avenue arm with the forecast figures will be subject to long queue lengths.

Table 9: Havant Rd/Selangor Rd-Junction ID 70–PICADY Model

	AM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Selangor Avenue	58.2	1.72	59.9	1.60	60.8	1.62
Havant Rd-RT	0	0	0	0	0	0
	PM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Selangor Avenue	72.7	2.82	86.1	2.25	79.2	2.18
Havant Rd-RT	0	0	0	0	0	0

6.31. The 2036 forecast figures have been tested with the model of the junction based on the 2019 scenario that was used and assessed as part of the SRTM. However, physical changes have been implemented at this junction in connection with planning permission APP/16/00774.

6.32. The permission is for the erection of 147 dwellings with associated parking, access, landscaping, and surface water drainage, pumping station, sub-station and signalised junction onto Havant Road (amended scheme).

6.33. The signalisation has not been taken into consideration although it is recognised that the recent works provide a significant betterment compared to the 2019 modelled situation.

Barton Rd/ Eastleigh Rd-Junction ID A1

6.34. The summary of the PICADY modelling tests for this Priority Junction are presented in Table 11 and results show problems at Eastleigh Rd in both AM &PM peak and Barton Rd right turn in the PM Peak in the Do Minimum scenario. However as part of the SRTM interventions, the situation improves with the RFC being reduced to 0.9.

6.35. Given the close proximity of this junction to the Southleigh strategic development site it is considered likely that off-site highway works will be required as part of this development which is likely to improve the operation and/or capacity of the junction.

Table 10: Barton Rd/ Eastleigh Rd-Junction ID A1– PICADY Model

	AM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Eastleigh Rd	1.3	0.54	1.7	0.62	1.5	0.59
Barton Rd RT	0.2	0.12	0.2	0.17	0.2	0.17
	PM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Eastleigh Rd	4.5	0.84	78.1	1.76	6.1	0.9
Barton Rd RT	0.3	0.22	1.2	0.54	1.1	0.5

Southleigh Rd/Eastleigh Rd-Junction ID A2

6.36. Summary of the PICADY modelling tests for this Priority Junction are presented in Table 12 below and results show that the junction is operating satisfactorily, particularly in the 2036 Do Something scenario. No further mitigation measures are recommended for this junction as part of this Addendum.

Table 11: Southleigh Rd/Eastleigh Rd-Junction ID A2 – PICADY Model

	AM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Eastleigh Rd-LT	0.3	0.24	2.6	0.72	1.4	0.57
Eastleigh Rd-RT	0.3	0.20	4	0.8	2.2	0.68
Southleigh Rd East-RT	0.2	0.17	0.3	0.22	0.3	0.22
	PM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Eastleigh Rd-LT	0.5	0.32	1.2	0.53	0.6	0.34
Eastleigh Rd-RT	0.3	0.22	0.7	0.39	0.5	0.33
Southleigh Rd East-RT	0.5	0.31	2.1	0.66	2.4	0.7

North St/Victoria St-Junction ID A4

6.37. Summary of the PICADY modelling tests for this Priority Junction are presented in Table 13 below and results show that this junction operates satisfactory with the 2036 forecast figures. No further mitigation measures are recommended for this junction as part of this Addendum.

Table 12: North St/Victoria St-Junction ID A4– PICADY Model

	AM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Victoria Rd	0.4	0.24	0.4	0.25	0.4	0.26
North St-RT	0	0.03	0	0.03	0	0.03
	PM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Victoria Rd	1.2	0.52	1.8	0.63	1.8	0.63
North St-RT	0	0.01	0	0.01	0	0.01

Bartons Rd/Horndean Rd /Emsworth Common Rd -Junction ID31

6.38. This is a staggered priority junction. Summary of the PICADY modelling outputs for this junction are presented in Table 14 and results show that there are problems with capacity and queue lengths for both Horndean Rd and Emsworth Rd in AM Peak and PM peak, even in the baseline scenario.

Table 13: Barton Rd/Horndean Rd /Emsworth Common Rd -Junction ID31 – PICADY Model

	AM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Barton Rd-LT	14.2	1.37	0	0	0	0
Barton Rd-RT	140.9	1.44	140.6	1.46	133.4	1.46
Horndean Rd South-RT	0.3	0.25	0.3	0.25	0	0.03
Emsworth Common Rd-LT	2	1.05	2.1	1.09	0.5	0.37
Emsworth Common Rd-RT	10	1.01	11.9	1.05	6.7	0.94
Horndean Rd North-RT	0.6	0.36	0.6	0.38	0.6	0.39
	PM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Barton Rd-LT	18.3	1.25	25.2	1.4	6.6	1.17
Barton Rd-RT	70.3	1.27	127.9	1.45	45.6	1.19
Horndean Rd South-RT	0	0.02	0	0.02	0	0.02
Emsworth Common Rd-LT	8.9	1.36	12.3	1.54	8.9	1.38
Emsworth Common Rd-RT	85.7	1.43	124.5	1.67	85.3	1.43
Horndean Rd North-RT	0.3	0.19	0.5	0.3	0.9	0.46

6.39. This demonstrates that there is an existing issue with the operation of this junction which is likely to be exacerbated through any increase in background traffic, committed developments and proposed local plan allocations – including the Southleigh development site.

Horndean Rd/Southleigh Rd-Junction ID 60 & 61

6.40. Summary of the PICADY modelling results for this priority junction are presented in Table 15 below. The data outputs show that there are capacity and queuing problems with Southleigh Rd West left turn and right turn and Southleigh Rd East right turn in both AM and PM peak.

Table 14: Horndean Rd/Southleigh Rd-Junction ID 60-61 -PICADY Model

	AM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Southleigh Rd West-LT&RT	2.6	0.74	91.5	1.55	64.6	1.43
Horndean South-RT	0.1	0.06	0.1	0.07	0.1	0.07
Southleigh Rd East-RT	1.8	0.65	9.2	0.95	7.8	0.93
Horndean Rd North-RT	0	0	0	0	0	0
	PM Peak					
	2036 Baseline		**2036 Do Minimum**		**2036 Do something***	
	Queue (PCU)	**RFC**	**Queue (PCU)**	**RFC**	**Queue (PCU)**	**RFC**
Southleigh Rd West-LT&RT	8.8	0.99	33.4	1.38	27.9	1.31
Horndean South-RT	0.1	0.13	0	0	0	0
Southleigh Rd East-RT	3.7	0.8	8.3	0.94	8.8	0.95
Horndean Rd North - RT	0	0	0	0	0	0

6.41. The modelling results indicate that the impact of background traffic, committed developments and proposed local plan allocations (including the Southleigh development site) have an adverse effect on the operation of the junctions.

6.42. While the SRTM interventions do mitigate the impact of increased traffic, to a degree, it is likely that physical off-site highway works would be required at this junction to facilitate the Southleigh development site, in particular, due to the significant level of additional traffic that would travel via this route.

7.0 MODELLING RESULTS SUMMARY

7.1. In order to test the likely impact of the Southleigh development site on the road network within Havant, a number of local junctions have been individually assessed to understand the level of operation as part of three future scenarios in 2036 – as outlined in paragraph 6.8.

7.2. The fifteen junctions that make up the local network are a mix of signalised junctions, roundabouts and priority junctions which surround the proposed Southleigh development site geographically This is to ensure that all associated development traffic can be captured and appropriately taken into consideration.

7.3. The results suggest that the introduction of up to 2,100 dwellings at the proposed Southleigh development site introduces a number of capacity issues on the local network. It is evident that the following junctions are operating close to capacity or over capacity in the 2036 Do Something scenario based on the assessed Degree of Saturation (DoS) or Ratio to Flow Capacity (RFC):

- Southleigh Rd /Emsworth Rd/Pook Lane (Junction ID 25) Signalised Junction;
- A27 on/off Slip/Emsworth Rd and A27/Havant Rd/Church Lane Roundabouts (Junction ID 26);
- Hordean Rd/New Brighton Rd (Junction ID 29) Priority Junction;
- Havant Rd/Selangar Rd (Junction ID 70) Priority Junction;
- Barton Rd/ Eastleigh Rd (Junction ID A1) Priority Junction;
- Barton Rd/Horndean Rd /Emsworth Common Rd (Junction ID 31) Staggered Priority Junction; and
- Horndean Rd/Southleigh Rd (Junction ID 60 & 61) Priority Junction.

7.4. The 2036 Do Something scenario assumes that all trips associated with background traffic, committed development and emerging local plan allocations are on the network – and the SRTM transport interventions (as suggested in the emerging HBCLP TA) have been implemented.

7.5. This indicates that there are significant issues with a number of junctions adjacent to the proposed Southleigh development site and on the approached to the Strategic Road Network (SRN). The modelling outputs suggest that further amendments to local junctions, as well as a strategic form of mitigation is required to help take reduce and redistribute the level of traffic likely to be using this local network in 2036.

8.0 CONCLUSION

8.1. This Addendum reports on detailed local junction modelling which builds on, and compliments, the strategic modelling (use of the SRTM) previously undertaken as part of the HBCLP TA.

8.2. Using a local model to assess junctions in the vicinity of Southleigh development and the A27, the following key points have been concluded:

- It is unlikely that the local road network can adequately accommodate the future traffic forecast once HBCLP developments have been included;
- A number of the surrounding junctions show problems with their capacity and queue lengths when tested with the 2036 Baseline figures. These issues are exacerbated when junctions are tested with the DM scenario which includes planned developments;
- While the previously identified HBCLP transport interventions do provide some benefit on localised junctions it is considered that a scheme which will reduce and redistribute traffic from the local roads and onto the Strategic Road Network be progressed.

8.3. It is therefore considered that there is significant benefit in proceeding with an assessment of potential options for a scheme which will provide a connection to the A27, direct to and from the Southleigh Strategic Site, in order to remove a substantial amount of traffic arising from that development from the local road network and via routes to the SRN.

9.0 THE WAY FORWARD

9.1. The next stage is to present the findings of this Addendum to the relevant stakeholders and determine whether it addresses the concerns they had previously expressed.

9.2. It is suggested that as part of these discussions, there is a commitment to test the potential for a direct link to the A27 from the Southleigh development site to understand the likely impact on the local road network and the strategic road network.

9.3. Modelling results of the preferred option/options will identify the impact of the proposal with regard to surrounding road network, A27 and the land requirements. It is anticipated that further assessment of the likely distribution will occur at the junctions to understand the impact of a new link road that will influence wider travel patterns.

9.4. The assessments will identify the extent to which proposals would re-distribute traffic and the impacts this would have on the local road network, noting the extent to which the A27 junction design(s) would act as an attractor to traffic, and the impacts this would have on the local road network.

9.5. Modelling results will identify how each of the local junction operates with a direct link road and whether additional measures will be required for the network to perform satisfactory in the 2036 future year.

9.6. Further liaison will be required with Havant Borough Council, Hampshire County Council and Highways England throughout this process.

9.7. It is acknowledged that previous work on this has been undertaken (A27 – Southleigh Feasibility Study, dated August 2018) and any scheme development will respect potential issues surrounding land ownership, highway design, flood risk and other environmental matters to ensure that it could be deliverable.

10.0 TECHNICAL GLOSSARY

This section includes a glossary relating to the technical elements of the Report.

Sub-Regional Transport Model (SRTM): The transport model that underpins the Local Plan evidence base for the mainland Transport Assessment.

Degree of Saturation (DoS): Saturation flow is the term used to measure of the maximum rate of flow of traffic, typically for signalised junctions. The Degree of Saturation is expressed as a % and details how busy the junction is compared to the maximum rate of flow.

Maximum Mean Queue (MMQ): The MMQ is the estimated mean number of vehicles (or pcus) which have added onto the back of the queue up to the time when the queue finally clears.

Passenger Car Units (PCU): A Passenger Car Unit is a standardised measure used primarily to assess highway capacity, for modelling purposes. Different vehicles are assigned different values, according to the space they take up. A car has a value of 1; smaller vehicles will have lower values, and larger vehicles will have higher values.

Ratio to Flow Capacity (RFC): The RFC value indicates the extent to which traffic flows on a junction arm approach capacity. Any RFC below 0.85 is considered to operate with some spare capacity, whilst a RFC of between 0.85-0.99 suggests that the junction is at capacity. Values above 1.0 indicate that queuing and delay is likely to start to occur.

Appendices

Appendix 1: Southleigh Development Site Boundary

Appendix 2: SRTM (Systra) junction plots

Appendix 3: SRTM Study Area Zones

Appendix 4: SRTM Zone/Trip Distribution Plots

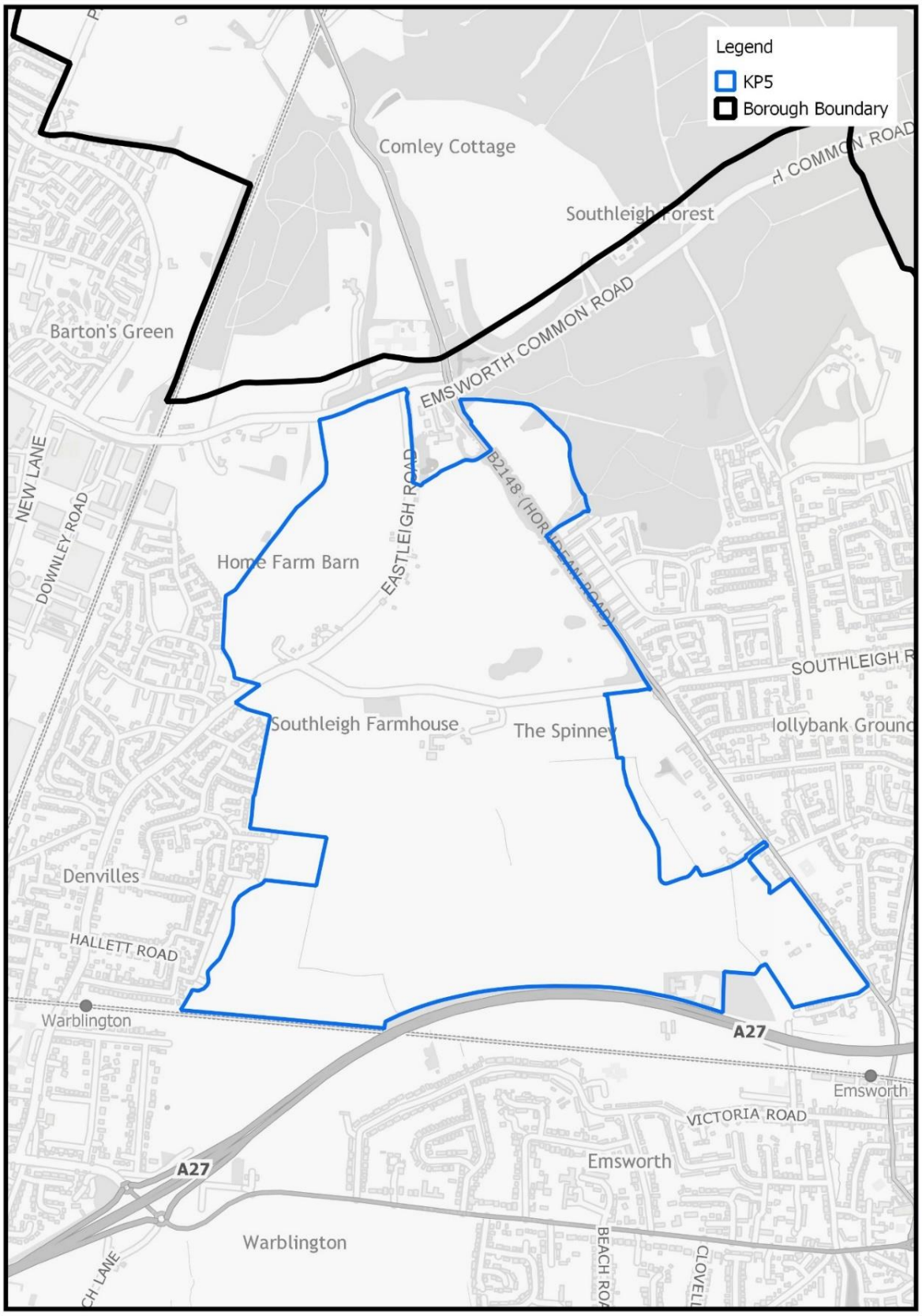
Appendix 5: Warblington Level Crossing Traffic Data

Appendix 6: Traffic Flow Diagrams

Appendix 7: Junction Views

Appendix 8: Traffic Models

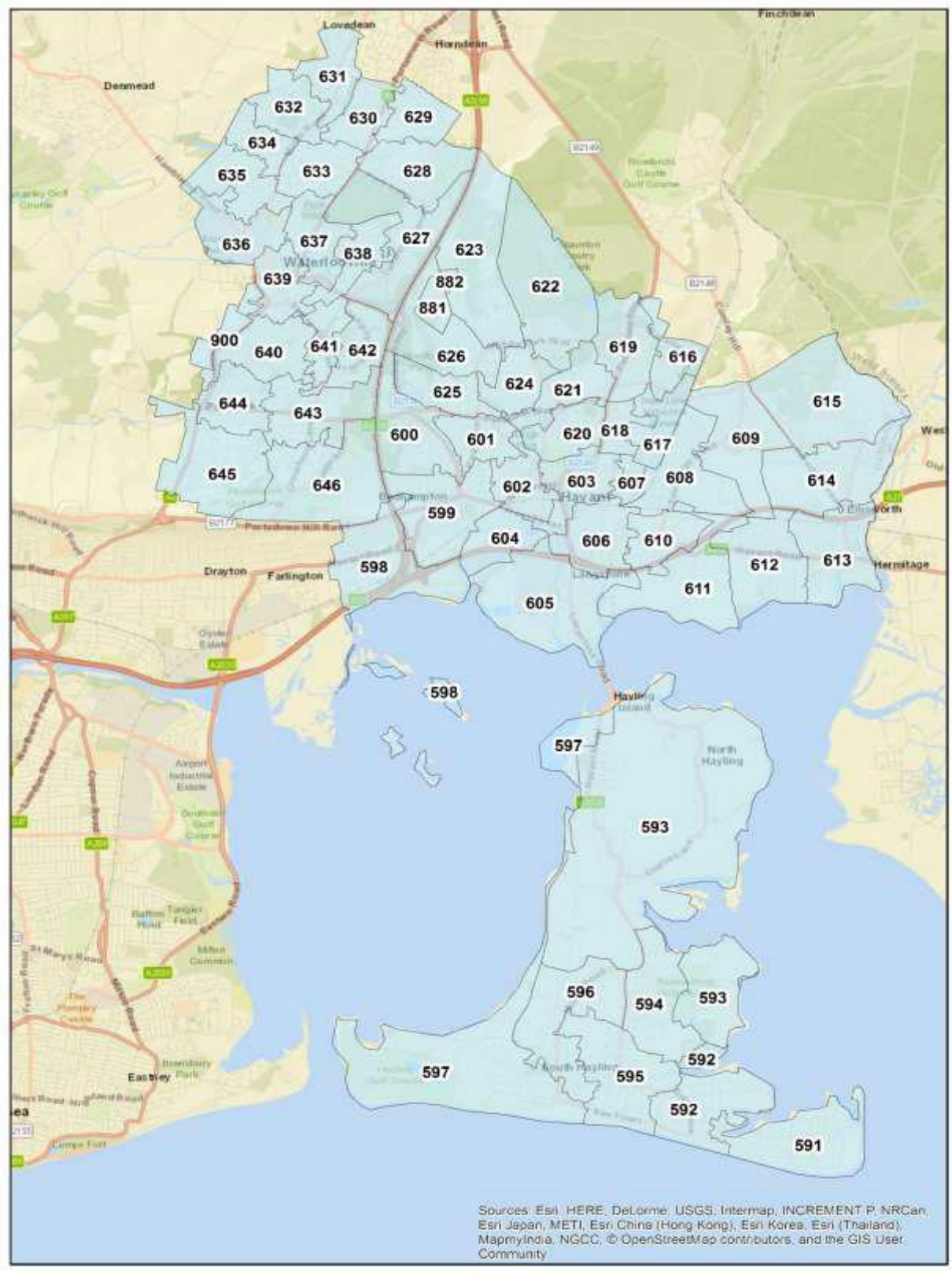
Appendix 1: Indicative Site Boundary for Southleigh Development Site



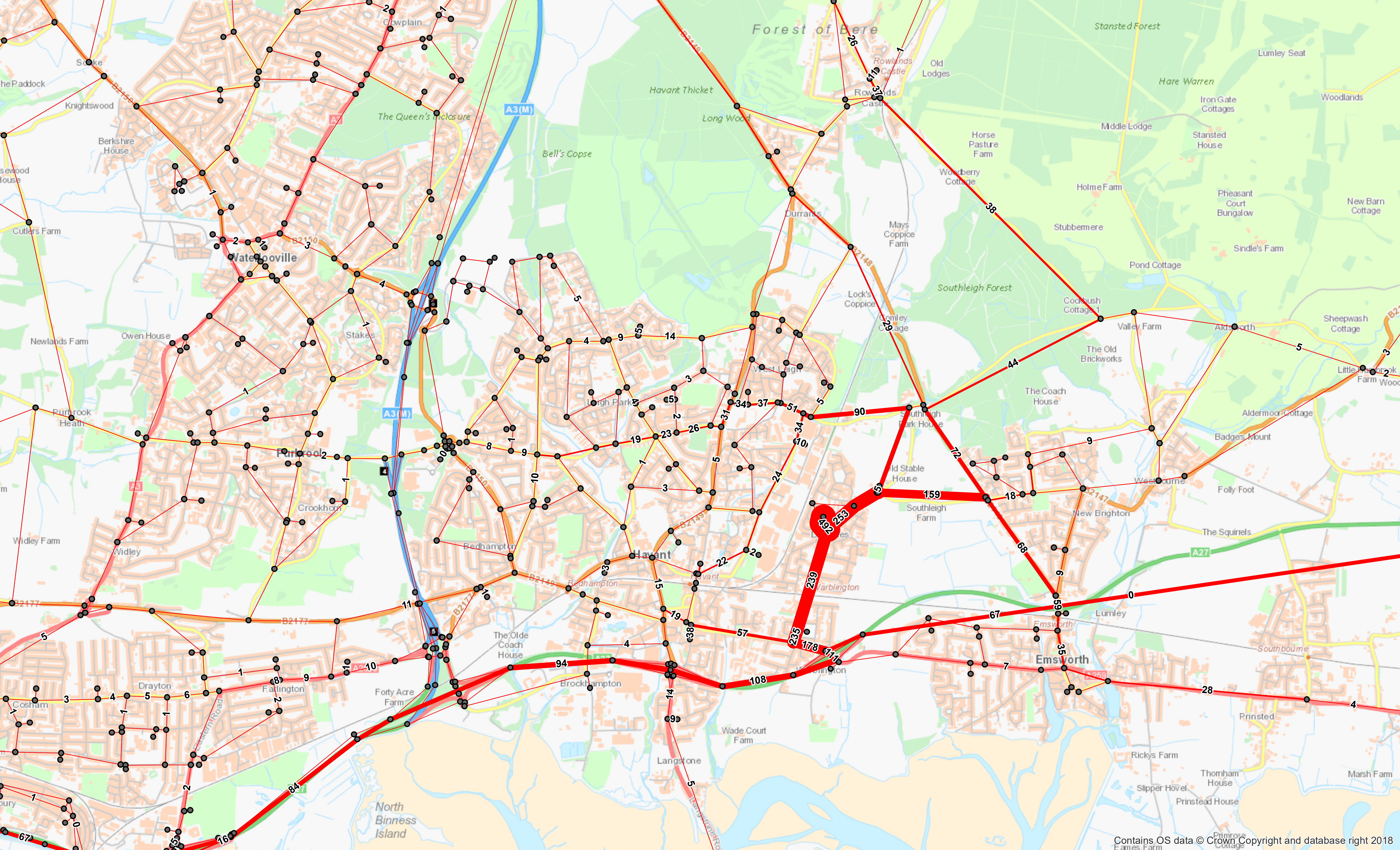
Appendix 2: SRTM Turning Movements-Junction plots

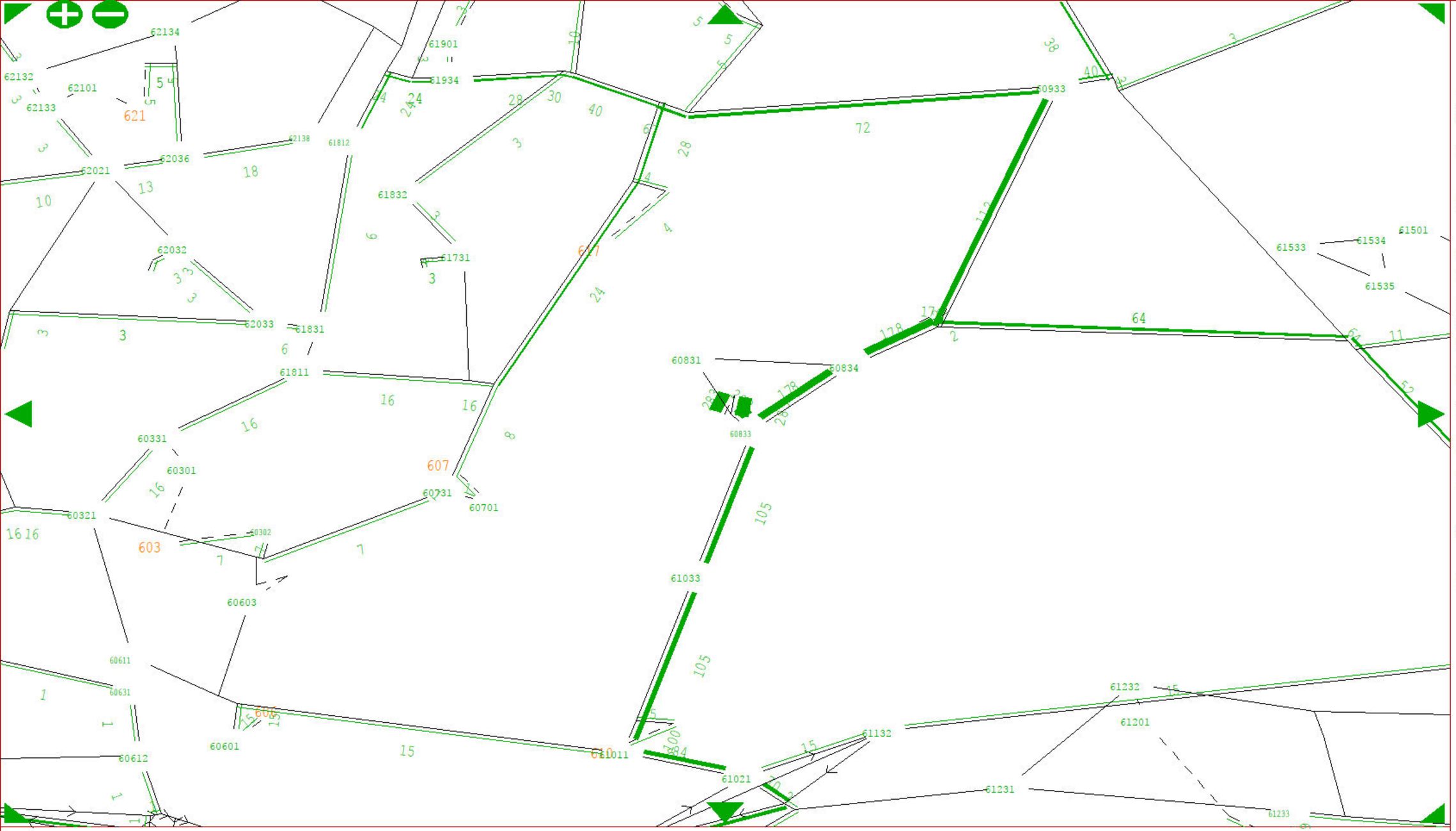
(Available on Request)

Appendix 3: SRTM study area



Appendix 4: SRTM Baseline Zone/Trip Distributions plots


Forest of Bere
Stansted Forest
Lumley Seat
Hare Warren
Woodlands
Iron Gate Cottages
Middle Lodge
Stansted House
Old Lodges
Rowlands Castle
Havant Thicket
Long Wood
The Queen's Inclosure
Bell's Copse
Horse Pasture Farm
Woodberry Cottage
Holme Farm
Pheasant Court Bungalow
New Barn Cottage
Mays Coppice Farm
Stubbermere
Durrants
Sindle's Farm
Pond Cottage
Southleigh Forest
Lock's Coppice
Cockbush Cottages
Valley Farm
Aldsworth
Sheepwash Cottage
The Old Brickworks
The Coach House
Aldermoor Cottage
Badgers Mount
Westbourne
Folly Foot
Old Stable House
Southleigh Farm
New Brighton
The Squirrels
Lumley
Emsworth
Southbourne
Printsted
Ricky's Farm
Thornham House
Slipper Hovel
Marsh Farm
Prinstead House
Cowplain
Stoke
The Paddock
Knightswood
Berkshire House
Cutlers Farm
Waterlooville
Stakes
Newlands Farm
Owen House
Purbrook Heath
Purbrook
Crookhorn
Widley Farm
Widley
Leigh Park
West Leigh
Bedhampton
Havant
Warblington
Drayton
Cosham
Farlington
Forty Acre Farm
The Olde Coach House
Brockhampton
Wade Court Farm
Langstone
North Binness Island
A3(M)
A3
A27
B2150
B2149
B2148
B2177
B2147
A259
Contains OS data © Crown Copyright and database right 2018



Link
Annotation
Display
Options:

Display Mode >
Bandwidths
...with...
Units = ?
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Directional

Bandwdth par >

Pen and/or >
range defs

offset Gap = ?
1.0 mm

Q - Return

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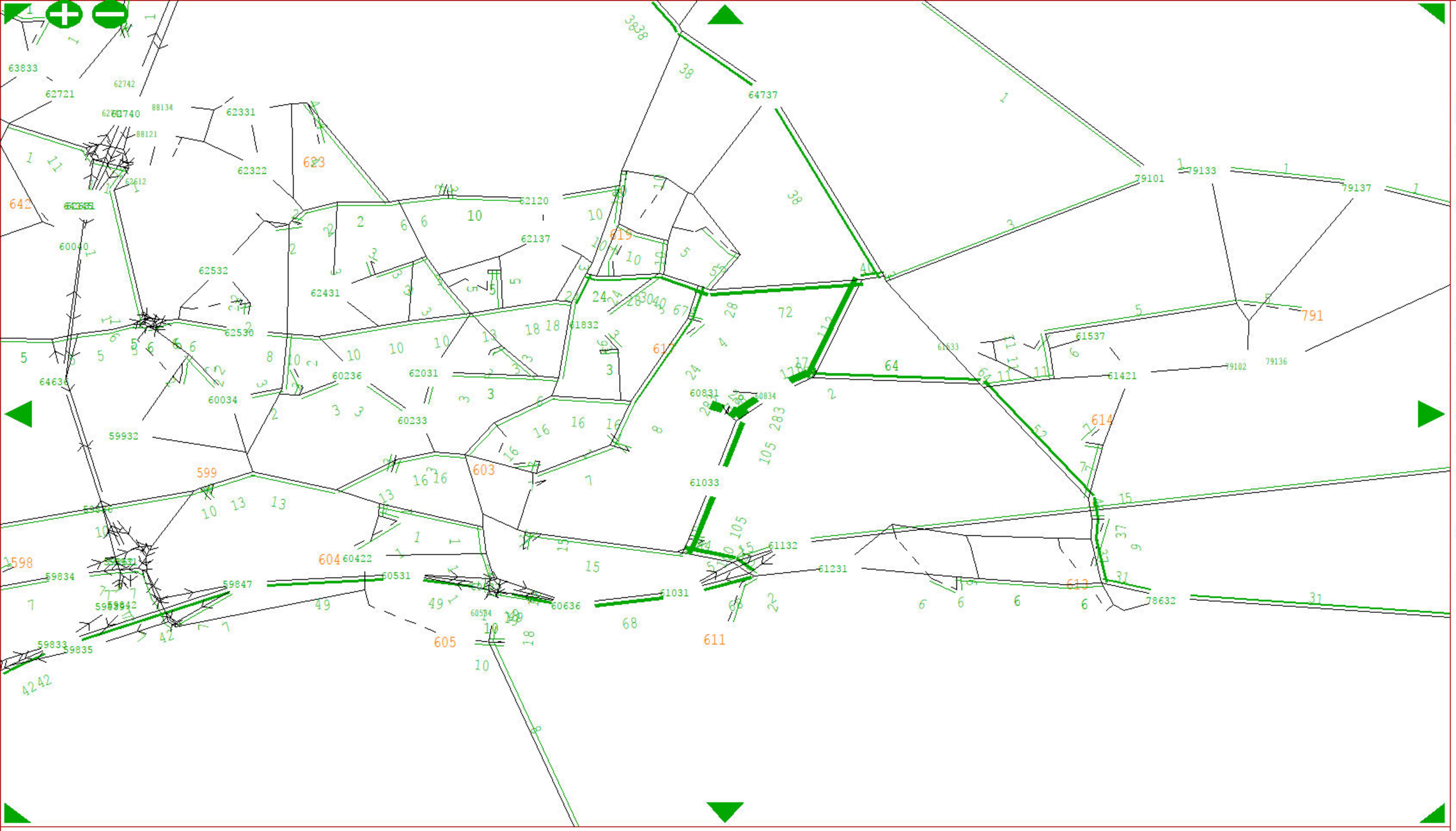

Link Annotation Display Options:

Display Mode >
Bandwidths
...with...
Units = ?
100.00 /mm

Toggle numer
/ geometric

Annotate as
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Numerical se >
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2-way link s
annotation:
Directional

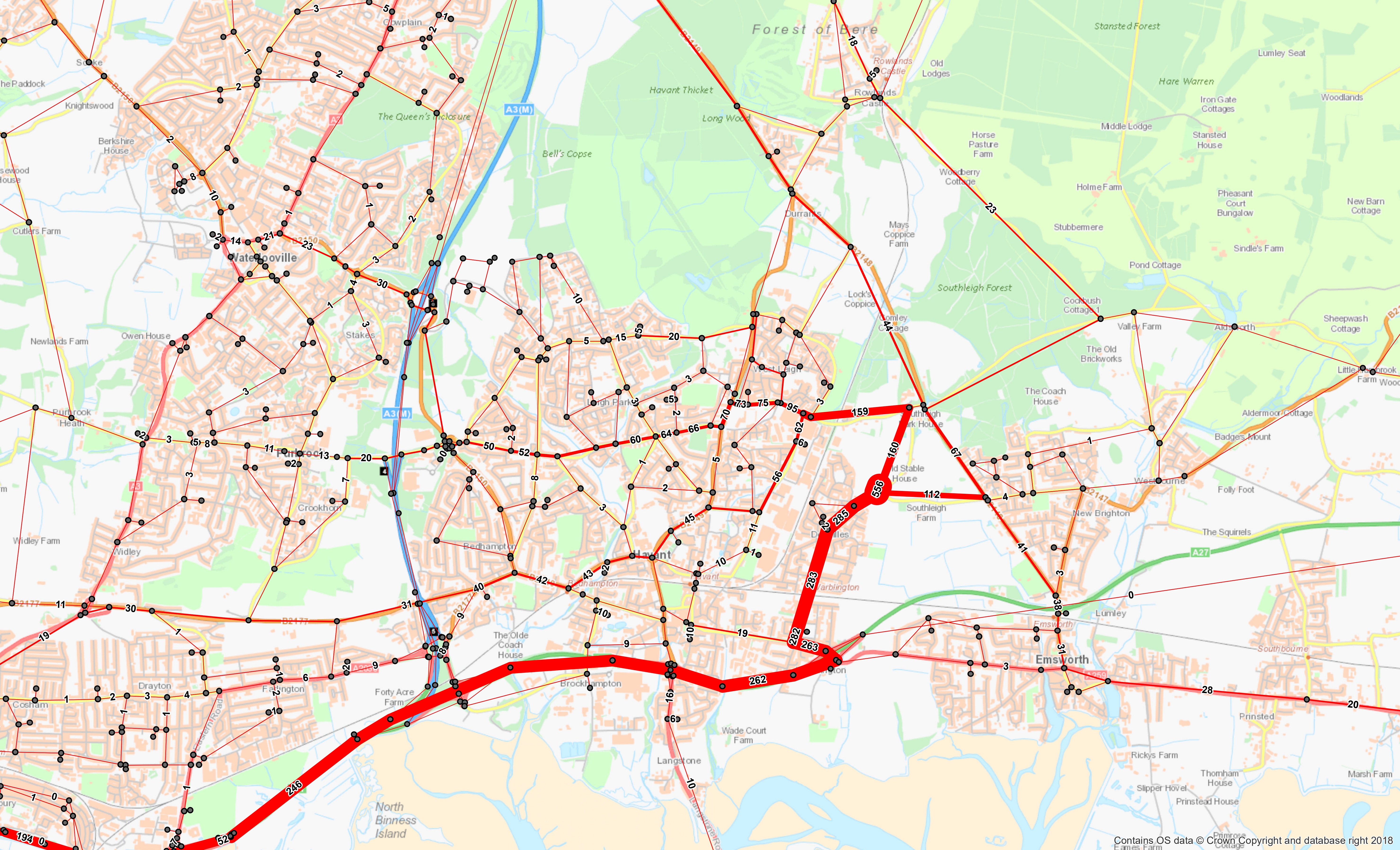
Bandwdth par >

Pen and/or >
range defs

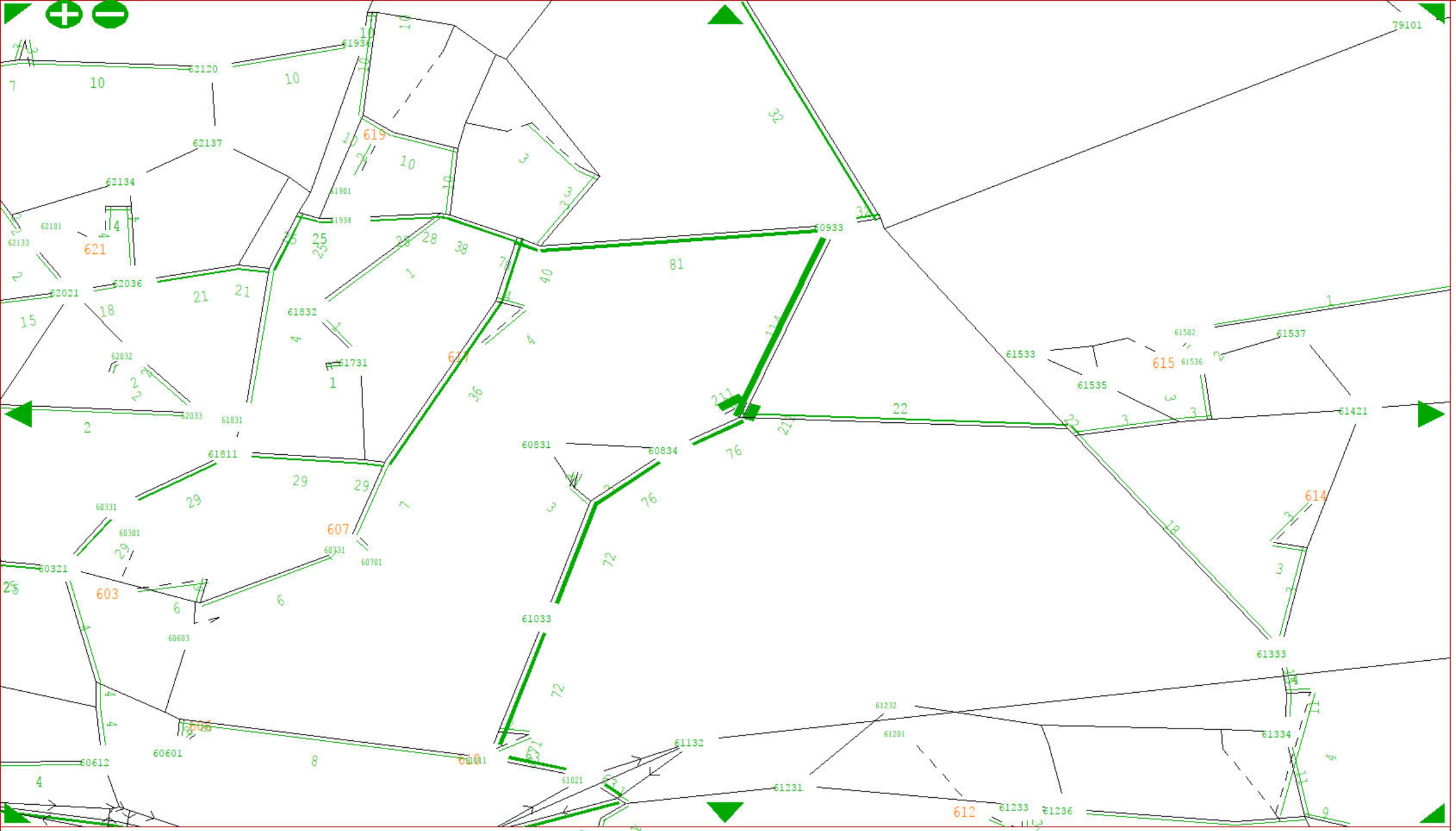
offset Gap = ?
1.0 mm

Q - Return

+ Menu bar!



Forest of Bere
Stansted Forest
Lumley Seat
Hare Warren
Woodlands
Iron Gate Cottages
Middle Lodge
Stansted House
Rowlands Castle
Old Lodges
Havant Thicket
Long Wood
The Queen's Inclosure
Bell's Copse
A3(M)
Horse Pasture Farm
Woodberry Cottage
Holme Farm
Pheasant Court Bungalow
New Barn Cottage
Durrants
Mays Coppice Farm
Stubbermere
Sindle's Farm
Pond Cottage
Southleigh Forest
Lock's Coppice
Comley Cottage
Cockbush Cottage
Valley Farm
Aldsworth
Sheepwash Cottage
The Old Brickworks
The Coach House
Aldermoor Cottage
Badgers Mount
Westbourne
Folly Foot
New Brighton
The Squirrels
A27
Lumley
Emsworth
Southbourne
Printsed
Ricky's Farm
Thornham House
Slipper Hovel
Prinstead House
Marsh Farm
Stoke
The Paddock
Knightswood
Berkshire House
Cutlers Farm
Waterlooville
Cowplain
Stakes
Newlands Farm
Owen House
Purbrook Heath
Purbrook
Crookhorn
Widley Farm
Widley
Leigh Park
West Leigh
Southleigh Park House
Old Stable House
Southleigh Farm
Denvilles
Bedhampton
Havant
Warblington
The Olde Coach House
Forty Acre Farm
Brockhampton
Wade Court Farm
Langstone
Drayton
Farlington
Cosham
North Binness Island
B2150
B2149
B2148
B2147
B2177
A3
A259
Contains OS data © Crown Copyright and database right 2018



Selected
Link
Assignment
Thru origin
Zone 609

Total Demand
Flow = 211

All User Cls

saVe in D.B. x

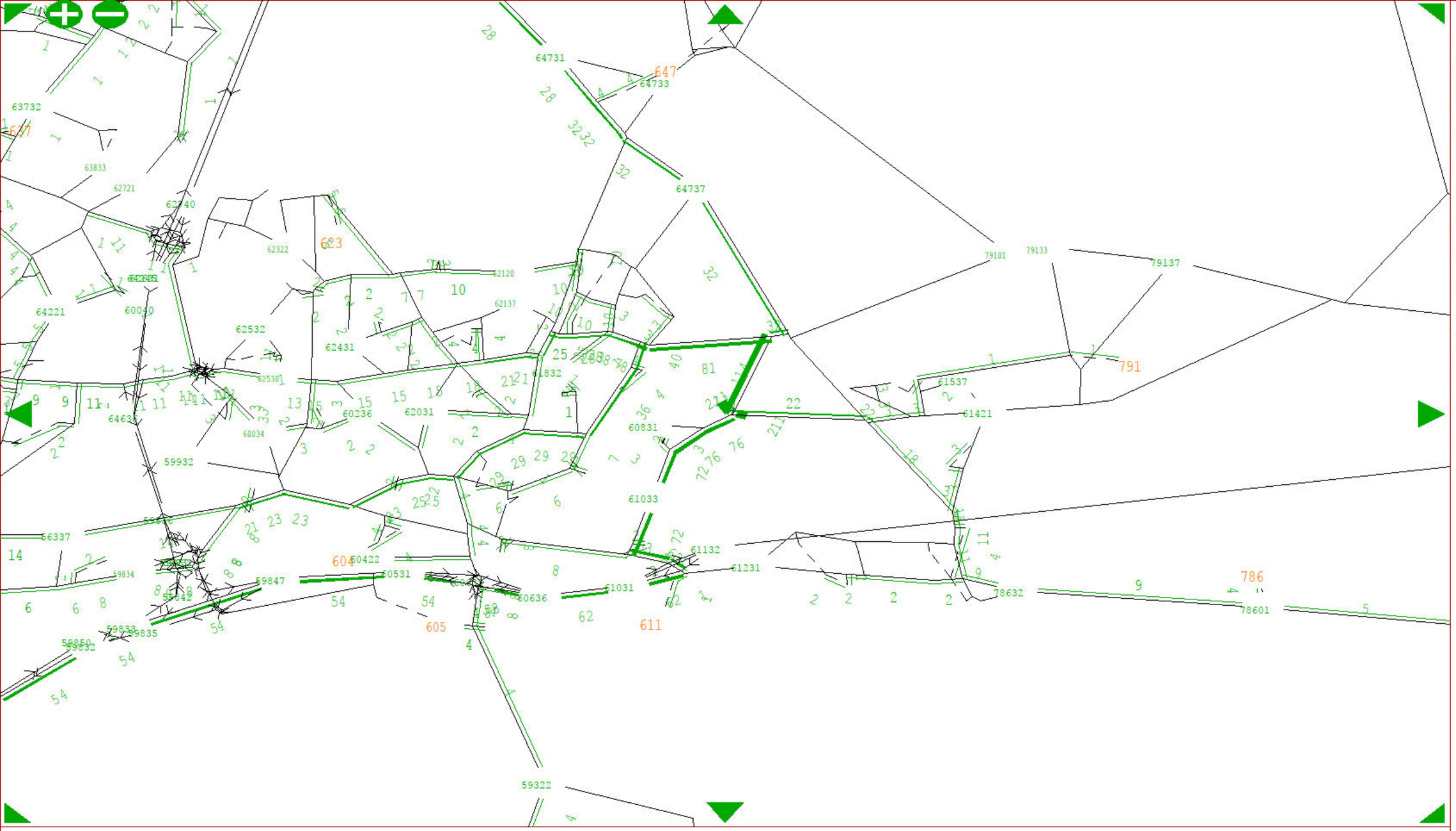
Full stats x

Information x

diSplay of
link annotat >

Q - Return

+ Menu bar!



Selected
Link
Assignment
Thru origin
Zone 609

Total Demand
Flow = 211

All User Cls

saVe in D.B. x

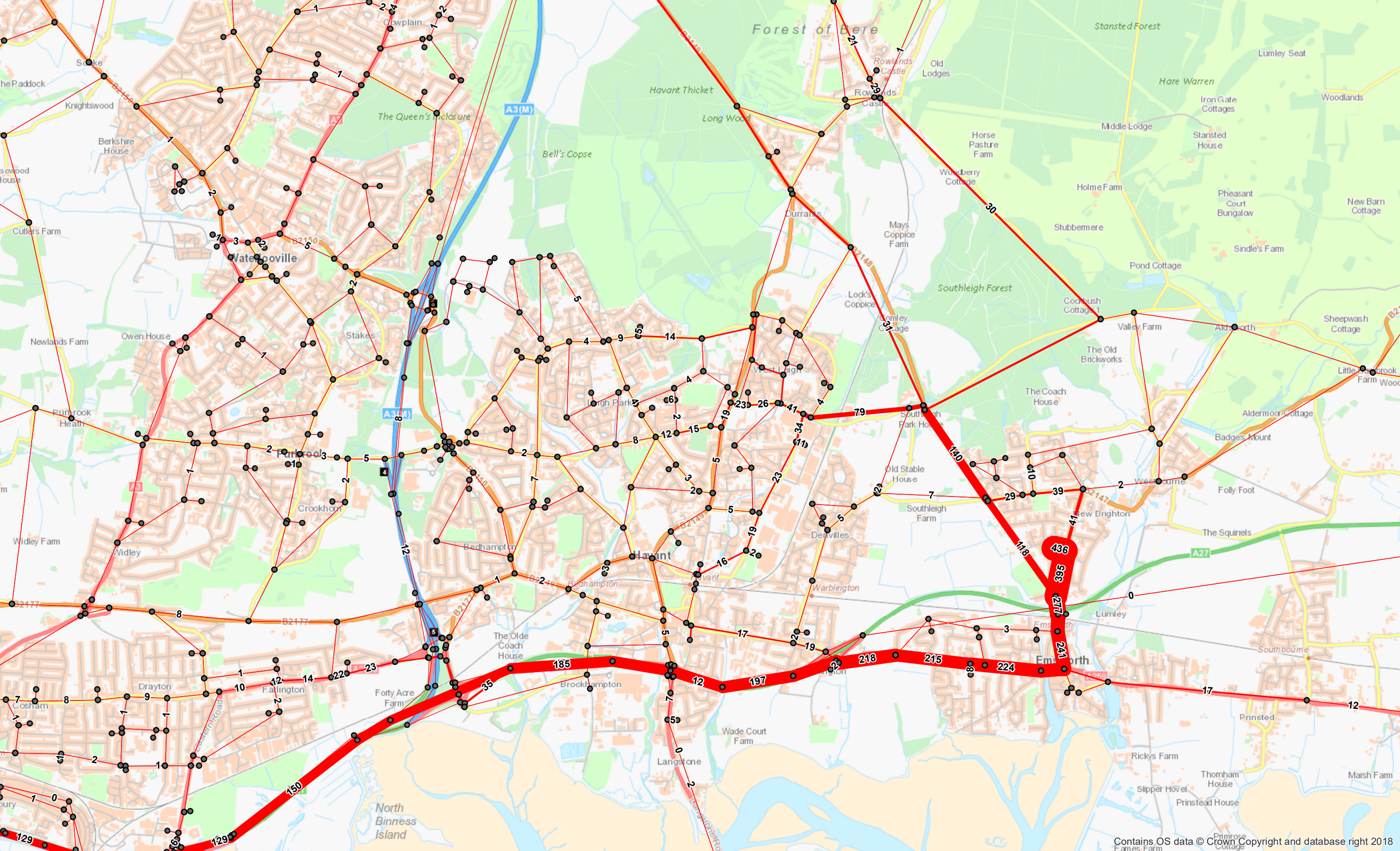
Full stats x

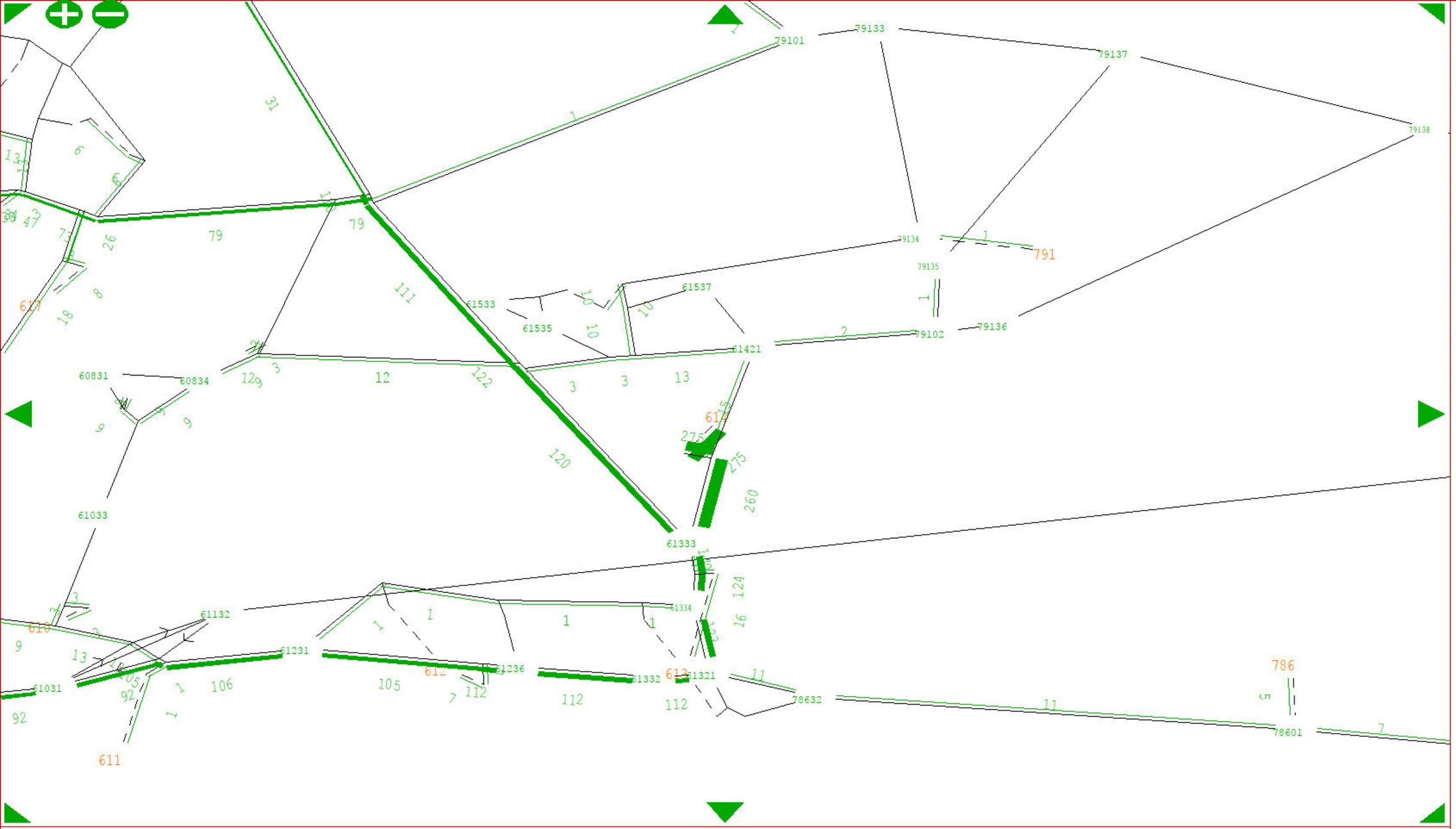
Information x

diSplay of
link annotat >

Q - Return

+ Menu bar!





Selected
Link
Assignment
Thru origin
Zone 614

Total Demand
Flow = 275

All User Cls

saVe in D.B. x

Full stats x

Information x

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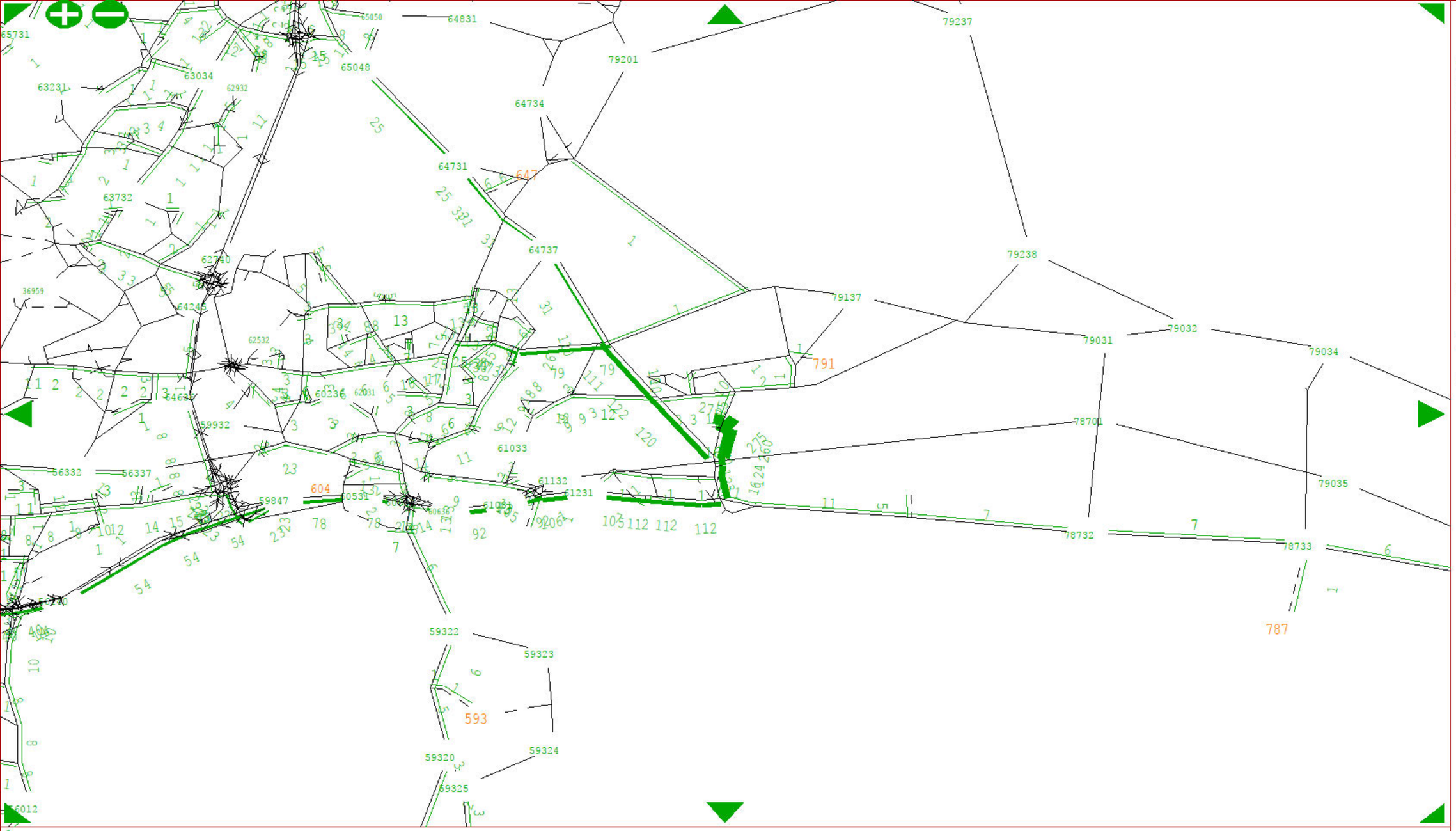

Selected
Link
Assignment
Thru origin
Zone 614

Total Demand
Flow = 275

All User Cls

saVe in D.B. x

Full stats x

Information x

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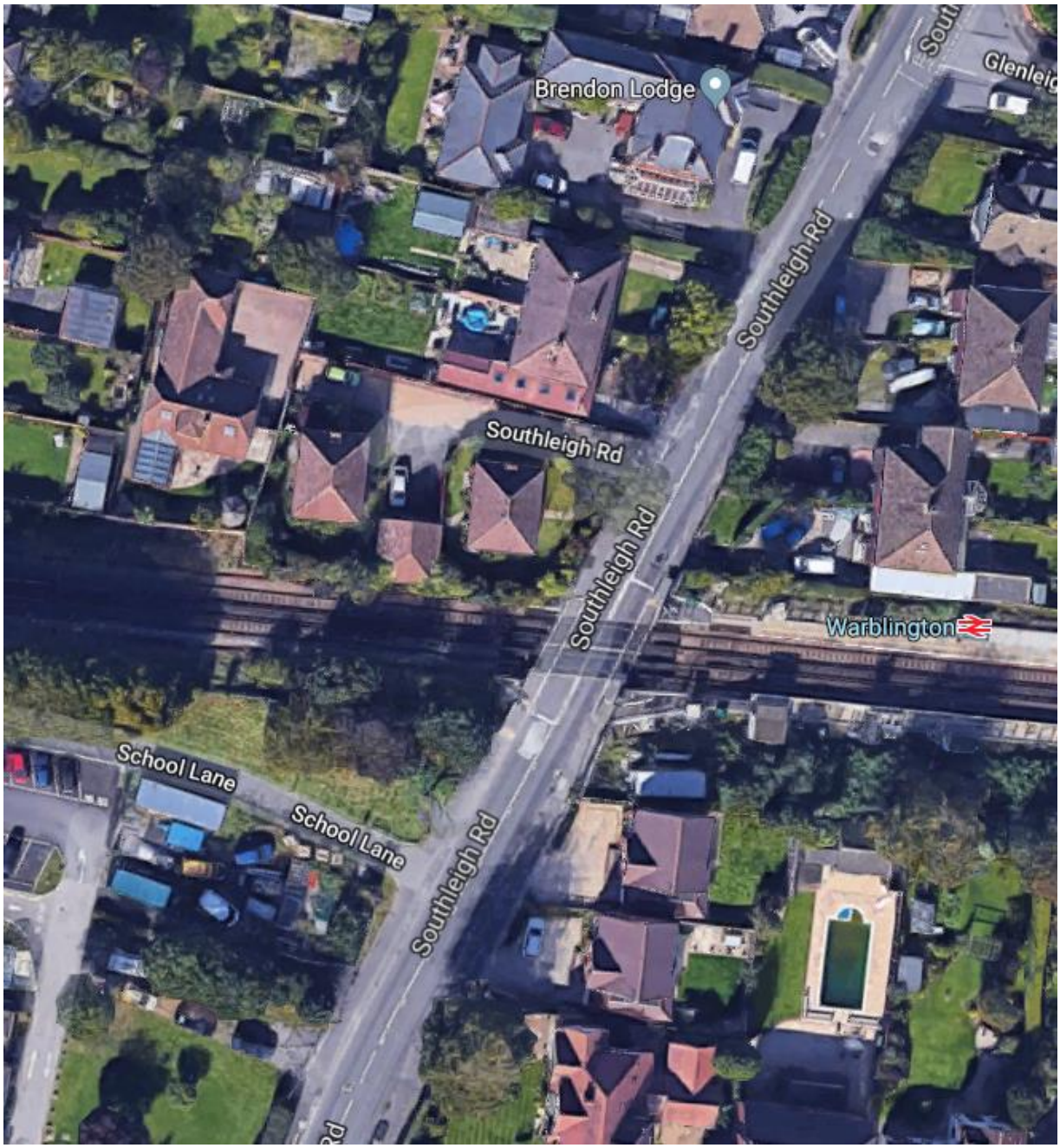
Appendix 5: Warblington Level-Crossing

July 2019 Survey Data & Analysis

K&M TRAFFIC SURVEYS

DATE : WEDNESDAY 3RD & MONDAY 8TH JULY 2019

LOCATION : WARBLINGTON LEVEL CROSSING, HAVANT



K&M TRAFFIC SURVEYS

DATE : WEDNESDAY 3RD & MONDAY 8TH JULY 2019

LOCATION : WARBLINGTON LEVEL CROSSING. HAVANT

MONDAY 8TH JULY 2019 - GOOD TRAIN SERVICE								TOTAL WAITING AT CROSSING			
TIME CROSSING LOWERED	TIME CROSSING RAISED	DURATION CROSSING CLOSED	Seconds	TIME BETWEEN EACH CROSSING USE (Traffic Flowing & Barriers raised)	Seconds	MAXIMUM QUEUE		HEADING NORTHBOUND		HEADING SOUTHBOUND	
						NORTHBOUND QUEUE	SOUTHBOUND QUEUE	PEDS	PEDAL CYCLES	PEDS	PEDAL CYCLES
07:05:07	07:07:58	00:02:51	171	00:10:21	621	6	12	0	0	2	1
07:18:19	07:21:32	00:03:13	193	00:05:14	314	18	17	0	0	0	0
07:26:46	07:31:48	00:05:02	302	00:03:28	208	16	29	0	0	1	0
07:35:16	07:42:03	00:06:47	407	00:03:53	233	38	37	0	0	1	1
07:45:56	07:48:53	00:02:57	177	00:06:03	183	17	22	0	0	0	1
07:54:56	07:59:16	00:04:20	260	00:02:37	157	24	42	0	0	3	1
08:01:53	08:04:23	00:02:30	150	00:08:09	489	6	26	0	1	2	2
08:12:32	08:14:41	00:02:09	129	00:01:01	61	12	16	0	1	3	7
08:15:42	08:18:26	00:02:44	164	00:08:00	480	13	38	0	1	8	8
08:26:26	08:30:44	00:04:18	258	00:03:26	206	34	34	0	2	4	12
08:34:10	08:37:06	00:02:56	176	00:08:39	519	22	18	0	1	0	2
08:45:45	08:48:06	00:02:21	141	00:00:47	47	17	13	2	0	1	3
08:48:53	08:49:51	00:00:58	58	00:01:26	86	14	5	0	0	0	0
08:51:17	08:54:15	00:02:58	178	00:11:54	714	14	16	0	1	0	3
09:06:09	09:08:59	00:02:50	170	00:06:06	366	15	8	0	1	0	0
09:15:05	09:20:03	00:04:58	298	00:00:43	43	40	28	0	1	1	0
09:20:46	09:23:07	00:02:21	141	00:06:23	383	40	36	0	0	0	1
09:29:30	09:35:47	00:06:17	377	00:01:17	77	42	45	0	0	0	1
09:37:04	09:38:59	00:01:55	115	00:04:48	288	32	29	0	0	0	1
09:43:47	09:47:09	00:03:22	202	00:07:22	442	24	20	0	0	2	1
09:54:31	09:57:10	00:02:39	159	00:00:29	29	25	11	0	1	0	0
09:57:39	10:04:14	00:06:35	395			40	26	1	0	1	2
All		00:03:30	210	00:04:52	283	23	24	0	0	1	2

WEDNESDAY 3RD JULY 2019 - CANCELLED TRAINS DURING THIS PERIOD DUE TO PERSON ON RAIL LINE											
07:36:53	07:41:12	00:04:19	259	00:02:53	173	19	18	0	0	2	3
07:44:05	07:46:37	00:02:32	152	00:19:15		14	27	0	0	1	0
08:05:52	08:10:12	00:04:20	260	00:01:42	102	22	51	0	1	8	10
08:11:54	08:15:34	00:03:40	220	00:09:09	549	27	62	1	0	3	31
08:24:43	08:27:25	00:02:42	162	00:02:43	163	13	27	0	1	1	4
08:30:08	08:33:31	00:03:23	203	00:02:53	173	42	42	0	0	4	7
08:36:24	08:38:09	00:01:45	105	00:06:21	381	13	19	0	0	0	2
08:44:30	08:45:31	00:01:01	61	00:08:08	488	12	10	0	0	0	1
08:53:39	08:55:32	00:01:53	113	00:07:00	420	11	18	0	0	0	0
09:02:32	09:07:35	00:05:03	303	00:07:33	453	26	41	0	0	2	0
09:15:08	09:19:49	00:04:41	281	00:10:07	607	33	31		0	0	2
09:29:56	09:33:44	00:03:48	228	00:04:38	278	21	21	1	1	0	2
09:38:22	09:39:41	00:01:19	79	00:04:32	272	13	12	0	0	0	0
09:44:13	09:46:57	00:02:44	164			11	15	2	0	0	0
		00:03:05	185	00:06:41							
Wed		**00:02:41**	**161**	**00:05:25**	**325**	**20**	**33**	**0**	**0**	**2**	**8**

Monday

08:01:53	08:04:23	00:02:30	150	00:08:09	489	6	26	0	1	2	2
08:12:32	08:14:41	00:02:09	129	00:01:01	61	12	16	0	1	3	7
08:15:42	08:18:26	00:02:44	164	00:08:00	480	13	38	0	1	8	8
08:26:26	08:30:44	00:04:18	258	00:03:26	206	34	34	0	2	4	12
08:34:10	08:37:06	00:02:56	176	00:08:39	519	22	18	0	1	0	2
08:45:45	08:48:06	00:02:21	141	00:00:47	47	17	13	2	0	1	3
08:48:53	08:49:51	00:00:58	58	00:01:26	86	14	5	0	0	0	0
08:51:17	08:54:15	00:02:58	178	00:11:54	714	14	16	0	1	0	3
09:06:09	09:08:59	00:02:50	170	##########	366	15	8	0	1	0	0
		00:02:37	**157**	**00:05:25**	**325**	**17**	**21**	**0**	**1**	**2**	**5**
Mon-Wed		**00:02:39**	**159**	**00:05:25**	**325**	**18**	**27**	**0**	**1**	**2**	**6**

Table xx: Summary of the Survey Data

TIME CROSSING LOWERED	TIME CROSSING RAISED	DURATION CROSSING CLOSED	Seconds	TIME BETWEEN EACH CROSSING USE (Traffic Flowing)	Seconds	MAXIMUM QUEUE		HEADING NORTHBOUND		HEADING SOUTHBOUND	
						NORTHBOUND QUEUE	SOUTHBOUND QUEUE	PEDS	PEDAL CYCLES	PEDS	PEDAL CYCLES
AM Peak (0800-0900)-Average	Mon-Wed	00:02:39	159	00:05:25	325	18	27	0	1	2	6
Maximum values		00:06:47	407	00:11:54	714	42	45	2	2	8	31
PM Peak (1700-1800)-Average	Wed	00:02:22	142	00:04:30	270	31	13	1	0	0	0
Maximum values		00:06:47	407	00:11:31	691	44	41	15	46	2	2

Tableyy:Calculation of the Cycle time based on the survey data

	AM Peak		PM Peak	
	Average	Max	Average	Max
	Seconds		Seconds	
Duration Crossing Closed	159	407	142	270
Assumed Clearnace between stages	20	20	20	20
Time between each crossing use(Traffic flowing)	325	714	270	691
Assumed Clearnace between stages	20	20	20	20
Cycle Time Based on the data	524	1161	452	1001

K&M TRAFFIC SURVEYS

DATE : WEDNESDAY 3RD JULY 2019

LOCATION : WARBLINGTON LEVEL CROSSING. HAVANT

WEDNESDAY 3RD JULY 2019 - GOOD TRAIN SERVICE				MAXIMUM QUEUE		TOTAL WAITING AT CROSSING			
TIME CROSSING LOWERED	TIME CROSSING RAISED	DURATION CROSSING CLOSED	TIME BETWEEN EACH CROSSING USE (Traffic Flowing & Barriers raised)			HEADING NORTHBOUND		HEADING SOUTHBOUND	
				NORTHBOUND QUEUE	SOUTHBOUND QUEUE	PEDS	PEDAL CYCLES	PEDS	PEDAL CYCLES
14:35:17	14:37:50	00:02:33	00:07:30	22	17	0	2	0	0
14:45:20	14:48:29	00:03:09	00:08:36	17	17	0	3	0	0
14:57:05	15:00:13	00:03:08	00:02:36	21	20	0	0	1	2
15:02:49	15:04:55	00:02:06	00:02:08	25	15	15	46	0	1
15:07:03	15:09:55	00:02:52	00:03:24	26	22	3	16	0	0
15:13:19	15:16:41	00:03:22	00:02:36	32	23	1	2	0	0
15:19:17	15:22:38	00:03:21	00:05:28	30	15	1	3	0	0
15:28:06	15:34:53	00:06:47	00:02:45	44	41	1	5	0	0
15:37:38	15:40:19	00:02:41	00:03:50	24	17	0	0	0	0
15:44:09	15:46:28	00:02:19	00:03:19	24	12	3	1	0	0
15:49:47	15:52:48	00:03:01	00:06:24	37	13	1	0	1	1
15:59:12	16:03:59	00:04:47	00:02:51	34	37	2	0	0	0
16:06:50	16:11:30	00:04:40	00:01:42	40	31	2	2	1	2
16:13:12	16:15:44	00:02:32	00:02:22	29	22	0	1	1	0
16:18:06	16:20:15	00:02:09	00:06:46	22	8	0	0	0	0
16:27:01	16:29:26	00:02:25	00:03:07	22	13	0	0	0	0
16:32:33	16:34:53	00:02:20	00:01:30	21	13	0	0	0	1
16:36:23	16:37:47	00:01:24	00:07:53	6	5	0	0	0	0
16:45:40	16:47:22	00:01:42	00:02:07	26	9	0	0	0	0
16:49:29	16:51:53	00:02:24	00:03:57	16	12	1	1	0	2
16:55:50	16:58:44	00:02:54	00:08:41	37	13	1	2	1	0
17:07:25	17:08:39	00:01:14	00:00:44	15	1	0	0	0	1
17:09:23	17:11:38	00:02:15	00:01:06	39	10	0	1	0	0
17:12:44	17:15:14	00:02:30	00:01:57	43	17	1	1	0	0
17:17:11	17:19:28	00:02:17	00:09:28	40	15	2	0	0	0
17:28:56	17:31:23	00:02:27	00:03:23	20	13	0	1	1	0
17:34:46	17:39:08	00:04:22	00:07:25	46	21	4	1	2	0
17:46:33	17:49:04	00:02:31	00:03:00	31	10	0	0	0	0
17:52:04	17:52:56	00:00:52	00:01:55	22	6	0	0	0	0
17:54:51	17:57:38	00:02:47	00:11:31	23	24	0	0	1	0
18:09:09	18:12:45	00:03:36	00:00:52	24	28	1	0	2	0
18:13:37	18:15:36	00:01:59	00:01:25	25	19	1	0	0	0
18:17:01	18:19:54	00:02:53	00:06:45	30	14	0	3	0	0
18:26:39	18:29:12	00:02:33	00:00:58	9	18	0	0	0	1
18:30:10	18:33:12	00:03:02	00:03:19	25	15	0	6	0	0
18:36:31	18:38:13	00:01:42	00:06:04	3	14	0	0	0	0
18:44:17	18:48:17	00:04:00	00:06:46	15	22	0	1	0	1
18:55:03	18:57:37	00:02:34		20	9	0	1	0	0
		00:02:48	00:04:13	26	17	1	3	0	0
Average pm peak		**00:02:22**	**00:04:30**	**31**	**13**	**1**	**0**	**0**	**0**

Appendix 6: Traffic flow Diagrams

2036 Baseline, 2036 Do Min and 2036 Do Something AM

2036 Baseline, 2036 Do Min and 2036 Do Something PM

Havant Borough Council
Transport Assessment Addendum
Southleigh Development

AM Peak Traffic-2036 Base Line

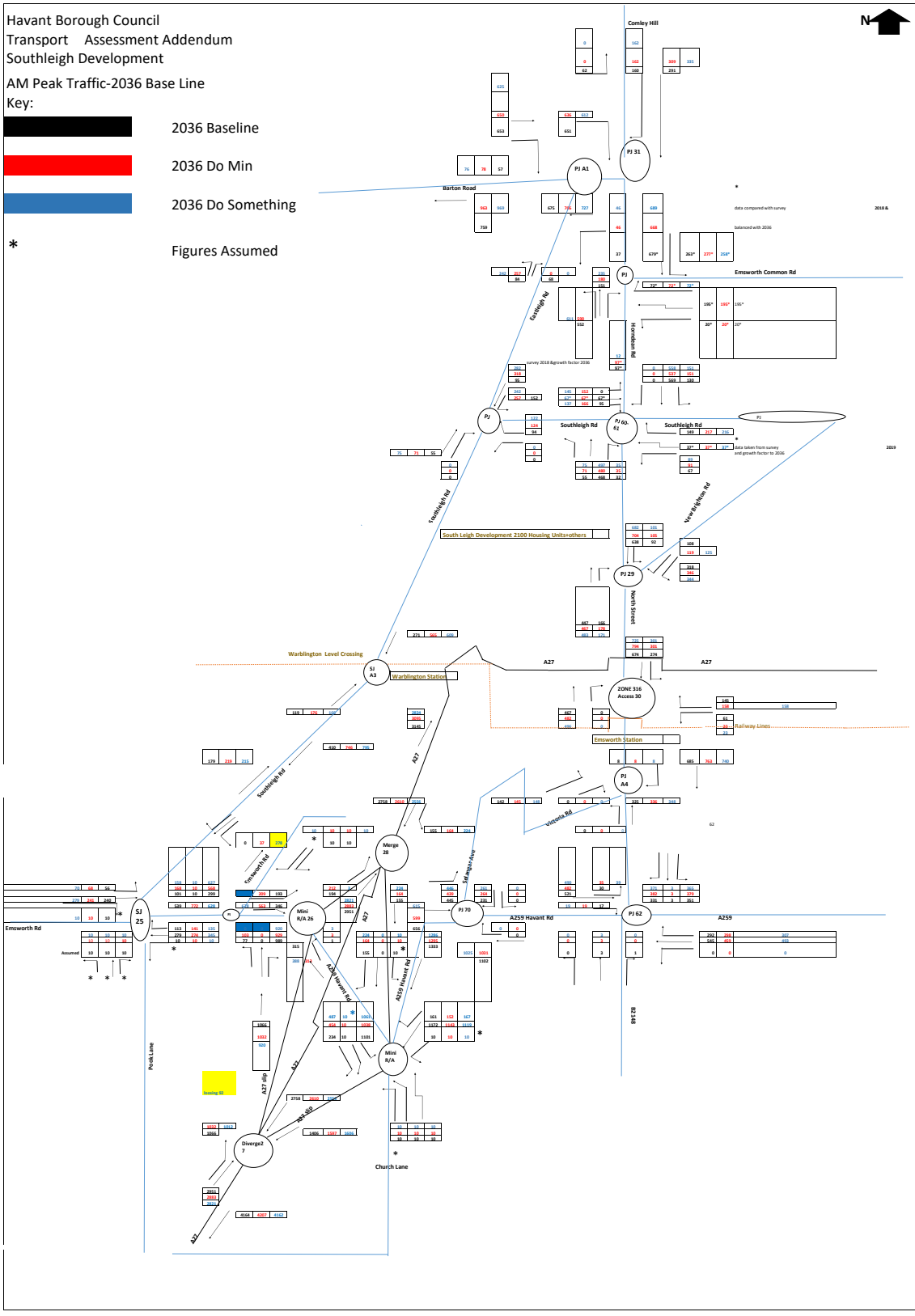
Key:

2036 Baseline

2036 Do Min

2036 Do Something

* Figures Assumed



Havant Borough Council
Transport Assessment Addendum
Southleigh Development

PM Peak Traffic-2036 Base Line

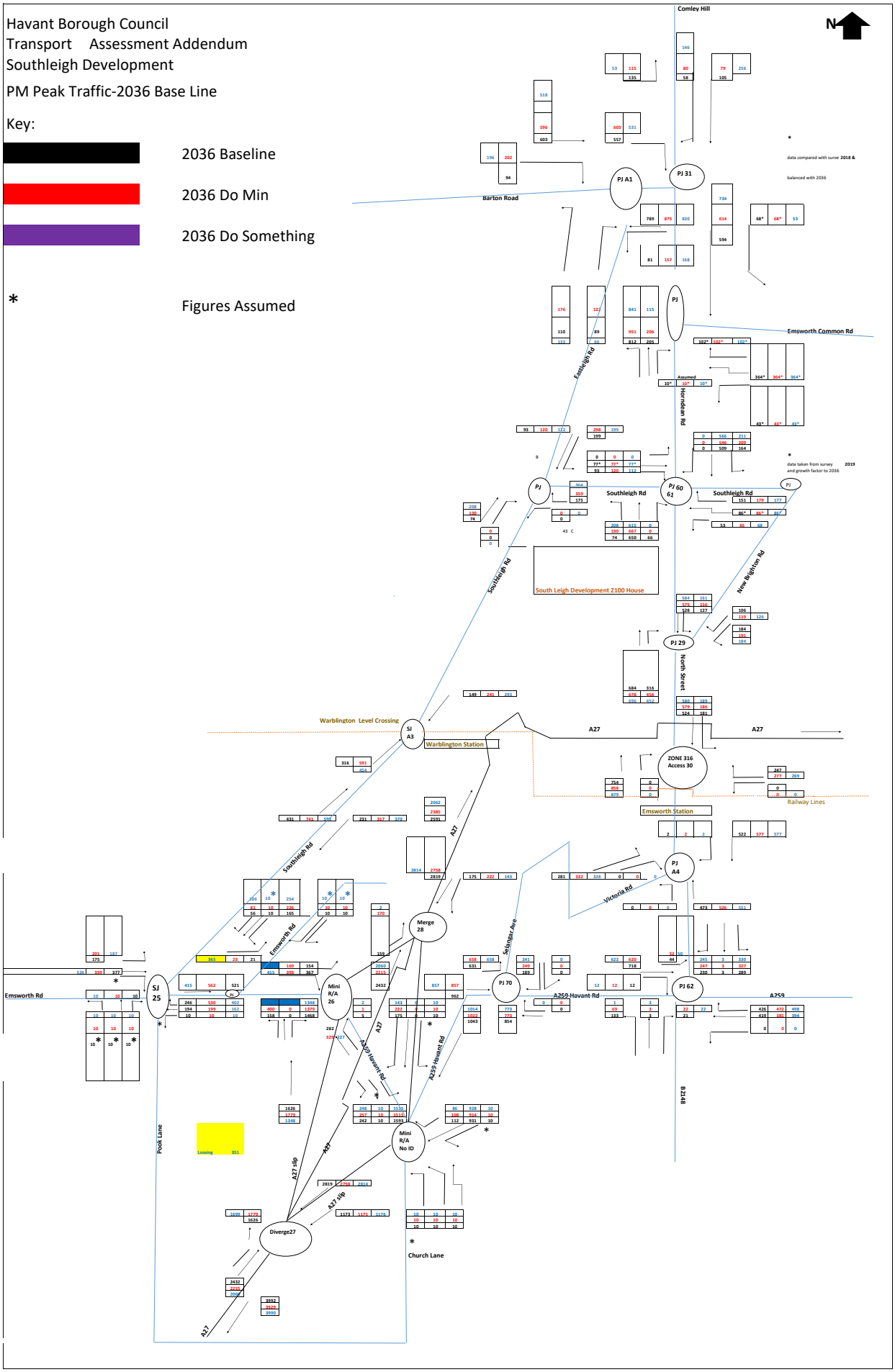
Key:

2036 Baseline

2036 Do Min

2036 Do Something

* Figures Assumed

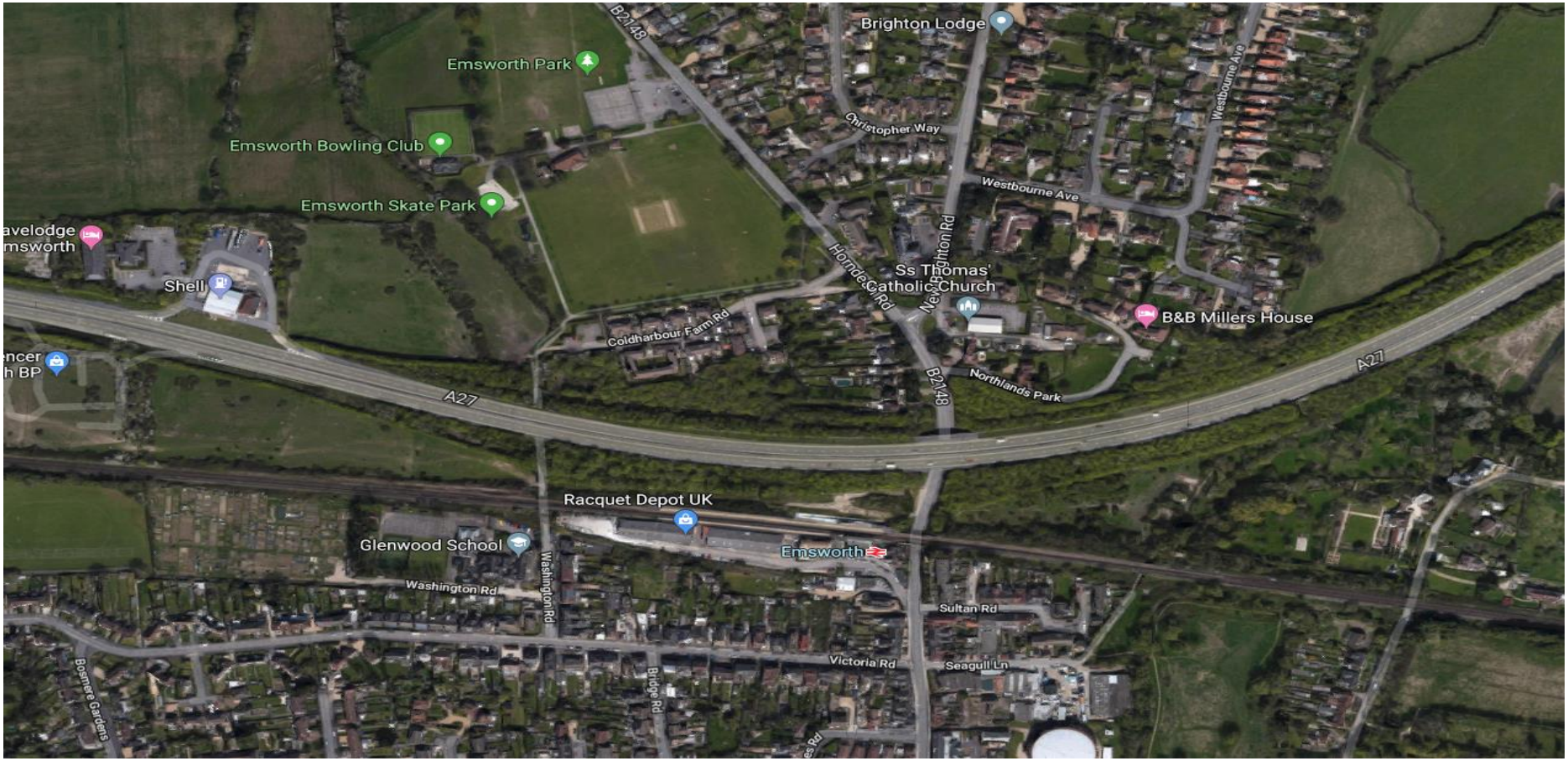


Appendix 7: Junction Layout Views - Southleigh Development site Network

Signal Junctions

Emsworth Rd/Southleigh Rd Junction (ID 25)

Interbridge Dvelopment Site (ID 30)-New Brighton Rd/Site Entrance/Emsworth Junction

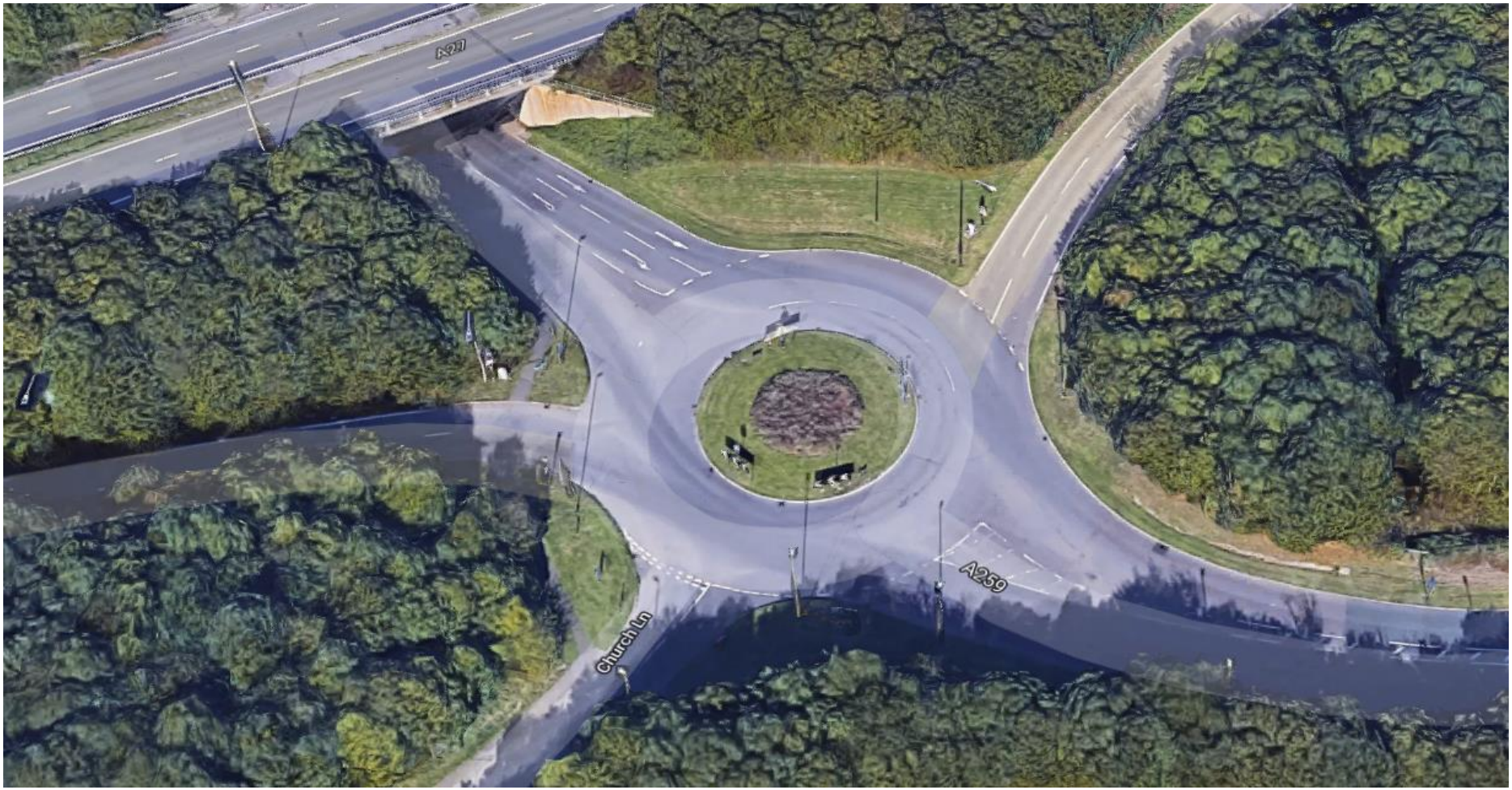


Southleigh Road/Warblington Level Crossing(ID A3)

Roundabouts

A27/Emmsworth Road R/a (ID 26)

A27/Church Lane R/a (No ID)



A259/Emsworth Rd R/a(ID 62)

Give way Lines

New Brighton Road/Hordean Rd Give way Line Junction (ID 29)

Emsworth Rd /Selangar Ave Give way Line Junction(ID 70)

Eastleigh Rd/Barton Rd Give Way Line Junction (A1)

Eastleigh Rd/Southleigh Rd Give Way Line Junction (ID A2)

Horndean Rd/Victoria Road-Give way Line Junction (ID A4)

Priority Junctions-Cross Roads

Barton Rd/Horndean Rd/Emsworth Common Rd Priority Junction (ID 31)

Southleigh Rd/Horndean Rd Priority Junction (ID 60-61)

Appendix 8: Traffic Model Outputs

(Available on Request)

London

15 Bermondsey Square
London
SE1 3UN

T: +44 (0)20 7340 1700
E: london@campbellreith.com

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

T: +44 (0)1675 467 484
E: birmingham@campbellreith.com

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

T: +44 (0)1737 784 500
E: surrey@campbellreith.com

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

T: +44 (0)161 819 3060
E: manchester@campbellreith.com

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com