

3 Method

This section of the report presents the method used to develop each of the scenarios tested and the development of the demand forecasts. LCRTM has been used to produce the matrices, and these have then been converted to WTM zones.

Model forecasts have been developed for 2035.

The forecasts have been developed for the time periods:

- AM (08:00-09:00)
- PM (17:00-18:00)

The forecasts have been created for all model user classes:

- Car Commute
- Car Other
- Car Employers Business (EB)
- LGV
- OGV

3.1 Method

The following process has been used to create the future year WTM matrices:

- WTM base year matrices converted to LCRTM zones (see section 3.1.1).
- LCRTM demographic and land-use projections updated for Wirral using the development information discussed in Section 2.
- The LCRTM trip generation process was run, pivoting off the WTM base year matrices at LCRTM zone level. District growth has been constrained to TEMPRO 7.2 as per TAG² M4 - Forecasting and Uncertainty.
- The LCRTM variable demand model has been run with the future year demand to incorporate variable demand impacts.
- The output matrices have been converted to WTM zone to form the WTM forecast matrices (see section 3.1.1).

3.1.1 Zone Conversions

A correspondence has been created between the LCRTM and WTM (zone systems. LCRTM has 467 zones and WTM has 668 zones which are largely a disaggregation of the LCRTM zones.

To convert between WTM and LCRTM it is simply a case of aggregating the WTM matrices, but to convert between LCRTM and WTM a correspondence has been set up as described below.

Firstly, a list was created noting the corresponding WTM zone for every LCRTM zone. Where a WTM zone crossed LCRTM zone boundaries the WTM zone was included in both instances.

² Department for Transport (DfT) Transport Analysis Guidance (TAG)

Trip end data from the WTM matrix was used to create a correspondence to convert between LCRTM and WTM zones by user class and time period where:

- The user classes are Commute, Other, EB, LGV and OGV.
- The time periods are AM and PM.

The correspondence was created by:

- Aggregating the WTM base year matrix to trip ends at WTM zone level.
- Aggregating WTM base year matrix to trip ends at LCRTM zone level (a simple addition as the WTM zones are within the LCRTM zones).
- Dividing the WTM trip ends by the LCRTM trip ends to calculate the proportion of each WTM trip end within the LCRTM zone, by origin and destination.

3.2 Forecasting Processes

The full LCRTM system includes components representing six travel responses comprising: trip generation, mode choice, time period choice, trip distribution, departure time choice and highways assignment and public transport assignment.

The trip generation process takes land-use and demographic forecasts to calculate trip growth. This growth is applied to the calibrated base year matrices, and the resultant matrix is constrained to TEMPRO trip end growth by district.

The demand model focuses on mode choice (how people travel), time period choice (when people travel), trip distribution (where people travel) and departure time choice (the hour of the morning peak period in which people travel).

The assignment models provide details of the routes taken and network performance.

Appendix C describes the LCRTM trip generation process and Appendix D provides details of the LCRTM demand model.

4 Results

This section presents the results of the highway assessment for each of the scenarios tested.

For each scenario the results are presented in terms of:

- Convergence statistics
- Network Statistics
- Flow plots
- Junctions over capacity

Each of these metrics is described below. Following this the results are presented for each scenario in turn.

4.1 Metrics

This section describes the metrics reported upon.

4.1.1 Model Assignment Convergence

Model convergence checks have been carried out to ascertain the stability of the model assignment results. This has been done by observing the flow difference of subsequent iterations within the model assignment.

The stopping criteria for the assignment/simulation loops in SATURN, as specified in TAG³ Unit M3.1 is for the percentage of links where the flow changes by less than 1% (denoted as %FLOWS) is greater than 98% on four consecutive iterations. Even though this guideline is used to show that the model is stable, a truer measure is the duality gap (delta, d, %GAP) which represents the percentage difference between the minimum cost routes and the chosen routes summed across the network. TAG Unit M3.1 recommends that delta and %GAP should be less than 0.1%. Table 4.1 presents the TAG convergence measures.

Table 4.1: Summary of Convergence Measures and Base Model Acceptable Values

Measure of Convergence	Base Model Acceptable Values
Delta and % Gap	Less than 0.1% or at least stable with convergence fully documented and all other criteria met
Percentage of links with flow change (P) <1%	Four consecutive iterations greater than 98%
Percentage of links with cost changed (P2) <1%	Four consecutive iterations greater than 98%

Source TAG M3.1

Model convergence statistics are presented below for the final iterations of the AM and PM models for each scenario, where it is evident that the model convergence criteria have been achieved for all time periods.

4.1.2 Network Statistics

The network statistics provide details of the overall network performance and can be used to understand the overall impact of the scenario. The statistics are presented in passenger carrying units (PCU) where a PCU represents the space a vehicle takes up on the road. Cars

³ Department for Transport: Transport Analysis Guidance

and LGVs are equivalent to one PCU and OGVs are equivalent to 2.4 PCUs. The statistics cover:

- Transient Queues – queues that dissipate, for example queuing at a red light
- Over-Capacity Queues – ‘permanent’ queues at an over capacity junction
- Link Cruise Time – travel time in free-flow conditions i.e. excluding impact of junction delay
- Total Travel Time – total travel time across all PCUs
- Travel Distance – total travel distance across all PCUs
- Average Speed – average speed across the network
- Total Trips Loaded – total trips on the network

4.1.3 Flow Plots

The traffic flow volumes have been analysed for the future year using bandwidth plots.

The bandwidth plots are based on actual flow volumes and represent the traffic flow that can load onto the highway network during the modelled time period.

4.1.4 Junctions over Capacity

The operational performance of the local highway network has been reviewed from reference to the volume over capacity (V/C) relationships for turning movements at junctions.

The junctions have been plotted on the network and colour classified according to the following capacity bands:

- **Yellow (85% V/C to 100% V/C):** This junction is operating with at least one turning movement that is approaching capacity and as a result there are increased queue lengths and delays.
- **Orange (100% to 115% V/C):** This junction is operating over capacity for at least one turning movement. Queues and delays at this location are likely to grow exponentially.
- **Red (> 115% V/C):** This junction is operating considerably over capacity for at least one turning movement and is likely to experience considerable congestion.

Tabulations are provided of the number of junctions within each category.

4.2 2035 Baseline Scenario Results

This section sets out the results of the highway assessment for the baseline scenario in terms of:

- Convergence statistics
- Network Statistics
- Flow plots
- Junctions over capacity

4.2.1 Convergence Statistics

The convergence statistics show the model reaches suitable convergence levels:

- The “%FLOWS” values are higher than 99% in the final four assignment loops for all models
- “%GAP” values for 2035 of 0.015 and 0.015 have been achieved for the AM and PM models respectively.

4.2.2 Network Statistics

Table 4.2 presents the overall network statistics for the baseline model. The modelling shows a 22-24% increase in traffic between 2015 and 2035 with corresponding increases in queues and travel time. The average speed across the network in the AM peak has decreased from 40 kph in 2015 to 38 kph in 2035, the equivalent figures for PM are 39 kph to 38 kph.

Table 4.2: Network Statistics – Baseline

Statistics	Base Year		Future Year		Difference		Percentage Difference	
	AM	PM	AM	PM	AM	PM	AM	PM
Transient Queues (PCU HRS/HR)	1,565	1,553	2,069	1,971	504	419	32%	27%
Over-Capacity Queues (PCU HRS/HR)	221	577	1,282	1,184	1,061	607	480%	105%
Link Cruise Time (PCU HRS/HR)	10,057	9,619	12,110	11,191	2,053	1,573	20%	16%
Total Travel Time (PCU HRS/HR)	11,844	11,748	15,461	14,346	3,618	2,598	31%	22%
Travel Distance (PCU KMS/HR)	477,314	459,822	585,451	546,946	108,138	87,124	23%	19%
Average Speed (KPH)	40	39	38	38	-2	-1	-6%	-3%
Total Trips Loaded (PCU)	481,832	487,182	596,446	596,279	114,613	109,097	24%	22%

4.2.3 Flow Volumes

Figure 4.1 and Figure 4.2 present the traffic flows for the AM and PM respectively.

The Wirral highway network is clearly depicted within the three figures in which the M53 forms the primary spine of the network, supporting traffic flow volumes over 2,000 PCU in all periods.

The A road network accommodates a large volume of flows and support access to various destinations in Wirral such as the A41 for key employment sites along the A41 Corridor, A553 for access to West Kirby and A552 for access to Birkenhead. All of which accommodate over 750 PCU in all periods. The A540 and A550 also accommodate large volumes of traffic flow exceeding 750 PCU in all periods, recognising the importance of these routes alongside the M53 as the key routes in the south for connectivity to Cheshire West and Chester.

Figure 4.1: Actual Flow (PCUs): 2035 Baseline: AM

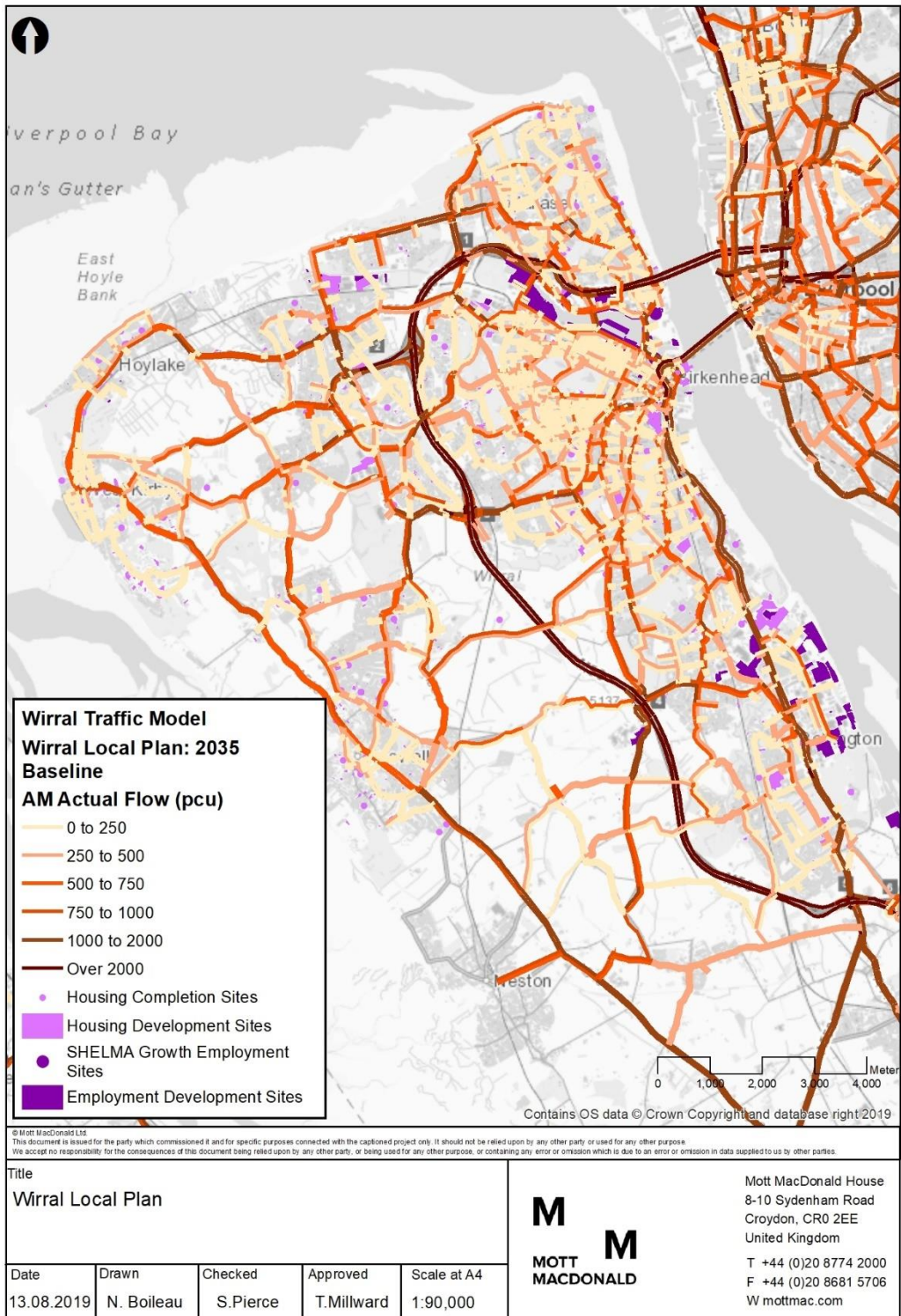
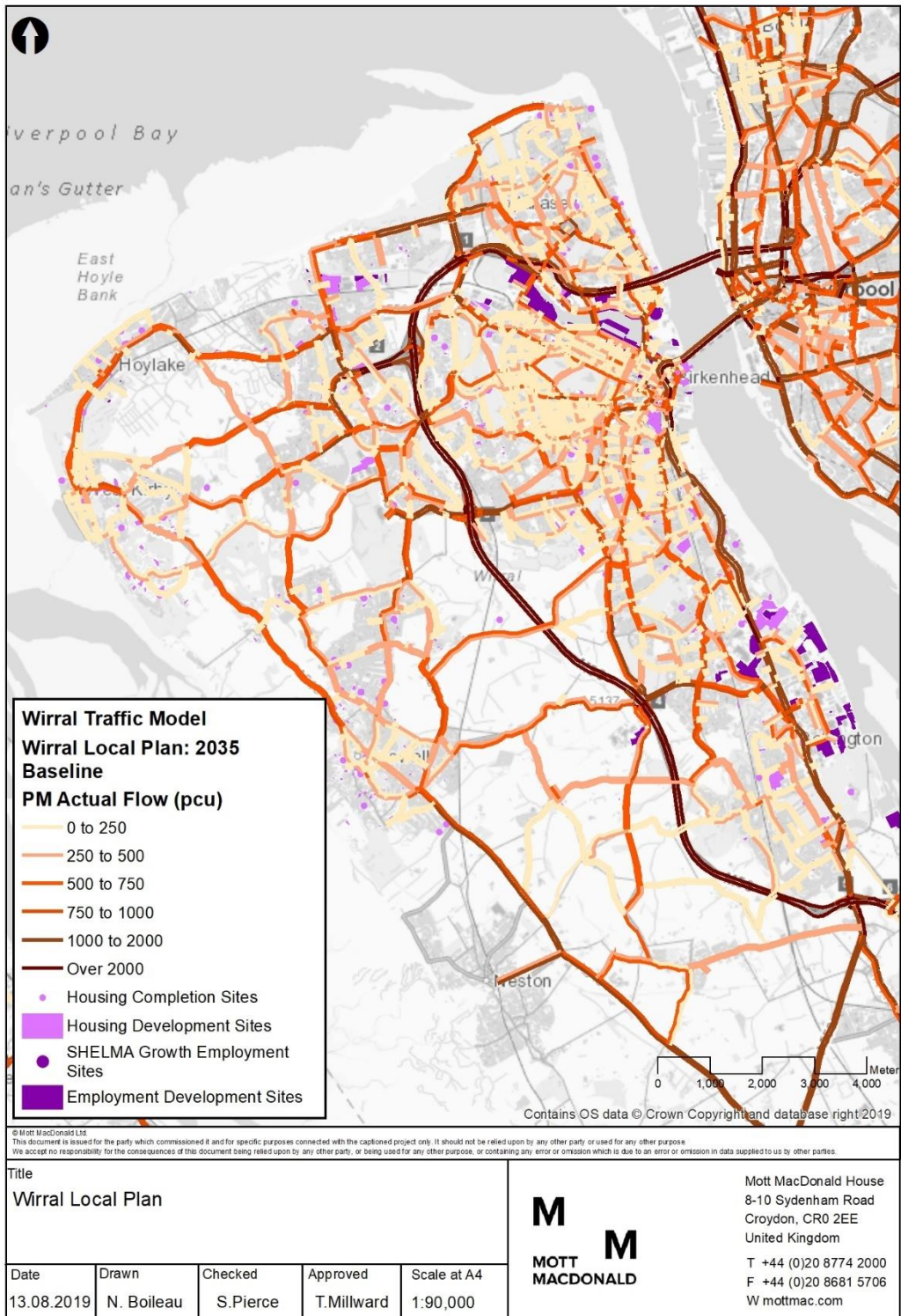


Figure 4.2: Actual Flow (PCUs): 2035 Baseline: PM



4.2.4 Junctions Over Capacity

Figure 4.3 to Figure 4.4 present the junctions approaching or over capacity in the 2035 baseline scenario in the AM and PM respectively.

There are 185 junctions that are over capacity in one or more time periods in 2035.

There are a number of junctions over capacity, in particular the Arrowe Park junction, the A41 in Bebington and Birkenhead Town Centre on the approach to Queensway Tunnel all of which are over 115% capacity in the 2035 AM. For the PM peak, two junctions record over 115% capacity, one located at Arrowe Park and the other at Birkenhead Town Centre.

In both time periods several junctions along the A41 corridor operate at over 85% capacity, with several also over 100%, such as to the south at the junction with the M53, and to the north in Birkenhead town centre. Junctions on the approaches to the M53 in north west Wirral are over capacity and there are junctions over capacity in Heswall and Barnston.

Table 4.3 summarises the number of junctions over capacity.

Table 4.3: 2035 Baseline Junctions over Capacity by Time Period

Time Period	Base Year				Baseline				Baseline – Base Year
	85% to 100%	100% to 115%	> 115%	Total	85% to 100%	100% to 115%	> 115%	Total	
AM	31	40	0	71	61	79	3	143	72
PM	36	40	2	78	53	69	2	124	46

Figure 4.5 to Figure 4.6 presents junctions that are approaching or over capacity in the 2035 baseline scenario that were under 85% V/C in the 2015 base year.

In the baseline there are 72 additional junctions approaching or over capacity compared to 2015 in the AM and 46 in the PM. These are focussed in east Wirral around Birkenhead and the A41 corridor. Approaches to the M53 and M53 junctions become over capacity in both east and west Wirral. There are some increases in junctions over capacity around Heswall and north west Wirral.

Figure 4.3: Junctions Over Capacity: 2035 Baseline: AM

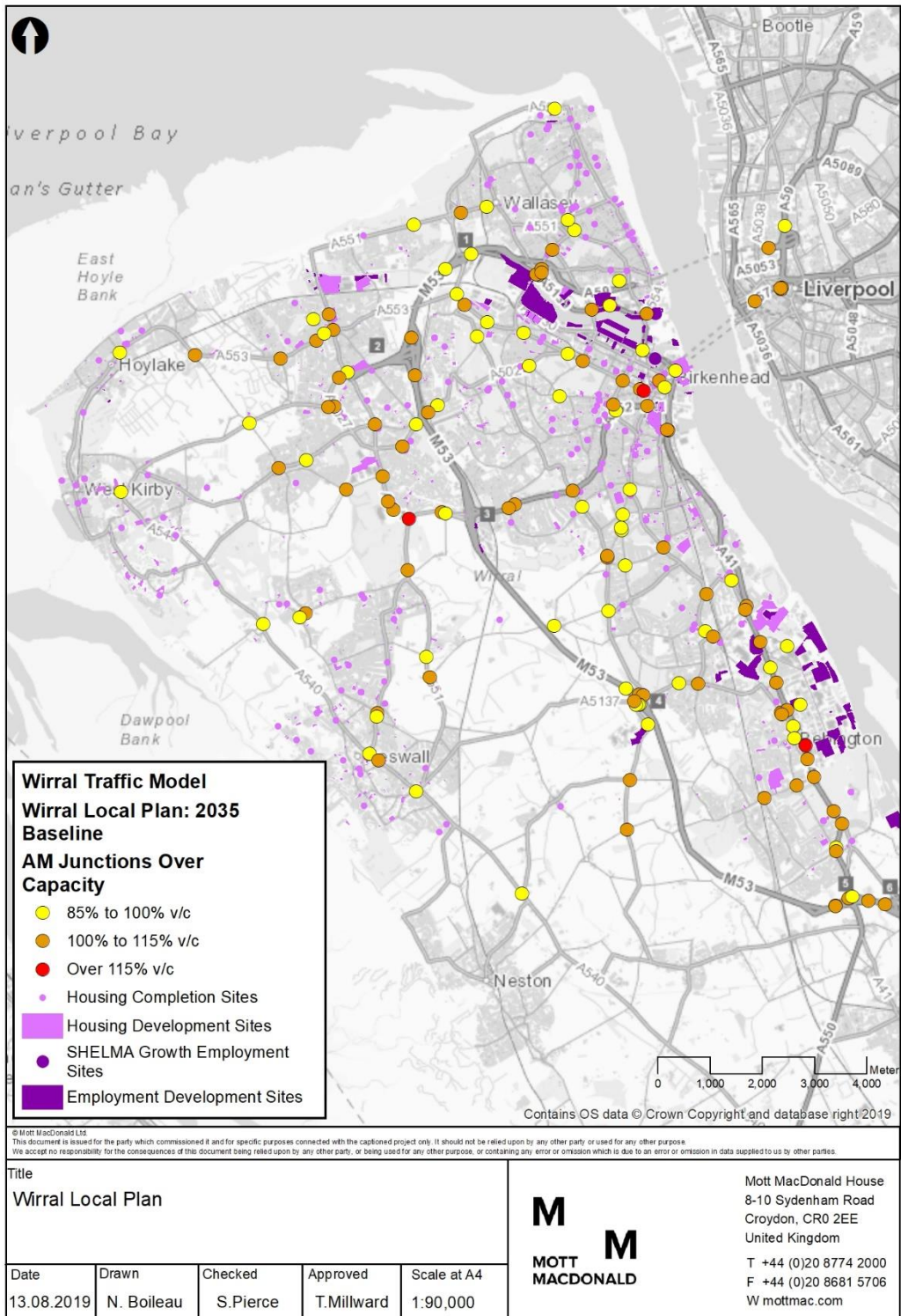


Figure 4.4: Junctions Over Capacity: 2035 Baseline: PM

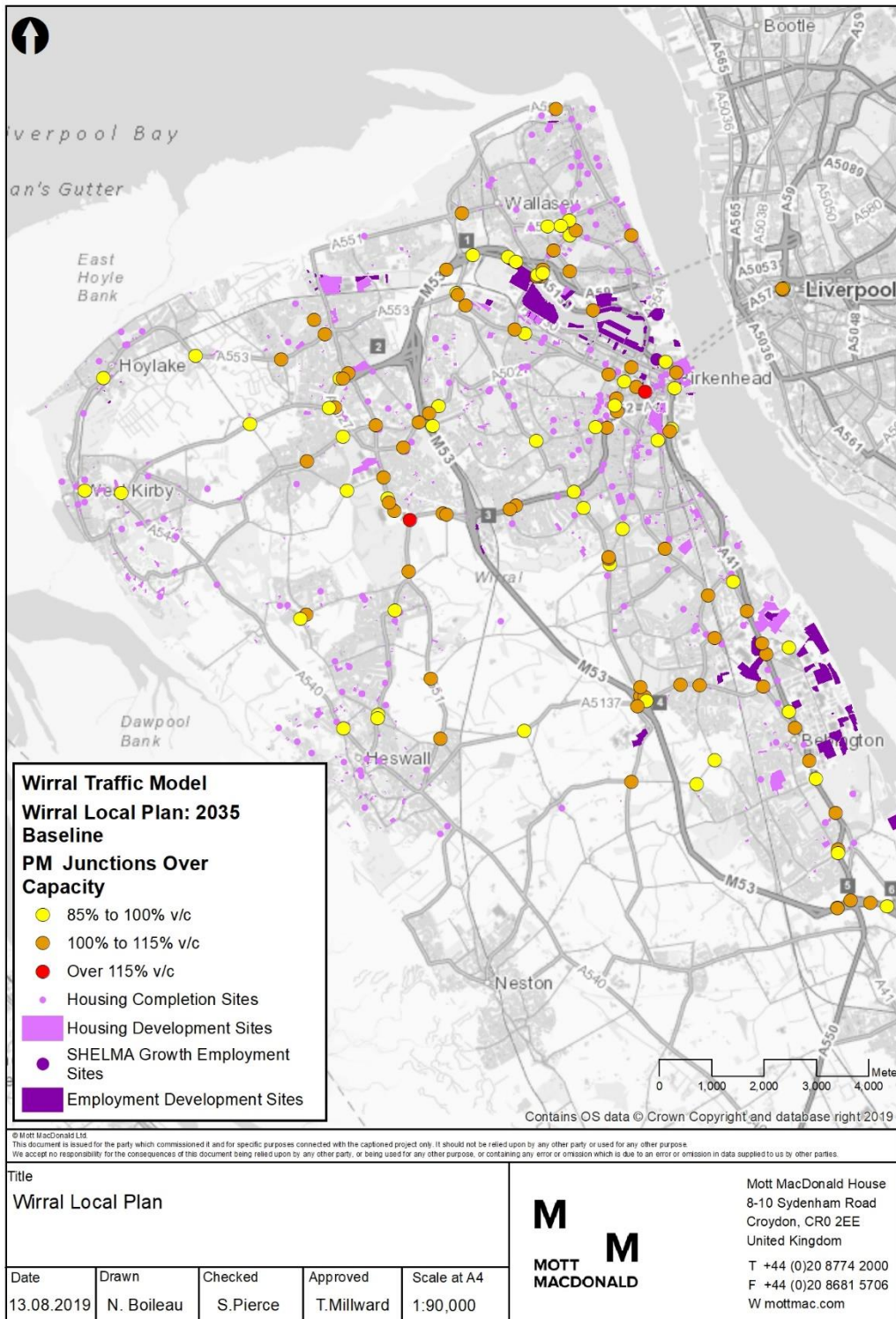


Figure 4.5: Junctions That Become Over Capacity in the 2035 Baseline: AM

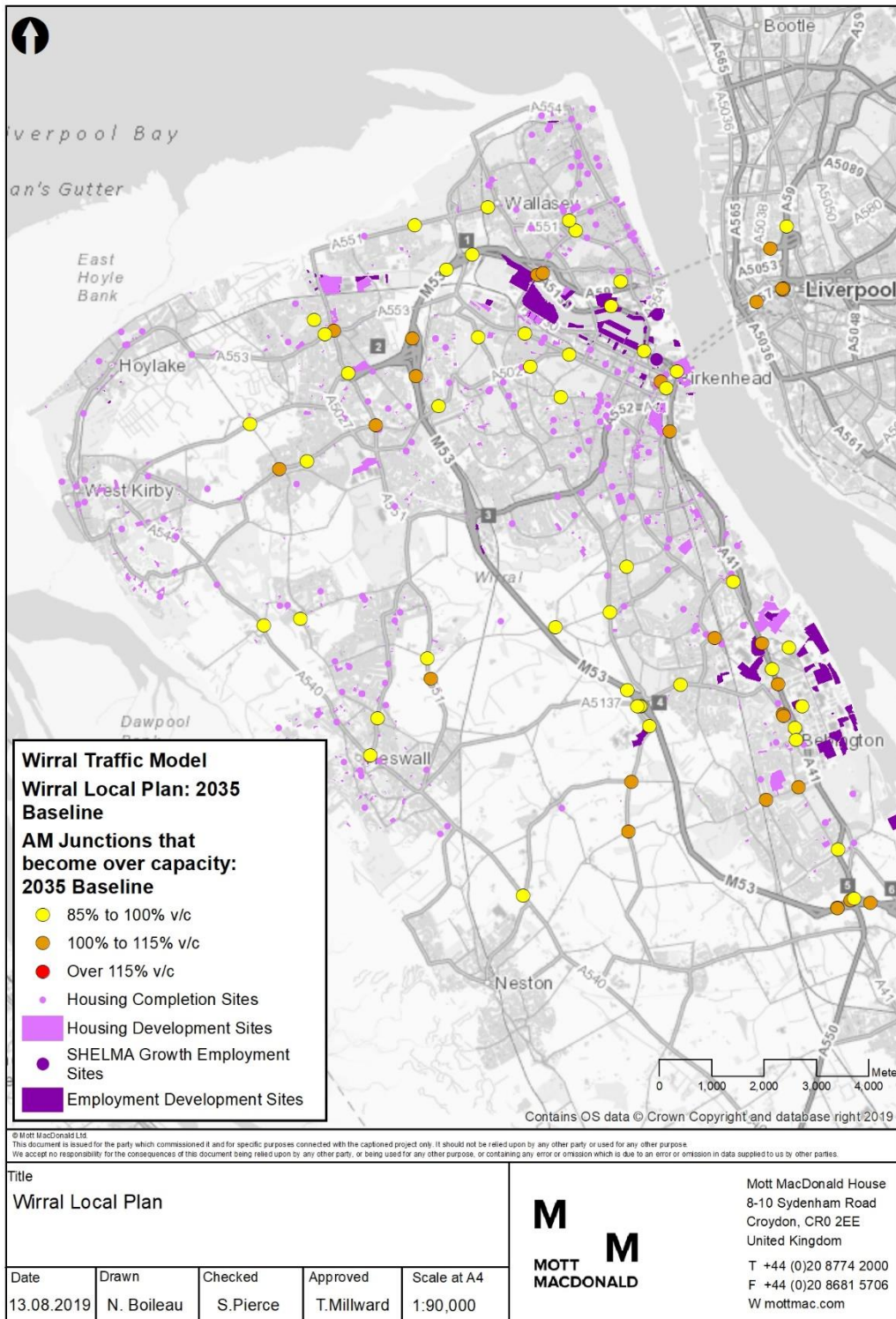
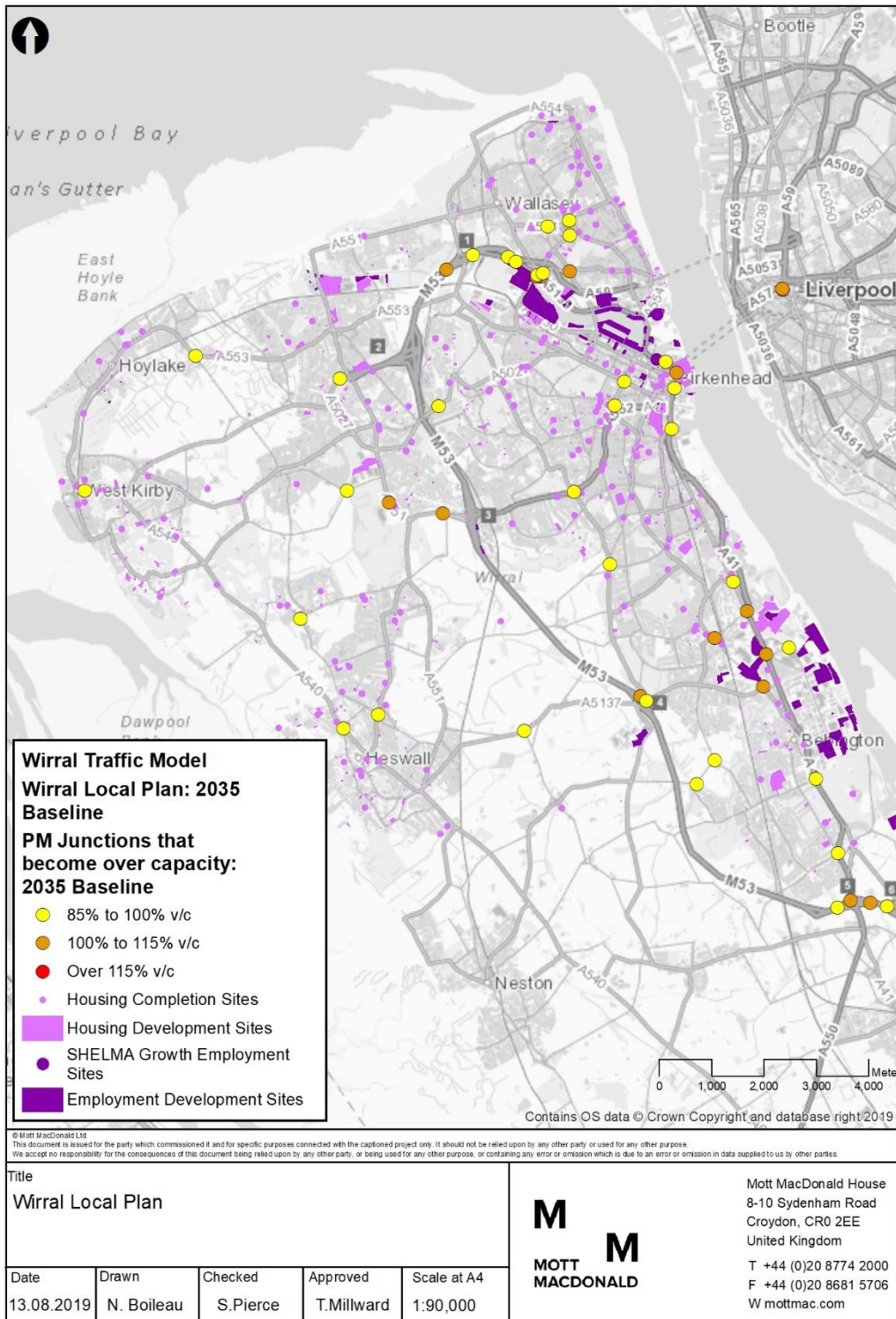


Figure 4.6: Junctions That Become Over Capacity in the 2035 Baseline: PM



4.3 Option 1A Urban Intensification Results

This section sets out the results of the highway assessment for Option 1A in terms of:

- Convergence statistics
- Network Statistics
- Flow plots
- Junctions over capacity

4.3.1 Convergence Statistics

The convergence statistics show the model reaches suitable convergence levels:

- The “%FLOWS” values are higher than 99% in the final four assignment loops for all models
- “%GAP” values for 2035 of 0.018 and 0.016 have been achieved for the AM and PM models respectively.

4.3.2 Network Statistics

Table 4.4 presents the overall network statistics for Option 1A. The modelling shows a 24% increase in traffic between 2015 and 2035 with corresponding increases in queues and travel time. The average speed across the network in the AM peak has decreased from 40 kph in 2015 to 37 kph in 2035, the equivalent figures for PM are 39 kph to 38 kph.

Table 4.4: Network Statistics – Option 1A

Statistics	Base Year		Future Year		Difference		Percentage Difference	
	AM	PM	AM	PM	AM	PM	AM	PM
Transient Queues (PCU HRS/HR)	1,565	1,553	2,136	2,014	571	461	36%	30%
Over-Capacity Queues (PCU HRS/HR)	221	577	1,405	1,236	1,184	658	535%	114%
Link Cruise Time (PCU HRS/HR)	10,057	9,619	12,265	11,346	2,207	1,727	22%	18%
Total Travel Time (PCU HRS/HR)	11,844	11,748	15,806	14,595	3,962	2,847	33%	24%
Travel Distance (PCU KMS/HR)	477,314	459,822	591,669	554,213	114,356	94,391	24%	21%
Average Speed (KPH)	40	39	37	38	-3	-1	-7%	-3%
Total Trips Loaded (PCU)	481,832	487,182	597,988	597,573	116,156	110,391	24%	23%

4.3.3 Flow Volumes

Figure 4.7 and Figure 4.8 present flow plots for AM and PM respectively.

The Wirral highway network is clearly depicted within the three figures in which the M53 forms the primary spine of the network, supporting traffic flow volumes over 2,000 PCU in all periods.

The A road network accommodates a large volume of flows and support access to various destinations in Wirral such as the A41 for key employment sites along the A41 Corridor, A553 for access to West Kirby and A552 for access to Birkenhead. All of which accommodate over 750 PCU in all periods. The A540 and A550 also accommodate large volumes of traffic flow exceeding 750 PCU in all periods, recognising the importance of these routes alongside the M53 as the key routes in the south for connectivity to Cheshire West and Chester.

Figure 4.7: Actual Flow (PCUs): 2035 Option 1A: AM

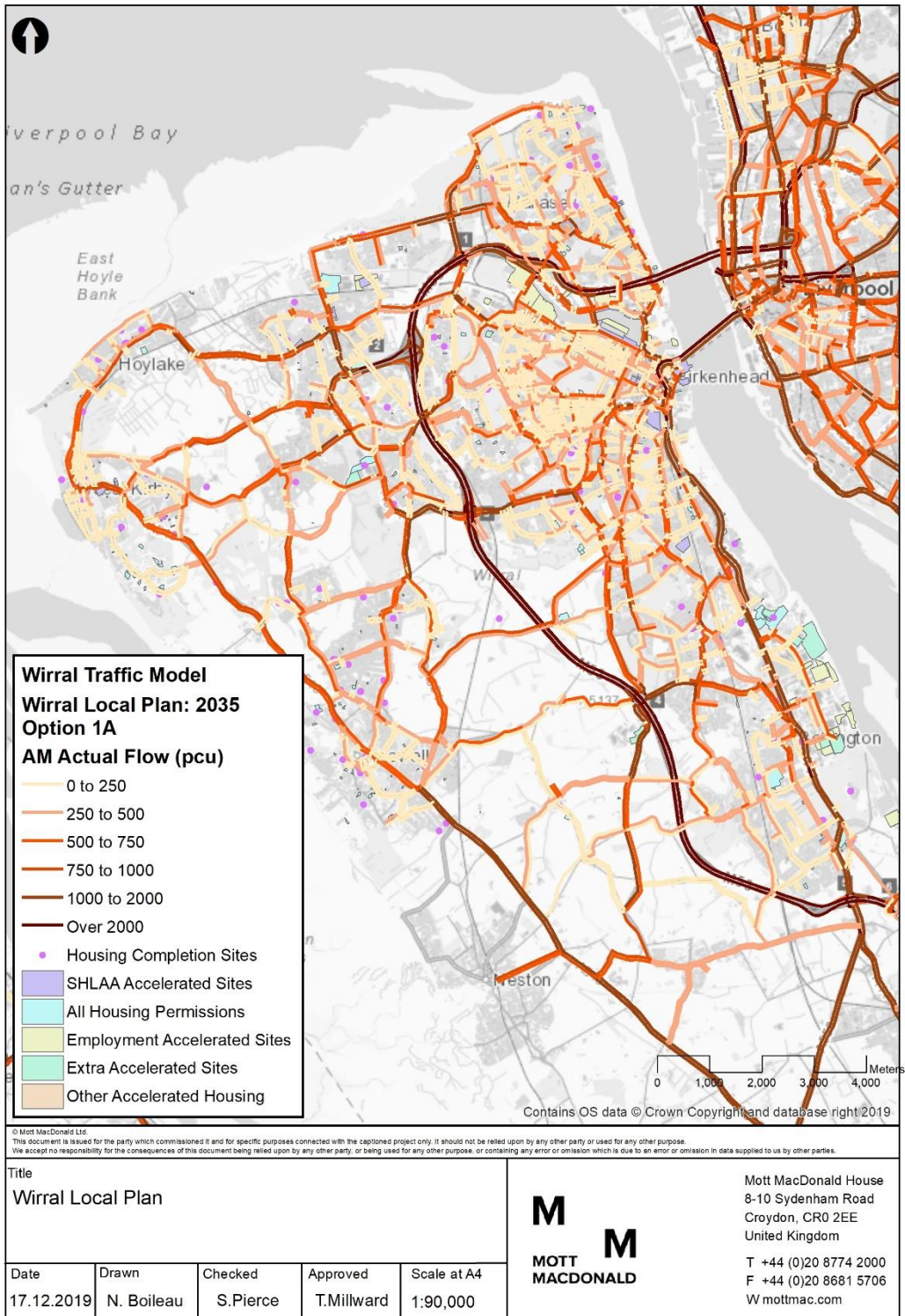
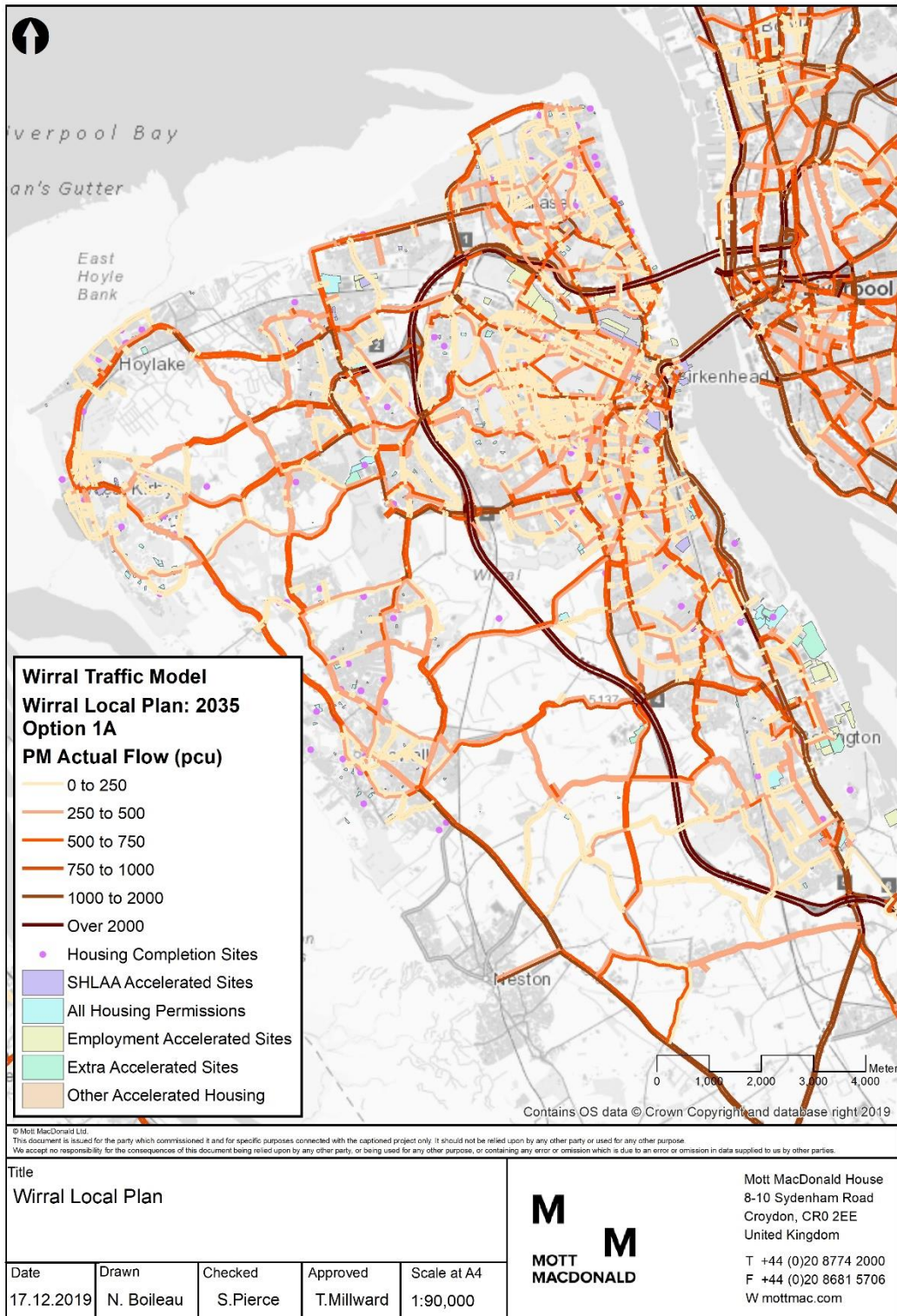


Figure 4.8: Actual Flow (PCUs): 2035 Option 1A: PM



4.3.4 Junctions over Capacity

Figure 4.9 and Figure 4.10 present the junctions approaching or over capacity in Option 1A in the AM and PM respectively.

There are 186 junctions that are over capacity in one or more time periods in 2035.

There are a number of junctions over capacity, in particular the Arrowe Park junction, the A41 in Bebington and Birkenhead Town Centre on the approach to Queensway Tunnel all of which are over 115% capacity in the 2035 AM. For the PM peak, two junctions record over 115% capacity, one located at Arrowe Park and the other at Birkenhead Town Centre.

In both time periods several junctions along the A41 corridor operate at over 85% capacity, with several also over 100%, such as to the south at the junction with the M53, and to the north in Birkenhead town centre. Junctions on the approaches to the M53 in north west Wirral are over capacity and there are junctions over capacity in Heswall and Barnston.

Table 4.5 summarises the number of junctions over capacity.

Table 4.5: Option 1A Junctions over Capacity by Time Period

Time Period	Base Year				Option 1A				Option 1A – Base Year
	85% to 100%	100% to 115%	> 115%	Total	85% to 100%	100% to 115%	> 115%	Total	
AM	31	40	0	71	63	82	3	148	77
PM	36	40	2	78	55	71	2	128	50

Figure 4.11 and Figure 4.12 present junctions that are approaching or over capacity in the 2035 baseline scenario that were under 85% V/C in the 2015 base year.

In Option 1A there are 77 additional junctions approaching or over capacity compared to 2015 in the AM and 50 in the PM. These are focussed in east Wirral around Birkenhead and the A41 corridor. Approaches to the M53 and M53 junctions become over capacity in both east and west Wirral. There are some increases in junctions over capacity around Heswall and north west Wirral. The results are similar to the baseline with some extra junctions over capacity which would be expected given the additional housing contained in Option 1A.

Figure 4.9: Junctions Over Capacity: 2035 Option 1A: AM

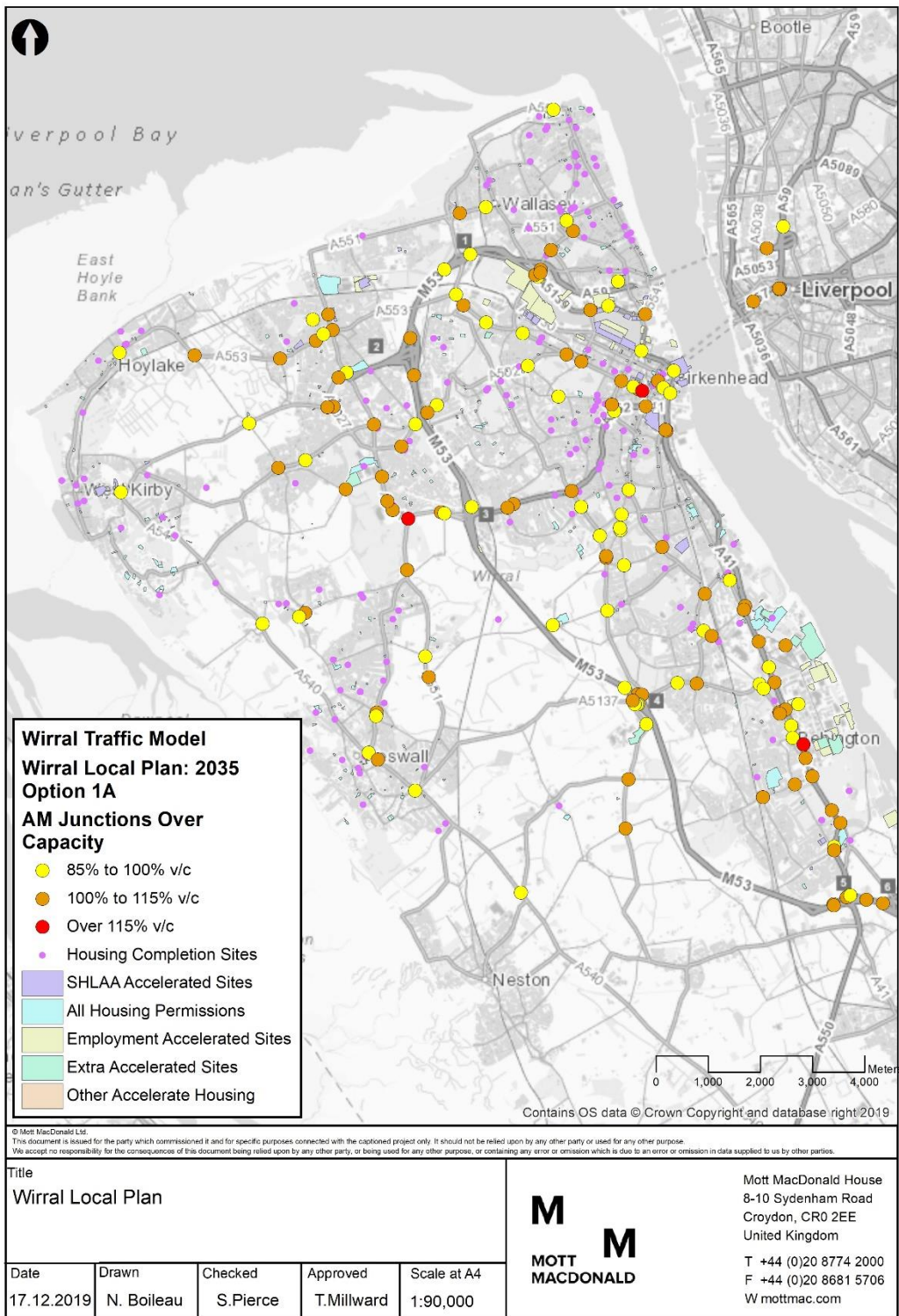


Figure 4.10: Junctions Over Capacity: 2035 Option 1A: PM

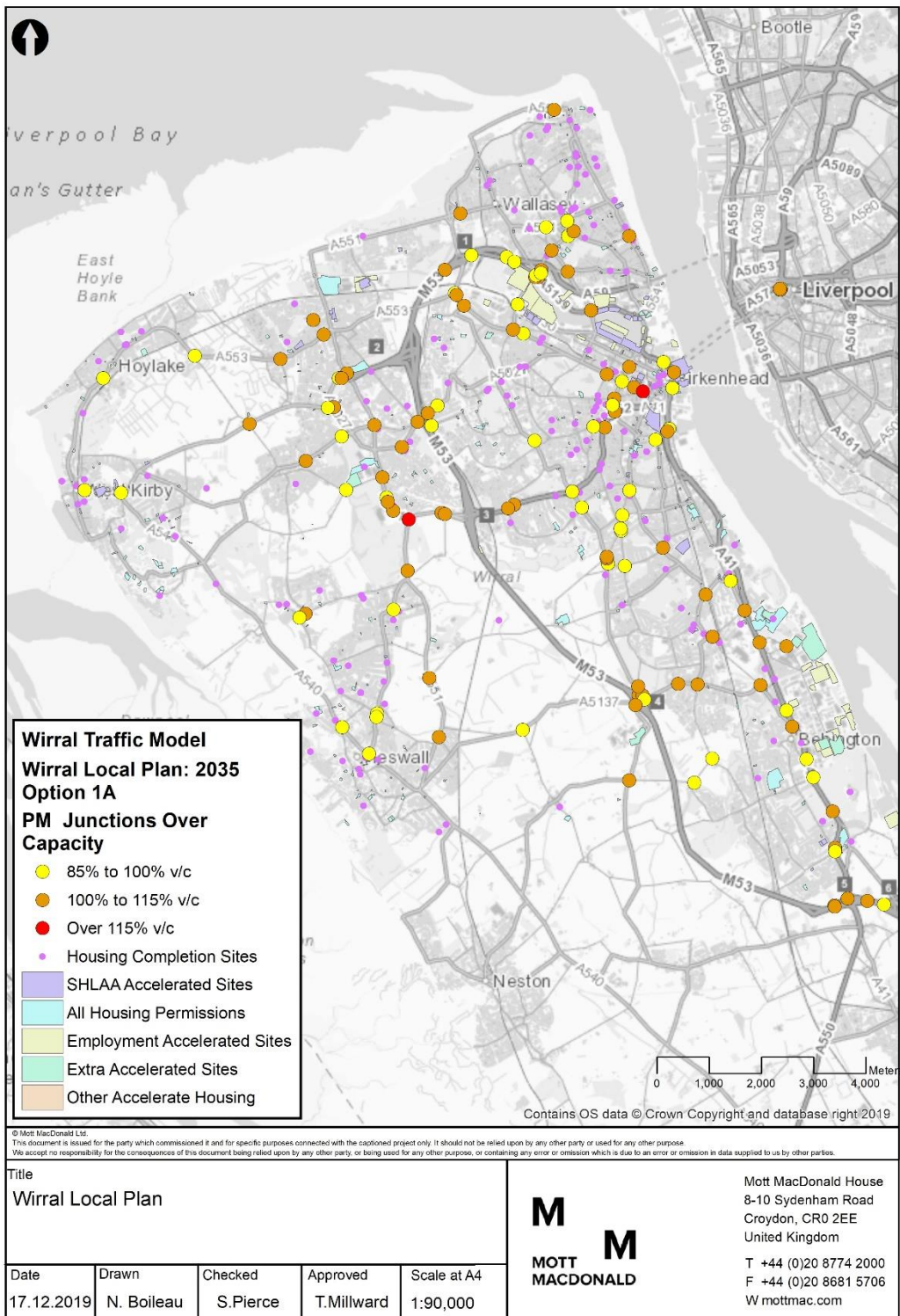


Figure 4.11: Junctions That Become Over Capacity in Option 1A: AM

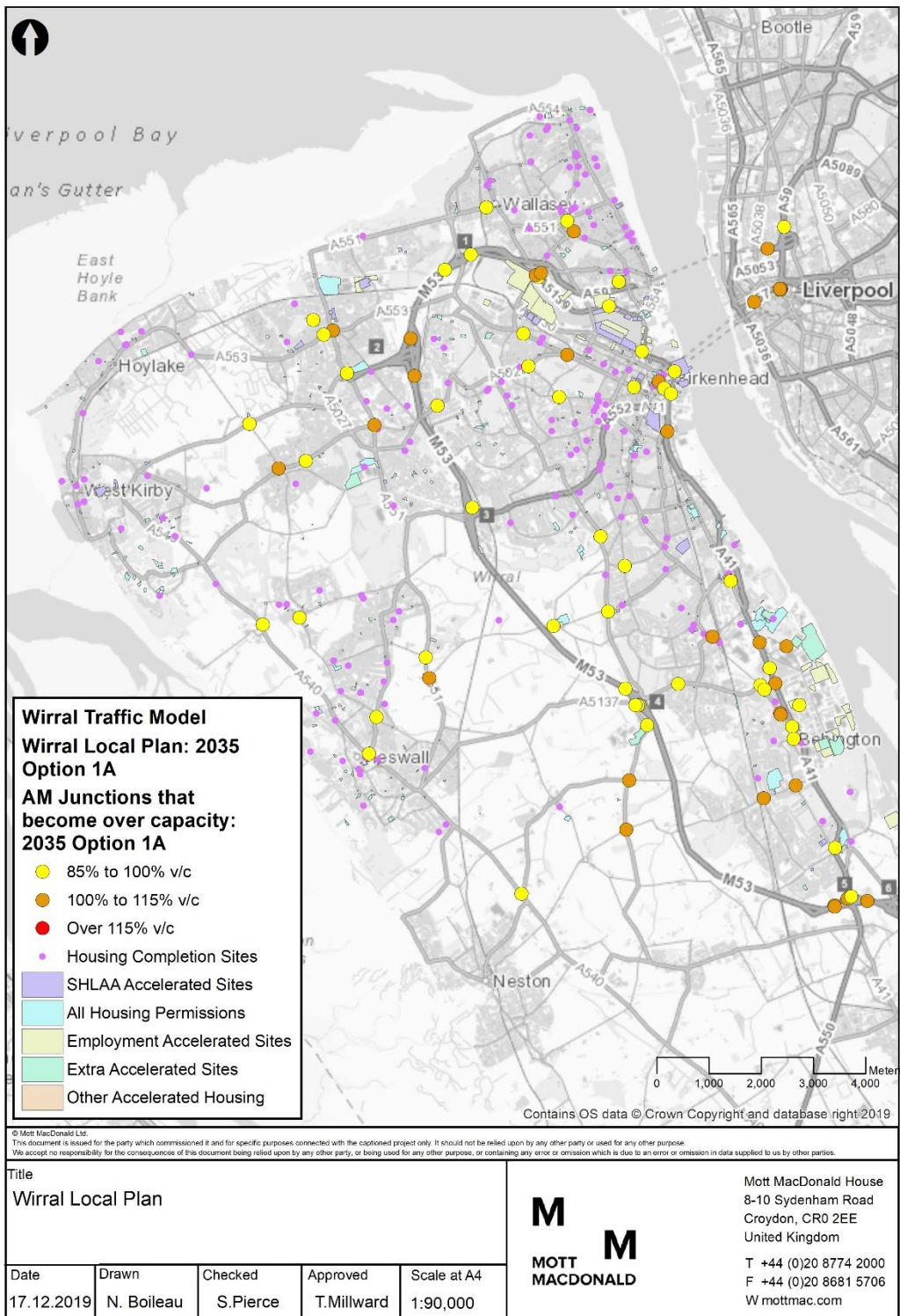
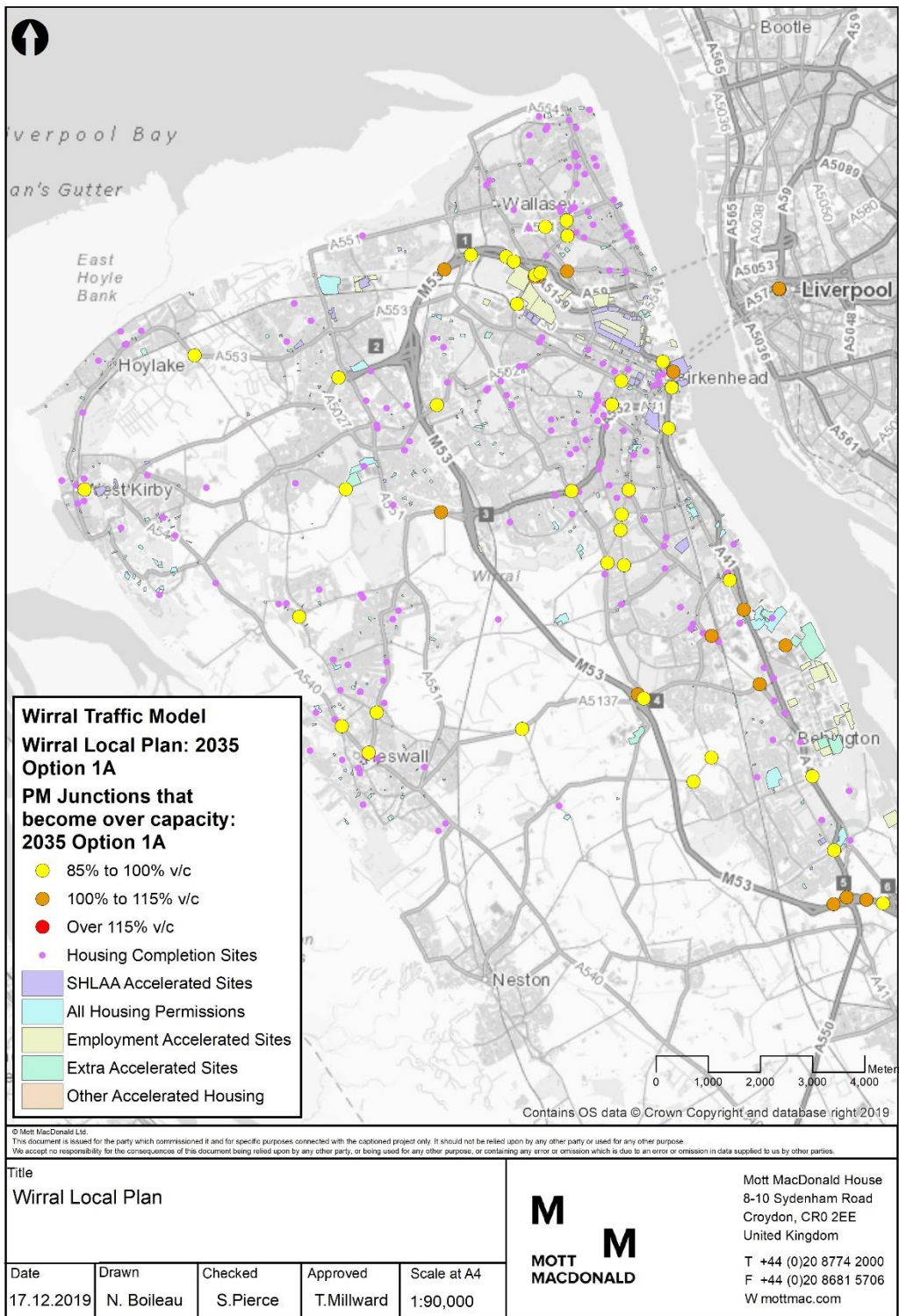


Figure 4.12: Junctions That Become Over Capacity in Option 1A: PM



4.4 Option 2A Green Belt Dispersed Sites Results

This section sets out the results of the highway assessment for Option 2A in terms of:

- Convergence statistics
- Network Statistics
- Flow plots
- Junctions over capacity

4.4.1 Convergence Statistics

The convergence statistics show the model reaches suitable convergence levels:

- The “%FLOWS” values are higher than 99% in the final four assignment loops for all models
- “%GAP” values for 2035 of 0.026 and 0.024 have been achieved for the AM and PM models respectively.

4.4.2 Network Statistics

Table 4.6 presents the overall network statistics for the baseline model. The modelling shows a 24% increase in traffic between 2015 and 2035 with corresponding increases in queues and travel time. The average speed across the network in the AM peak has decreased from 40 kph in 2015 to 37 kph in 2035, the equivalent figures for PM are 39 kph to 37 kph.

Table 4.6: Network Statistics – Option 2A

Statistics	Base Year		Future Year		Difference		Percentage Difference	
	AM	PM	AM	PM	AM	PM	AM	PM
Transient Queues (PCU HRS/HR)	1,565	1,553	2,221	2,075	656	522	42%	34%
Over-Capacity Queues (PCU HRS/HR)	221	577	1,782	1,579	1,561	1,002	706%	174%
Link Cruise Time (PCU HRS/HR)	10,057	9,619	12,486	11,582	2,429	1,964	24%	20%
Total Travel Time (PCU HRS/HR)	11,844	11,748	16,489	15,236	4,646	3,488	39%	30%
Travel Distance (PCU KMS/HR)	477,314	459,822	601,185	564,544	123,871	104,722	26%	23%
Average Speed (KPH)	40	39	37	37	-4	-2	-9%	-5%
Total Trips Loaded (PCU)	481,832	487,182	599,201	598,956	117,368	111,773	24%	23%

4.4.3 Flow Volumes

Figure 4.13 to Figure 4.14 present flow plots for AM and PM respectively.

The Wirral highway network is clearly depicted within the three figures in which the M53 forms the primary spine of the network, supporting traffic flow volumes over 2,000 PCU in all periods.

The A road network accommodates a large volume of flows and support access to various destinations in Wirral such as the A41 for key employment sites along the A41 Corridor, A553 for access to West Kirby and A552 for access to Birkenhead. All of which accommodate over 750 PCU in all periods. The A540 and A550 also accommodate large volumes of traffic flow exceeding 750 PCU in all periods, recognising the importance of these routes alongside the M53 as the key routes in the south for connectivity to Cheshire West and Chester. The introduction of the dispersed sites does not materially change the banding of flows compared to the baseline or Option 1A, however when looked at in greater detail there are increases in flow in the vicinity of the sites.

Figure 4.13: Actual Flow (PCUs): 2035 Option 2A Scenario: AM

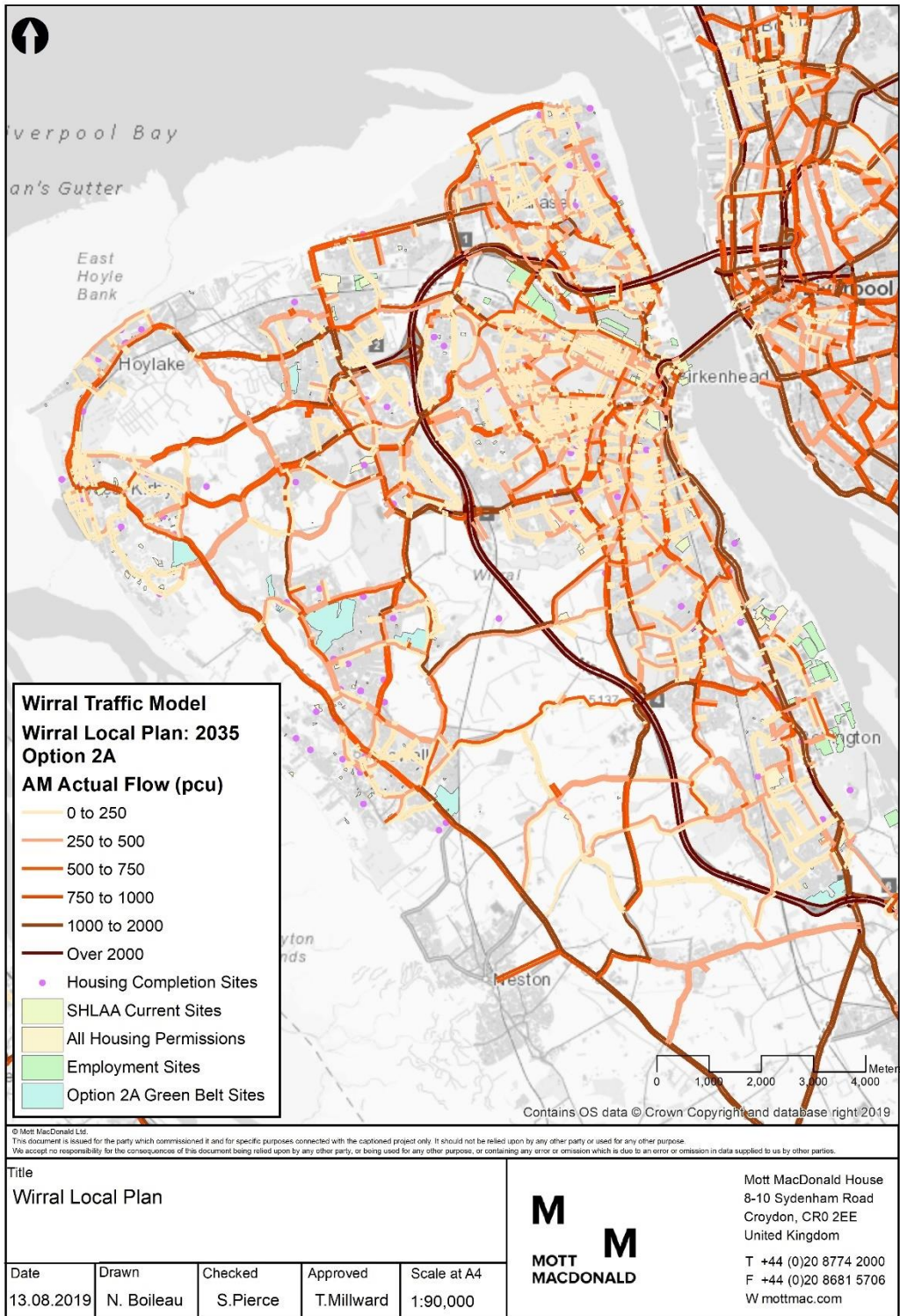
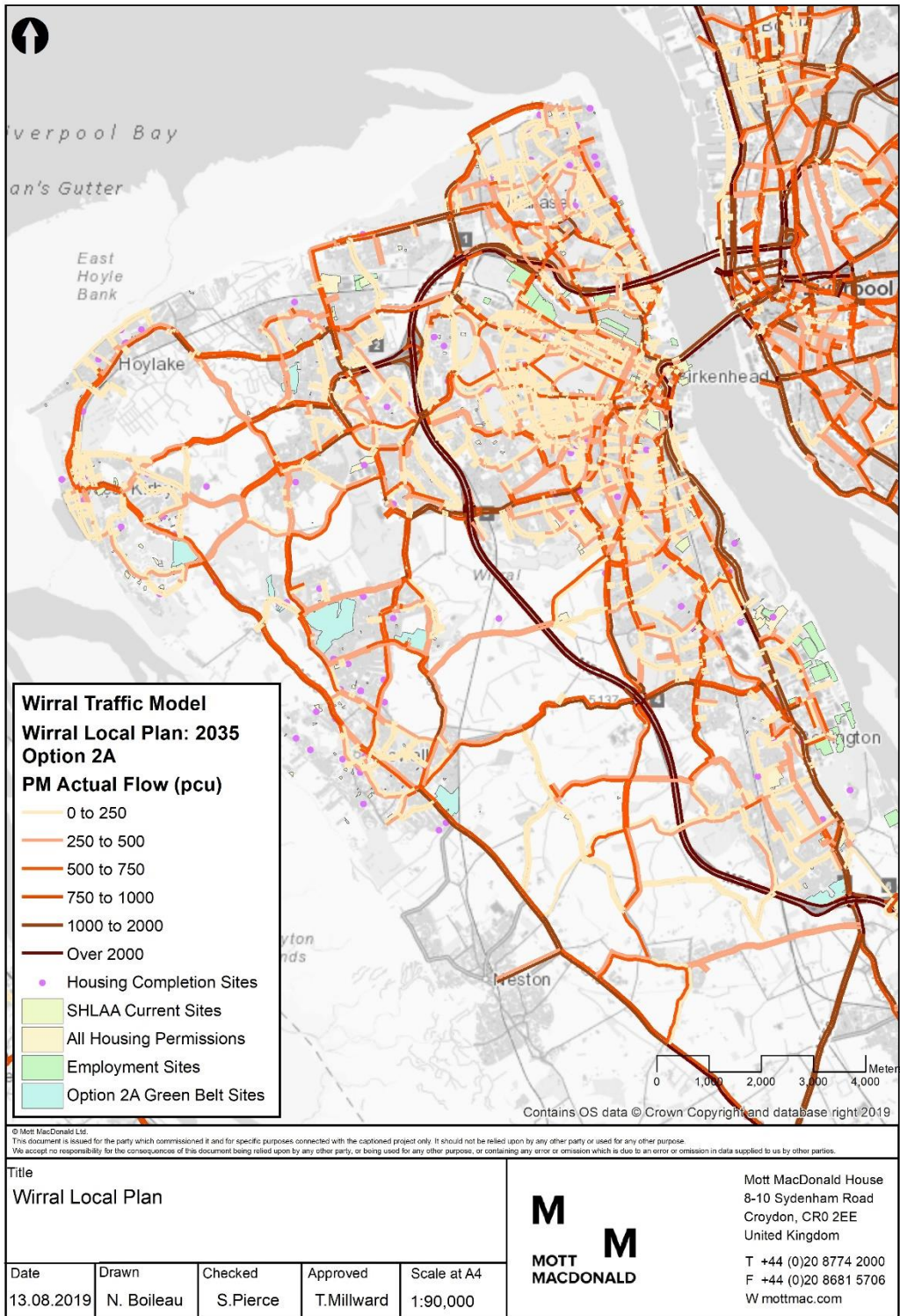


Figure 4.14: Actual Flow (PCUs): 2035 Option 2A Scenario: PM



4.4.4 Junctions over Capacity

Figure 4.15 and Figure 4.16 present the junctions approaching or over capacity in the 2035 Option 2A scenario in the AM and PM respectively.

There are 195 junctions that are over capacity in one or more time periods in 2035.

There are 9 junctions in the AM peak with a V/C of over 115%, in Barnston, Arrowe Park junction, junction 4 of the M53, approaches to junction 2 and junction 4 of the M53 and on the A41 and Birkenhead Town Centre. The highly over capacity junctions are concentrated in west Wirral. For the PM peak, one junction records over 115% capacity, at Birkenhead Town Centre.

In both time periods several junctions along the A41 corridor operate at over 85% capacity, with several also over 100%, such as to the south at the junction with the M53, and to the north in Birkenhead town centre. Junctions on the approaches to the M53 in north west Wirral are over capacity and there are a high number of junctions over capacity in Heswall and Barnston.

Table 4.7 summarises the number of junctions over capacity.

Table 4.7: Option 2A Junctions over Capacity by Time Period

Time Period	Base Year			Total	Option 2A			Option 2A – Base Year	
	85% to 100%	100% to 115%	> 115%		85% to 100%	100% to 115%	> 115%		Total
AM	31	40	0	71	72	84	9	165	94
PM	36	40	2	78	54	74	1	129	51

Figure 4.17 and Figure 4.18 present junctions that are approaching or over capacity in the 2035 baseline scenario that were under 85% V/C in the 2015 base year.

In Option 2A there are 94 additional junctions approaching or over capacity compared to 2015 in the AM and 51 in the PM. There are increases in in east Wirral around Birkenhead and the A41 corridor. Approaches to the M53 and M53 junctions become over capacity in both east and west Wirral. In Option 2A a number of junctions in west Wirral become over capacity especially around Heswall, Barnston and Greasby.

Figure 4.15: Junctions Over Capacity: 2035 Option 2A: AM

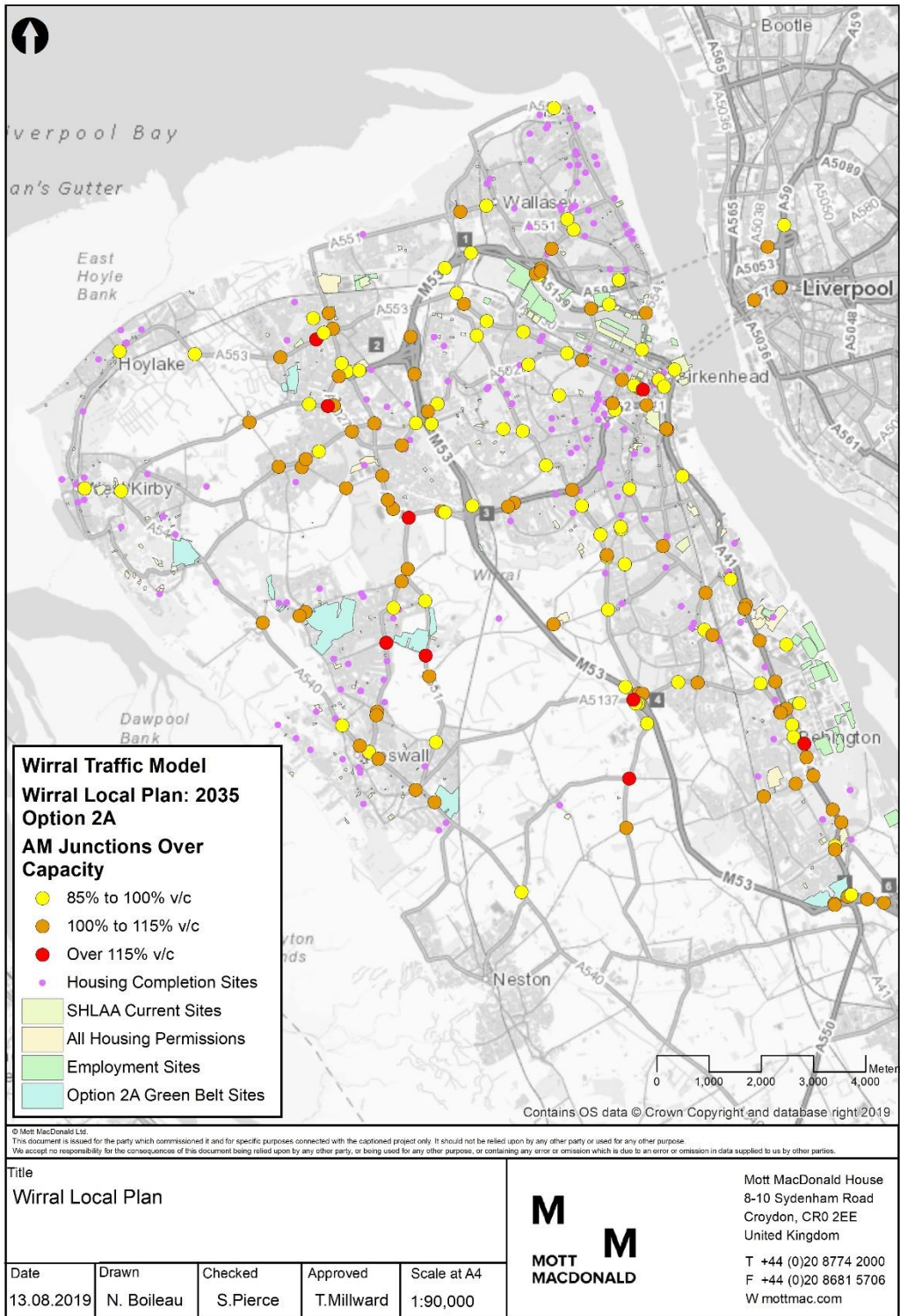


Figure 4.16: Junctions Over Capacity: 2035 Option 2A: PM

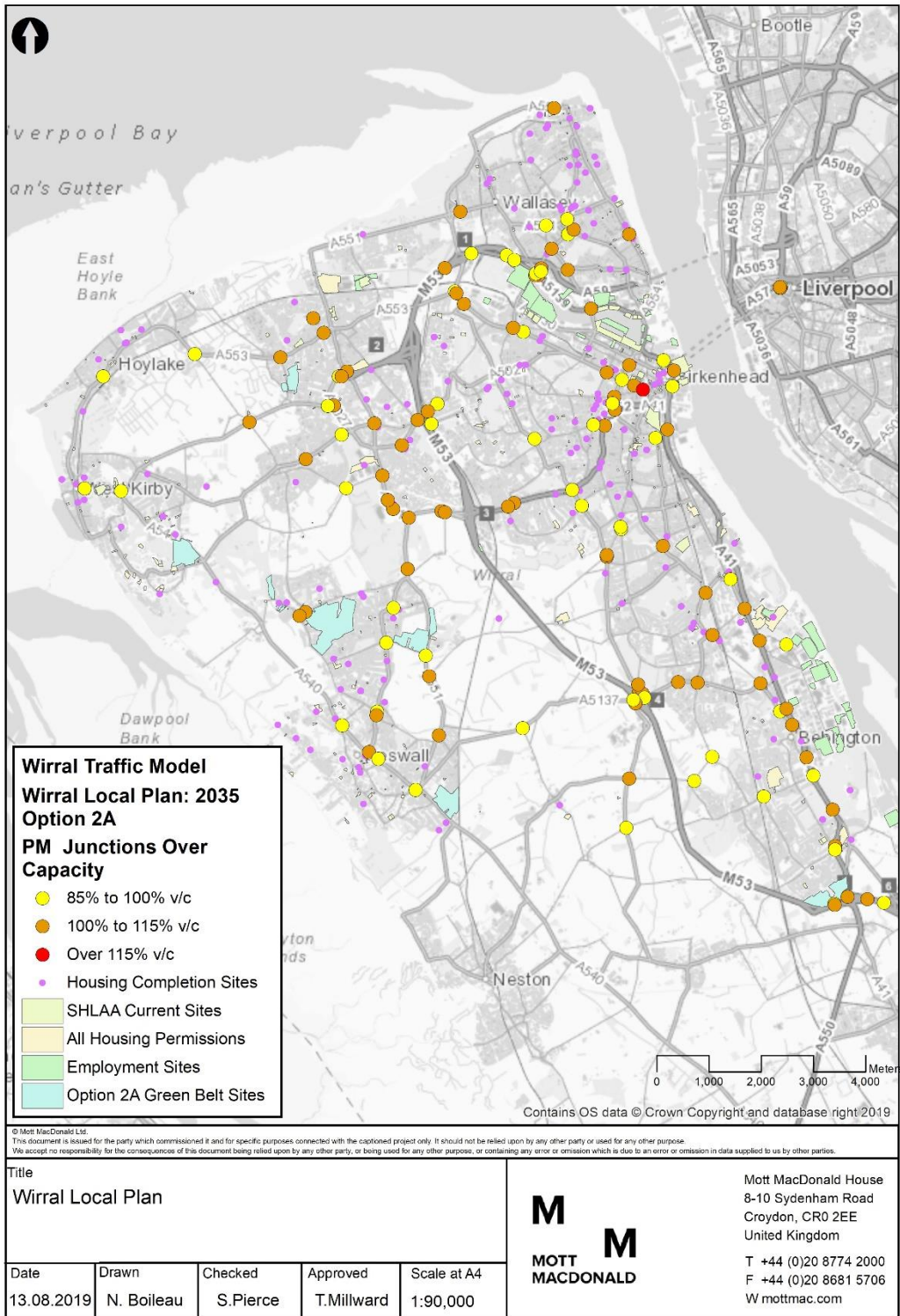


Figure 4.17: Junctions That Become Over Capacity in Option 2A: AM

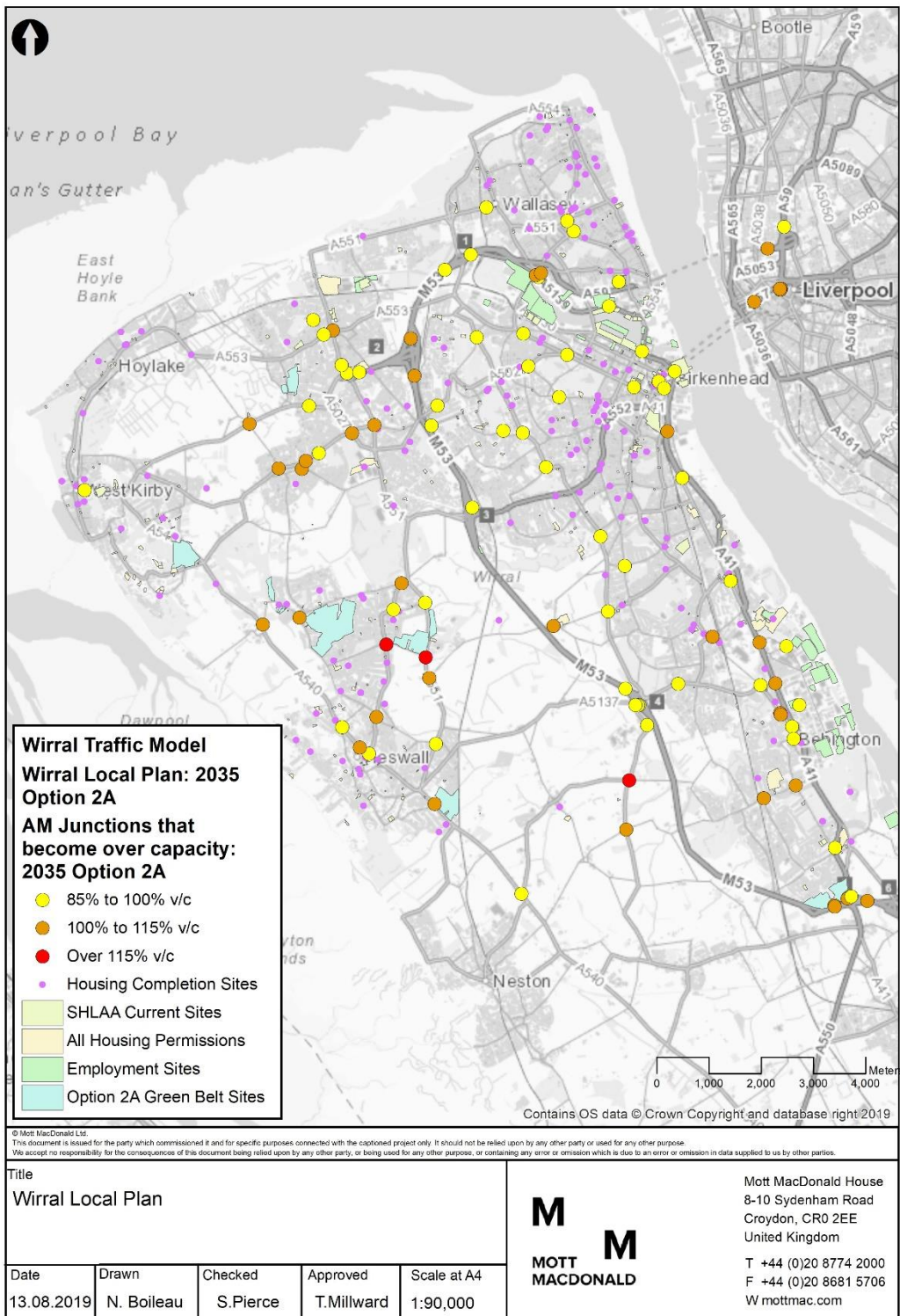
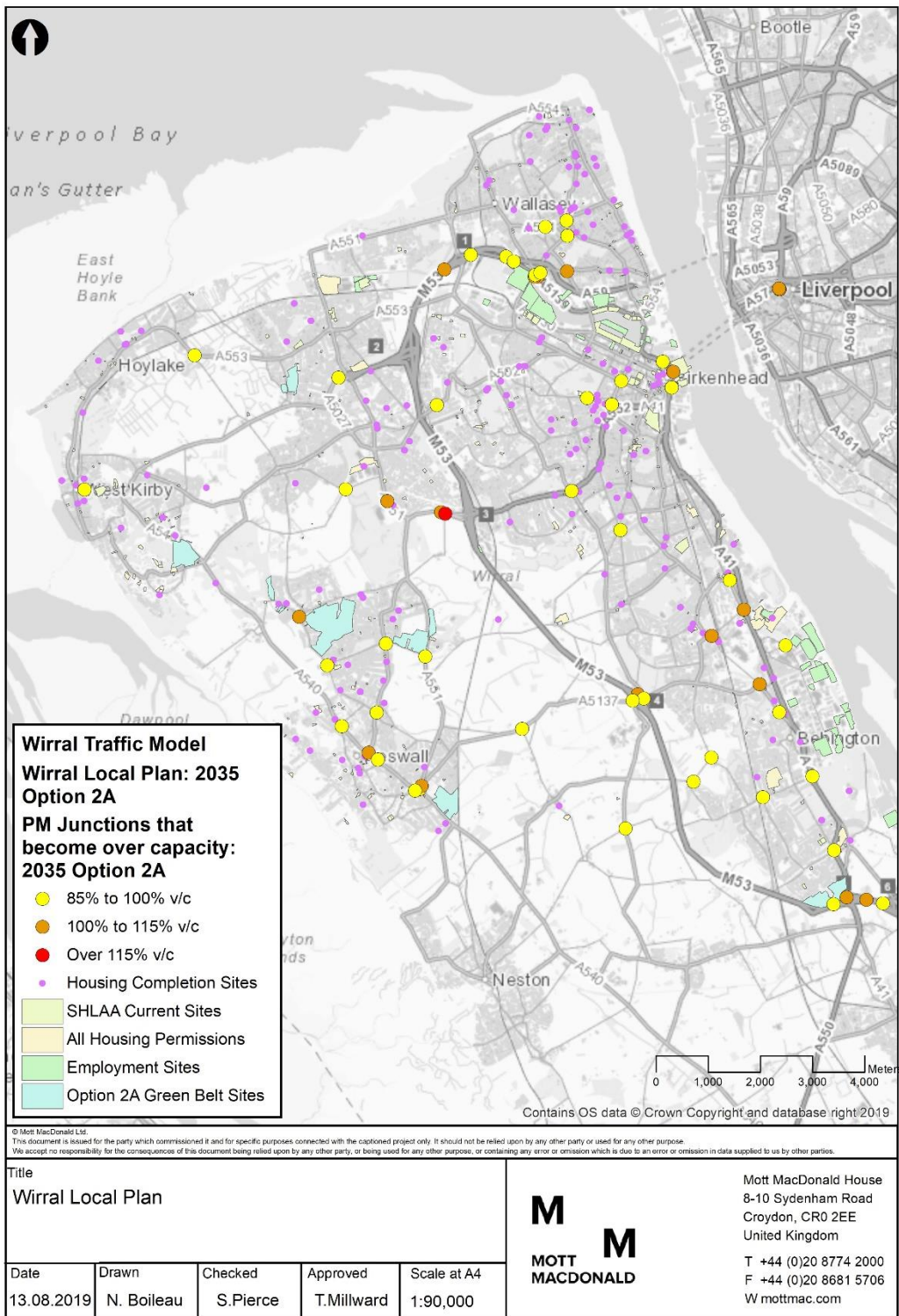


Figure 4.18: Junctions That Become Over Capacity in Option 2A: PM



4.5 Option 2B Green Belt SUE Results

This section sets out the results of the highway assessment for Option 2B in terms of:

- Convergence statistics
- Network Statistics
- Flow plots
- Junctions over capacity

4.5.1 Convergence Statistics

The convergence statistics show the model reaches suitable convergence levels:

- The “%FLOWS” values are higher than 99% in the final four assignment loops for all models
- “%GAP” values for 2035 of 0.019 and 0.016 have been achieved for the AM and PM models respectively.

4.5.2 Network Statistics

Table 4.8 presents the overall network statistics for Option 2B. The modelling shows a 24% increase in traffic between 2015 and 2035 with corresponding increases in queues and travel time. The average speed across the network in the AM peak has decreased from 40 kph in 2015 to 37 kph in 2035, the equivalent figures for PM are 39 kph to 38 kph.

Table 4.8: Network Statistics – Option 2B

Statistics	Base Year		Future Year		Difference		Percentage Difference	
	AM	PM	AM	PM	AM	PM	AM	PM
Transient Queues (PCU HRS/HR)	1,565	1,553	2,167	2,047	602	494	38%	32%
Over-Capacity Queues (PCU HRS/HR)	221	577	1,797	1,398	1,576	820	713%	142%
Link Cruise Time (PCU HRS/HR)	10,057	9,619	12,356	11,487	2,299	1,868	23%	19%
Total Travel Time (PCU HRS/HR)	11,844	11,748	16,320	14,931	4,476	3,183	38%	27%
Travel Distance (PCU KMS/HR)	477,314	459,822	596,348	560,589	119,035	100,767	25%	22%
Average Speed (KPH)	40	39	37	38	-4	-2	-9%	-4%
Total Trips Loaded (PCU)	481,832	487,182	598,944	598,401	117,112	111,219	24%	23%

4.5.3 Flow Volumes

Figure 4.19 and Figure 4.20 present flow plots for AM and PM respectively.

The Wirral highway network is clearly depicted within the three figures in which the M53 forms the primary spine of the network, supporting traffic flow volumes over 2,000 PCU in all periods.

The A road network accommodates a large volume of flows and support access to various destinations in Wirral such as the A41 for key employment sites along the A41 Corridor, A553 for access to West Kirby and A552 for access to Birkenhead. All of which accommodate over 750 PCU in all periods. The A540 and A550 also accommodate large volumes of traffic flow exceeding 750 PCU in all periods, recognising the importance of these routes alongside the M53 as the key routes in the south for connectivity to Cheshire West and Chester. The introduction of the SUE does not materially change the banding of flows compared to the baseline or Option 1A, however when looked at in greater detail there are increases in flow in the vicinity of the sites.

Figure 4.19: Actual Flow (PCUs): 2035 Option 2B: AM

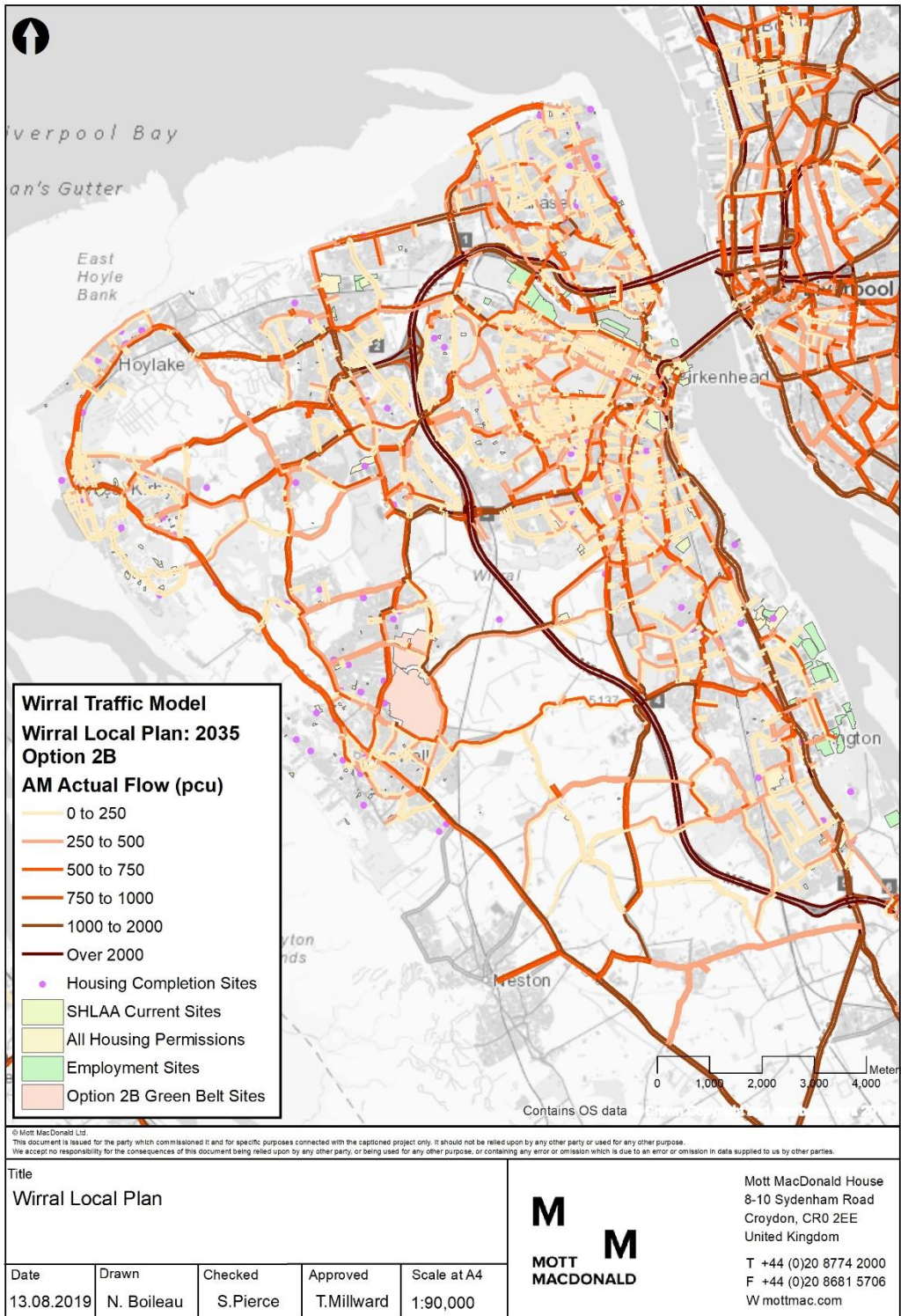
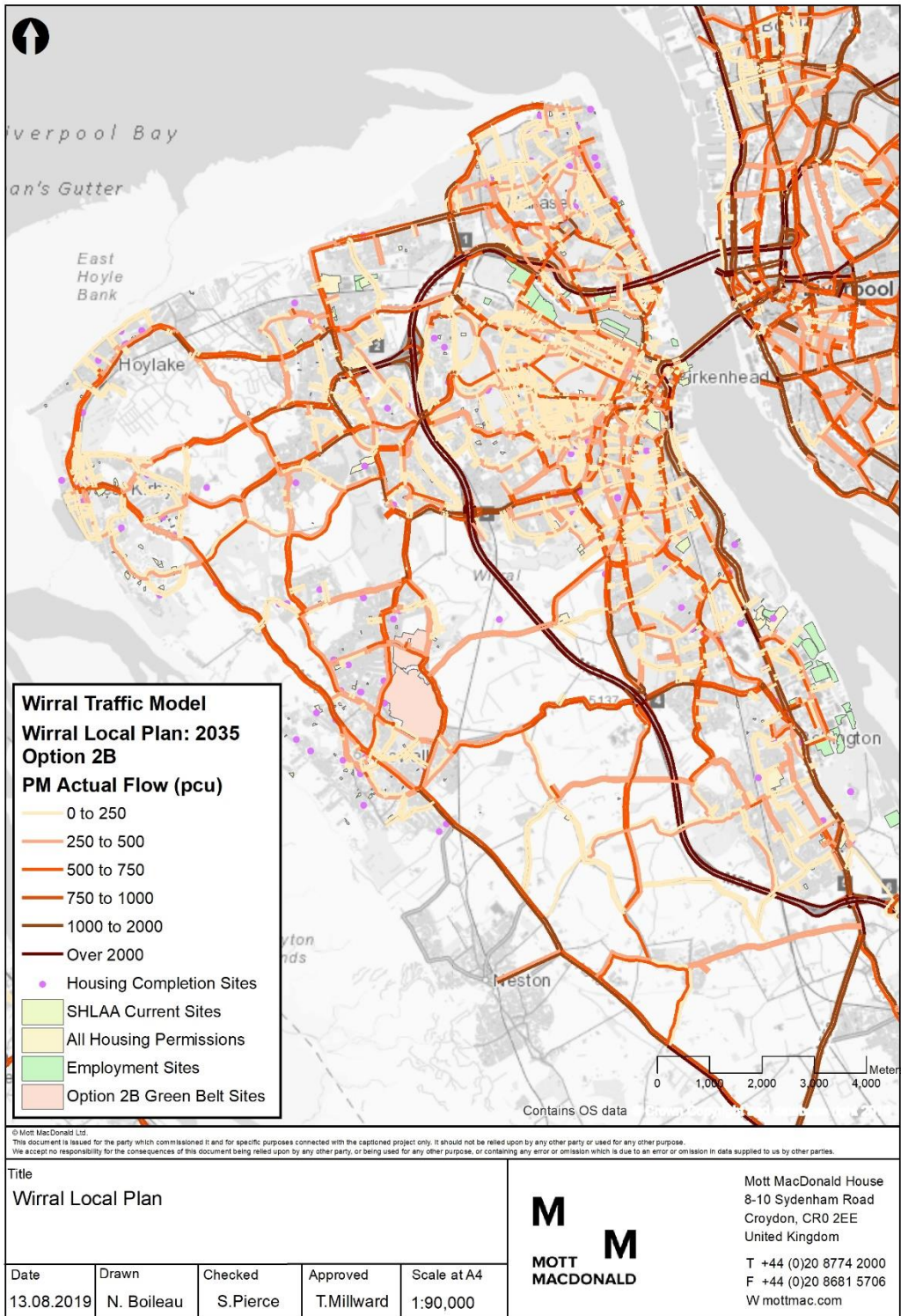


Figure 4.20: Actual Flow (PCUs): 2035 Option 2B: PM



4.5.4 Junctions over Capacity

Figure 4.21 and Figure 4.22 present the junctions approaching or over capacity in Option 2B in the AM and PM respectively.

There are 196 junctions that are over capacity in one or more time periods in 2035.

There are 9 junctions in the AM peak with a V/C of over 115%, these are focussed on the Barnston/Heswall area with the other junctions being located at Arrowse Park junction, junction 4 of the M53, on the A41 at Bebington and Birkenhead Town Centre. For the PM peak, two junctions record over 115% capacity, in Birkenhead Town Centre.

In both time periods several junctions along the A41 corridor operate at over 85% capacity, with several also over 100%, such as to the south at the junction with the M53, and to the north in Birkenhead town centre. Junctions on the approaches to the M53 in north west Wirral are over capacity and there are a high number of junctions over capacity in Heswall and Barnston.

Table 4.9 summarises the number of junctions over capacity.

Table 4.9: Option 2B Junctions over Capacity by Time Period

Time Period	Base Year			Total	Option 2B			Option 2B – Base Year	
	85% to 100%	100% to 115%	> 115%		85% to 100%	100% to 115%	> 115%		Total
AM	31	40	0	71	65	86	9	160	89
PM	36	40	2	78	58	77	2	137	59

Figure 4.23 and Figure 4.24 present junctions that are approaching or over capacity in the 2035 baseline scenario that were under 85% V/C in the 2015 base year.

In Option 2B there are 89 additional junctions approaching or over capacity compared to 2015 in the AM and 59 in the PM. There are increases in in east Wirral around Birkenhead and the A41 corridor. Approaches to the M53 and M53 junctions become over capacity in both east and west Wirral. In Option 2B a number of junctions in west Wirral become over capacity especially around Heswall, Barnston and Greasby. Around Heswall in the vicinity of the SUE site three junctions have a V/C of over 115% in the AM.

Figure 4.21: Junctions Over Capacity: 2035 Option 2B: AM

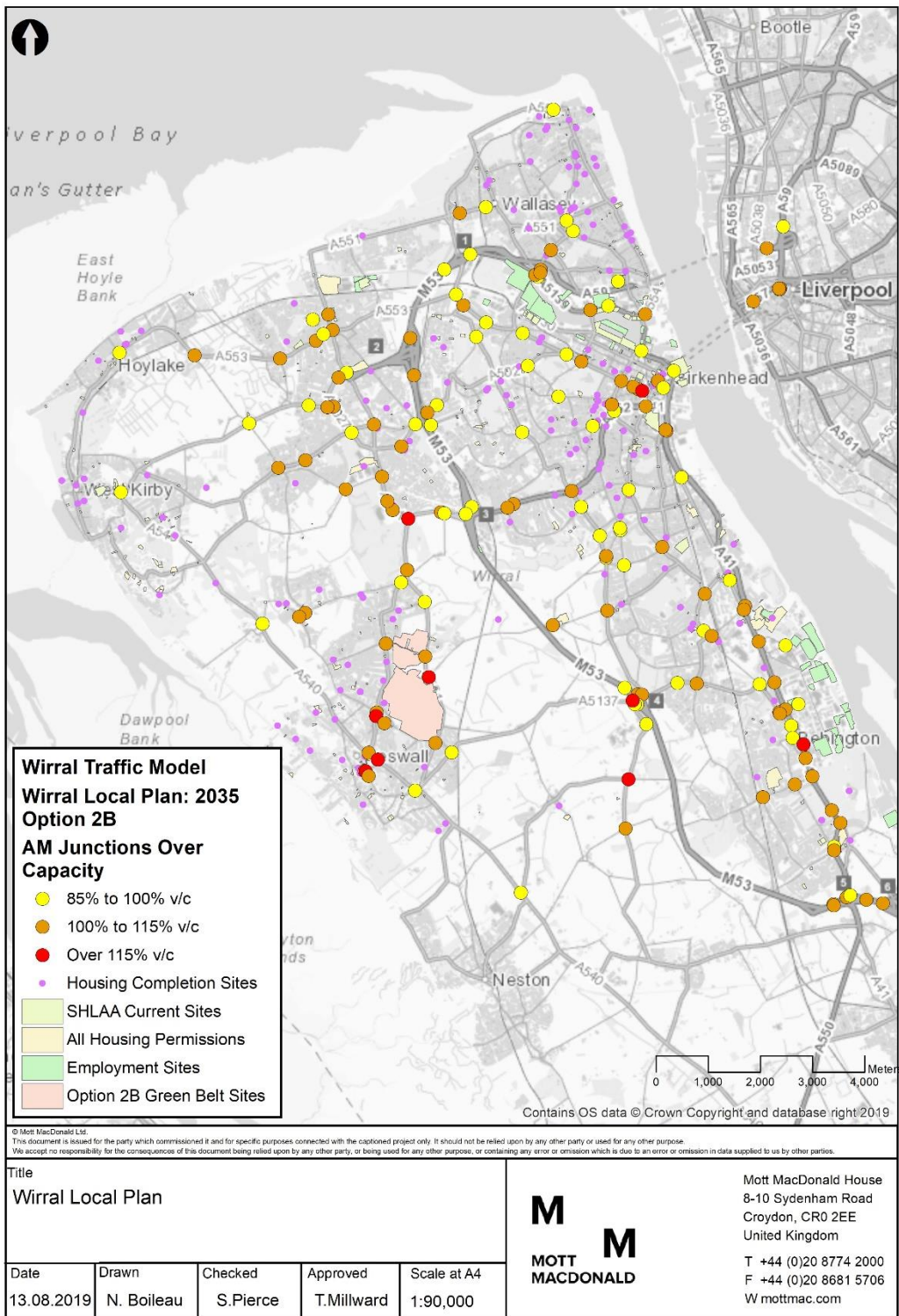


Figure 4.22: Junctions Over Capacity: 2035 Option 2B: PM

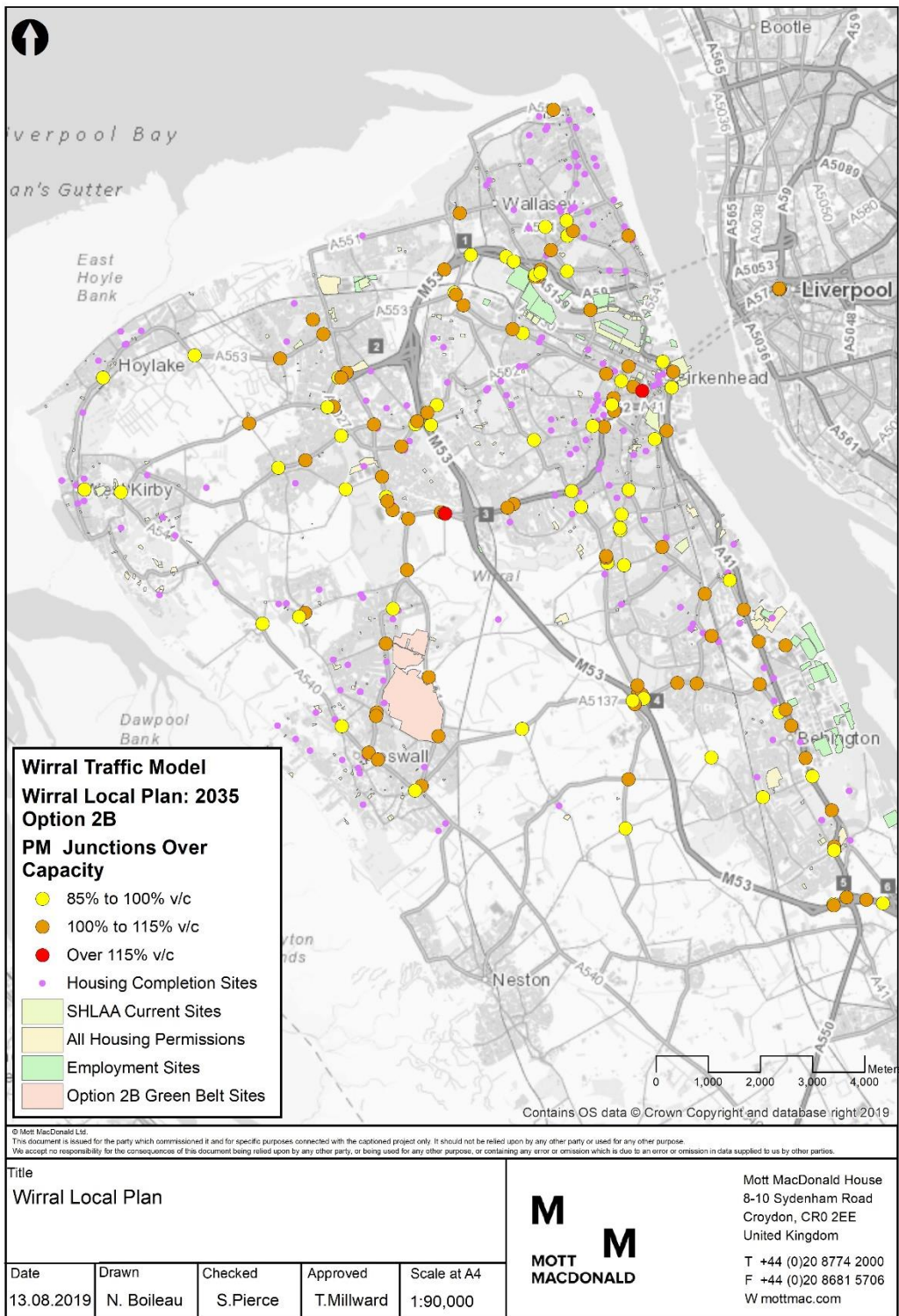


Figure 4.23: Junctions That Become Over Capacity in Option 2B: AM

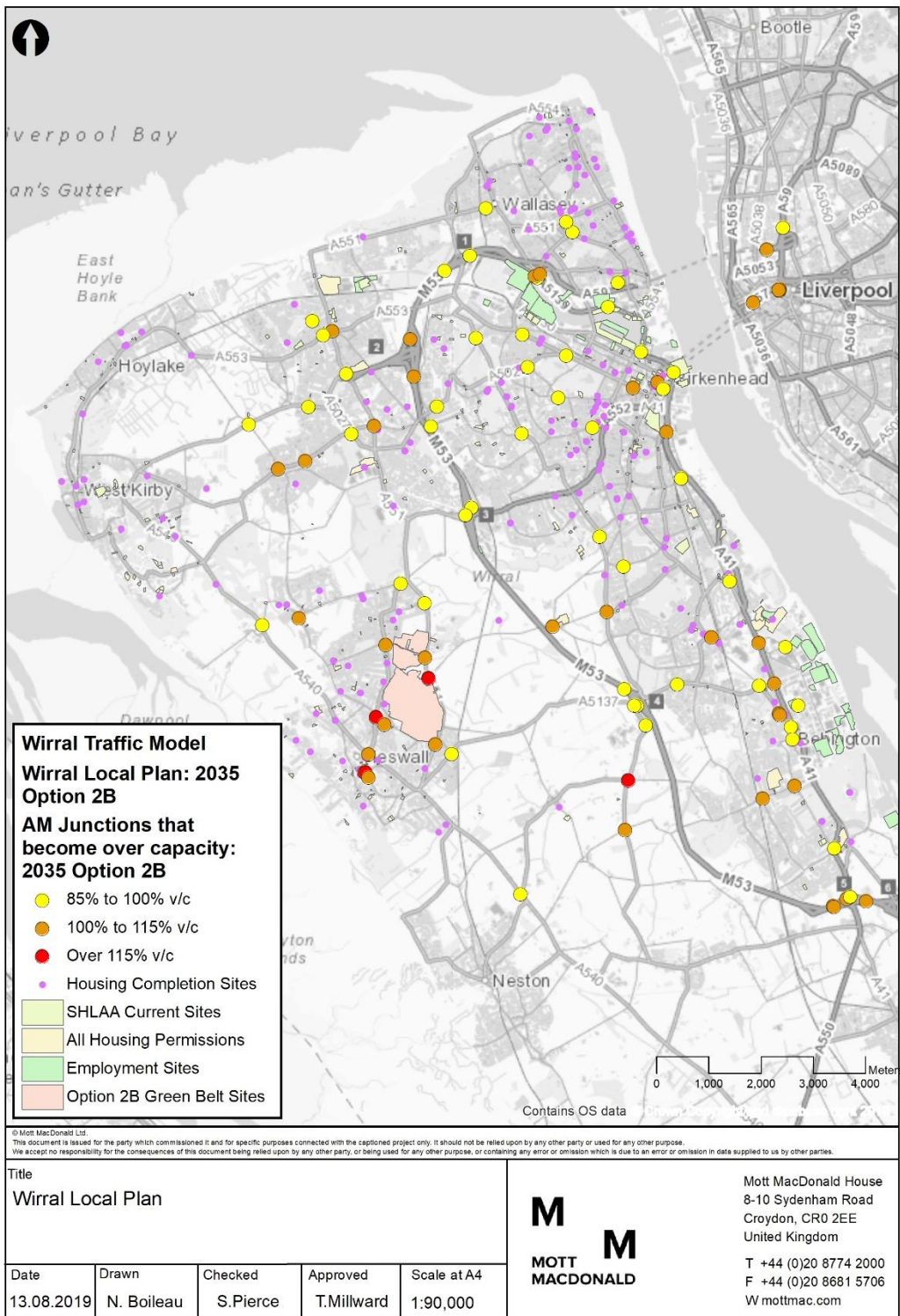
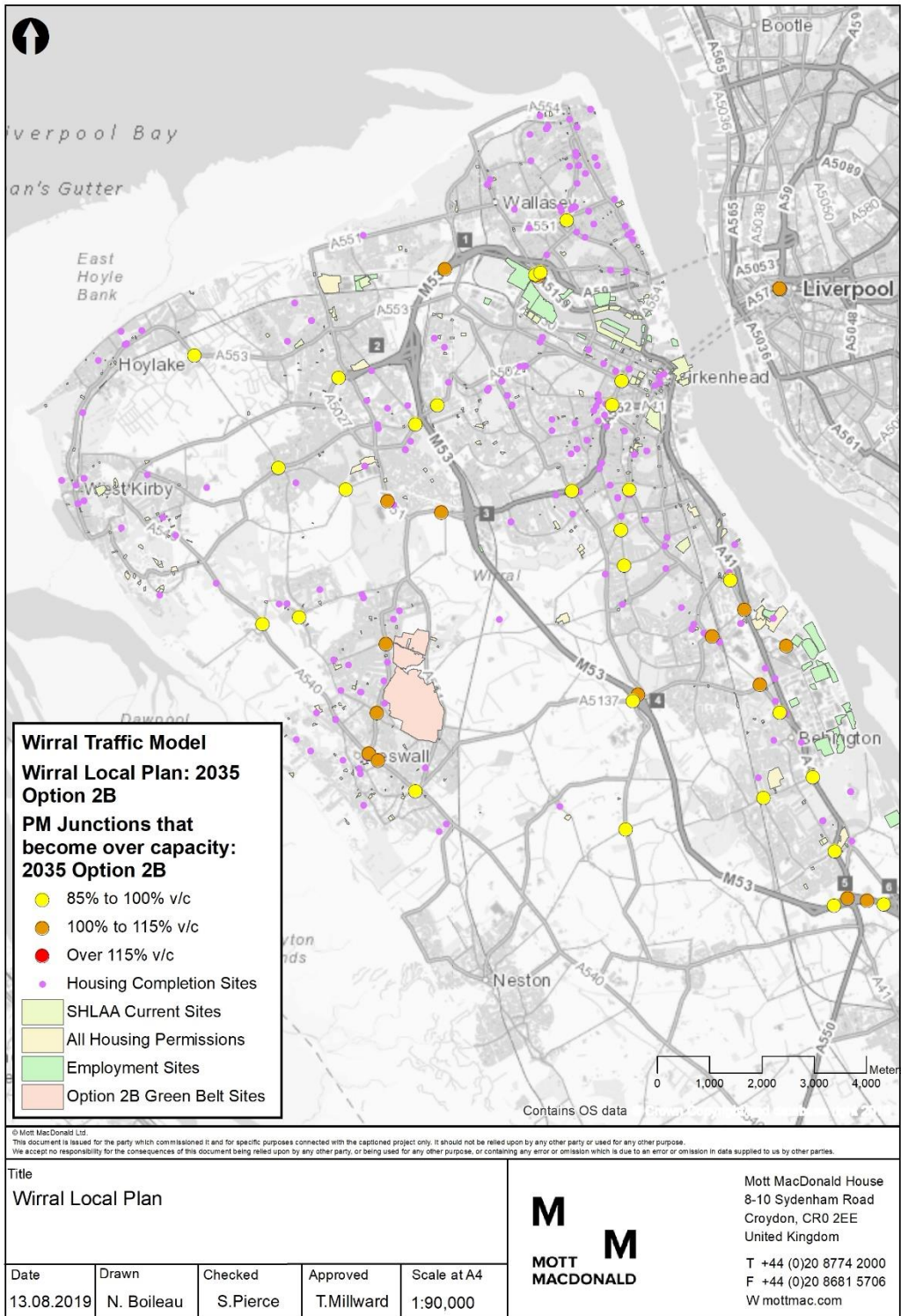


Figure 4.24: Junctions That Become Over Capacity in Option 2B: PM



5 Summary

Wirral Council has appointed Mott MacDonald to conduct modelling assessments of the Wirral Local Plan strategic spatial options, comprising four scenarios. These scenarios have been developed from committed planning applications, Strategic Housing Land Availability Assessments (SHLAA), completions from 2015-present day, windfall housing allocations, demolition numbers, green belt housing and employment supply sites, using data provided by Wirral Council. The output of this study is a determination of the effect of these forecasts on the existing highway network.

The scope of work comprises developing future year highway forecasts that take into account traffic associated with proposed housing and employment scenarios together with any committed network updates.

The model scenarios that have been assessed are defined below:

- Baseline 2035.
- Option 1A 2035 – Urban Intensification.
- Option 2A 2035 – Green Belt – Dispersed sites.
- Option 2B 2035 – Green Belt – Sustainable Urban Extension sites.

Model forecasts for the defined scenarios have been prepared for the following time periods:

- AM (08:00 - 09:00).
- PM (17:00 - 18:00).

Table 5.1 summarises the number of junctions with a volume over capacity (V/C) of over 85% in each scenario. A V/C of over 85% indicates that a junction will be experiencing congestion. Table 5.2 shows the number of additional junctions with a V/C greater than 85% compared to the base year.

The modelling has not considered any onsite or offsite junction improvements or mitigation measures for any of the sites; it represents the situation on the current network plus committed highway schemes.

Table 5.1: Number of Junctions Approaching or Over Capacity by Scenario (number of junctions)

	Base Year	Baseline	Option 1A	Option 2A	Option 2B
AM	71	143	148	165	160
PM	78	124	128	129	137

Table 5.2: Additional Junctions Approaching or Over Capacity Compared to the Base Year (number of junctions)

	Difference Baseline - Base Year	Difference Option 1A - Base Year	Difference Option 2A - Base Year	Difference Option 2B - Base Year
AM	72	77	94	89
PM	46	50	51	59

The modelling shows:

- In the baseline there are 72 additional junctions approaching or over capacity compared to 2015 in the AM and 46 in the PM. These are focussed in east Wirral around Birkenhead and the A41 corridor. Approaches to the M53 and M53 junctions become over capacity in both east and west Wirral. There are some increases in junctions over capacity around Heswall and north west Wirral.
- In Option 1A there are 77 additional junctions approaching or over capacity compared to 2015 in the AM and 50 in the PM. These are focussed in east Wirral around Birkenhead and the A41 corridor. Approaches to the M53 and M53 junctions become over capacity in both east and west Wirral. There are some increases in junctions over capacity around Heswall and north west Wirral. The results are similar to the baseline with some extra junctions over capacity which would be expected given the additional housing contained in Option 1A.
- In Option 2A there are 94 additional junctions approaching or over capacity compared to 2015 in the AM and 51 in the PM. There are increases in east Wirral around Birkenhead and the A41 corridor. Approaches to the M53 and M53 junctions become over capacity in both east and west Wirral. In Option 2A a number of junctions in west Wirral become over capacity especially around Heswall, Barnston and Greasby due to the locations of the SUE sites.
- In Option 2B there are 89 additional junctions approaching or over capacity compared to 2015 in the AM and 59 in the PM. There are increases in in east Wirral around Birkenhead and the A41 corridor. Approaches to the M53 and M53 junctions become over capacity in both east and west Wirral. In Option 2B a number of junctions in west Wirral become over capacity especially around Heswall, Barnston and Greasby. Around Heswall in the vicinity of the SUE site three junctions have a V/C of over 115% in the AM.

In all scenarios the AM has a higher number of junctions over capacity than the PM. Figure 5.1 presents the number of junctions over capacity by scenario and V/C band in the AM and Figure 5.2 presents the equivalent information for the PM.

Figure 5.1: Junction V/C by Band - AM

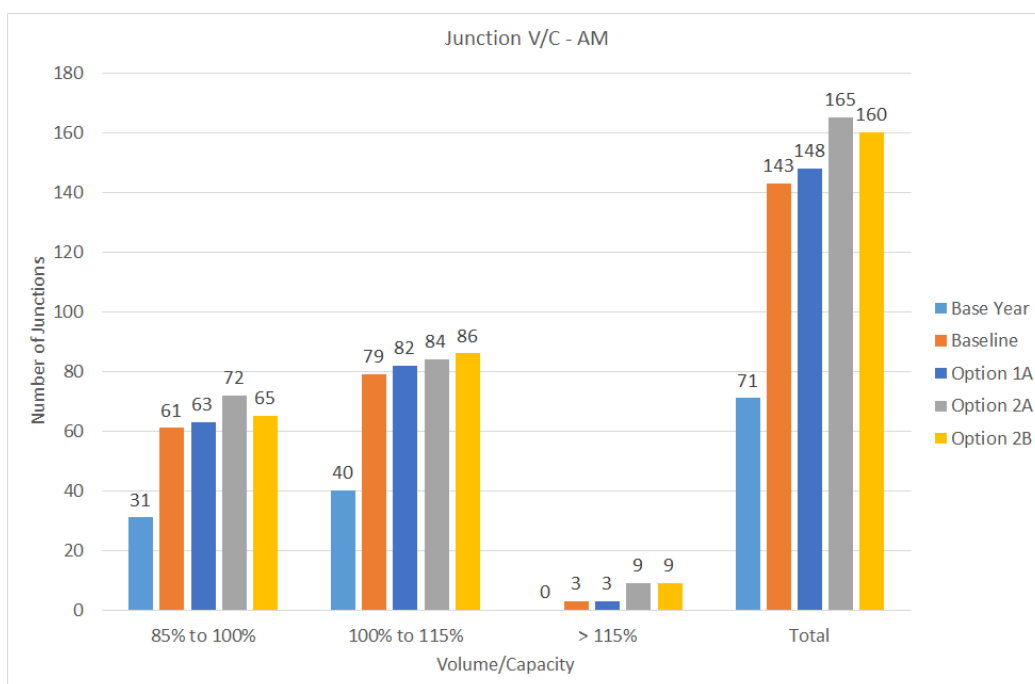
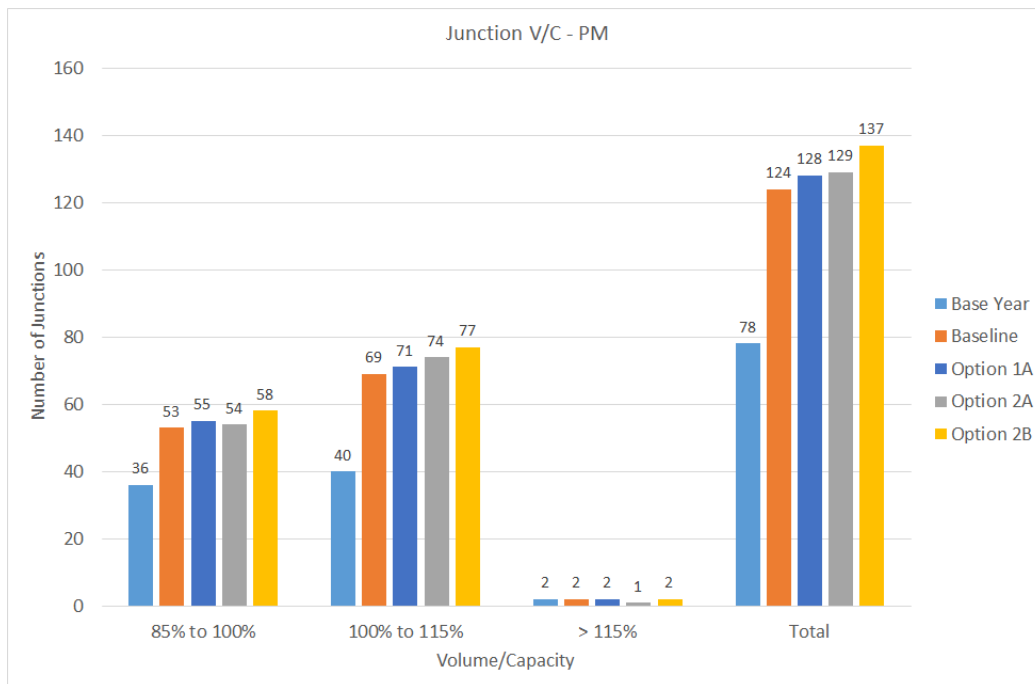


Figure 5.2: Junction V/C by Band - PM



In the AM and PM, the baseline and Option 1A have similar results with Option 1A having five additional junctions over capacity in the AM and four in the PM. These are mostly between 85-115% V/C with 3 junctions having a V/C of over 115% in the AM for both scenarios and two junctions in the PM.

Options 2A and 2B have respectively 17 and 12 additional junctions over capacity than Option 1A in the AM and 1 and 9 additional junctions over capacity in the PM. Both Option 2A and 2B have 9 junctions with a V/C of over 115% in the AM: in Option 2A these are spread over West Wirral and in Option 2B these are focussed on the Heswall/Barnston area. In the PM Option 2A has one junction and Option 2B two junctions with a V/C of greater than 115%.

The transport modelling provides a high level indication of the impact on the network of each of the scenarios. In the baseline and Option 1A this is focussed on east and north west Wirral, Option 2A additionally impacts on west Wirral and Option 2B the additional impacts are on Heswall/Barnston.

The next stages of this work include potential modelling of the mitigation measures identified as part of the transport feasibility studies and transport assessment of site allocations. This would enable the impact on the network to be understood once these mitigation measures are in place and identify areas where further mitigation may be required.