SKANSKA

# Technical Note

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| Project: | East Wisbech Broad Concept Plan | To: Belinda Pedler |
| Subject: | Development Access Point Modelling | From: Ross Jones |
| Date: | 10/01/2018 | cc: Wendy Otter / Richard Jones |

## Introduction

Skanska have produced a high-level spreadsheet traffic model of the proposed East Wisbech Broad Concept Plan development site in the east of Wisbech. The purpose of the model is to assess the suitability of various access point options for traffic generated by the development site.

This note aims to explain the modelling undertaken for assessing the access point options for the development site.

## Study Area

The East Wisbech Broad Concept Plan site is located on the eastern side of Wisbech, adjacent to the A47, in a mostly residential area. The main vehicular access points to the study area are located along Stow Road, Sandy Lane, Burrettgate Road and Broadend Road.

The proposed site will cover an area of 47.97 hectares consisting of 1,703 dwellings over 27 plots, and include a primary school and a district centre.

Figures 1 and 2 show the location of the proposed development site and the access point options.

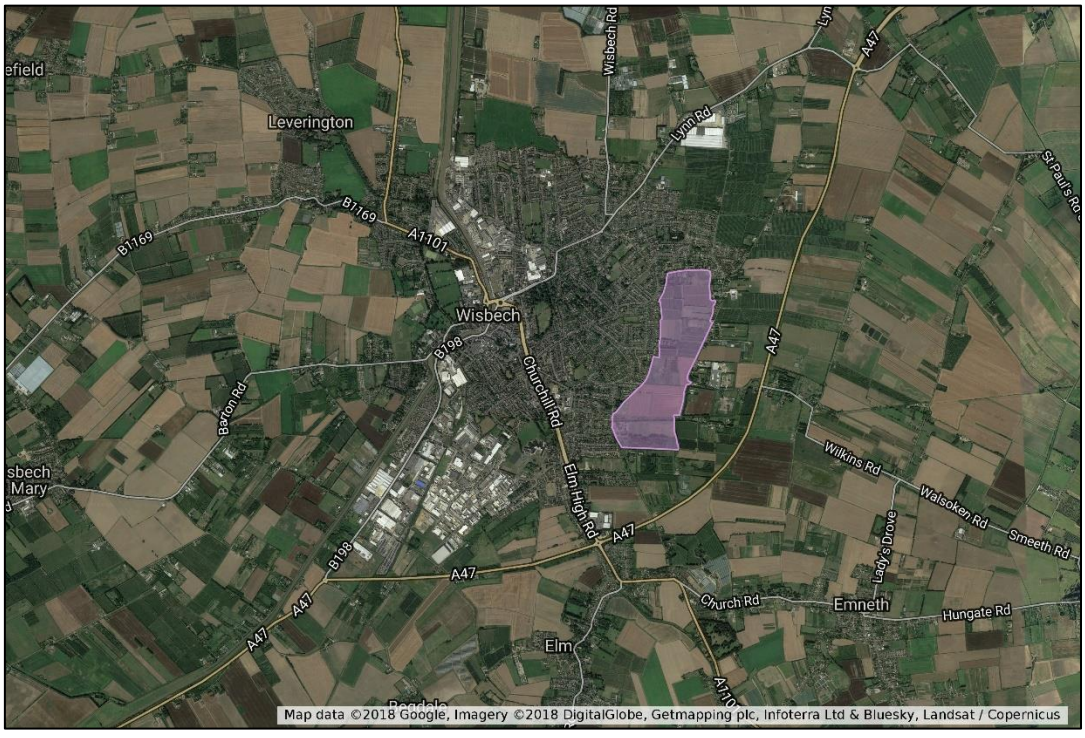


*Figure 1: Study Area Location*


*Figure 2: Location of Access Point Options*

## Methodology

A spreadsheet traffic model has been created that considers the volume of traffic generated from the development's housing and district centre and its impact on base year traffic flows along the local highway network. Base year traffic data was extracted from the 2021 Do Minimum Wisbech Area Transport Study (WATS) model for each link and turning movement and assigned within the spreadsheet model. Development traffic that was originally planned for the site within the WATS model has been removed to avoid any double-counting of development trips. The 2021 model flows were used as the base scenario in line with the development build profile identified within the WATS Model uncertainty log.

The following four "Do Something" scenarios were undertaken for each time period with each assessing the impact of development traffic on different combinations of access points:

- Do All – Impact of development if all access points are enabled;
- Scenario 1 – Impact of development if accesses 1 and 5 are removed;
- Scenario 2 – Impact of development if accesses 1, 4 and 5 are removed, and;
- Scenario 3 – Impact of development is accesses 1, 4, 5 and 6 are removed.

Accesses 1 and 5 have been removed in Scenario 1 as these are considered the least feasible by Fenland District Council. Access 4 has been removed in Scenario 2 to assess the impact of development traffic on the western links which have the highest base year flows. Access 6 has been removed in Scenario 3 to assess the impact of removing an access point on the eastern side of the development.

### Trip Generation

Housing traffic generated to and from the development in the AM (08:00 – 09:00) and PM (17:00 – 18:00) peak hours was estimated using trip rates calculated from the Cardea development in Peterborough. AM and PM peak traffic surveys were undertaken at the Cardea site in December 2017 to collect in and out traffic flows for calculating the housing trip rates for East Wisbech. Cardea was considered to be a suitable case study as it is comparable in size and land-use mix to the proposed site.

Housing trip rates for East Wisbech were calculated for the AM and PM peaks as follows:

$$Housing\ "In"\ Trip\ Rate = \frac{Cardea\ Housing\ Trips\ "In"}{Total\ \ Dwellings\ within\ Cardea}$$

$$Housing\ "Out"\ \text{Trip Rate} = \frac{Cardea\ Housing\ Trips\ "Out"}{Total\ Dwellings\ within\ Cardea}$$

Total "In" and "Out" housing trips were then estimated as follows:

$$Total\ \text{"In" Housing Trips} = \text{Housing "In"}\ Trip\ Rate\ \times Total\ Proposed\ Dwellings\ within\ East\ Wisbech$$

$$Total\ \text{"Out" Housing Trips} = \text{Housing "Out"}\ Trip\ Rate\ \times Total\ Proposed\ Dwellings\ within\ East\ Wisbech$$

District centre trips to and from the development were kept constant with Cardea as the volume of trips generated should be comparable across both sites. District centre trips were sourced from a traffic survey previously undertaken at Cardea.

Table 1 overleaf shows the trip rates used within the spreadsheet model.

**Table 1: AM and PM Trip Rates**

| | | AM | | | PM | | |
|---|---|---|---|---|---|---|---|
| Land-use | Unit | In | Out | Total | In | Out | Total |
| District Centre | Trips | 92 | 62 | 154 | 205 | 171 | 376 |
| Houses | Trips per House | 0.21 | 0.40 | 0.61 | 0.35 | 0.20 | 0.55 |

Trip Distribution

Four main "external" zones were considered when distributing development-related trips through the model network and these include:

- North-West – Trips related to the north of Wisbech and beyond;
- West and Central – Town centre and western related trips
- South-West – Cromwell Road industrial area related trips, and;
- A47-Bound (East Exit) – Trips that would access the A47 from the east of Wisbech.

The external zones represent areas that experience the largest car commuter flows[1] from locations bordering the development site. Table 2 below summarises the estimated percentage of trips expected to use each zone.

**Table 2: Percentage of Trips Using each Zone**

| Trip Distribution | |
|---|---|
| **External Zone** | **%** |
| North-West | 18% |
| West and Central | 18% |
| South-West | 15% |
| A47-Bound (East Exit) | 49% |
| **Total** | **100%** |

The generated "in" and "out" trips that would use each external zone was calculated as follows:

$$"In"\ Trips\ at\ External\ zone = Total\ "In"\ Trips\ \times \%\ Census\ Trips\ at\ Zone$$

$$"Out"\ Trips\ at\ External\ Zone = Total\ "Out"\ Trips\ \times \%\ Census\ Trips\ at\ Zone$$

The "in" and "out" trips at each external zone were loaded onto designated entry/exit points within the model and then distributed to and from each assessed access point by multiplying the "in" and "out" trips at each external zone by the percentage of dwellings expected to use each assessed access point.

The development flows were added to the base year flows along each link to find the total link flows for each scenario.

[1] *based on 2011 Census Origin-Destination Journey to Work data*

## Results

### Base Year Traffic

Base year two-way flows for junctions with an access point for the AM and PM peak hours were calculated using the model network and remain constant throughout all scenarios as shown below in Tables 3 and 4.

**Table 3: AM Peak (08:00 – 09:00) Base Year Two-Way Junction Flows**

| | AM Peak (08:00 - 09:00) | Base Year Two-way Junction Flows | | | | |
|---|---|---|---|---|---|---|
| | Accesses | Base | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | | | | | |
| | 2 | 446 | 446 | 446 | 446 | 446 |
| | 4 | 215 | 215 | 215 | 215 | 215 |
| | 5a | 215 | 215 | 215 | 215 | 215 |
| | 5 | 185 | 185 | 185 | 185 | 185 |
| East | 6 | | | | | |
| | 6a | | | | | |
| | 7 | | | | | |
| | 7a | 238 | 238 | 238 | 238 | 238 |
| | 8 | 238 | 238 | 238 | 238 | 238 |
| | **Total** | **1,537** | **1,537** | **1,537** | **1,537** | **1,537** |

**Table 4: PM Peak (17:00 – 18:00) Base Year Two-Way Junction Flows**

| | PM Peak (17:00 - 18:00) | Base Year Two-way Junction Flows | | | | |
|---|---|---|---|---|---|---|
| | Accesses | Base | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | | | | | |
| | 2 | 480 | 480 | 480 | 480 | 480 |
| | 4 | 270 | 270 | 270 | 270 | 270 |
| | 5a | 270 | 270 | 270 | 270 | 270 |
| | 5 | 197 | 197 | 197 | 197 | 197 |
| East | 6 | | | | | |
| | 6a | | | | | |
| | 7 | | | | | |
| | 7a | 262 | 262 | 262 | 262 | 262 |
| | 8 | 262 | 262 | 262 | 262 | 262 |
| | **Total** | **1,741** | **1,741** | **1,741** | **1,741** | **1,741** |

The Access 2 junction experiences the highest two-way junction flows with 446 in the AM peak and 480 in the PM peak. Two-way junction flows gradually decline as traffic travels northwards with the lowest flows experienced at the Access 5 junction. There are no base year junction flows in the AM or PM peak for Accesses 1, 6, 6a and 7 because no junctions exist in these locations on the highway network at present.

## Trip Generation and Distribution

Table 5 below shows the calculated trip distribution per access for each scenario. With all A47-bound trips exiting the development from the east of the site, the development site was split into two halves with trip distribution calculated separately for each half.

**Table 5: Trip Distribution (%) per Access Point for each Scenario**

| | | Trip Distribution (%) | | | |
|---|---|---|---|---|---|
| | Accesses | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | 38% | | | |
| | 2 | 12% | 50% | 50% | 50% |
| | 4 | 10% | 10% | | |
| | 5a | 30% | 39% | 50% | 50% |
| | 5 | 9% | | | |
| East | 6 | 2% | 2% | 2% | |
| | 6a | | | | |
| | 7 | 2% | 2% | 2% | 4% |
| | 7a | | | | |
| | 8 | 96% | 96% | 96% | 96% |
| | **Total** | **200%** | **200%** | **200%** | **200%** |

Tables 6 and 7 below show the total trips generated per access point for each scenario in the AM and PM Peak hours.

**Table 6: AM Peak (08:00 – 09:00) Trip Generation per Access Point for each Scenario**

| | AM Peak (08:00 - 09:00) | Total Trips Generated per Access (In + Out Flows) | | | |
|---|---|---|---|---|---|
| | Accesses | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | 234 | | | |
| | 2 | 74 | 308 | 308 | 308 |
| | 4 | 64 | 64 | | |
| | 5a | 184 | 241 | 304 | 304 |
| | 5 | 57 | | | |
| East | 6 | 12 | 12 | 12 | |
| | 6a | | | | |
| | 7 | 12 | 12 | 12 | 23 |
| | 7a | | | | |
| | 8 | 556 | 556 | 556 | 556 |
| | **Total** | **1,192** | **1,192** | **1,192** | **1,192** |

Table 7: PM Peak (17:00 – 18:00) Trip Generation per Access Point for each Scenario

| | PM Peak (17:00 - 18:00) | Total Trips Generated per Access (In + Out Flows) | | | |
|---|---|---|---|---|---|
| | Accesses | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | 258 | | | |
| | 2 | 82 | 340 | 340 | 340 |
| | 4 | 70 | 70 | | |
| | 5a | 203 | 266 | 336 | 336 |
| | 5 | 63 | | | |
| East | 6 | 13 | 13 | 13 | |
| | 6a | | | | |
| | 7 | 13 | 13 | 13 | 26 |
| | 7a | | | | |
| | 8 | 615 | 615 | 615 | 615 |
| | **Total** | **1,317** | **1,317** | **1,317** | **1,317** |

In total, there are 1,192 trips generated by the whole development in the AM peak and 1,317 trips in the PM peak.

In all time periods, Access 8 generates the highest number of trips followed by Access 2 and 5a. Access 8 enables the majority of development traffic to directly reach the A47. Access 1 generates the second highest number of trips in the Do All scenario but it is considered to be the least feasible by Fenland District Council and is therefore not considered in Scenarios 1 to 3, resulting in trips from the southern section of the development rerouting to Access 2. Removing Access 4 in Scenario 2 results in trips rerouting to Access 5a for North-West, town centre and south-west travel.

The traffic flows generated at each access in all scenarios are not expected to have a significant impact on the operation of the adjoining junctions.

## Impact of Development

Tables 8 and 9 below summarise the total two-way flows (base plus trip generation) for the AM and PM peak hours for each junction with an access point.

Table 8: AM Peak (08:00 – 09:00) Total Two-way Junction Flows

| | AM Peak (08:00 - 09:00) | Total Two-way Junction Flows | | | | |
|---|---|---|---|---|---|---|
| | Accesses | Base | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | | 234 | | | |
| | 2 | 446 | 521 | 758 | 767 | 767 |
| | 4 | 215 | 280 | 429 | 384 | 384 |
| | 5a | 215 | 439 | 632 | 641 | 641 |
| | 5 | 185 | 337 | 464 | 464 | 464 |
| East | 6 | | 41 | 41 | 41 | |
| | 6a | | 41 | 41 | 41 | |
| | 7 | | 162 | 162 | 162 | 162 |
| | 7a | 238 | 162 | 162 | 162 | 162 |
| | 8 | 238 | 818 | 818 | 818 | 818 |
| | **Total** | **1,537** | **3,035** | **3,507** | **3,479** | **3,398** |

**Table 9: PM Peak (17:00 – 18:00) Total Two-way Junction Flows**

| | PM Peak (17:00 - 18:00) | Total Two-way Junction Flows | | | | |
|---|---|---|---|---|---|---|
| | Accesses | Base | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | | 258 | | | |
| | 2 | 480 | 535 | 795 | 811 | 811 |
| | 4 | 270 | 293 | 395 | 352 | 352 |
| | 5a | 270 | 466 | 619 | 634 | 634 |
| | 5 | 197 | 357 | 433 | 433 | 433 |
| East | 6 | | 45 | 45 | 45 | |
| | 6a | | 45 | 45 | 45 | |
| | 7 | | 179 | 179 | 179 | 179 |
| | 7a | 262 | 179 | 179 | 179 | 179 |
| | 8 | 262 | 878 | 878 | 878 | 878 |
| | **Total** | **1,741** | **3,235** | **3,569** | **3,556** | **3,467** |

Total two-way junction flows appear to fluctate between scenarios but this is because traffic generated at one access point would inevitably have to travel through other junctions that are connected to an access point to reach their destination. This will at times result in “double counting” of vehicles within two-way junction flows throughout the model network. In scenarios 1 to 3 for example, two-way junction flows for Accesses 2 and 8 are similar because traffic has to move through both junctions to travel to and from the A47. When an access is removed in any one scenario it can result in traffic rerouting through an access that leads to more/less junctions and therefore more or less double counting.

In all scenarios and time periods, there is an increase in two-way flows at all junctions with an access point except for the Access 7a junction. In the base year, traffic uses Sandy Lane (between Accesses 2 and 7a) to reach the A47. However, the introduction of Access 8 in the Do Something scenarios provides improved connectivity to the A47 and as a result all non-development traffic reroutes from 7a to 8. Traffic that still uses the 7a junction in the Do Something scenarios is passing through from the northern-most sections of the development.

The overall increase in total two-way junction flows across all scenarios and time periods would not be expected to have a significant impact on the operation of the junctions connected to the development.

Tables 10 and 11 show the net impact of development traffic (total traffic minus base year traffic) on junctions that are connected to an access point in the AM and PM peaks for all scenarios.

**Table 10: Net Impact of Development Traffic on Access Junctions in the AM Peak (08:00 – 09:00)**

| | AM Peak (08:00 - 09:00) | Total Two-way Junction Flows | | | | |
|---|---|---|---|---|---|---|
| | Accesses | Base | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | | 234 | | | |
| | 2 | 446 | 75 | 312 | 321 | 321 |
| | 4 | 215 | 65 | 214 | 169 | 169 |
| | 5a | 215 | 224 | 417 | 426 | 426 |
| | 5 | 185 | 152 | 279 | 279 | 279 |
| East | 6 | | 41 | 41 | 41 | |
| | 6a | | 41 | 41 | 41 | |
| | 7 | | 162 | 162 | 162 | 162 |
| | 7a | 238 | -76 | -76 | -76 | -76 |
| | 8 | 238 | 580 | 580 | 580 | 580 |
| | **Total** | **1,537** | **1,498** | **1,970** | **1,942** | **1,861** |

**Table 11: Net Impact of Development Traffic on Access Junctions in the PM Peak (17:00 – 18:00)**

| | PM Peak (17:00 - 18:00) | Total Two-way Junction Flows | | | | |
|---|---|---|---|---|---|---|
| | Accesses | Base | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | | 258 | | | |
| | 2 | 480 | 55 | 315 | 331 | 331 |
| | 4 | 270 | 23 | 125 | 82 | 82 |
| | 5a | 270 | 196 | 349 | 364 | 364 |
| | 5 | 197 | 160 | 236 | 236 | 236 |
| East | 6 | | 45 | 45 | 45 | |
| | 6a | | 45 | 45 | 45 | |
| | 7 | | 179 | 179 | 179 | 179 |
| | 7a | 262 | -83 | -83 | -83 | -83 |
| | 8 | 262 | 616 | 616 | 616 | 616 |
| | **Total** | **1,741** | **1,494** | **1,828** | **1,815** | **1,726** |

The highest two-way flows are experienced on the junctions connected to Accesses 2, 5a and 8 in the AM and PM peaks across all scenarios. However, these flows would not be expected to have a signficant impact on the operation of the junctions connected to the development. As explained above, traffic reroutes from Access 7a to 8 in the Do Something scenarios and therefore results in a reduction in total two-way flows at the Access 7a junction.

Tables 12 and 13 show the percentage change in junction flows (total traffic divided by base traffic) as a result of development traffic across all scenarios in the AM and PM peak.

**Table 12: Percentage change in Access Junction Flows in the AM Peak (08:00 – 09:00)**

| | AM Peak (08:00 - 09:00) | % Change in Junction Flows | | | | |
|---|---|---|---|---|---|---|
| | Accesses | Base | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | | | | | |
| | 2 | | 17% | 70% | 72% | 72% |
| | 4 | | 30% | 99% | 79% | 79% |
| | 5a | | 104% | 194% | 198% | 198% |
| | 5 | | 82% | 151% | 151% | 151% |
| East | 6 | | | | | |
| | 6a | | | | | |
| | 7 | | | | | |
| | 7a | | -32% | -32% | -32% | -32% |
| | 8 | | 244% | 244% | 244% | 244% |

**Table 13: Percentage change in Access Junction Flows in the PM Peak (17:00 – 18:00)**

| | PM Peak (17:00 - 18:00) | % Change in Junction Flows | | | | |
|---|---|---|---|---|---|---|
| | Accesses | Base | Do All | Scenario 1 | Scenario 2 | Scenario 3 |
| West | 1 | | | | | |
| | 2 | | 11% | 66% | 69% | 69% |
| | 4 | | 8% | 46% | 30% | 30% |
| | 5a | | 73% | 129% | 135% | 135% |
| | 5 | | 81% | 120% | 120% | 120% |
| East | 6 | | | | | |
| | 6a | | | | | |
| | 7 | | | | | |
| | 7a | | -32% | -32% | -32% | -32% |
| | 8 | | 235% | 235% | 235% | 235% |

Large percentage increases in junction flows are experienced at junctions with Accesses 2, 4, 5a, 5 and 8 across all scenarios in the AM and PM peaks. Nevertheless, the absolute total two-way junction flows in the Base and Do Something scenarios are not of a great enough level for a large percentage change in flows to significantly impact the operation of the access junctions in all scenarios.

## Conclusion

This technical note has outlined the methodology for assessing the suitability of various access point options for traffic generated by the proposed 1,703-dwelling development in the East of Wisbech.

- Base year (2021) two-way junction flows are below 500 vehicles at each junction within the modelled network in the AM (08:00 – 09:00) and PM (17:00 – 18:00) peak hours.
- An estimated 1,192 and 1,317 trips would be generated by the proposed development in the AM and PM peak hours respectively.
- Access 8 generates the largest number of trips in the AM (556) and PM (615) Peak in all scenarios. Most trips (49%) are expected to be destined for the A47 and Access 8 is the most direct point of access for reaching the A47 from the development.
- In the AM and PM peak hours for all scenarios, the increase in junction flows would not have a significant impact on the operation of the junctions on both the eastern and western sides of the development.
- The implementation of four/five access points to the development site would be enough to accommodate the traffic generated by the development.

It is recommended that a further study is undertaken to assess the impact of traffic generated by the site on the wider highway network within Wisbech.