

# WCC Modelling Protocol

## Advice Note 009 – Use of Isolated Junction Models

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Protocol Category	Model Licensing	Version	002
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### Introduction

1. This Advice Note (AN) has been produced to explain Warwickshire County Council's (WCC) requirements for isolated junction modelling to be provided in addition to the microsimulation modelling.
2. It is accompanied by other advice notes which provide guidance on different aspects of the development and application of modelling appraisal within Warwickshire County council.

### Modelling triggers

3. Several conditions may trigger the need for isolated junction modelling, including:
4. Supplementary junction assessment to consider junction specific matters.
  - Supplementary junction assessment to consider junction specific matters.
  - Absence of an available microsimulation model.
  - Insufficient detail or calibration levels within an existing microsimulation model.
  - To support detailed design of junction proposals.
  - To provide the necessary evidence that a signal strategy can be delivered (i.e., through LinSig).
5. Isolated junction modelling may/will be requested either to supplement or supersede the microsimulation modelling when:
  - The development is not considered sufficiently large to justify assessment within an existing microsimulation model.
  - The calibration within the microsimulation model requires supplementary analysis.
  - The proposed scheme involves signalisation and therefore needs to also be proven through application of a LinSig assessment to provide a summary of junction performance.
6. Through scoping, it may be agreed that a small development may not require an assessment of impacts through microsimulation. Additionally, all isolated junction modelling requirements including the location and form of assessment and scenarios/years must be agreed with WCC prior to submission.
7. If an isolated junction model is required, then traffic flows should be derived from the microsimulation models where possible.

8. The flows can be extracted from the microsimulation model either via turning flows for simple junction models, or Origin Destination (O/D) matrices for linked junctions.
9. Guidance on how to request this information is available in Traffic Modelling Webpage<sup>1</sup> and the associated costs and timescales for the provision of this information can only be confirmed once scoping has been completed to determine the necessary level of complexity and number of scenarios associated with the data extraction exercise.
10. As a minimum, flows should be requested from the microsimulation model to be disaggregated by:
  - Light Vehicles
  - Heavy Vehicles
  - Development Specific Traffic Flows
11. These traffic flows would be run through the isolated junction modelling once converted to PCUs WCC considers an HGV factor of between 2.3 and 2.5, subject to the HGV composition within the local area, as appropriate to adopt in such circumstances.
12. In areas where calibration of the microsimulation model has been highlighted as a weakness then it is recommended that a further level of disaggregation, concerning the light vehicles, is requested as follows:
  - Baseline traffic
  - Heavy Vehicles
  - Committed Developments
  - Generic Traffic Growth
  - Other Growth (such as Local Plan or other developments considered pertinent)
  - Development specific trips
13. There are two different sets of flows which can be extracted from the microsimulation models these are:
  - Modelled Flows – The flows observed through the modelling (where practicable flows should include end queues to account for suppressed demand)
  - Demand Flows – Flows observed through the modelling absent, as far as it is possible to do so, of the effects of congestion.
14. Modelled flows are extracted as turning flows from the model without any additional adjustments to the model being required. However, use of these flows in isolation will result in the isolated junction model considering throughput levels which align with only those levels identified as being achieved through the microsimulation model. This means that the isolated junction assessment will only consider what has been proven to work within the microsimulation model and as such WCC may also require analysis of the queue lengths at these junction, to be incorporated in to the turning flows, to ensure that suppressed traffic volumes are accounted for.

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<sup>1</sup> <https://www.warwickshire.gov.uk/modelling-surveys>

15. Demand flows are extracted as turning flows from the model but based on a run of the model with the effects of congestion removed. This is required because, as has been mentioned previously, use of modelled flows in isolation can often serve to prove that the flow which was accommodated within the microsimulation run can be accommodated within the isolated junction model. Two key elements are omitted through this approach:
- Traffic which is in a queued state at the end of the simulation.
  - Traffic which has not travelled through the junction because it has either reassigned due to congestion or is unable to reach the junction for the same reason (i.e., it is trapped in congestion upstream).
16. It is prudent to consider both sets of flows within an assessment and it is recognised that these two sets of flows will represent the potential range of outcomes that may occur. Traffic flows which are extracted based on modelled flows may underestimate the flow that the junction needs to be able to accommodate through the design. It is possible to compensate for this by incorporating the vehicles which are queued on each junction approach at the end of the simulation hour since this would account, to some extent, for suppressed demand within the period. It accounts for vehicles wishing to travel through the junction but not able to do so within the assessment hour, it does not account for traffic which has diverted away from the junction in response to adverse conditions.
17. Similarly, the demand flows may represent overly optimistic conditions in instances where there are simply too many other constraints which may serve to prevent traffic reaching the junction being assessed.
18. It should be noted that it is not always the case that the demand for a junction may exceed the modelled flows. The modelled flows may be higher in instances where the junction is seen to attract traffic which is rat-running to avoid congestion on other routes. In such instances the modelled flows may be a more appropriate design target if it is the case that rat running is to be discouraged.
19. Conversely, where a junction is on a main corridor or route of strategic importance, it is expected that the demand flows should at least form part of the design target since the design should be able to minimise the occurrence of rat running when it is considered undesirable.
20. WCC will consider both in their appraisal of scheme options through isolated junction modelling.
21. Where a design is considered particularly complex or likely to come forward in a sensitive part of the network it may also be necessary to iterate the proposals through the Paramics models whereby any scheme identified in the isolated junction model is put back through the Paramics model to enable a full appraisal of the scheme to be completed.

### Modelling tools

22. WCC recommend the use of LinSig to assess signalised junctions and ARCADY/PICADY (Junctions 9 or latest available software) for roundabouts and priority junctions.
23. LinSig modelling is expected to be completed where a development is considered likely to influence or trigger a change at an existing signalised junction or as part of the evidence to support the delivery of a new signalised junction on WCCs network.
24. LinSig modelling should also be completed in consultation with WCCs Traffic Control and Information Systems (TCIS) within Engineering and Design Services.
25. Where WCC already holds and agreed/approved model it can be made available to the developer for a fee. WCC would recommend that, where it is possible to do so, agreed models are used to minimise the need for additional audits to be undertaken.

### Reporting

26. Upon completion of the isolated junction modelling, it is expected that all models, reports and inputs (including reference to the Paramics model scenarios they have been extracted from where applicable) should be submitted to WCC for review.
27. Outputs should be always provided in form of a report for the junctions modelled. This should be considered as a separate document which should have reference on the main document.
28. Where a microsimulation model exists, the isolated junction modelling should be reported supplementary to the microsimulation modelling and not in the absence of the microsimulation modelling. WCC will defer to the microsimulation modelling, which provides an overview of the effects of any proposal on a corridor basis allowing for the effects of junction blocking, first and then the isolated junction modelling will be used to confirm design principles. However, it is important to note that, if a scheme is not demonstrated to function acceptably within the isolated junction model then WCC may not accept the proposals.