

The Importance of Transport Assessments and their role in Development and Approval of Key Infrastructure

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Amey

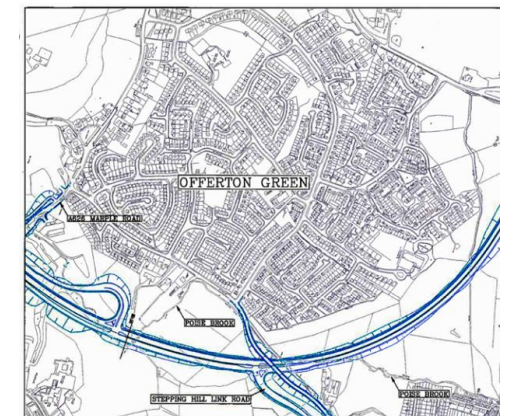


Today's presenter is Gavin Coupe, Practice Lead for Transport Planning at Amey Consulting.

Gavin has over 22 years' experience working in Transport Planning. He relishes challenging work and opportunities (such as presenting lunch and learns) which has led him to work on flagship projects all over the world. He has worked across the UK and Ireland as well as in the UAE, Qatar, Oman, Kazakhstan, India, Canada, Panama, Australia, and most recently The Bahamas.

Some of his most high-profile projects in the UK are the Oxford Circus redevelopment, including the incorporation of the diagonal crossings, the 2012 London Olympics, the A55 extension and the East Leeds Orbital Route (ELOR).

Gavin has an extensive technical skillset with a focus on development planning, including being able to act as an expert witness at Public Inquires.



- What is a Transport Assessment?
- The Scoping Stage
- The TA
- Modelling the Impacts
- Mitigation - what is appropriate?

What is a Transport Assessment? And what should it include?



A TA looks to **predict** what would happen to transport if a change was made, usually a development. The scope and scale of a TA is proportional to the potential transport impact of the proposed development. So an application to build an extension to a house would not need a TA. But a large housing estate would need a TA and associated Travel Plan (TP). There is the option to produce a lower-level Transport Statement for developments that will have limited impact.

Tiny Development

Nothing needed

Small Development

Transport Statement

Large Development

Transport Assessment
Travel Plan

A transport assessment will need to set out the transport impacts of the development including proposed **mitigation** to any negative impacts which could be junction improvements or the provision of better active travel infrastructure or improved bus services.

Because it is a prediction, it is open to interpretation. It is therefore important to try and agree assumptions with the local authority, and any key stakeholders, such as National Highways, in good time.

The following should be considered when settling the scope of the proposed assessment:

- Information about the proposed development, site layout, (particularly proposed transport access and layout across all modes of transport)
- Information about neighbouring uses, amenity and character, existing functional classification of the nearby road network;
- Data about existing public transport provision, including provision/ frequency of services and proposed public transport changes;
- A description of the travel characteristics of the proposed development;
- An assessment of trips from all directly relevant committed development in the area
- Data about current traffic flows on links and at junctions within the study area and identification of critical links and junctions;
- An analysis of the injury accident records on the public highway in the vicinity of the site;
- An assessment of the likely associated environmental impacts of transport related to the development,
- Measures to improve the accessibility of the location to non-car modes;
- A description of parking facilities in the area and the parking strategy of the development;
- Ways of encouraging environmental sustainability by reducing the need to travel; and
- Measures to mitigate the residual impacts of the development

The Scoping Stage

Purpose

To agree assumptions at an early stage.

Trip Generation

How will this be estimated?

What is the estimated rate of trip generation? What are the outturn trips?

Distribution and Assignment

How will the trips be distributed on to the network – ie. Where will they go?

How will they be assigned to the network – ie. How will they get there?

Impact on the network

Ideally we would be able to set out the locations that will be looked at in detail as part of the TA

There are two main ways to generate trips

Trics

Trics is an industry standard database of sites that have been surveyed allowing for trip rates, per unit, to be set out. The user must select site(s) that are similar to the site that is the subject of the TA.

Pro's – quick and easy to use

Con's – can be difficult to get a good 'match' and open to significant interpretation meaning different people can get different results, particularly for housing developments.

First Principles

Identifying a similar site(s) to the proposed development and surveying the generated trips then divide by unit. A similar site in a nearby location can often be said to be a good estimate.

Pro's – Can lead to robust predictions

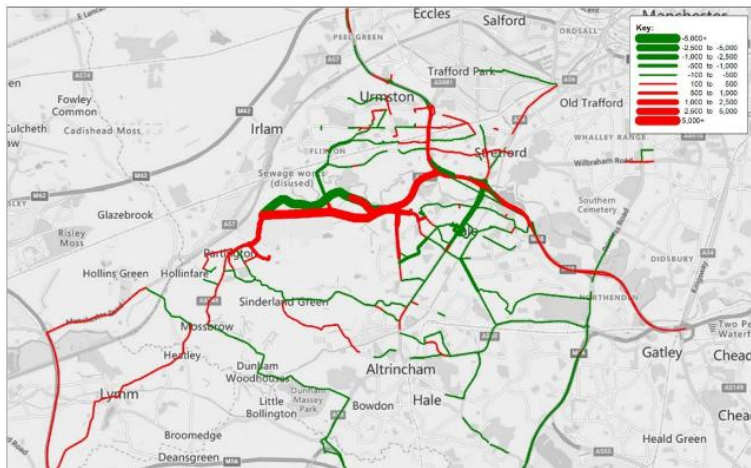
Con's – can be difficult to find suitable sites and to accurately capture the total trips. Adds cost.



Distribution

Where the generated trips will go or come from.

If we are extending a school, then getting postcode data for existing pupils will give a great starting point.



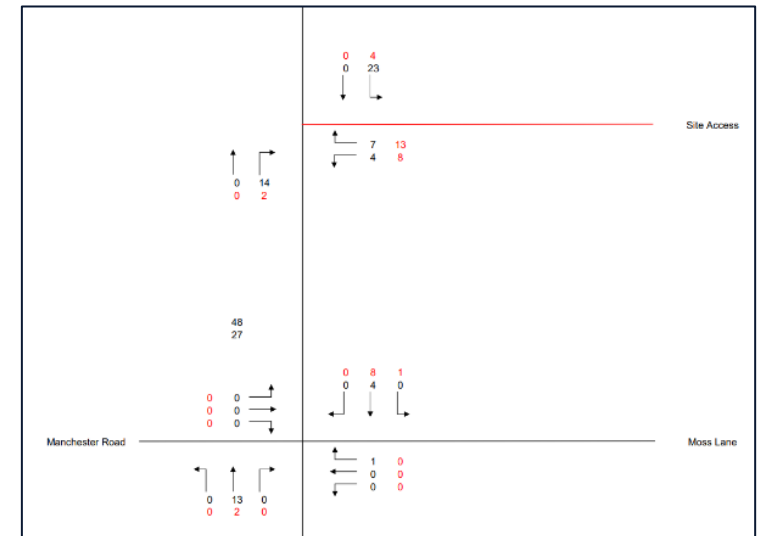
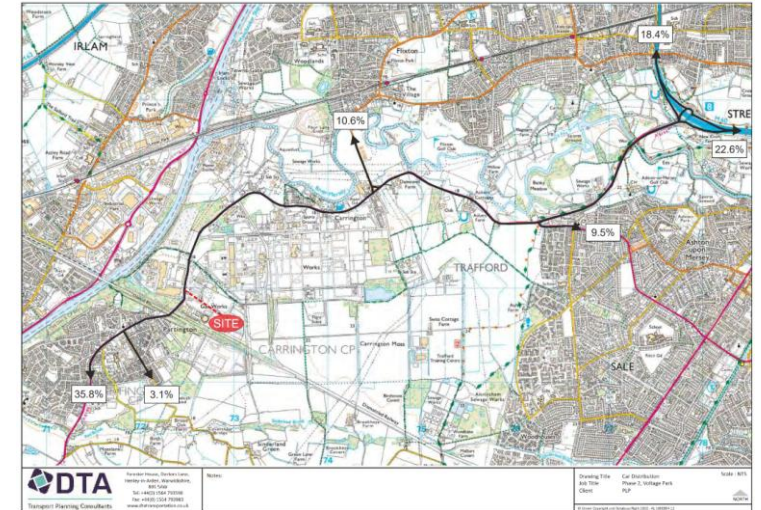
Tools

Strategic transport models such as a SATURN model covering the area of interest to the TA can be really helpful tools to both distribute and assign traffic from a development. The Local Authority should be able to advise on the availability of such a model at the scoping stage. There may be a cost to have a model run undertaken.

Once distribution and assignment is complete, locations for assessment can be identified based on the level of impact of the development.

Assignment

The routes that generated trips will take



Background Traffic

Which junctions are going to be counted ready for assessment?

Which peaks are we selecting? Morning and Evening are standard but developments like a leisure centre might have an absolute peak on a Saturday

Growth

How might traffic change by the time the development actually opens? – An Opening Year Assessment

How might traffic change after opening? – A Design Year Assessment

We can assess traffic growth using government forecasts but we can also use historic changes in traffic flow to contextualise for our locality if data is available.

Committed developments, those that have planning permission or sometimes that are going through the process, should be included. The TA's for those developments will set out their flows.

Because TA's are forecasts based on judgement, two people doing the same work will likely come to different conclusions. Scoping helps with getting agreement on the basic assumptions at an early stage such that the content of a TA is not a surprise to the people reviewing it.

Starting Point

Developer

Reviewing Authority

The location is very sustainable

The location is not very sustainable

The development will not generate much traffic

The development will generate high levels of traffic

Traffic will assign on routes avoiding that congestion hotspot

Traffic will assign through that congestion hotspot

The impact will be very low

The impact will be severe

Limited mitigation is needed

Significant mitigation is needed

Scoping Report and agreements avoid the above arguments being had at the end of the process

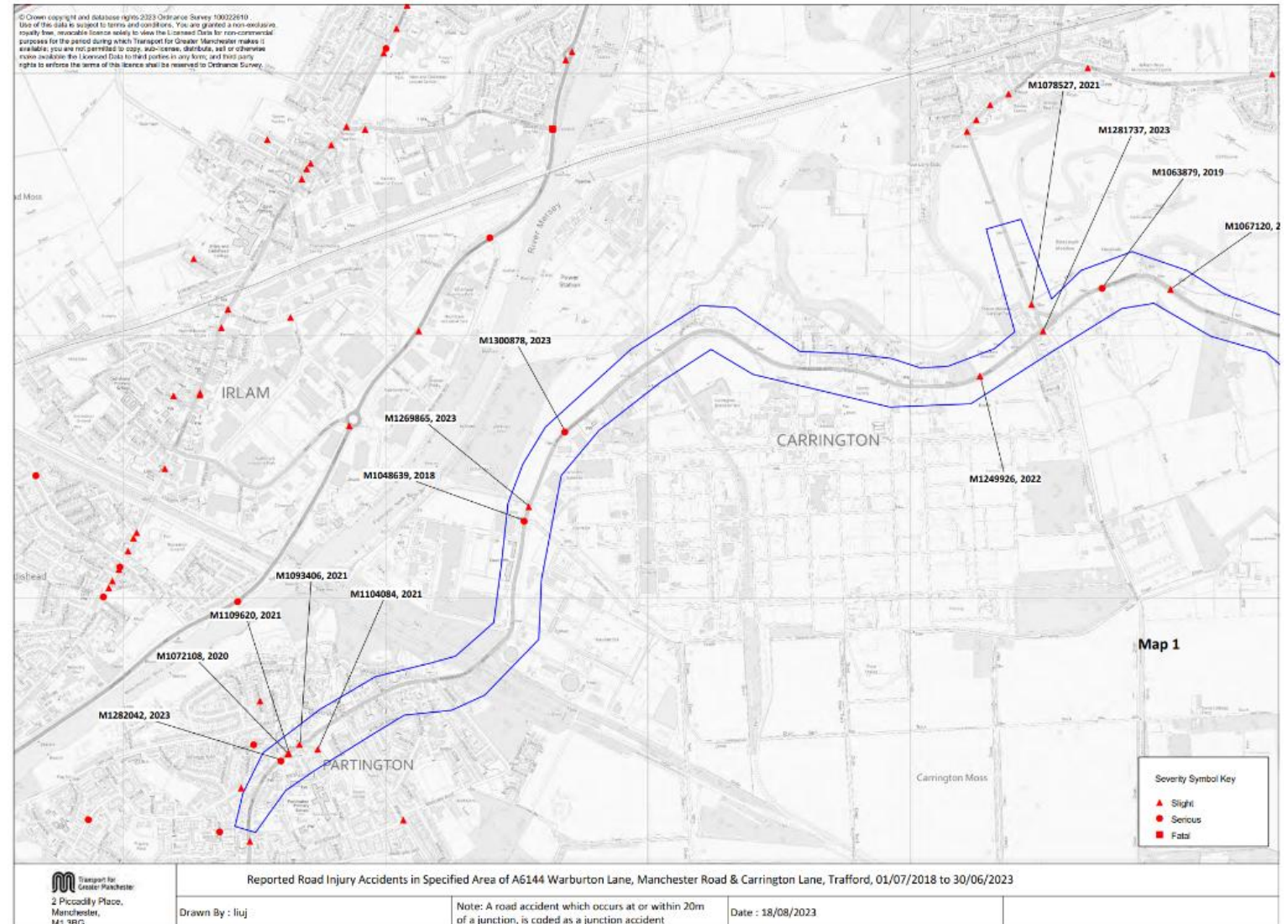
The TA

Are there any hotspots of accidents?

Are there any common causes such as speeding, poor lighting?

Are there any common vehicle types that would not be expected such as a large number of cyclist accidents?

Will the development exacerbate the existing accidents or create new risks leading to accidents?

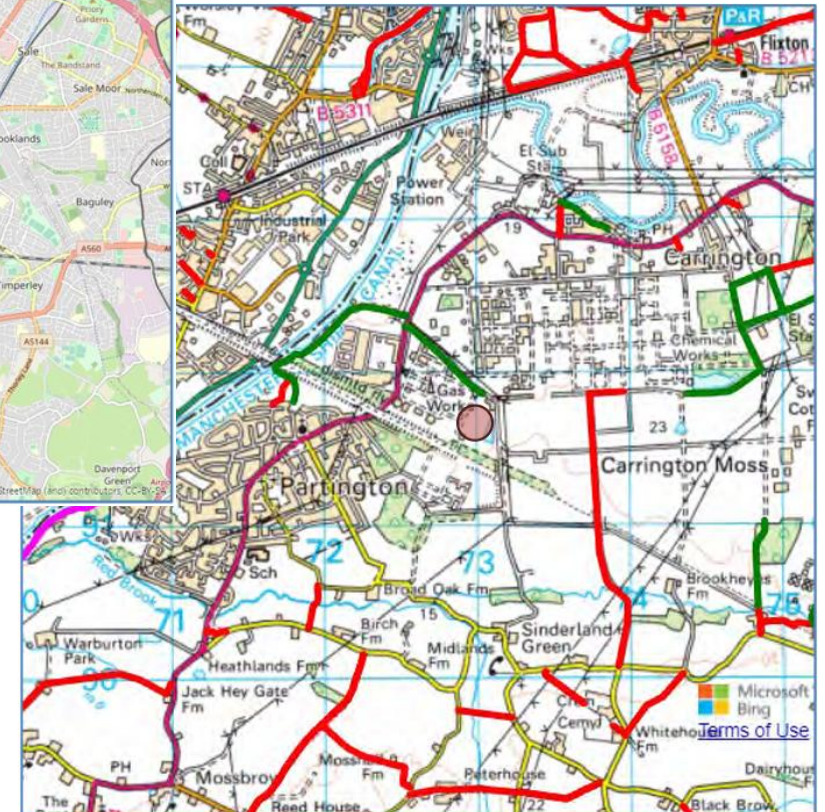
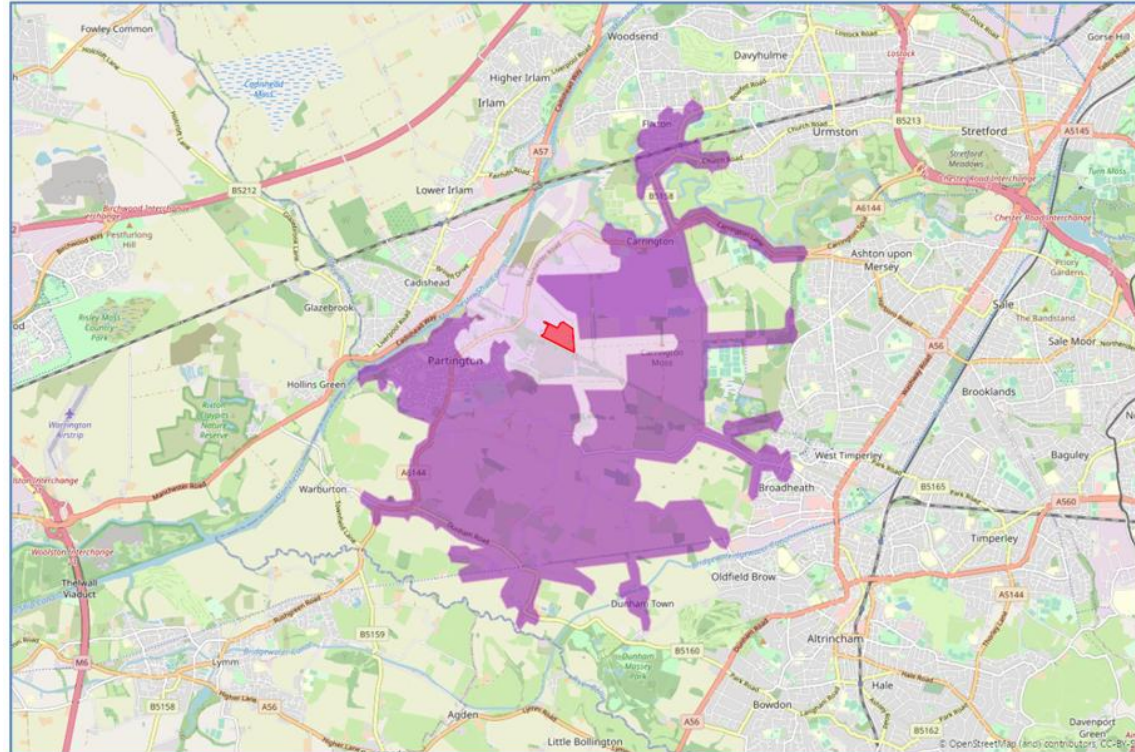


What provision exists?

How does the development relate to the surrounding area in terms of reasonable travel distances?

What should the development do to encourage active travel use?

- Cycle parking, preferably covered and secure
- Showers
- Contribute towards improved infrastructure for active travel in the local area



What provision is there?

Infrastructure – quality of stops and shelters, information

Service – frequency, destinations served, quality of bus and reliability

Some authorities have mapping of accessibility levels

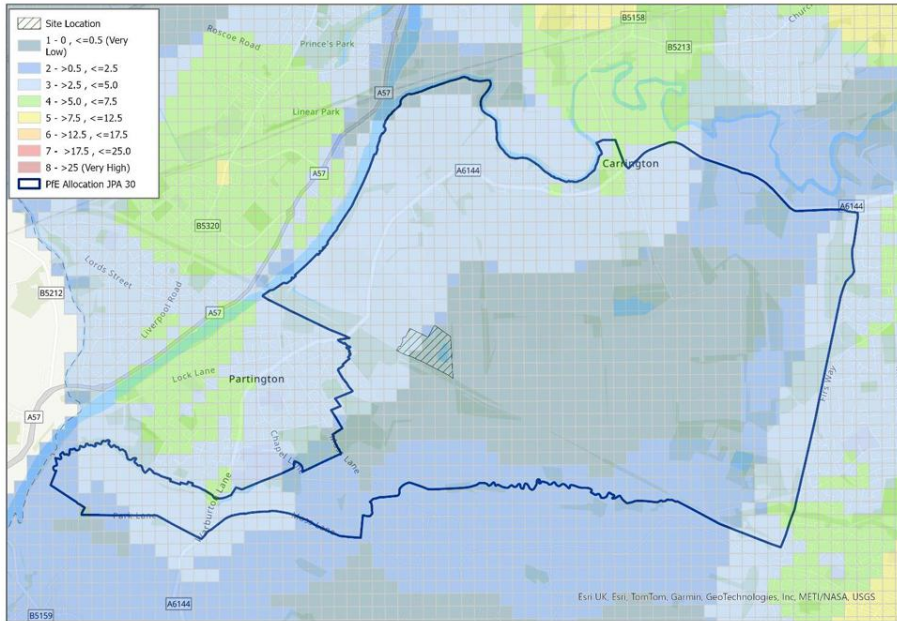
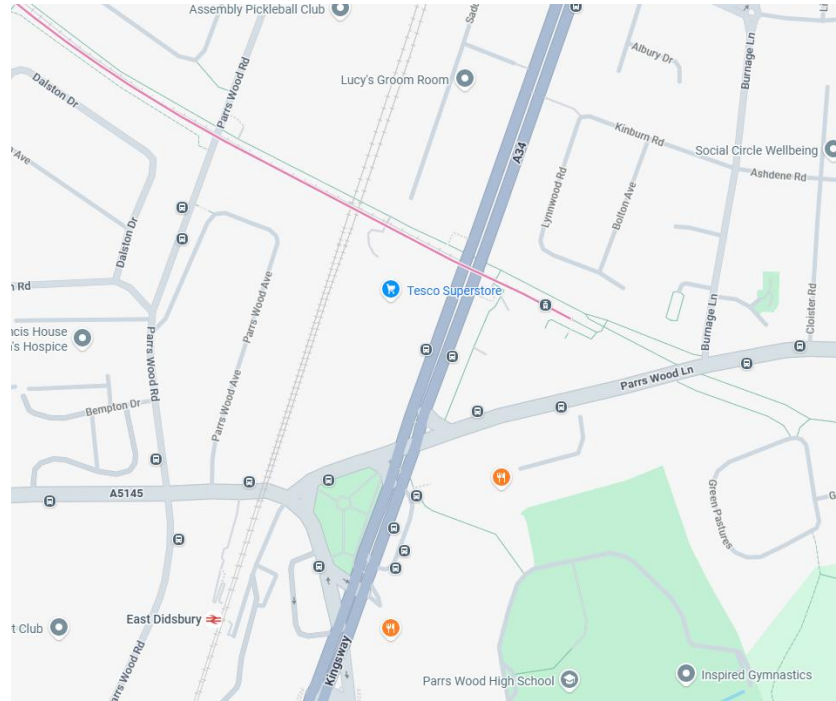


Table 1: Summary of Local Bus Services

Service	Route	Weekday Frequency		
		AM Peak	PM Peak	Off-Peak
247	The Trafford Centre - Altrincham	Every 30 minutes		
253	Partington - Carrington - Flixton - Piccadilly Gardens	2 Services	-	-
255	Partington - Carrington - Urmston - Piccadilly Gardens	Every 30 minutes		
Cat5	Altrincham - Sale - Carrington - Partington - Warrington	Every 60 minutes		



Modelling Impacts

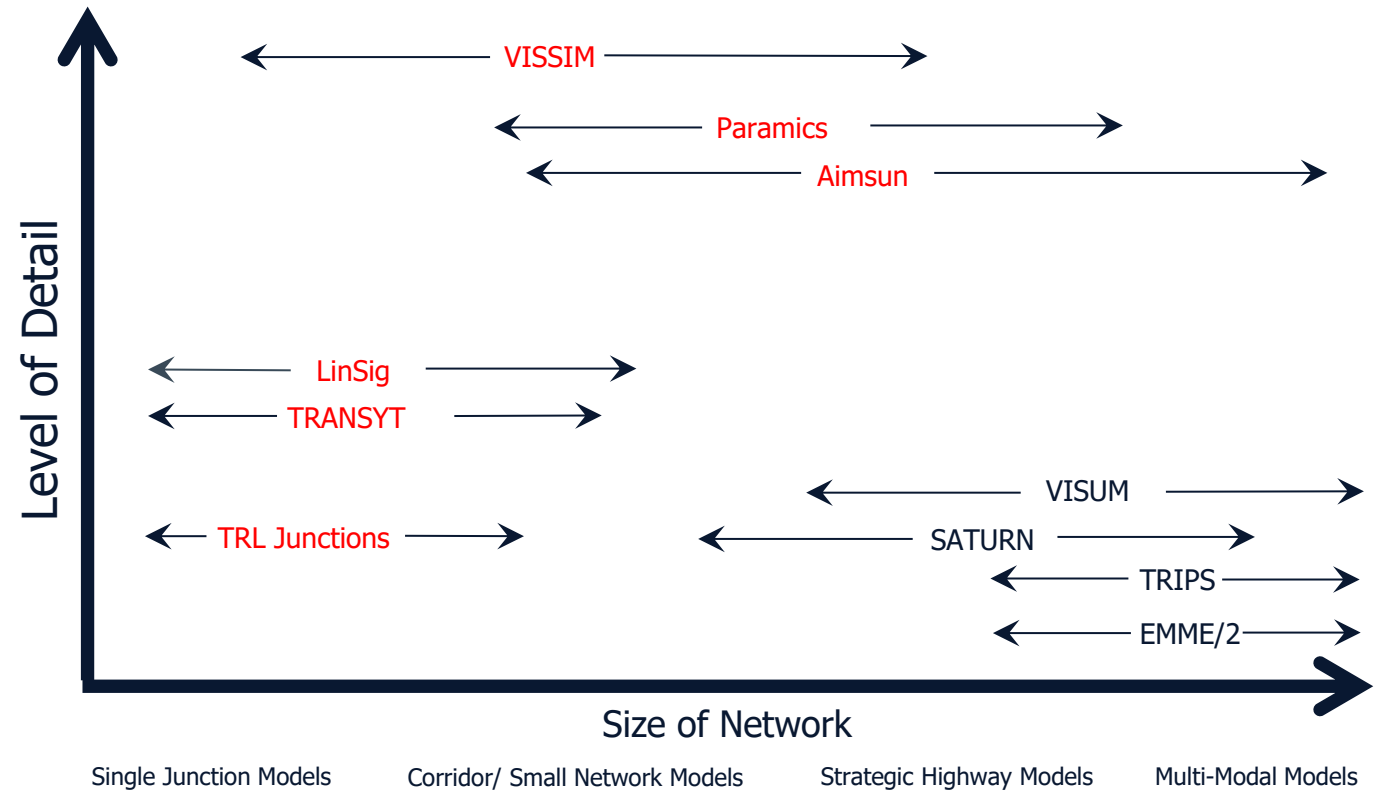
Local Models

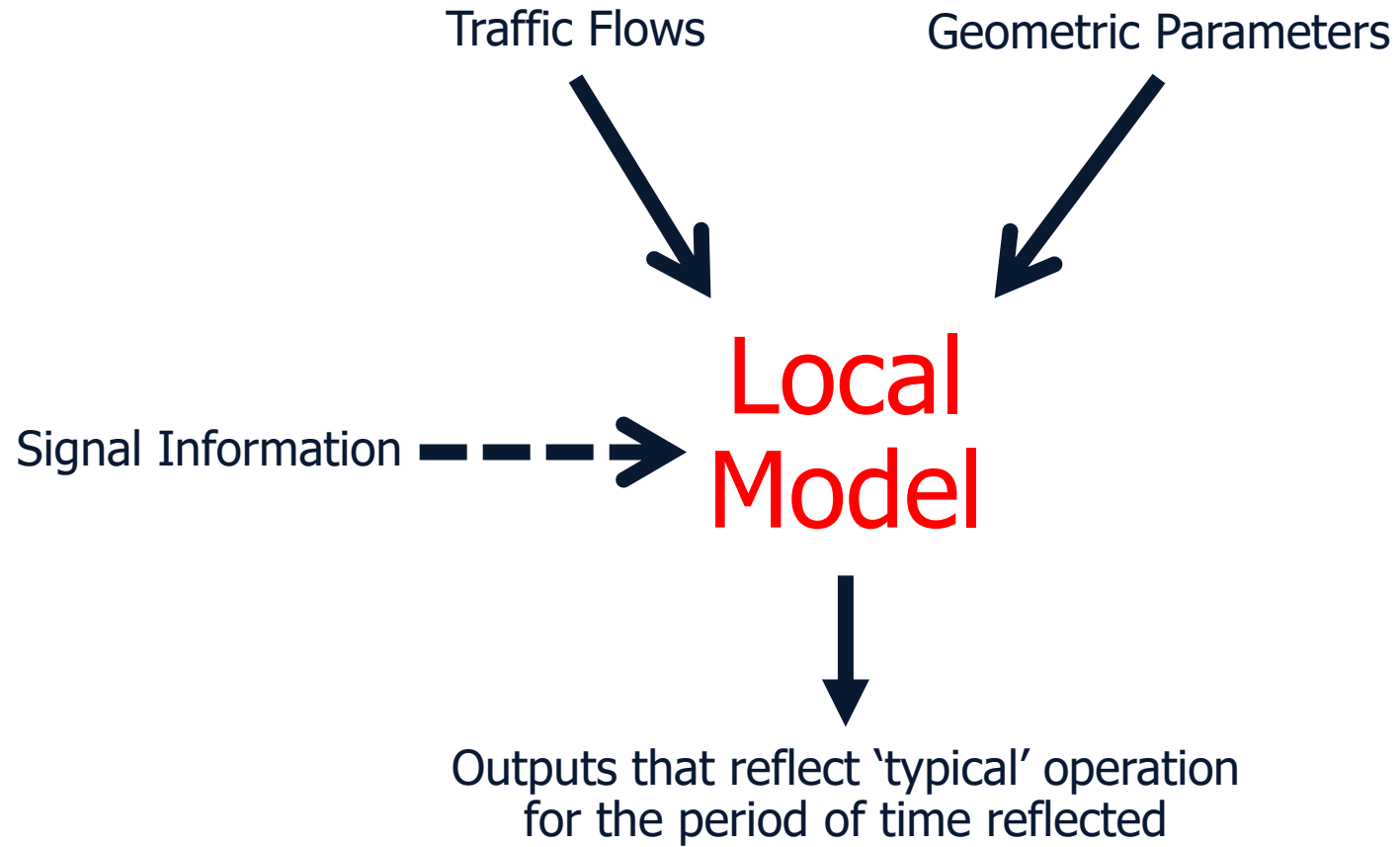
- ✓ TRL Junctions (priority junctions)
- ✓ LinSig & TRANSYT – Signalised and mixed control networks

Microscopic Simulation Models

- ✓ Vissim
- ✓ Paramics
- ✓ Aimsun

There is a balance between the level of detail of a model and the cost to create it. The model choice has to be both appropriate and proportionate





OS Base vs Topo



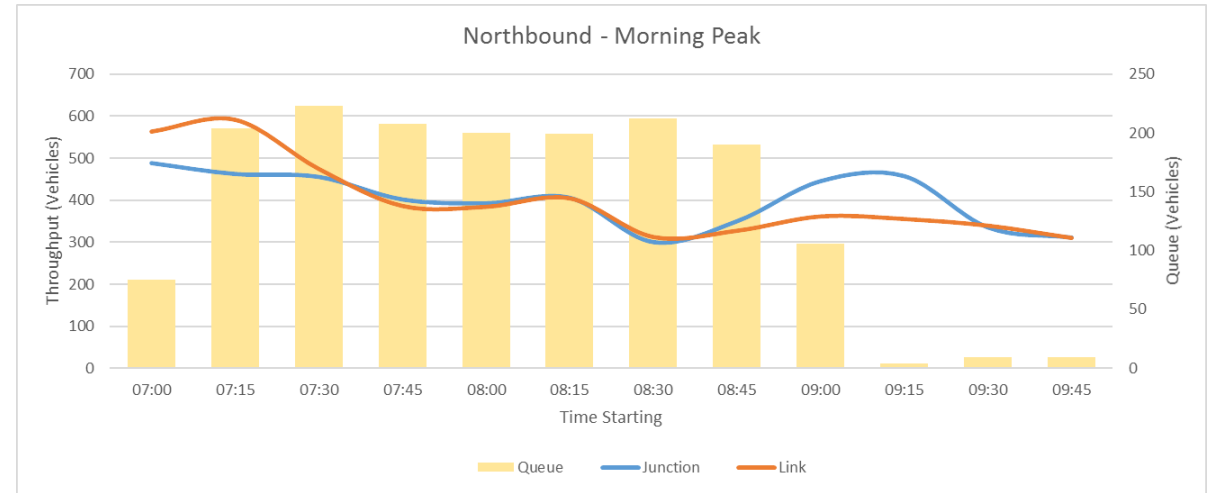
Hatching and Unused Space



Tools like Google Maps can show typical traffic. This can be used to assist with defining appropriate periods for traffic counts.



Remember that local models work in Passenger Car Unit (PCU) equivalents and the identified peak periods when looking at flows in PCU may differ from those when estimated in vehicles.



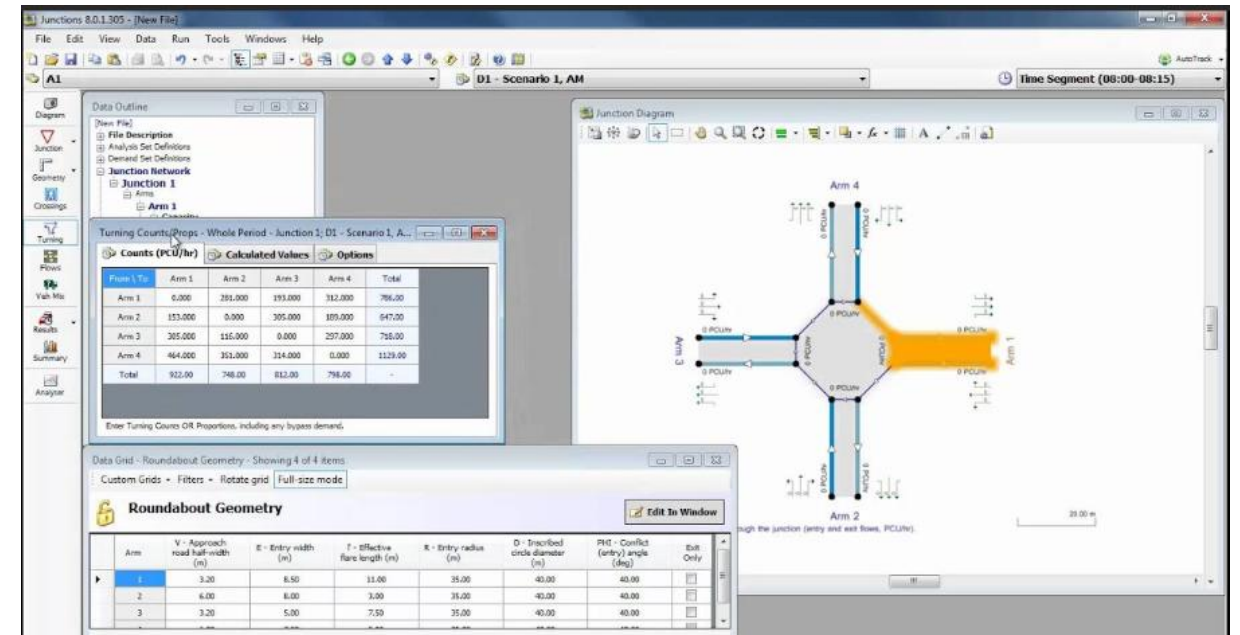
Latent demand is important to understand. This can be done by collecting queue data and comparing start and end queues or upstream flows where the network is uncongested.



Priority Intersection Capacity And Delay - PICADY

Assessment of Roundabout Capacity And Delay – ARCADY

Black box tools that model traffic as flows like a liquid. You can't 'see' the assessment so understanding the basics is important as it will help the user to predict the broad outputs and therefore spot errors where the model predicts something different.



Traffic flows can be modelled in any of the following ways:

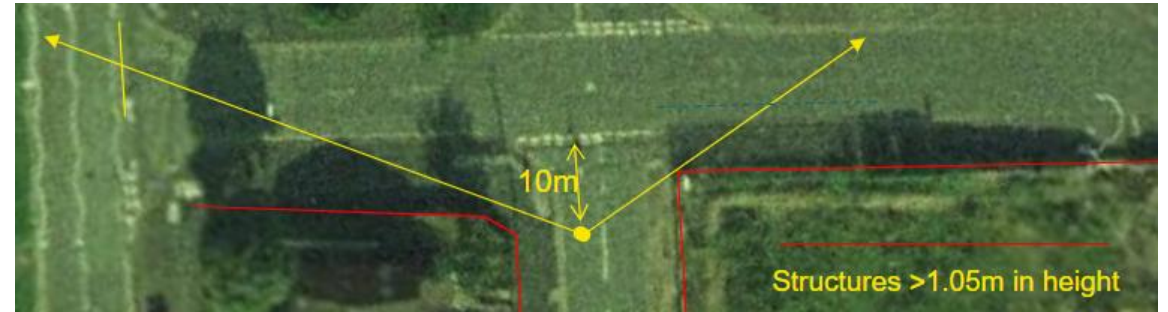
- **FLAT – Remains constant (typical) over the hour. Similar to TRANSYT or LinSig**
- ONE HOUR (ODTAB) – 90 minute profile synthesised from one hour O-D table
- **DIRECT - demand flow profile data entered directly by time period which is variable**
- LEVELS - profile synthesised from time/flow data
- FOUR - profile synthesised from four hourly counts
- PHF (Peak Hour Factor) – synthesises a simple profile (Primarily for use in the USA)

Despite the range of options, FLAT and DIRECT should nearly always be the chosen input.

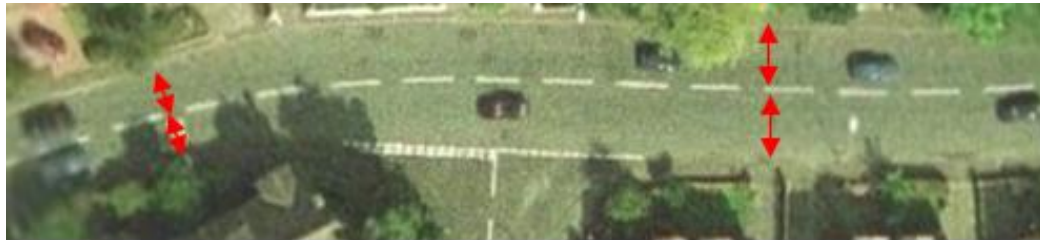
Widths – Minor Arm



Visibilities – Minor Arm



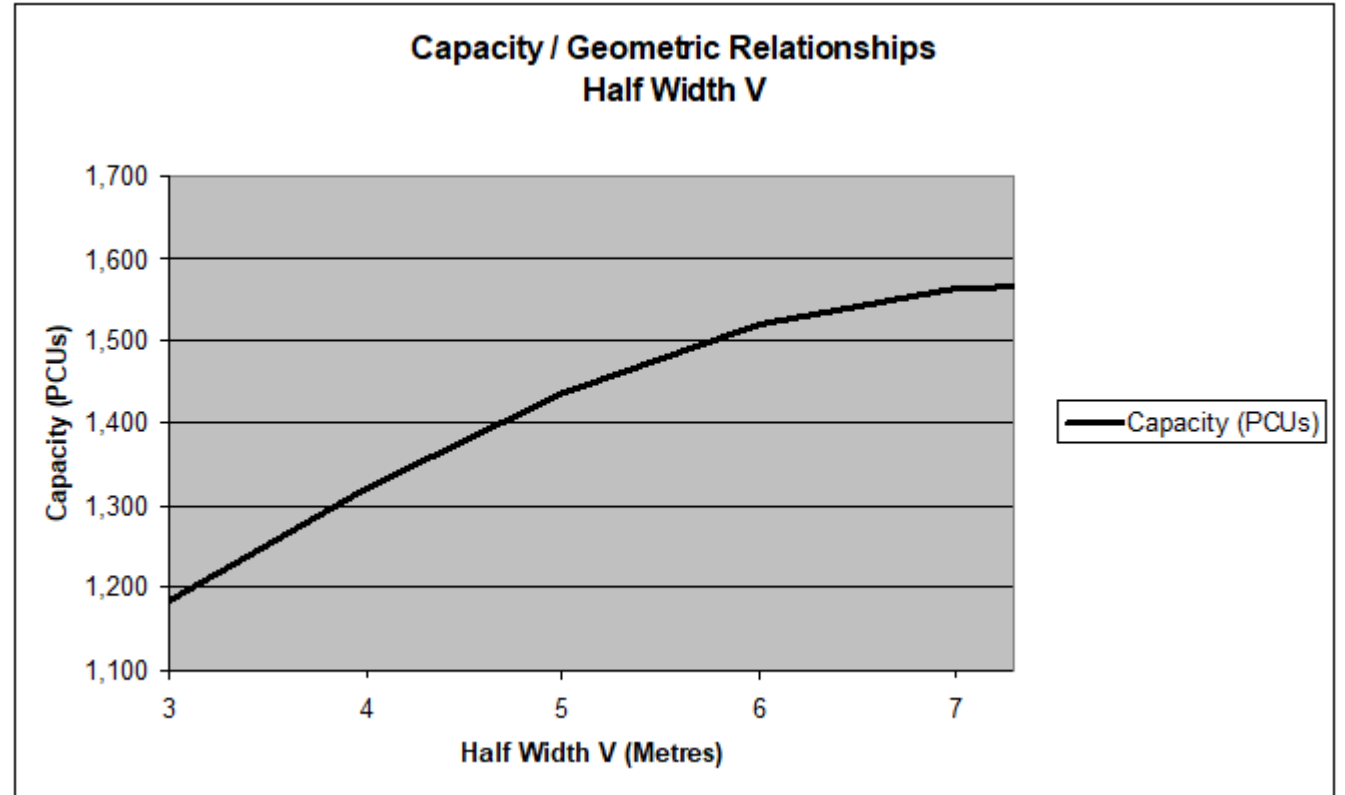
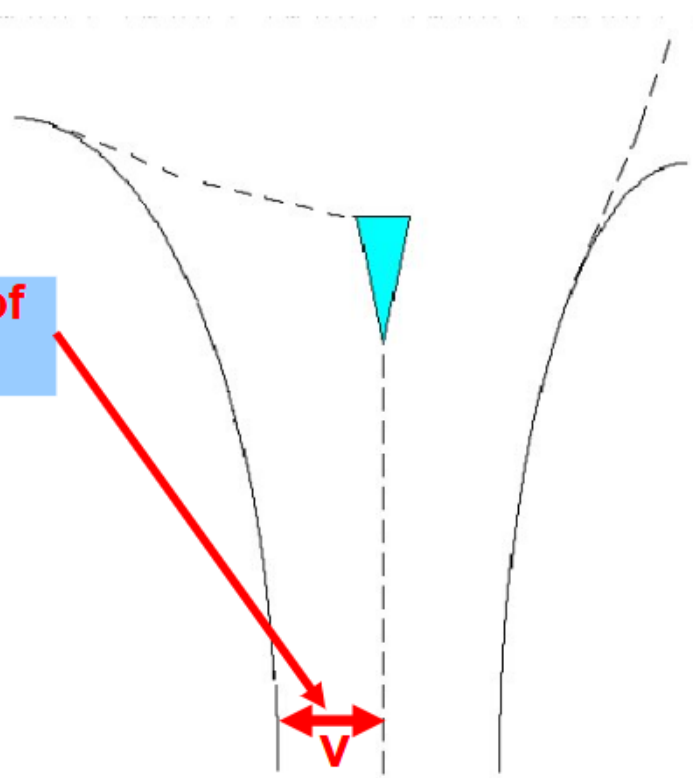
Widths – Major Arm

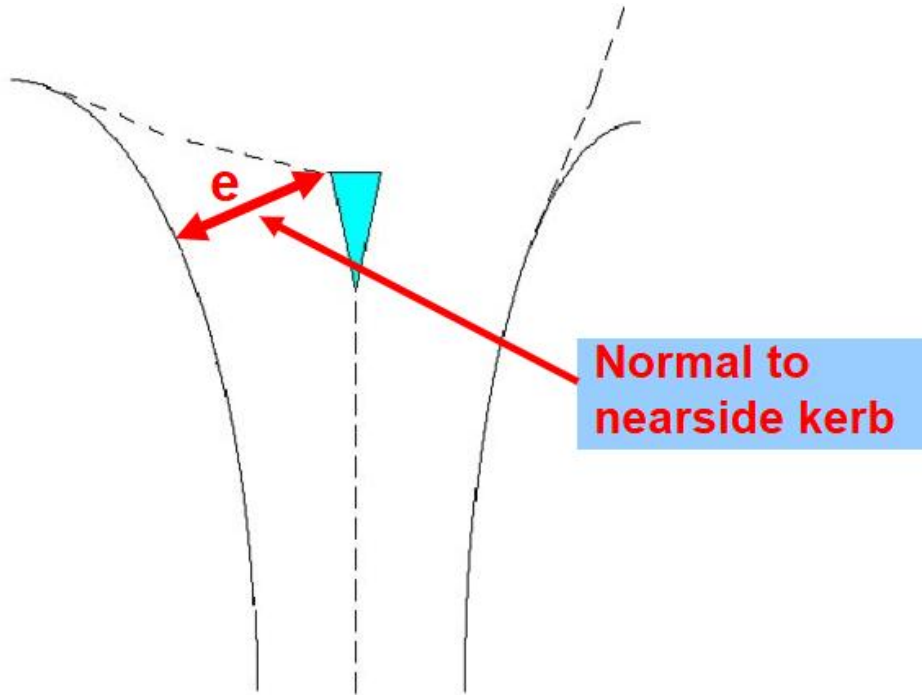


Visibilities – Major Arm (Right turn)

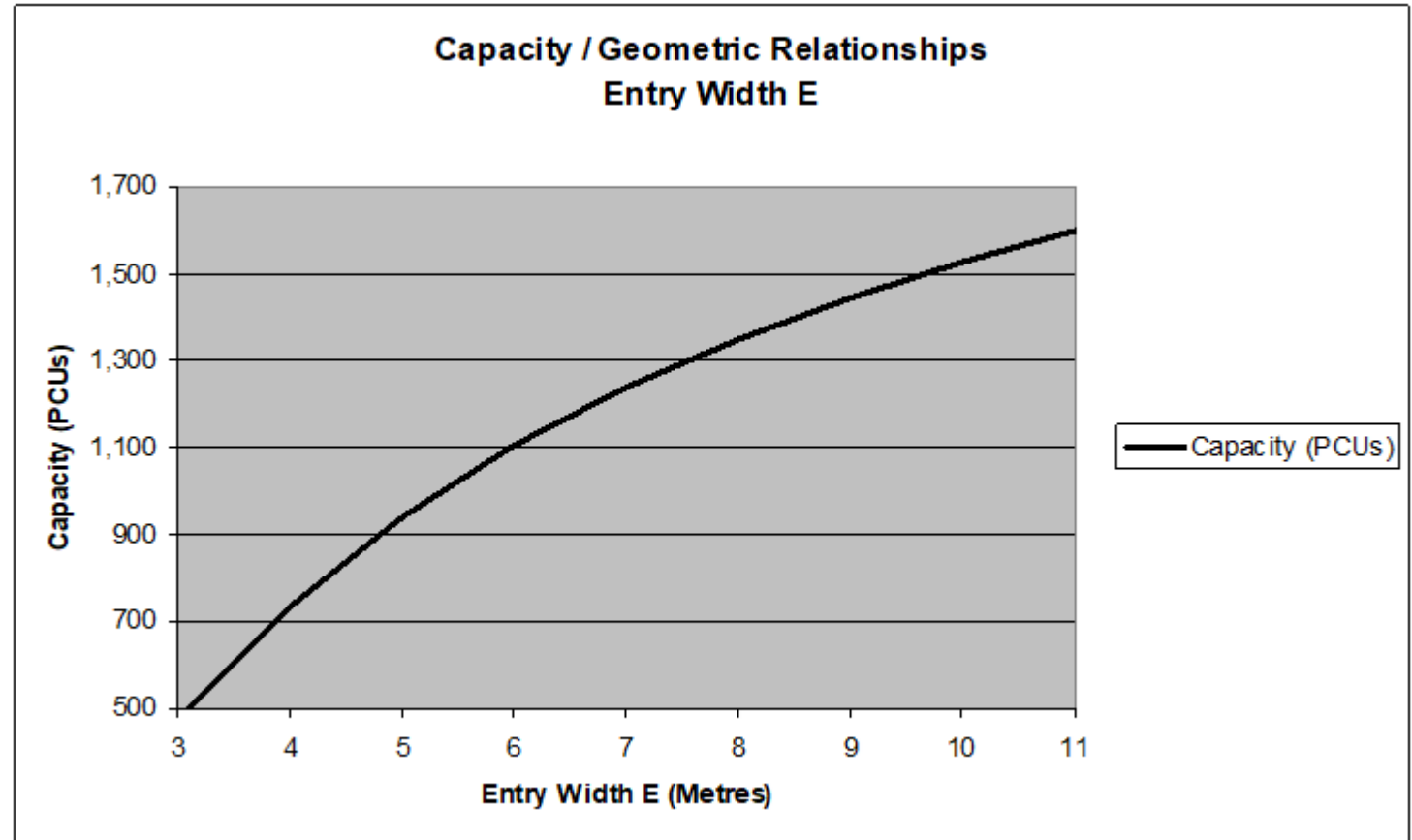


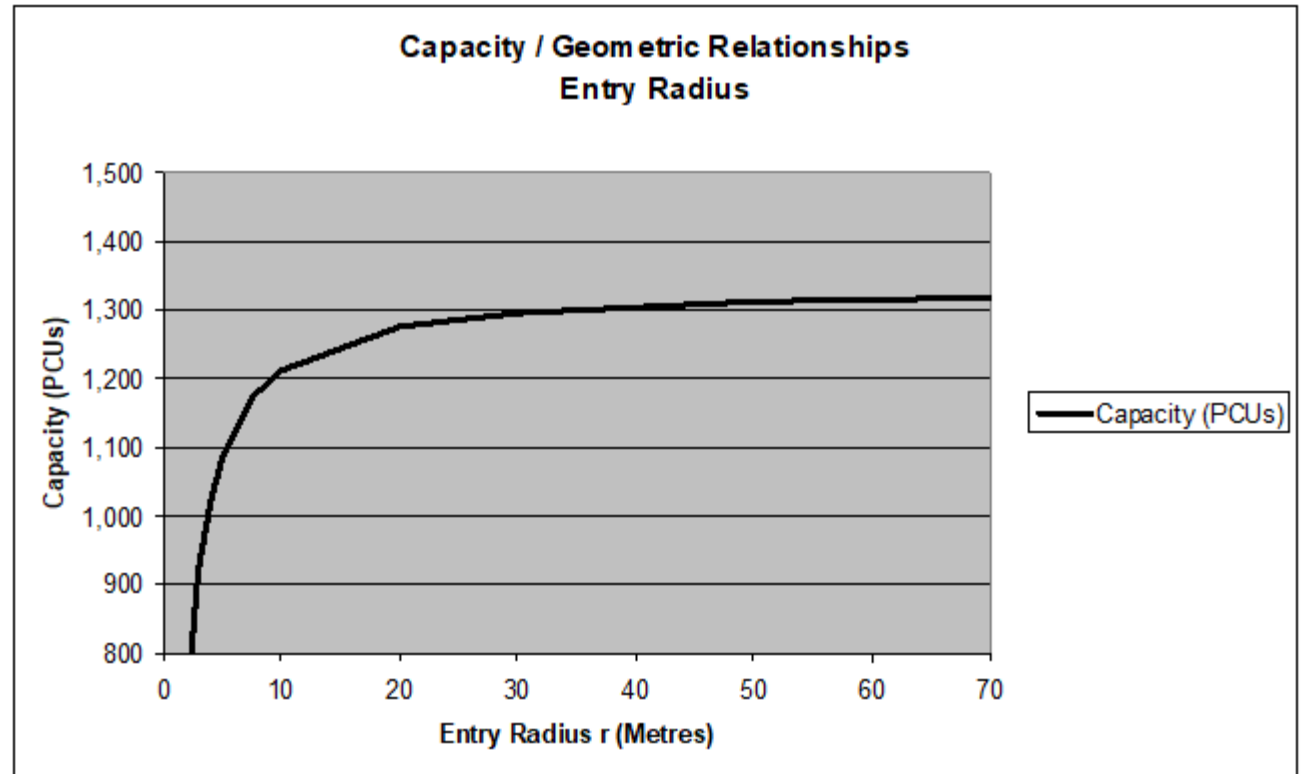
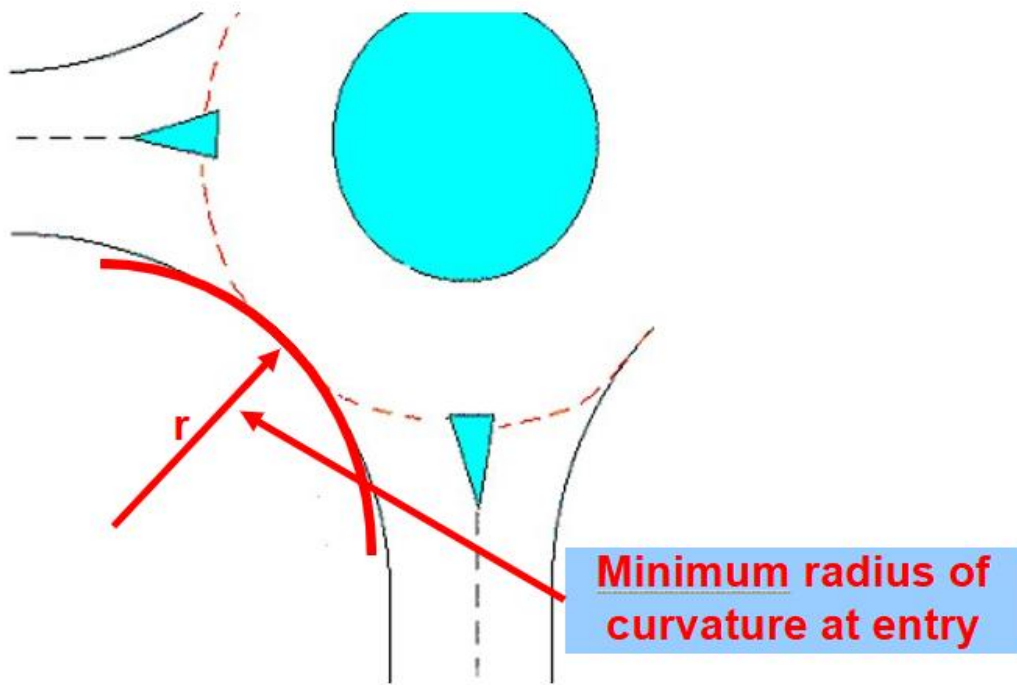
Upstream of
entry flare

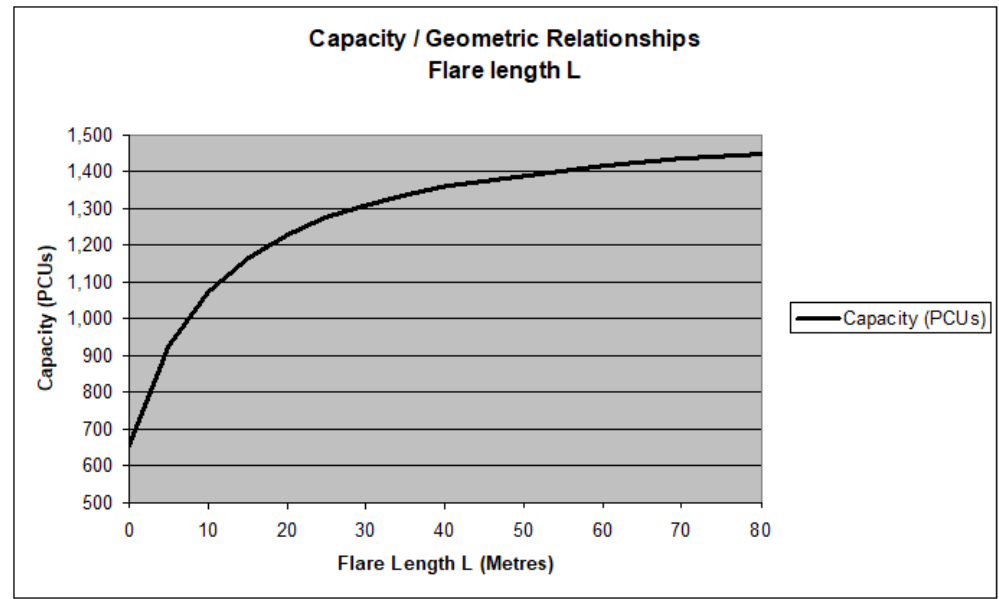
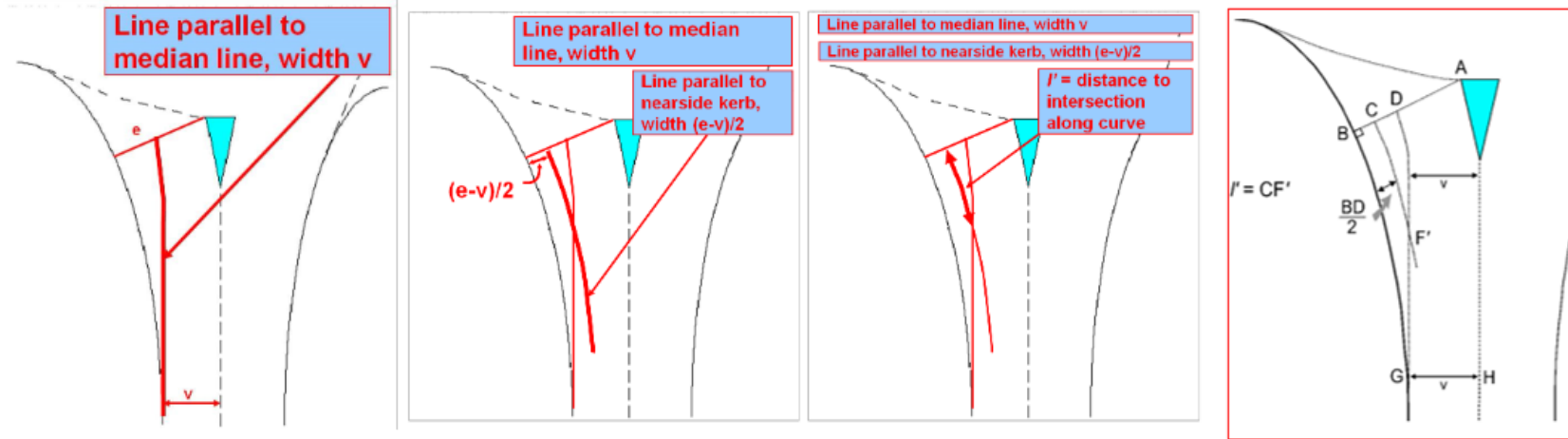


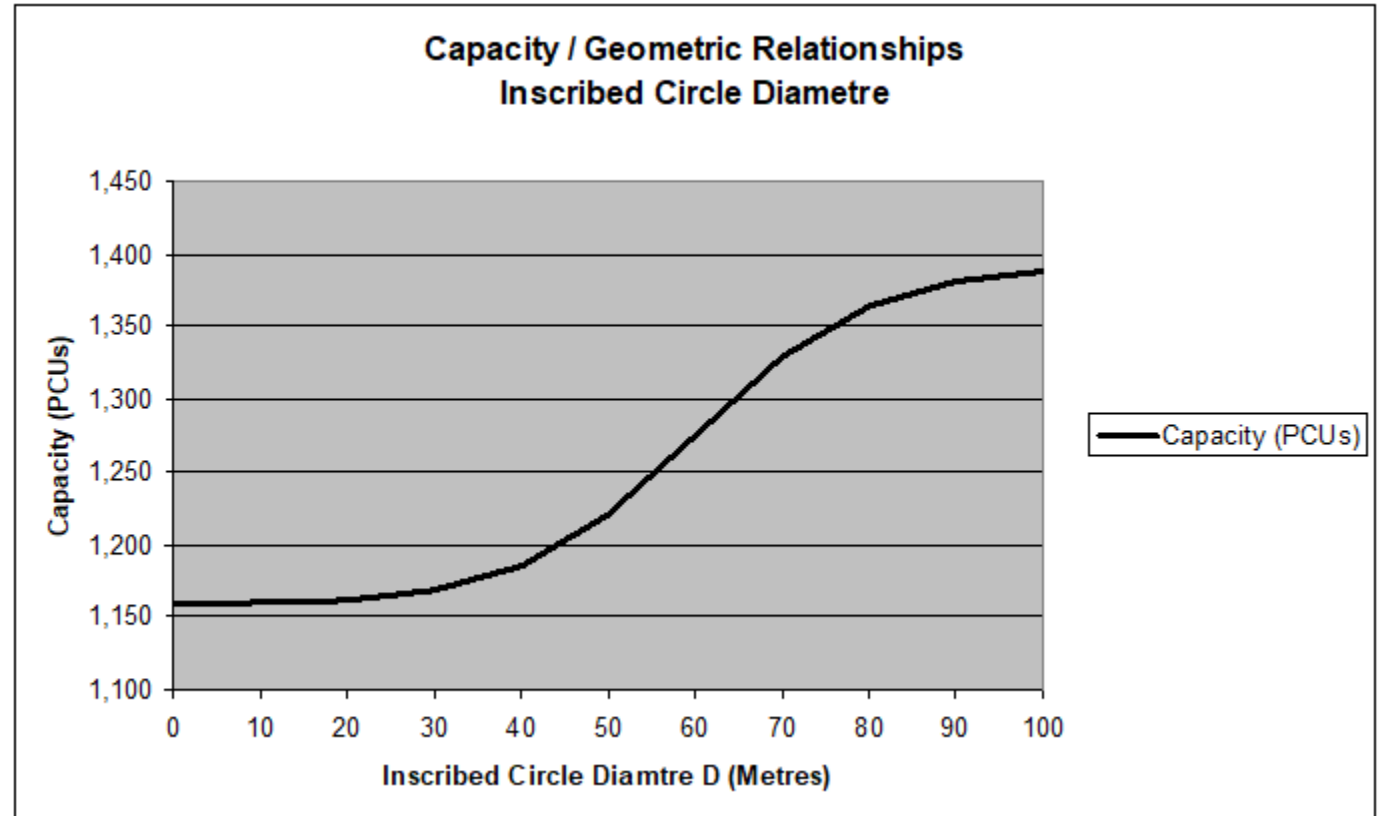
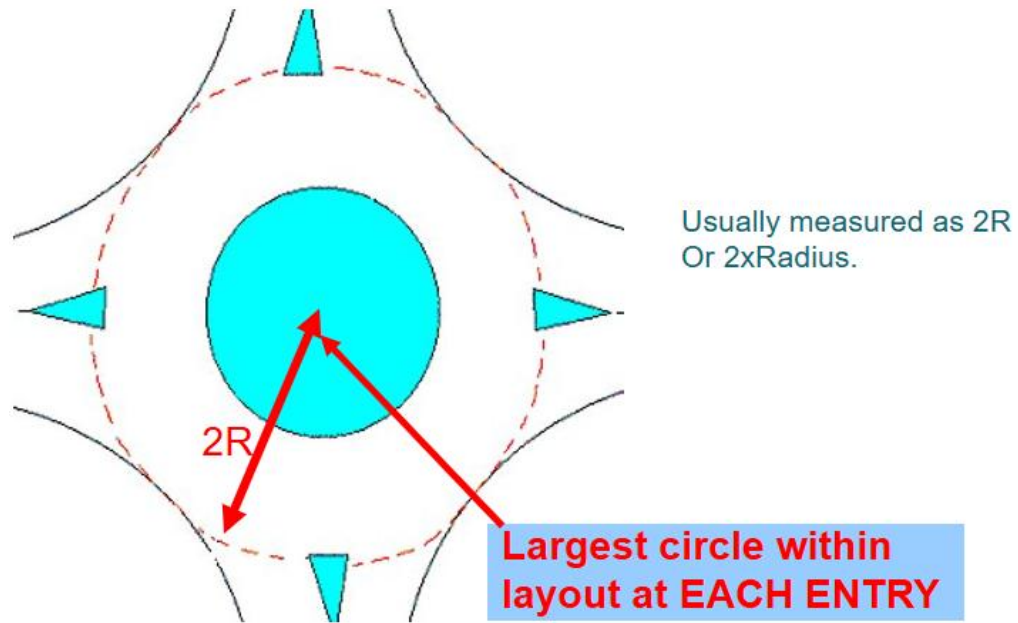


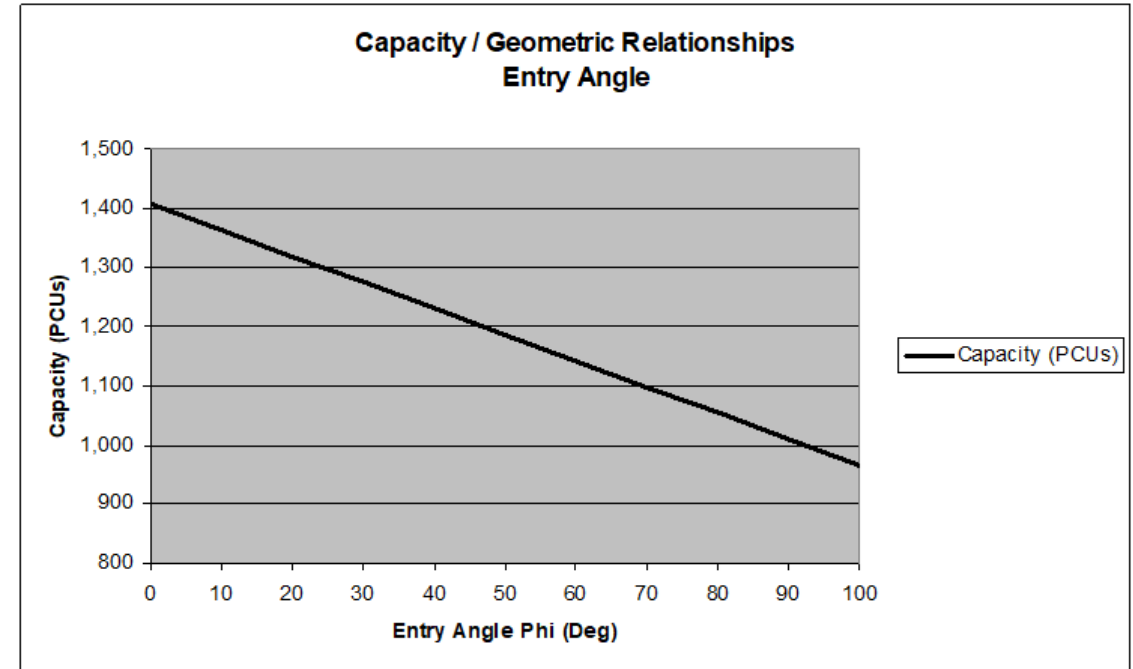
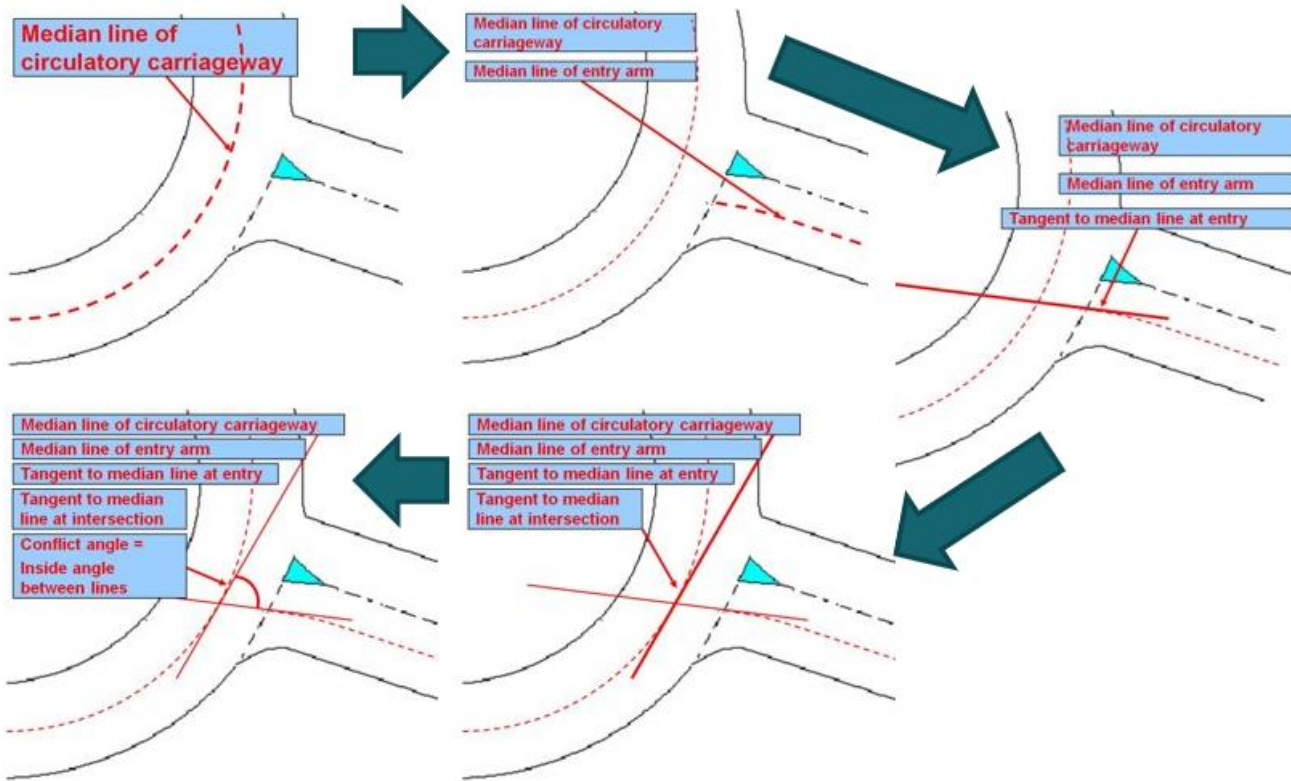
Note that this measurement takes no account of the number of lanes











Summary

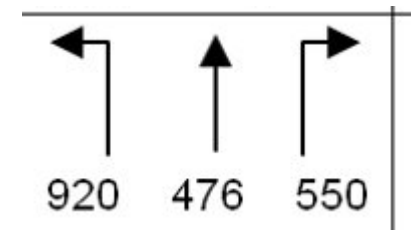
The list below shows the overall effect from the doubling of the geometric parameter from a typical default value as a percentage increase in capacity.

- Entry Width (E) = 90%
- Approach Road Half Width (V) = 20%
- Flare Length (l') = 10%
- Inscribed Circle Diameter (D) = 15%
- Entry Angle (\emptyset) = 10%
- Entry Radius (r) = 2%

Limitations

The ARCADY formula does not understand the provision of lanes on an approach nor how those lanes are used. Therefore, in the example below, ARCADY would assume an 'even' spread of demand across the approach whereas almost half of the demand would actually be in one of the three lanes.

Failing to understand this issue will result in overestimation of capacity.



TRL Research Report 67 (RR67) gave us the equation to calculate saturation flow for unopposed movements. It uses the following parameters;

Lane width in meters (W),

Percentage gradient ($d_G G$)

Proportion of turning traffic (f),

radius of turn (r) and

nearside or offside lane (d_n).

$$S_1 = (S_0 - 140d_n) / (1 + 1.5 f/r)$$

$$\text{Where } S_0 = 2080 - 42d_G G + 100 (w - 3.25)$$

$d_n = 0$ for offside lane and 1 for nearside lane.

The radius is the radius of the turning movement taking the central point of the vehicle (like the intergreen measurements) and not the kerb!(This is different to the radius measurement in ARCADY)

In general, we ignore the gradient unless we know the road is on a 'notable' uphill gradient such as on the slip road at a grade a junction with grade separation.

'nearside lane' does not necessarily mean the lane is physically nearside. It relates to the frictional effects of being near a kerb as well as the influence of slower vehicles restricting the discharge rate. Only lanes where a movement is repeated from an adjacent lane should be coded as non-nearside. This could be the case where there is a double ahead at a pedestrian crossing and the offside of the two lanes would be non-nearside.

The best approach

A model of an existing layout built using:

- Signal Timing sheet data
- Signal Specification drawing
- Operational Timings

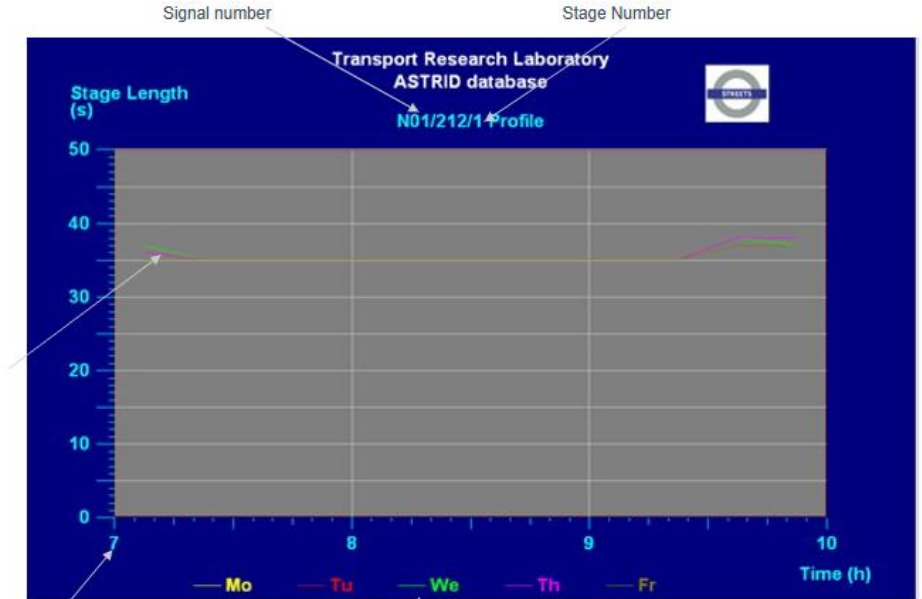
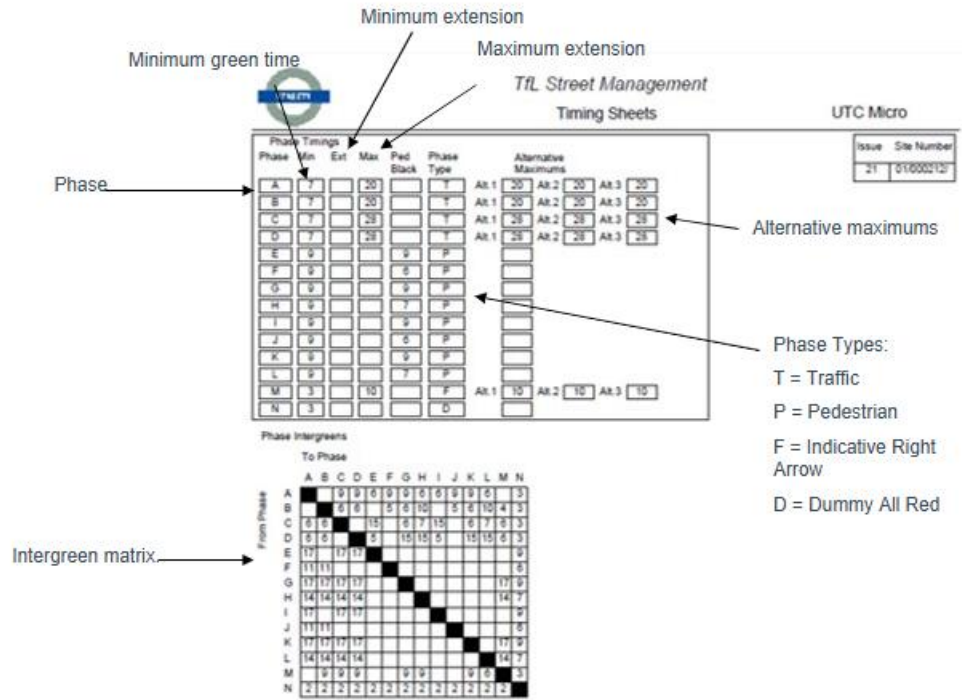
A lesser approach

A model of an existing layout built using:

- Measured intergreens
- Assumed phasing and staging
- Assumed cycle and stage times



The best approach – Real Data going into a model



Time of Day

Demand Dependent Stage number

Off Peak

Junction number.	J01/184	12:30-13:30	2:033/033	3:033/033	4:034/034
J = junction.	J01/185	12:30-13:30	3:062/134		
P = Ped Crossing	J01/190	12:30-13:30	2:062/132		
	J01/194	12:30-13:30	3:010/132		
	J01/212	12:30-13:30	4:034/066		
	J01/213	12:30-13:30	2:067/067	3:067/067	
	P01/242	12:30-13:30	64/68		
	P01/410	12:30-13:30	65/67		

Number of cycles in which the stage was called

Total number of cycles in peak period. Please be aware that this number is sometimes double or triple the actual number of cycles. In this case the cycle time at J01/212 is 104 seconds, meaning that the maximum number of cycles in an hour is 34. This means that for J01/212 stage 4 is called every cycle.

TRL Junctions

Ratio of Flow to Capacity (RFC) – literally the flow per unit of time divided by the derived capacity per unit of time.

The model is assumed to be accurate to a 95% confidence interval at +/- 15%. As such, it is assumed that a prediction of 85% RFC will turn out to be 70-100% RFC 95% of the time.

Level of Service – a grading system originally set out in the US Highway Capacity Manual (HCM) that looks at delay per vehicle

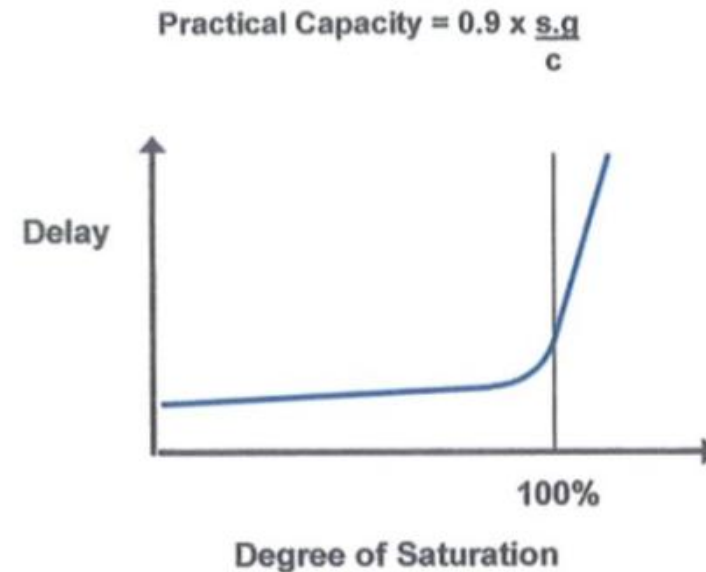
What are transportation institutions? HCM's LOS

Level of Service (LOS)	Signalized Intersection	Unsignalized Intersection
A	≤10 sec	≤10 sec
B	10-20 sec	10-15 sec
C	20-35 sec	15-25 sec
D	35-55 sec	25-35 sec
E	55-80 sec	35-50 sec
F	≥80 sec	≥50 sec

Signalised Models

Degree of Saturation (DoS) – the demand per unit of time divided by the theoretical capacity per unit of time.

100% DoS means the demand and effective capacity are equal. However, the Practical Capacity is limited to 90% DoS because delays start to tend towards exponential at that point.



TRL Junctions

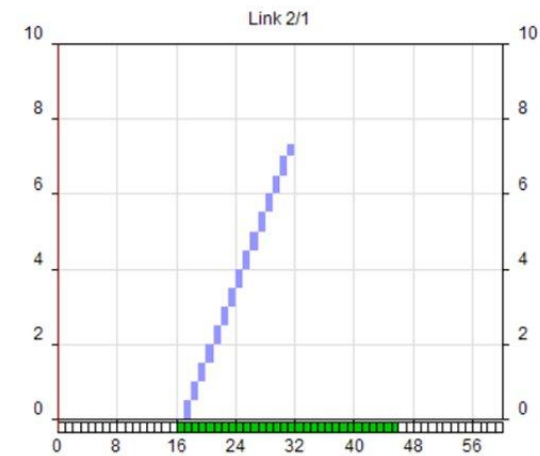
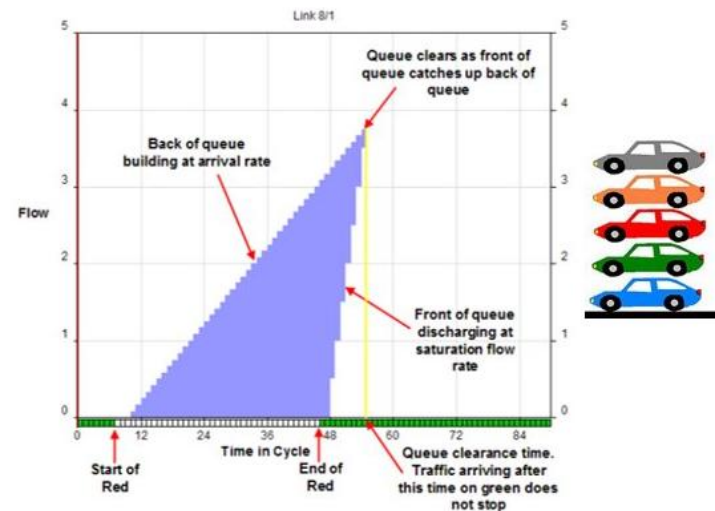
End of period queue in the units that the flows were inputted.
With multiple periods, there will be multiple outputs.

Signalised Models

Mean Maximum Queue (MMQ) in PCU – a way of trying to show the average maximum queue length per signal cycle.

In LinSig, vehicles travel the full length of a link before queueing ‘vertically’. This means that LinSig can’t understand the potential interaction of queues with upstream junctions.

When the arrival rate and discharge rate are broadly the same, there is a risk of sliver queueing, where a ‘fragment’ of a queue perpetuates back and gives a false output.





Historically, one PCU would be regarded as being 5.75m of road space. So we could say that an output of 10pcu in a queue would be 57.5m.

However, as modern vehicles, particularly cars, are getting bigger on average, it is worth considering if a value closer to 6m, or 6m per PCU is a better reflection. Or, at least, 'more robust'.

Mitigation

Mitigation can take the form of a whole host of measures

Reducing Movements by Car

Active Travel improvements

Public Transport improvements

Reducing Peak Period Impact

Flexible working commitments. Planning agreements on operational hours

Improving Junctions

Mitigate for the impact of the development at junctions that suffer clear negative impacts. This does not necessarily mean that the junction must operate within capacity if it was predicted to be over capacity before the development impacts.

New and modified junctions must go through a Road Safety Audit (RSA) process with some of that work being done as part of the application.

Checking!

The TA and the associated modelling will be checked by the Local Authority and stakeholders such as National Highways, who have some bespoke standards for assessment. This process will be smoother if there is a detailed and agreed Scoping Report!

What to check?

In broad terms, all of the assumptions and statements made in the TA will be checked. The review should be asking for data such as:

- Raw traffic counts
- Flow processing spreadsheets
- Models

Models should be checked for geometry, flows, signal timings (if applicable). But checks should also be proportionate to the level of detail in the inputs. Remember that OS Base is not as accurate as Topo. Assumptions on signal cycle time and demand dependent stages can also vary the accuracy.

Do not argue about detail we don't have!

If you cant agree then you could end up in a Public Inquiry, and that really needs to be avoid if at all possible

Amey transport Planning is Recruiting!

Contact me at Gavin.coupe@amey.co.uk

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