ARCADY HEALTH WARNING: Account for Unequal Lane Usage or risk damaging the public purse!

by Barbara Chard, Head of Junction Unit, Cornwall County Council

The ARCADY computer program was first released in 1981. Developed by the Transport Research Laboratory, the program predicts capacities and delays on roundabout approaches from user specified geometric and origin/destination data. The latest release, Visual ARCADY/4, was released in October 1996. The program development can be studied by acquiring and reading references 1 to 10.

Over the years much development work has been carried out with many new features added to the program, for example, geometric delay, formulae for grade-separated entry arms, pedestrian crossings on approaches, accident rate and type predictions and, most recently, the addition of a more user friendly data entry module. However, in the intervening twenty six years, the 'heart' of the ARCADY model has remained essentially unchanged, i.e. the use of an empirical formula to derive, using geometric and traffic demand input data, the entry capacity of each arm as a function of the circulating flow across the arm entry.

This model is well proven. However, of itself, it can take no account of either unused or unequally used lanes or flared sections on the entry approaches (see Photographs 1.1 and 1.2). ARCADY is in fact completely "blind" to such occurrences, and as a consequence may produce hopelessly over-optimistic predictions. In the case of unspotted erroneous Traffic Impact Assessment (TIA) submissions, this can lead to (and probably already has) the construction of inadequate designs that have to be 'improved' and/or replaced at a later date, often at a Highway Authority's considerable expense!

Following the author's public voicing of these concerns (Cornwall County Council presentation, *Arcady and Lane Usage - Time for an Update?*, ICE SW Association Transportation Engineering Group, Bristol, 5th December 1996), the Transport Research Laboratory (TRL) have agreed to place a warning in their new release, Visual ARCADY/4 documentation. They have also invited the author to submit a report illustrating the problem and any proposed solution methodology, this for their consideration and possible inclusion in future ARCADY User Manual documentation.

This paper basically constitutes such a report. Examples illustrating the inability of ARCADY to directly account for non or unequal lane usage are given together with details of the authors modelling methodology aimed at achieving more 'realistic' queue and delay predictions.

1. INTRODUCTION

The purpose of this paper is to:-

- Alert ARCADY Users to the problem of ARCADY's inability to directly account for non or unequal lane usage on roundabout approaches;
- Illustrate the problem with a simple example;
- Present methods adopted by the author to overcome the problem and achieve 'more realistic' ARCADY predictions;
- Present ideas as to how ARCADY and/or competitor programs need to develop from here.

As a prelude to the above, section 2 reminds readers of the basic methodology employed in the ARCADY computer program.
Nigel Harris
Area Planning Manager (East) 
Broadland District Council
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Norwich
NR7 0DU

Dear Mr Harris

Re: Application 20171386 Land East of the Memorial Hall, Brundall.

Further to receipt of your email dated 13th July 2018 from Mr Ian Roberts of Bellamy Roberts, I can confirm that we observed the infrastructure and traffic conditions at the Cucumber Lane, Yarmouth Road roundabout junction with the A47 for a 90-minute period, commencing at 12:20pm on Friday 16th March 2018.

The site visit was undertaken in accordance with the Approved Audit Brief which suggested at item h) that, there was no requirement for the site to be visited at any particular time of the day.

We invariably consider the time of the day for our site visits and chose to visit the site around midday to early afternoon and not during the general peak hours as traffic conditions are lighter and more free flowing. It was therefore considered, that the observations would be more consistent with how drivers interact within the local highway network throughout the week. As fully competent auditors, we are trained to scrutinise and examine proposals, considering all conditions be it when the highway network is congested or free flowing, the weather is sun, rain or snow, as well as all combinations of highway users and do not exclusively rely on the conditions observed during the site visit.

In any case, prior to committing to the time of the site visit, the Audit Team reviewed the Audit Brief and Personal Injury Accident (PIA) data that was included. The data showed that 65% of the road traffic incidents that resulted in personal injury were attended to by the Local Constabulary, took place during off-peak hours to include one that resulted in serious injuries and another in a fatality. In terms of the detailed review, of the 8 incidents that were recorded to have taken place during the peak periods; 37.5% were the result of rear shunts, 37.5% took place when a driver / rider lost control and 25% occurred as a vehicle turned right across the path of another on the roundabout. The type and location of the incidents noted above, were consistent with the incidents that occurred during off-peak hours albeit there was a slightly higher percentage of incidents occurring as a result of a vehicle turning right across the path of another on the roundabout during off-peak hours.

It was therefore felt that, observations during off-peak hours would be sufficient to undertake the Stage 1 Road Safety Audit which assessed the road safety implications of the proposed widening of the Cucumber Lane and Yarmouth Road approach as well as the provision of circulatory road markings.

I trust that this confirmation is helpful and satisfies the validity of the Stage 1 Road Safety Audit, which was undertaken in full accordance with National Standards detailed in HD19/15.
Dear Ms Evans,

I am not sure if this is the right thing to do, but as two of these items were specific questions asked, I wanted to let you have the full details of the link to the ARCADY article I mentioned in my question, as a reference for the Inspector.

http://jctconsultancy.co.uk/Home/docs/tec_arcadyHealthWarning.pdf - I am attaching the first page here, so that the Inspector can get an idea of the point of the full report, before deciding whether or not to read the rest. The headline and author are below.

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When I asked the Highways expert about this, I felt his response did not address the question, and if he had not heard of this potential problem, makes one wonder just how 'expert' he is.

On a slightly different tack - Quantum's Highways expert stated that the surveys were done at peak times - this does not seem to agree with the Fenley report on behalf of Quantum that confirms and defends the fact they observed "the infrastructure and traffic conditions.................for a 90 minute period commencing at 12.20 pm on Friday 16th March 2018". This Fenley letter to Nigel Harriss is dated 13th July 2018. (Copy attached, but this will also be in the papers the various parties already have.)

Lastly, I refer to the first day's Round Table Discussion where it was, I believe, said that there would be a view of the 'Heritage Asset' from Run Dyke (presumably a comment used to justify the view lost behind the development)? I would like to point out that today, we walked down the slope onto the area proposed for the Country Park (if that will be on the 'valley floor')and can say that the Church cannot be seen from there, due to the low level of the ground and height of nearby trees.
Kind regards,

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