

## **Note on a simple usage survey of the area of Redland Green in the vicinity of Trees 1-4: for input into a Quantified Tree Risk Assessment (QTRA).**

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### **Summary**

A simple usage survey of the area in the vicinity of four trees in Redland Green Park was conducted 2<sup>nd</sup>-4<sup>th</sup> February 2008. The survey exposed, as had been expected, a very large variability of usage through the day and between week-days and week-ends. It is not ideal to conduct a survey such as this in winter. We determined that though we expect recreational usage in summer (week-ends and after school in particular) will be higher, the predominant usage is by commuters which will be relatively constant through the year. We applied a correction for school holidays since much of the pedestrian traffic is school related. We estimate that over a year the average probability of occupation (i.e. a person in the risk area of the tree at any instant) for trees 1 and 2 is 0.06. Trees 3 and 4 had a much lower probability of occupation at 0.001 and 0.0004 respectively.

### **Introduction**

Concerns had been expressed regarding the risks posed by four ancient and veteran ash trees (numbered 1-4) and it became apparent that a brief usage survey of the area in the vicinity of the trees was needed as part of a Quantified Tree Risk Assessment (QTRA).

The area concerned is a steep valley transacted by a main path/cyclepath, together with a minor dirt path. Trees 1-3 collectively form a canopy and tree 4 is separate from the other trees.

The necessity of conducting the survey in early February has made it extremely difficult to estimate usage levels in summer. We have chosen not to try and quantify peoples' memories. Rather, if still appropriate, we will return to the area in spring and summer and conduct separate surveys during those time of year. We do feel we can quantify the difference between term time and holidays and week-ends and week-days and have done this. Clearly usage will be higher in summer. At this stage, we have estimated a correction factor for summer, come up with an annual total, which we stress is therefore a very preliminary result.

### **Materials and Methods**

We opted for a simple count of people passing the trees rather than a more sophisticated examination of how much time each person spends in the vicinity of a tree. During our survey we counted cyclists separately as on average they move faster past the trees and are exposed to any risk for approximately half the time. Thus in terms of risk, each cyclist is 0.5 pedestrian equivalent.

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Local knowledge and the interviewing of regular users of the park indicated that there are a number of variables to consider when designing a suitably stratified survey. These are listed:

1. Term time or holidays (we feel that we can accommodate for much of this by separately counting any children (with/without parents) evidently going to school). We deducted them from the calculations for school holidays and half terms which are 13 weeks per annum)
2. Week-day or week end. We have results from a Saturday, a Sunday and a Monday.
3. Rush hour or slack time during the week. We assume that the rush hour lasts for approximately one hour in the morning and have timed our survey to get estimates of peak traffic. Evening rush hour is separated between the children who go home earlier than commuters. However, we assumed that all those who went one way in the morning came back in the opposite direction in the evening and have therefore doubled our morning figures.
4. Winter or summer? This survey was conducted in winter. We recorded the weather conditions.

In addition to counting people as described above we determined usage of the area off the path by examining wear on the grass or earth substrate.

In order to calculate target occupation, overall usage of the park throughout the year was assumed to be limited to 12 hours per day on average. We used the assumption suggested by Ellison (2005) that pedestrians occupy the target area for an average of 5 seconds. Based on the estimates that cyclists occupied the area for half of the time of pedestrians, the occupation time for cyclists was assumed to be 2.5 seconds.

## **Results**

The great majority of the usage is clearly along the footpath/cyclepath. The rest of the area of the park in the vicinity of the trees is not used much by walkers or picnickers (as it is too steep) with the small exception of the path next to Tree 3 which is used by children on mountain bikes and others on an occasional basis.

The raw counts are presented in Table 1. These are shown as average hourly target occupation in seconds in table 2 assuming 5 seconds per pedestrian and 2.5 seconds per cyclist. Total annual target occupation was calculated on the basis of 104 weekend days, 195 school days and 260 working days per annum. Weekend target occupation was calculated as 12 times the average hourly occupation. Weekday target occupation was calculated as 10 times the average low traffic occupation plus 2 times the average rush hour occupation.

If  $q$  is the average number of pedestrians counted in a 5 minute period then the average number of seconds of occupation in a 5 minute period is  $5 \times q$ , assuming 5 seconds of occupation for each person and the average number of seconds of occupation in an hour

is  $12 \times 5 \times q$ . If  $b$  is the average number of cyclists counted in a 5 minute period then the average number of seconds of occupation in a 5 minute period is  $2.5 \times b$ , assuming 2.5 seconds of occupation for each person and the average number of seconds of occupation in an hour is  $12 \times 2.5 \times b$ .

Let  $p_1$  = Average hourly rush hour seconds of occupation of parents and children  
 Let  $p_2$  = Average hourly rush hour seconds of occupation of adults (without children)  
 Let  $p_3$  = Average hourly low traffic seconds of occupation of parents and children  
 Let  $p_4$  = Average hourly low traffic seconds of occupation of adults (without children)  
 Let  $p_5$  = Average hourly weekend seconds of occupation of parents and children  
 Let  $p_6$  = Average hourly weekend seconds of occupation of adults

With the corresponding  $c_i$  for cyclists (treated as single individuals)

Then total seconds of occupation per year for each category  $i$  is given by

$T_1 = p_1 \times 195 \times 2$  based on 195 school days a year and 2 hours of rush hour each day  
 $T_2 = (p_2 + c_2) \times 260 \times 2$  based on 260 week days a year and 2 hours of rush hour each day  
 $T_3 = p_3 \times 260 \times 10$  based on 260 week days a year and 10 hours of low traffic period per day  
 $T_4 = (p_4 + c_4) \times 260 \times 10$  based on 260 week days a year and 10 hours of low traffic period per day  
 $T_5 = p_5 \times 104 \times 12$  based on 104 weekend days a year and 12 hours of average traffic  
 $T_6 = (p_6 + c_6) \times 104 \times 12$  based on 104 weekend days a year and 12 hours of average traffic

Total annual occupation (in seconds) is given by  $N = \sum_{i=1}^{i=6} T_i$

Probability of occupation is given by  $N / (60 \times 60 \times 24 \times 365)$

### **Trees 1 and 2.**

These trees are in the vicinity of the cyclepath/footpath.

Total annual target occupation = 1800000seconds, giving a probability of occupation of 0.06.

### **Tree 3**

This tree is set well back from the main cyclepath and the risk is only to cyclists or pedestrians passing along the dirt footpath.

Examination of wear to the grass shows that the usage levels are not high because the path is not visible in the grass on either side of the tree canopy but only in the exposed dirt under the tree.

Total annual target occupation = 38000seconds, giving a probability of occupation of 0.001.

#### **Tree 4.**

This tree is an ancient hedgerow tree on the very edge of the park. Examination of wear to the grass shows that the levels of usage here are the lowest of the four trees, as confirmed by the survey.

Total annual target occupation = 12000seconds, giving a probability of occupation of 0.0004.

#### **Discussion**

Our main conclusion is that due to the very different kinds of usage of the park it is simply not possible to conduct a valid usage survey over a short (say) two hour period. Levels of use in a single five minute count along the cyclepath varied from 0 – 102 people. Depending on the time of day, or day of the week that the survey were conducted, average hourly occupation may vary by a factor of 10. This is the reason that we have conducted repeated five minute surveys.

We believe that the usage figures for those that pass through the park (on the way to school and work) would be only slightly higher in summer as compared with winter. In warmer months more people use the park for recreational purposes. However, as the main usage is during the rush hour, and we expect it would not vary much through the year, we feel that our results can be used to extrapolate to a year-round total.

Whilst we believe that these results represent a step forward in determining the usage we feel that they cannot be relied upon until similar surveys have been done in spring and summer months.

#### **References**

Ellison, M.J. 2005. Quantified Tree Risk Assessment Used in the Management of Amenity Trees. *J Arboric. International Society of Arboriculture, Savoy Illinois* 31:2 57-65

Table 1. Five minute counts of individuals

Date	Time period	Adults on footpath (tree 1,2)	Cyclists on footpath (tree 1,2)	Parents plus children (tree 1,2)	Vicinity of tree 4	Dirt path by tree 3
02/02/2008 Saturday (cold, sunny)	13:25 - 13:30	2	0	0	0	0
	13:35 - 13:40	2	0	0	0	0
	13:45 - 13:50	1	0	0	1	0
	13:55 - 14:00	6	5	4	0	0
	14:05 - 14:10	2	2	2	0	0
	14:15 - 14:20	2	0	4	0	1
03/02/2008 Sunday (cloudy, cold, moderate wind)	15:00 - 15:05	1	0	0	0	0
	15:10 - 15:15	0	0	2	0	0
	15:20 - 15:25	0	0	0	0	0
	15:30 - 15:35	0	2	0	0	0
	15:40 - 15:45	5	0	0	0	0
04/02/2008 Monday (fine with mist then sunny, few clouds)	08:00 -08:05	5	1	25	0	0
	08:10 - 08:15	9	0	93	0	0
	08:20 - 08:25	0	1	13	0	0
	08:30 - 08:35	18	1	7	0	0
	08:40 - 08:45	11	1	14	0	0
	08:50 - 08:55	10	2	0	1	1
04/02/2008 Monday (cold, sunny, then light showers)	11:00 - 11:05	1	0	3	0	0
	11:10 - 11:15	4	0	1	0	1
	11:20 - 11:25	1	0	0	0	0
	11:30 - 11:35	4	0	1	0	0
	11:40 - 11:45	8	0	0	0	0
	11:50 - 11:55	3	0	0	0	0

Table 2. Average target occupation

	Adults on footpath (tree 1,2)	Cyclists on footpath (tree 1,2)	Parents plus children (tree 1,2)	Vicinity of tree 4	Dirt path by tree 3
Average hourly weekend target occupation (seconds)	114.5	24.5	65.5	5.5	5.5
Average hourly weekday target occupation (seconds)- low traffic period	210.0	0.0	50.0	0.0	10.0
Average hourly weekday target occupation (seconds) - rush hour period	530.0	30.0	1520.0	10.0	10.0