

Warren Footpath Lighting Project

Thames Landscape Strategy in Action!



London's Arcadia
Draft Report February 2009
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**THAMES
LANDSCAPE
STRATEGY**
HAMPTON to KEW



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1.0 Introduction:

The Warren Footpath runs along the Middlesex bank of the River Thames from Orleans Gardens to Richmond Bridge, in the London Borough of Richmond upon Thames. It is the main off-road route between Richmond and Twickenham Town Centres and is well used by pedestrians and cyclists. There is also evidence to suggest the area is well used by bats.

London's Arcadia has received funding from Biffaward to improve the Warren Footpath for the benefit of bats. Some species of bat are extremely light sensitive; therefore the main factor to consider in making the area more bat-friendly is the modification of the current street lighting along the Warren Footpath.

The current street lighting on the Warren Footpath is inconsistent and inefficient containing a range of lights and lamp columns (some dating back to the 1950s) which create small pools of light and long sections of darkness along the footpath.

In order to modify the lighting along the Warren Footpath it is necessary to consider how the Warren Footpath is currently being used by both people and bats and how any modification of the lighting would affect this usage. This report examines the current lighting on the Warren Footpath as well as presenting the research carried out into how the footpath is being used by people and bats.

1.1 Site description:

The Warren Footpath runs between Orleans Road in Twickenham to Richmond Bridge in Richmond (see Figure 1). The footpath runs along the Middlesex bank of the River Thames passing Marble Hill House and Park.

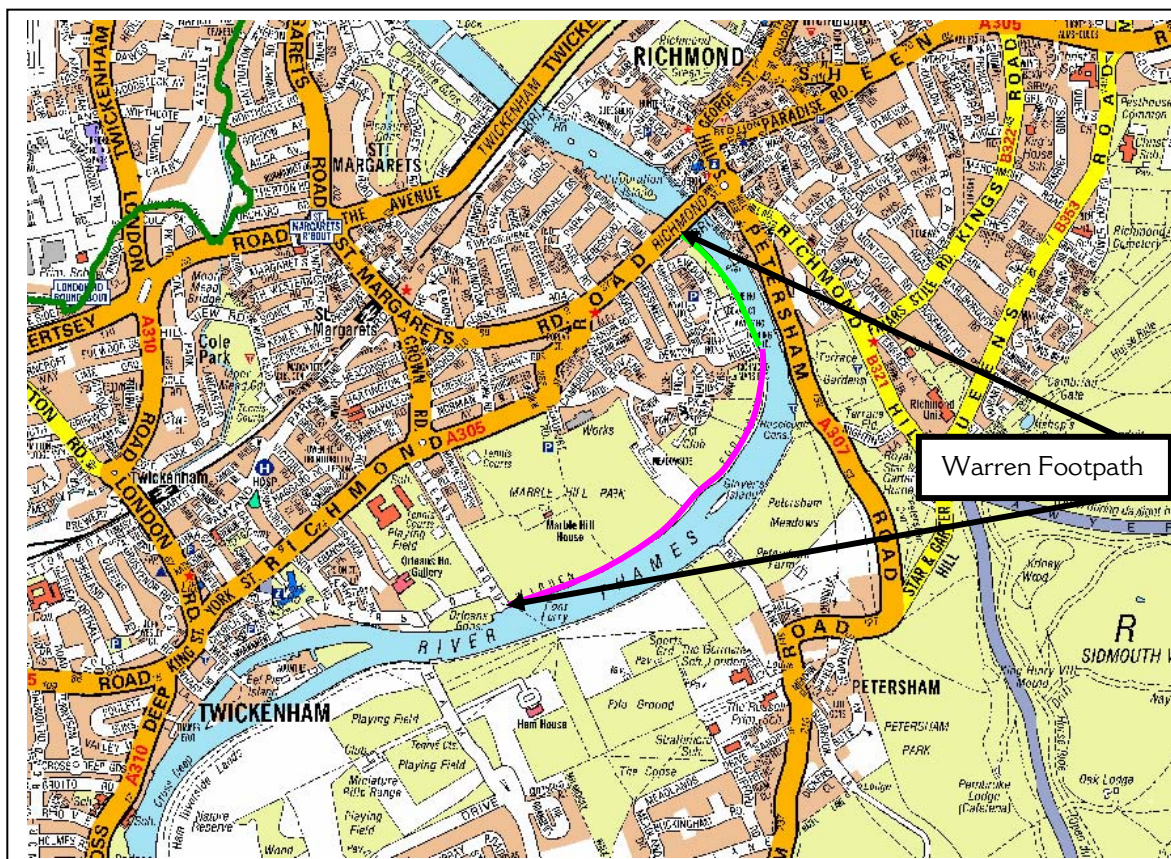


Figure 1 Showing the Warren Footpath as a connecting route between Twickenham and Richmond town centres. The section in green shows the more urban stretch from Richmond Bridge to Denton Road. The section in pink shows the more rural stretch from Denton Road to Orleans Road, the foot ferry and the end of the Warren Footpath.

Figure 1 above shows the two different sections of Warren Footpath. Although the footpath is continuous, there is a noticeable difference between the section from Richmond Bridge to Denton Road (marked in green on figure 1) and the section from Denton Road to Orleans Road and the foot ferry (marked in pink on figure 1). is urban in feel; it is well lit, with clear views of Richmond Bridge as well as being overlooked by flats and houses. Cambridge Gardens runs alongside Warren Footpath and has an open grass area with playground, tennis court and café with clear views of residential streets. After Denton Road the footpath becomes more rural with no residential roads intersecting the footpath effectively making the footpath a tunnel from Denton Road to Orleans Road and the foot ferry where the only route off the footpath is through Marble Hill Park. This section has more vegetation along the footpath; the ambient light from the main road is lost due to the bend in the river and the residential feel of the footpath is replaced by the greenery of Meadowbank and Meadowside and Marble Hill Park.

1.2 Green space and important habitat features for bats:

With the largest urban park in Europe and numerous smaller pocket parks along the river, Richmond is the greenest borough in London. A few note-worthy green spaces are close to Warren Footpath, including Marble Hill Park, which borders the River with its stand of mature trees. Orleans House Gallery and Gardens nearby consists of an ornamental garden as well as a young, small broadleaved woodland. York House Gardens is another ornamental Garden with several ponds and water features.

Across the river on the Surrey side is Richmond Park a National Nature Reserve with its veteran trees, ample green space and numerous ponds. Richmond Park is connected to the River by the Ham Avenues; from Ham Gate, there is a continuous tree line of oak, plane and predominantly lime which runs passed Ham House and finishes at the River Thames. This linear landscape feature is a well used flight path for bats and a green corridor used by other wildlife to travel from one habitat to another.

Figure 2 below clearly shows the River is sandwiched between ample green space presenting not only a feeding habitat for bats, but one that has viable connecting features and corridors for species to commute from roost to feeding ground.

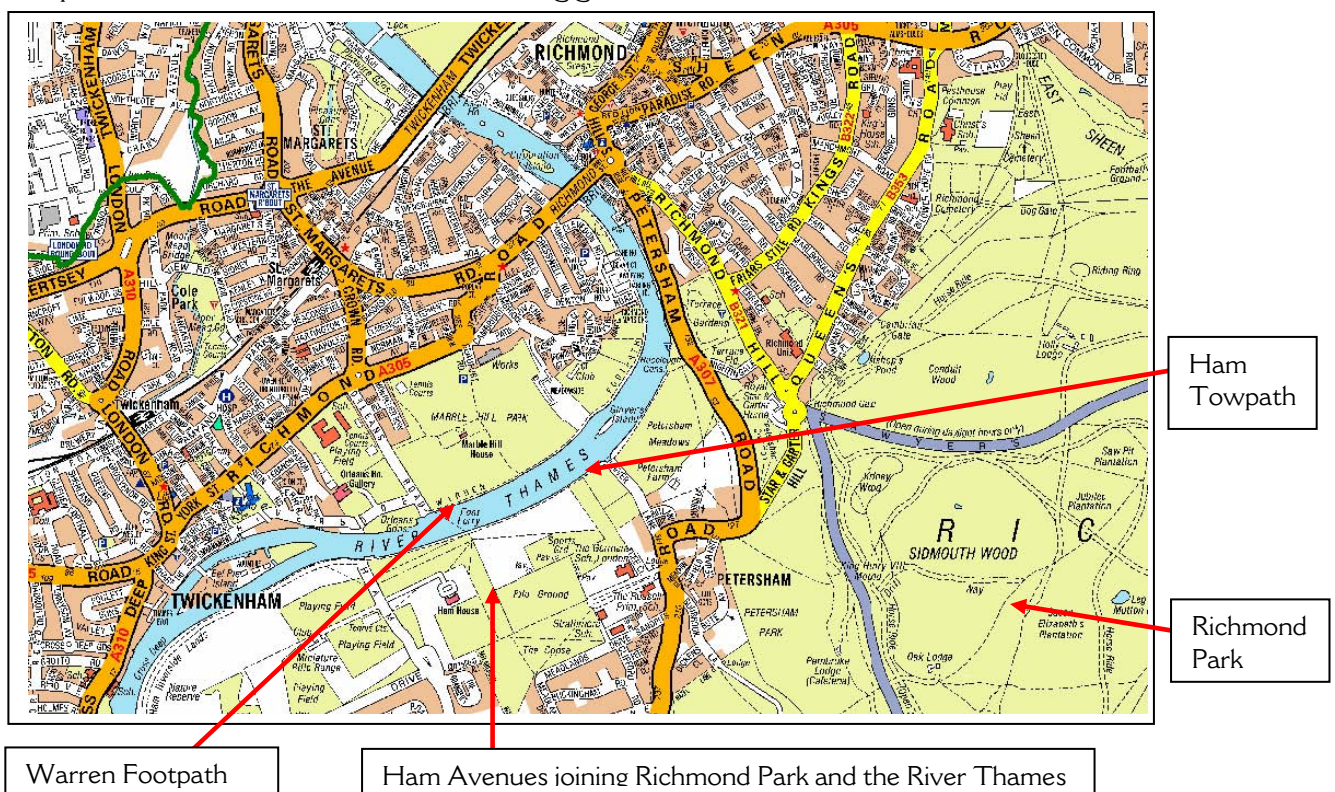


Figure 2 Map of Warren Footpath showing its location amongst various green spaces in the borough of Richmond.

1.3 Public usage of the footpath:

The Warren Footpath is the major off-road route connecting Richmond and Twickenham town centres; for this reason it is well used for leisure and as a commuter route. The footpath is well used in the day time for leisure by dog walkers and families (mainly mothers with buggies during the weekdays) as well as for fitness, by walkers, joggers and cyclists.

Use of the river at night and after dark was largely unknown and this is one of the questions this report studies.

1.4 Bat usage along the footpath and river:

A desk top study was commissioned by Alison Fure (a local bat surveyor) to collate all information known about how bats are using the area. The full report can be found in the Appendix. Table 1 details the bat species recorded in the vicinity of the Warren Footpath and their frequency.

Table 1 Showing the national and local frequencies of bat species (amended version of Fure, 2008)

Species	National frequency	Local frequency	Main roosts
Common pipistrelle (<i>Pipistrellus pipistrelles</i>)	Very common	Common	Buildings near Twickenham
Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>)	Very common	Common	Buildings in Twickenham
Brown long-eared (<i>Plecotus auritus</i>)	Common	Probably common but under-recorded	Buildings near the river at Teddington
Serotine (<i>Eptesicus serotinus</i>)	Uncommon	Uncommon	Building in Teddington
Natterer's (<i>Myotis nattereri</i>)	Uncommon	Status unknown, probably common in Richmond Park	Building near the river at Teddington
Daubenton's (<i>Myotis daubentonii</i>)	Common	Common	Trees and the underground sites in the local area
Noctule (<i>Nyctalus noctule</i>)	Fairly common	Widespread but declining	Trees nearby
Leisler's (<i>Nyctalus leisleri</i>)	Rare	Fairly common	No known roosts in the area
Nathusius' pipistrelle (<i>Pipistrellus nathusii</i>)	rare	Regularly recorded in small numbers	Building along Barge Walk (Hampton Court)

The report shows that the River Thames and its surrounding vegetation represent an important foraging and feeding habitat for bats. Of note are the species identified as roosting close to the Warren Footpath, in Twickenham: common and soprano pipistrelle, Daubenton's and noctule bat.

Evidence from boat surveys shows that the periphery of the islands along the River Thames (Glover's Island and Eel Pie Island along the Warren Footpath) provides important feeding habitats for bats.

The London Species Action Plan for Bats (London Bat Group, 2008) states there are eight known breeding bat species in the borough. Of these, the soprano and common pipistrelle are most common, occurring in all London Boroughs with the noctule and Daubenton's bat being regularly recorded and widespread. However, there is evidence to suggest that nationally population numbers are declining with the common and soprano pipistrelle declining by as much as 70% between 1978 and 1993 (Harris *et al.*, 1995). Within London, there has been a statistically significant decline in bat populations, in particular for the noctule, Leisler's and serotine bats (Guest *et al.*, 2000).

The Richmond Species Action Plan states the important sites for bats within the borough including: the London Wetland Centre in Barnes, the River Crane valley, Richmond and

Bushy Parks, Stain Hill reservoirs, as well as various sites within the River Thames corridor, such as Petersham Lodge Woods and Lonsdale Road reservoir.

The Warren Footpath is situated within the River Thames corridor and therefore is an important bat habitat.

The edge of Petersham Lodge Woods (mentioned above) was surveyed for bats as part of our research (see Section 2.4); the site is located on the opposite side of the river to Warren Footpath and is approximately located at stations 12 – 13 on the Ham Towpath transect on Figure 8.

Whether bats cross the river from the Ham side to the Warren Footpath is largely unknown.

1.5 Current lighting:

A light survey was carried out along the Warren Footpath by a leading light company. The results are detailed in Figure 3 below showing the current lighting levels in lux outside Marble Hill House.

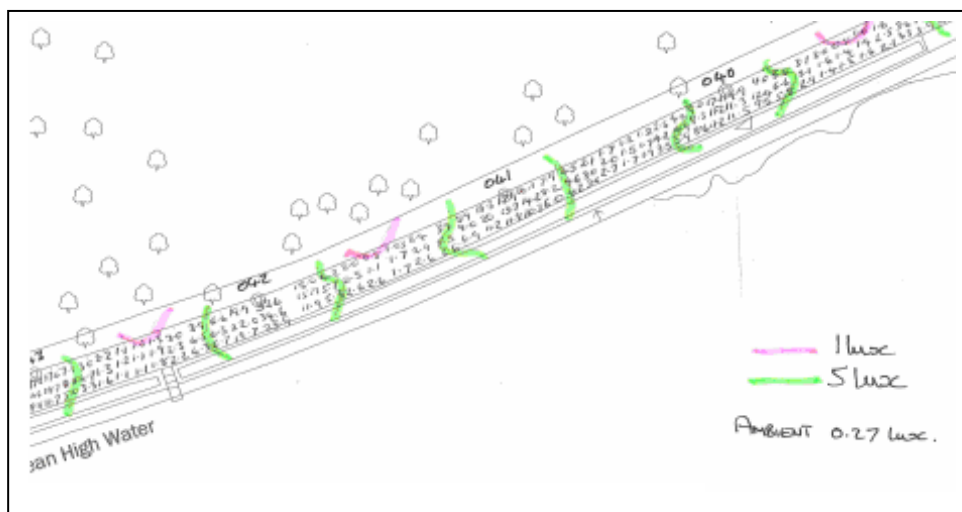


Figure 3 showing the light levels in lux along the Warren Footpath outside Marble Hill House on 4th February 2009. The numbers 040 – 043 represent the light columns and the numbers in a smaller font (on the footpath itself) represent the lux levels.

In some areas the lux levels are as high as 23.9 lux on the side of the footpath closest to the River Thames. Although it was not possible to obtain details of light levels along the river, we can assume that if the lux level is 23.9 on the area of the footpath closest to the river, then the lux level spilling onto the river will be similar to this. It is important to take into consideration that the light levels of a full moon is widely considered to be 1 lux.

The current street lighting on the Warren Footpath is not uniform; it consists of a variety of ages, spacing between lamps, sizes, shapes, bulbs, fixtures and fittings. Figures 4 – 6 show a range of the street lights currently found on the Warren Footpath consisting of a variety of lampposts dating from 1950s to the present day. There are 48 street lights along the 2 km footpath, roughly one every 40m (although this is not uniform); most of these are High Pressure Sodium (SON) lamps emitting Ultra Violet (UV) light that attracts insects and has a particularly adverse effect on bats (Urbis Lighting Limited, 2008). The current street lights are programmed to turn on when the ambient light drops below 55 lux. Most of the street lamps are positioned high in the tree canopy as shown clearly in Figure 5 resulting in the inefficient use of energy and lighting. Often the light bulbs are on during daylight hours when they are not needed (Figure 5). Much of the light is obscured by tree branches which results in pools of light directly under the columns with long stretches of darkness between street lights. This problem is particularly bad when the trees are in leaf. As such the current lighting is inefficient and does not serve the intended purposes for people to use in the hours of darkness.

1.6 Bats and lighting

There are 17 species of bat in the UK, all of which are nocturnal insect-feeding mammals that use echolocation (a type of sonar) to navigate and catch prey in the dark. Bats roost in trees, houses and underground tunnels using several different roosts throughout the year. During the winter months when there are few insects available, bats hibernate. During the spring and summer months, females will gather together in maternity roosts to give birth to live young. Bats are protected by law under the Wildlife and Countryside Act 1981 making it an offence to kill, capture or disturb bats and their roosts.

The current lighting presents issues for bats as well as people. The tree canopy is an important foraging area for bats. Insects are drawn to the UV light that is emitted by the street lamps, some bats are fairly light tolerant and will exploit the easy feeding ground around street lights with their abundance of insects. Other rarer species of bats are extremely light-shy (Daubenton's, long-eared, Natterer's, Brandt's, whiskered, Bechstein's, Barbastelle and greater and lesser horseshoe) and will avoid lit areas. (Bat Conservation Trust, 2008). This creates a problem as insects are drawn from afar to the UV light of the street lamps leaving fewer insects in the dark areas and therefore less food for the rarer light-shy bat species that will not venture into lit areas for fear of predation.



Figure 4 Two street lights with metal columns next to each other, each with a different lamp and fitting



Figure 5 Metal column with spherical fixture. Light is on during daylight hours when not needed



Figure 6 Street light with concrete column

Figure 7 shows the current lighting along the Warren Footpath from the vantage point of Richmond Hill. The issue of light spill into the river is clear, it is this light spill that intercepts the dark corridor of the river and thus reduces the available foraging habitat for bats. It is this light spill that we are aiming to reduce in any new lighting design.



Figure 7 Photograph taken from Richmond Hill of the Warren Footpath at night showing the light spill into the River Thames. Also visible is Ham Towpath, the unlit side of the river and Kempton Racecourse (the floodlights in the distance). Photograph by Ken MacKenzie

Bats are highly evolved nocturnal mammals. One of the reasons they are nocturnal is to avoid predation. Artificial lighting can increase the chances of predation by birds of prey. Observations of kestrels hunting at night under the artificial light of motorways shows what disruption artificial lighting can bring to the order of the natural world (Bats Conservation Trust 2008). Light-shy bat species will avoid the street lights for fear of predation and thus valuable foraging habitat for bats (such as the tree canopy or the river bank) is lost.

Dark corridors such as the River Thames are extremely important for bats as they represent not only a valuable feeding area but also a means of commuting from one habitat to another. One of the problems with the current lighting is the huge amount of light that falls over the River. This is clearly shown in Figure 7. This light spill effectively fragments these dark river corridors thus reducing in size and in some cases destroying the vital dark foraging habitats available for bats. The Ham Towpath (visible in the foreground of Figure 7) is an example of a dark corridor ideal habitat for foraging bats.

The Daubenton's bat is an extremely light-shy species and one that is a water specialist feeding on water-born insects. It flies like a hovercraft just above the surface of the water picking off insects with its large hairy feet. It is one of the last bats to emerge after sunset (waiting for low light levels before it ventures from the roost) and is not found routinely feeding above 0.1 lux* (Fure, 2008).

* Lux is the standard unit of illuminance and luminous emittance. It is used in photometry as a measure of the apparent intensity of light hitting or passing through a surface. 1 lux is the measurement of light from a full moon overhead in the tropics on a clear night while it is 0.27 lux for a full moon overhead on a clear night in the UK. Light levels below 1 lux can be considered moonlight levels or less.

It is not only the Daubenton's bat that uses dark river corridors for feeding, many bat species will predate insects in the vegetation overhanging and lining the river. A bat survey by boat along the Thames and Lee Navigation (Fure, 2008) showed that increased light levels along the river resulted in a decreased level of bat activity. Where there was no light spillage onto the water, there was a greater diversity of bat species.

2.0 Research

Research was carried out in two separate areas: people and bats. The following sections details the research carried out.

2.1 People research:

This research into the human use of the Warren Footpath involved a qualitative study with questionnaires and a quantitative study using automated counters.

2.2 Questionnaires:

A pilot study was carried out amongst 12 users of the Warren Footpath. A copy of this questionnaire can be found in the Appendix along with the results. The pilot questionnaire was then modified to produce the final version.

Questionnaires were carried out in person by stopping passers by on the Warren Footpath. A minimum of two interviewees positioned at either the Twickenham end or the Richmond end of the Warren Footpath stopped passing members of the public and asked them if they would take part in a survey about the lighting on the towpath. Interviews were carried out at different times of the day, in different weather conditions and at different light levels throughout the course of one year. A copy of the questionnaire can be found in the Appendix. The main questions posed were the interviewee's opinion of the current street lighting along the footpath and if the interviewee used the footpath after dark. A question at the start filtered out occasional users of the footpath so that the results reflect only those that use the footpath on a regular basis.

2.3 Counters:

In addition to the questionnaires, there were also three automated counters installed on the Warren Footpath in June 2008. Two counters recorded the number of pedestrians passing through an infra red beam; one of these was positioned at Richmond Bridge and the other near the foot ferry by Marble Hill Park. The third counter, also located by the foot ferry near Marble Hill Park, recorded the number of cyclists passing over a pressure point system embedded in the tarmac.

These counters recorded the number of pedestrians and cyclists passing these points every hour. The data was retrieved manually from the counters (see figure 8) and uploaded onto a PC for analysis.



Figure 8 Showing the pedestrian and cyclists counter unit, open and ready for the data to be retrieved.

2.4 Bat surveys

In order to monitor the impact of any lighting changes on bats, it was necessary to establish baseline data for bat species currently present along the Warren Footpath. As a comparison, the opposite and unlit side of the river (Ham Towpath) was also surveyed for bats as a control measure. Surveys were run once a month from May to October 2008. The survey was devised with the help of bat experts from the Bat Conservation Trust, the Wildfowl and Wetland Trust and the London Bat Group. Each survey started 10 minutes after sunset. Both sides of the river were surveyed simultaneously by volunteers. Each group walked a transect with 21 stations along the river, each station was 100m apart, see Figure 9 below.

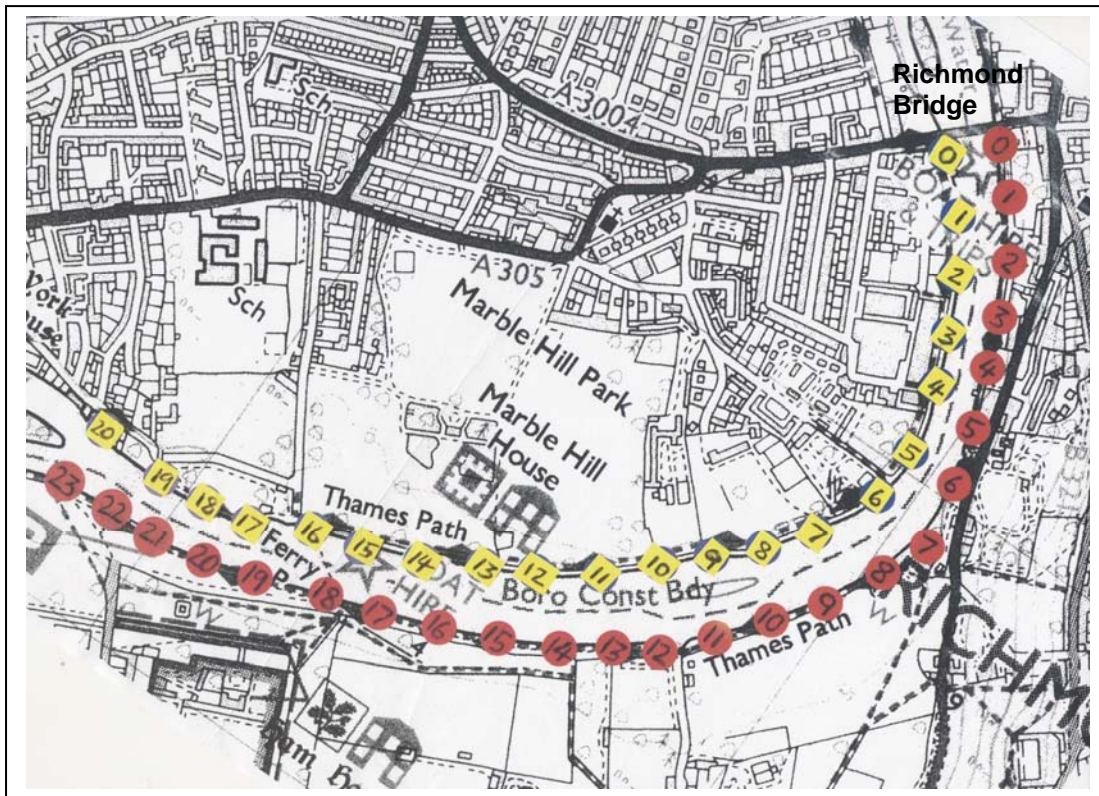


Figure 9 showing the bat survey transect and survey stations. Yellow circles represent the Warren Footpath transect and red circles represent the Ham Towpath transect.

Note: Survey stations 21 – 23 on the Ham Towpath were never surveyed.

At each station, surveyors stopped for two minutes and recorded the number of bat passes for each species. In addition the whole survey was recorded onto minidisk so that species could be verified at a later date using sonogram analysis[†]. Map from

2.5 Light surveys

In addition to the bat data collected, light levels in lux were recorded at each survey station along both sides of the river using light meters. A lighting expert also attended one of the surveys and using state of the art technology took light readings for each station.

3.0 Volunteer Participation

The project presented an opportunity for the community to learn more about their local environment and wildlife by taking part in the bat surveys.

Bat surveys were carried out over a six month period, during which time more than 100 volunteers took part in surveys along the River Thames clocking up over 250 volunteer hours. Volunteers ranged from 11 year old Sea Scouts to local retired people with volunteers

[†]Sonogram analysis is a visual representation of a bat's echolocation call. It provides a way of confirming the recordings from a bat detector.

travelling from as far a field as North London and Richmond Virginia in the USA to take part in the surveys!

The BBC children's television programme *Newsround*, recorded a feature on the bat surveys when the Petersham and Ham Sea Scouts volunteered for London's Arcadia. This highlighted the perils facing bats to a whole new audience of young people.

As part of the twinning between Richmond upon Thames and Richmond Virginia in the USA, 20 Richmond Virginian teenagers from underprivileged backgrounds took part in bat surveys as part of their exchange programme. Many of these students had never left America before and none of them had ever taken part in a bat survey or accessed the natural environment after dark. Many were inspired by the experience and went away with a new found passion for the natural world.

Volunteers also ranged in skill and ability from experts in bat identification to complete novices. Many of the less experienced volunteers attended repeat surveys and were able to build on and improve their id skills. Although the project was about gaining knowledge of bats using the area, the volunteers also gained training and skills in bat identification.



Figure 10 showing volunteers carrying out a bat survey in Richmond during June 2008

4.0 Results

Results from the research are detailed below in 2 sections: people and bats.

4.1 People

Results for the people research have been divided into two sections: the questionnaires and the counters.

4.1.1 Questionnaires

In total, 97 questionnaires were completed by members of the public using the Warren Footpath between October 2007 – July 2008 during different times throughout the hours of daylight and darkness. The following tables and figures highlight the most important findings from these questionnaires.

Table 2 shows the activity of those interviewed. The highest number of questionnaires was answered by people who were walking.

Table 2 Showing the activity of the person interviewed

	Pedestrian	Cyclist	Jogger	Not recorded
Number of questionnaires answered	80	10	4	3

Table 3 shows the majority of people interviewed use the footpath regularly. For those that responded saying they were “rare” users of the footpath, the interview was not continued. Of those asked, 86% were regular users of the Warren Footpath.

Table 3 Showing how often the interviewee used the Warren Footpath

	Regular	Occasional	Rare	Not answered
Number of interviewees	83	7	5	2
Number as a percentage	86%	7%	5%	2%

Interviewees were asked which sections of the Warren Footpath they regularly used. The results are shown in Table 4 below. For details of the two separate sections of the Warren Footpath please refer to Figure 1.

Table 4 Showing the sections of Warren Footpath that interviewees used

Part of Warren Footpath used regularly by interviewee	The entire length of the Warren Footpath	Another	Between Richmond Bridge and Denton Road	Not answered	Between Denton Road and the Foot Ferry
Number of interviewees	69	15	6	5	2

The majority of those interviewed used the entire length of the Warren Footpath. Where interviewees answered “Another” the majority used a route through Marble Hill Park.

Table 5 Showing the numbers of people who use the footpath after dark, both on their own and in company

<i>Q. Do you use the footpath when it is dark either on your own or in company?</i>					
	No never	Yes on my own	Yes on my own and also in company	Yes but always in company	Not answered
Responses	30	28	18	15	6
Responses as a percentage	31%	29%	19%	15%	6%

Table 5 shows that by a small majority, most people do not use the footpath after dark. There is however quite an even spread across those that would use the footpath on their own after dark and those that would only use the footpath in company after dark and those that would use the footpath after dark alone and in company. It should be noted that since many of the surveys took place at dusk or in the night that there will be an expected bias towards the number of people that use the Warren Footpath after dark. To counter this element, counters were put in place to obtain a real use of numbers at all times of the day. These counters are still functioning and data is continually being collected to augment this study.

Table 6 below shows the main reason given for not using the footpath after dark. Interviewees were not prompted for this question.

Table 6 Showing the main unprompted reasons given for not using the Warren Footpath after dark. (Responses are only from those interviewed who did not use the footpath after dark.)

<i>Q. What are the main reasons you do not go along this part of the footpath alone when dark?</i>				
	Perceived safety	No need to use it	Poor lighting	Poor visibility
Responses	33	9	2	1
Responses as a percentage	73%	20%	5%	2%

Table 6 shows the main reason for people not using the footpath after dark is the perception of the area being unsafe. As detailed in Section 1.3, the main use of the footpath is for leisure and commuting, for this reason people do not appear to be using the footpath after dark. In any case, the footpath is not actually a short cut but more of a scenic route so reasons to use the footpath after dark decrease as the views of the river and surrounding area are no longer visible.

Those who never used the footpath after dark or only used the footpath after dark in company were read out several statements and asked to respond in agreement, disagreement or with a don't know. Table 7 below details the results.

Table 7 Showing the prompted answers to why they did not use the footpath when dark.

<i>Q. Do you agree or disagree with the following reasons for not using this part of the footpath during the dark evenings or mornings?</i>			
	Agree	Disagree	Don't know
There are other safer routes when dark	34	12	3
Do not want/need to use the area when dark	30	15	2
The area feels too remote/isolated	27	18	1
The lighting is not good enough	23	7	18
Feels unsafe because next to a river	10	35	1

Table 7 confirms the view that people have no need or want to use the footpath after dark as there are other more suitable and "safer" routes to use after dark and at night.

Table 8 below details the reasons why those interviewed did not use the footpath in order of number of responses. The numbers have been adjusted to represent the overall opinion of those interviewed i.e. the number of "agree" answers minus the number of "disagree" answers with the "don't know" responses discounted.

Table 8 Showing the adjusted numbers for the reasons why those interviewed did not use the Warren Footpath.

Reason for not using the Warren Footpath after dark	Net number agree or disagree
There are other safer routes to use when dark	22 agree
The lighting is not good enough	16 agree
Do not want/need to use the area when dark	15 agree
The area feels too remote/isolated	9 agree
Feels unsafe because next to a river	25 disagree

Table 8 shows the main prompted reason for people not using the Warren Footpath after dark was the same as the unprompted reason, that of perceived safety of the area.

Figure 11 below shows the results to one of the most important questions asked during the questionnaire; would people use the Warren Footpath more if the lighting was improved.

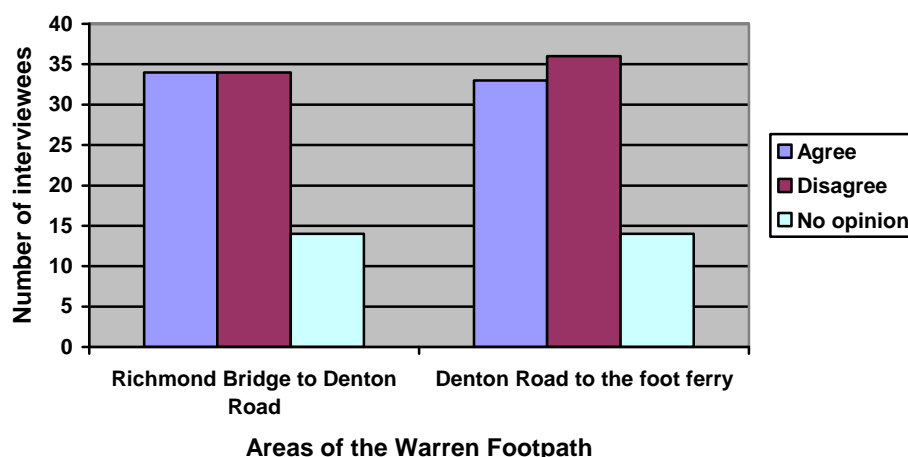


Figure 11 Showing the responses from interviewees to the question “if the lighting was improved I would use this towpath more often when dark”

The results show that when taking into consideration the different routes used, overall, people would not use the footpath more if the lighting were improved. This shows there is no need to improve the lighting for people along the Warren Footpath as people do not wish to use the area after dark. If the lighting were improved for people, there would probably not be an increase in numbers using the footpath.

Table 9 below shows the responses to how people felt about the lighting being switched off along the Warren Footpath at certain times of the night. A small margin of people disagree with the lighting being switched off between Richmond Bridge and Denton Road (the more urban section of the footpath, see Figure 1); whereas a small margin of people agree with switching off the lights along the area between Denton Road and the foot ferry (the more rural section).

Table 9 Showing the responses from interviewees when asked the question “I think it would make sense to switch off the lighting here at certain times of the year/week or night”.

<i>Q. I think it would make sense to switch off the lighting at certain times of the year/the week/ the night?</i>				
	Agree	Disagree	Don't Know	Net Total
Richmond Bridge to Denton Road	33	36	6	3 disagree
Denton Road to the foot ferry	36	33	5	3 agree

4.1.2 Counter results

The results below are divided into two sections: pedestrians and cyclists.

4.1.3 Pedestrians

Figure 12 below shows the average number of pedestrians that used the Warren Footpath each hour over the space of five months from June – December 2008. One thing to note when looking at Figure 10 is that the summer of 2008 was a notably wet summer with August in particular being below the seasonal average for temperature and above the seasonal average for rainfall (Met Office 2008). This may account for fewer people than expected using the warren Footpath in August.

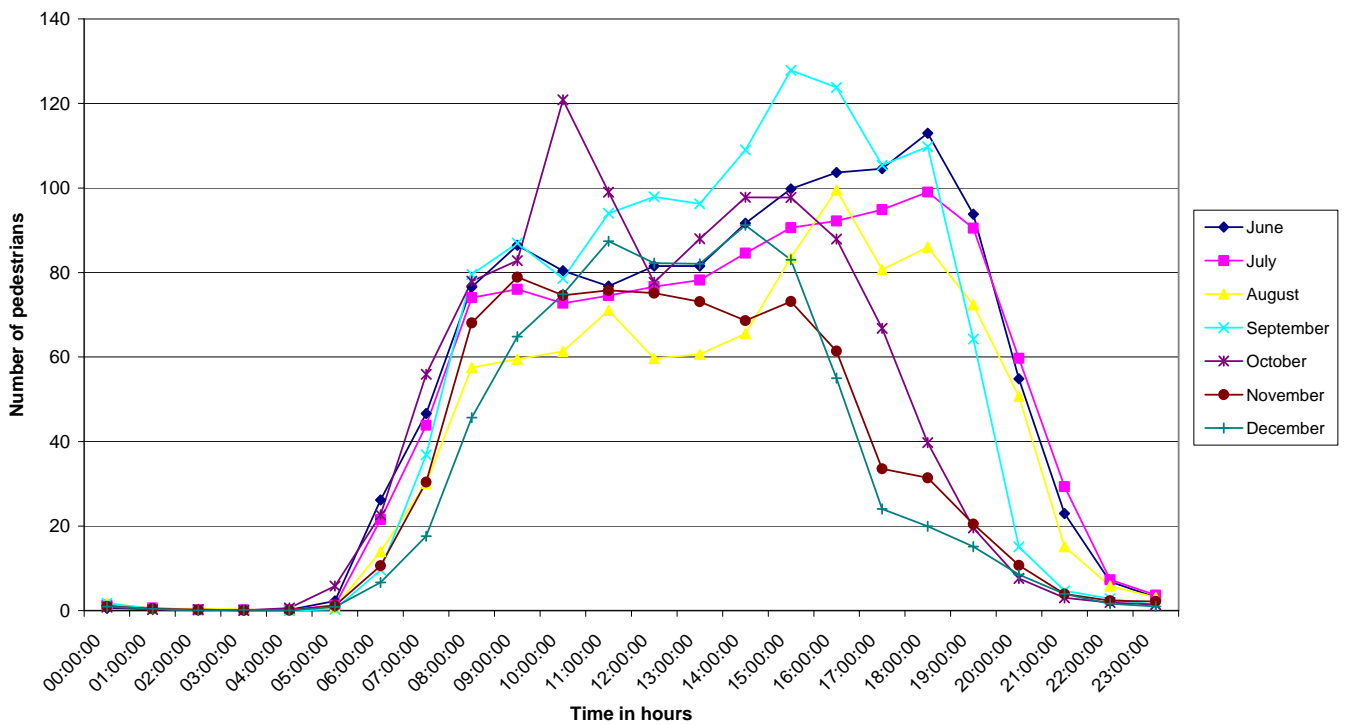


Figure 12 Showing the average number of pedestrians using the Warren Footpath each hour between the months of June – December 2008.

What is clear from the data is that very few pedestrians are using the footpath between the late evening and early morning. On average, between the hours of 10pm and 11pm, 44 pedestrians in total used the footpath throughout the whole seven months. Over the same 7 month period between midnight and 5am on average only 28 people walked along the Warren Footpath. This is an average of 4 people per month that walked along the footpath late at night and early in the morning when the street lights are on.

The noticeable drop in activity during poor weather conditions in August could confirm that for pedestrians, this footpath is used for leisure and recreation rather than a viable transport connection as the main road (Richmond Road) is the quicker and more direct route from Twickenham to Richmond (see Figure 1). This could explain the drop in usage after the hours of darkness when the Warren Footpath represents the longer and less direct route and for these reasons, the route less used.

Figure 12 shows peaks in pedestrian traffic during the mornings between 8:00am and 9:00am and in the evenings between 6:00pm and 7:00pm which does coincide with commuting times which perhaps suggests commuting is one use of the footpath. Once the clocks go back in October, pedestrian traffic noticeably reduces, in particular during the hours of darkens (from 4:00pm onwards). This trend suggests that the pedestrian traffic is seasonal and affected by the levels of light i.e. when it is dark earlier, people use the footpath less.

4.1.4 Cyclists:

Counters were installed on the Warren Footpath in June 2008 recording the number of cyclists along the Warren Footpath each hour. Figure 13 below shows the two peak times when cyclists use the towpath: 8am and 7pm which confirms the theory of the footpath being a commuting route

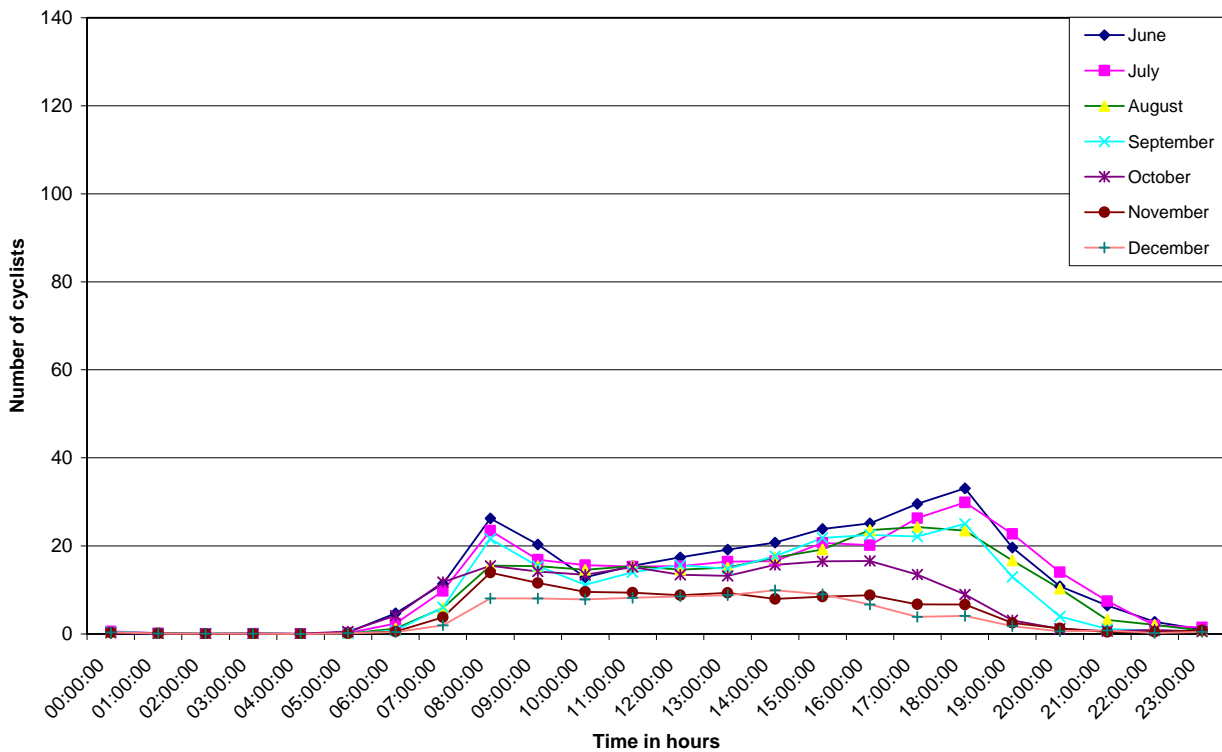


Figure 13 Showing the average number of cyclists using the Warren Footpath each hour between the months of June to December in 2008.

What is also clear from Figure 13 is that very few people are cycling along the Warren Footpath after dark. Between the hours of 10pm and midnight over the seven month period an average of seven cyclists used the footpath. This number decreases after midnight with an average of one cyclist using the footpath during the hours of midnight and 5am for the same seven month period.

4.1.5 Pedestrian and Cyclist use summary:

The pedestrian and cyclist counters clearly indicate that the use of the Warren Footpath is primarily during daylight hours. The majority of the night use of the footpath occurs in the commuting hours during autumn and winter when daylight hours are shorter and it gets darker earlier and stays dark for longer.

One additional factor that has not been reviewed to mark these drops in footpath traffic is that the Warren Footpath floods on the spring tides over 7m (based on chart datum with London Bridge being 3.20 metres below Ordnance Datum, Newlyn, this does not factor in fluvial or other meteorological events). Most spring tides occur early in the evening which corresponds to the 3.30pm-6pm commuter time particularly in the autumn and winter months. This will restrict the use of the Warren Footpath further during these dark hours. A review of the 2008 Tide Tables shows there were 41 flood tides over 7.0m during October, November and December, out of which 12 of the flood tides were during early evening commuting times when the current street lighting would have been on but the footpath under water and inaccessible.

4.2 Bat survey results:

Figure 14 below shows the results for the total number of bat passes recorded for each bat species during the surveys throughout summer 2008 on both sides of the River Thames. At first glance Figure 14 appears to show that the Warren Footpath has a greater level of bat activity than the Ham Towpath.

Figure 14 shows that pipistrelle activity occurs more frequently on the Warren Footpath side of the river. This may be due to the fact there are several bat roosts in the houses in Twickenham as well as in Orleans House Gallery and grounds and possibly Marble Hill Park, all of which are in close proximity to the river. As previously mentioned, pipistrelle bats are less light sensitive than other bat species (Bat Conservation Trust, 2008), however it should be noted that during the surveys, bats were never seen flying in lit areas on either side of the river.

What is important to note is the lack of certain bat species on the Warren Footpath side of the River Thames. The rarer species of bat are found in greater numbers on the Ham Towpath and unlit side of the river, Leisler's serotine and Daubenton's. It is note worthy that Daubenton's bat are an extremely light-shy species and activity is noticeably lower along the lit Warren Footpath.

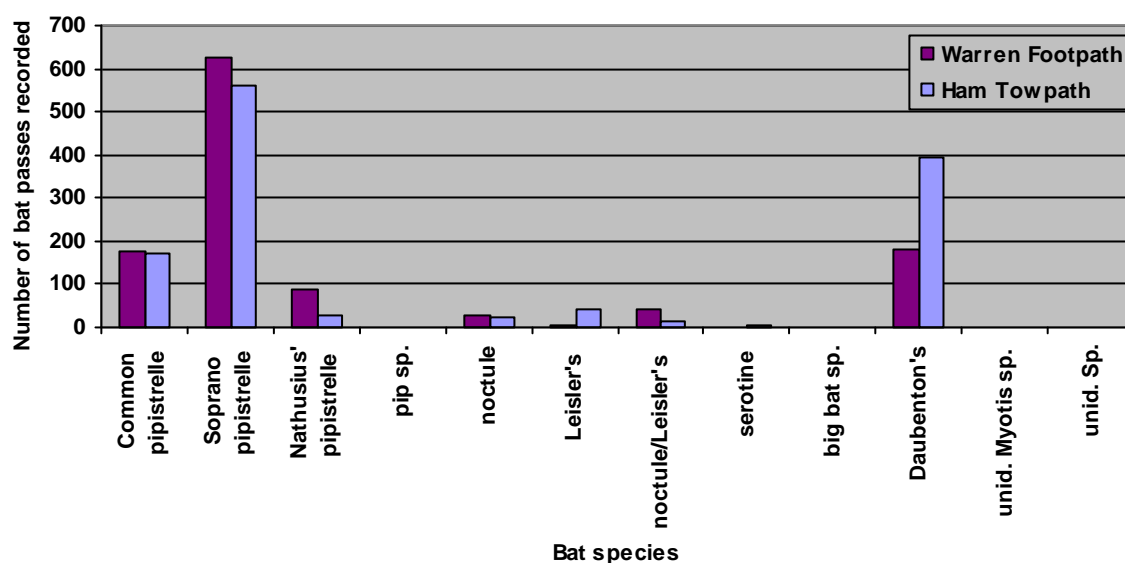


Figure 14 Showing the total number bat passes recorded during the surveys that took place from May to October 2008 on both the Warren Footpath and the Ham Towpath. Where two species are listed this means the exact bat species was not identified and could be either.

Within this riparian habitat Daubenton's bat are key bat species; they are also an extremely light-shy species and the last to emerge in the evenings waiting for low light levels of less than 1lux. Along the Warren Footpath, there were a few dark areas that coincided with survey points, one example is station 13 (see Figure 15) where light levels were 2.46 lux on the footpath (less than this on the river). Here Daubenton's bats were recorded continuously for the 2 minute survey period; it is likely the Daubenton's bat were feeding in the darker areas along the water's edge. At other stations along the Warren Footpath Daubenton's bat were recorded in very low numbers or not at all. If this concentrated Daubenton's activity is compared with activity on the Ham Towpath there is an interesting result.

Along the Ham Towpath, Daubenton's bats were continually recorded in large numbers at all stations after Buccleugh Gardens (stations 7-20 on Figure 9). However rarely was Daubenton's bat recorded continuously for the 2 minute survey period. This does not infer there were less Daubenton's bats on the Ham Towpath as overall there was considerably more Daubenton's activity on the Ham Towpath as Figure 14 shows. What it does show is more about the habitat and behaviours of Daubenton's bat. The continuous passes of Daubenton's recorded on the Warren Footpath are most likely due to the light spill onto the river from the street lamps. Figure 7 shows the considerably light spill from Warren Footpath, the Daubenton's bat appear to be feeding in the dark areas between the light spill (not

venturing into the lit areas) and thus their habitat is restricted compared with the Ham Towpath where there are no lights and therefore passes are not restricted to a small area resulting in less “continuous” recordings.

Another factor to consider is that although the surveyors were standing at a station underneath a streetlight, the bat detectors may well have been picking up bat echolocation calls from dark areas surrounding the street light. From observations during surveys, this seemed to be the case as rarely were bats seen along the Warren Footpath and bats were never seen flying into the lit areas or feeding around the street lights.

The presence of serotine bats only on the Ham Towpath may be due to Petersham Meadows (stations 8 – 12 on the Ham Towpath side of the river see Figure 9). Serotine bats are the only bats to eat dung beetles as part of their insect diet; the presence of livestock at Petersham meadows could be the reason serotine bats were recorded at this location. It is thought that these bats have a particular liking for insects associated with grazing animals and so are often found in areas where cattle or other live stock are present. Our surveys did show the presence of serotine bats in the locality of Petersham Meadows. Serotine bats were only recorded at stations 11, 12, 13 and 17 all of which are in the vicinity of Petersham Meadows where cattle graze throughout the summer months.

Serotine bats are considered rare in the borough and for this reason the foraging ground of Petersham Meadows and Petersham Lodge Woods are extremely important habitats to conserve for bats as well as other wildlife. Furthermore, it should be noted that there are no street lights in these areas.

The absence of brown long-eared bats from our surveys may be due to the fact they are one of the later bats to emerge, are very light-shy species and have a very quiet echolocation call difficult to pick up on bat detectors.

4.3 Lighting results

A measurement of the light levels at each survey station was undertaken by a lighting expert on 9th June 2008. The results are shown in the figure 15 below.

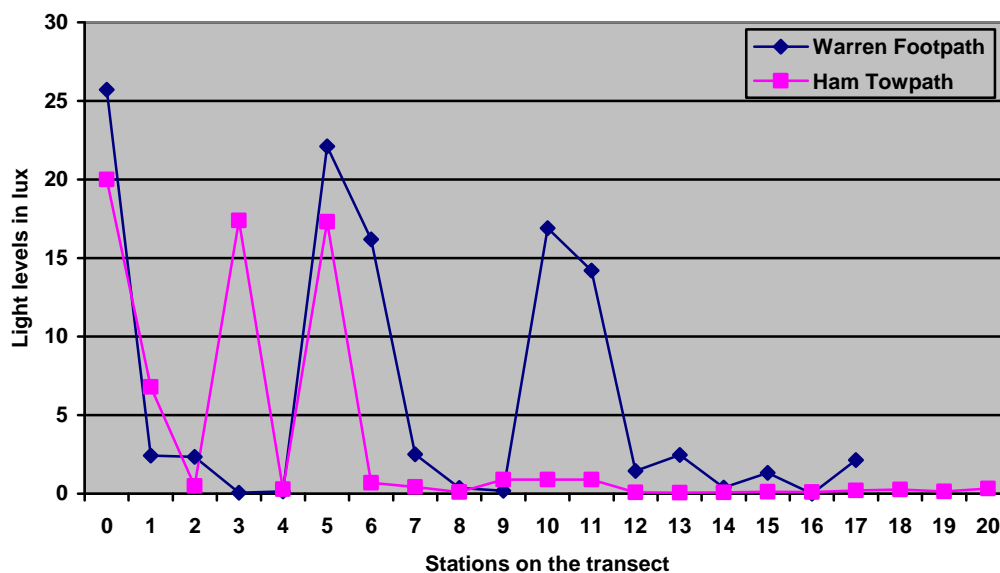


Figure 15 Showing the light levels in lux recorded at each survey station along transects on both sides of the river on 9th June 2008

Figure 15 shows the difference in light levels in lux between the Warren Footpath and the Ham Towpath. After station 7, there is no more street lighting along the Ham Towpath. At

stations 9 – 11 the increase in light levels is due to ambient lighting from Petersham Road and Richmond Hill.

Figure 15 clearly shows that the Warren Footpath has inconsistent levels of lighting shown by the huge fluctuations in lux levels from one station to the next.

Table 10 Showing the average light levels in lux for each side of the river as recorded by lighting experts on 9th June 2008 survey

Survey transect	Average light levels in lux on June survey 2008
Warren Footpath	6
Ham Towpath	3

Note the readings were carried out consecutively starting with the Ham Towpath (rather than simultaneously as the bat surveys were done and carried out without the two minute bat survey) so the actual average levels of light on the Ham Towpath would in fact be darker than 3 lux. Similarly, since the Warren Footpath was surveyed later in the evening than the Ham towpath, the average lux level is darker for the Warren footpath than it would have been if a direct comparison was possible.

Table 10 shows that the average light level in lux on the Warren Footpath is actually twice as much as that on the Ham Towpath.

5.0 Next steps

Results of the various research studies have shown that the Warren Footpath is used infrequently by people during the hours of darkness and barely used at all between the hours of 11pm – 5am yet the footpath is still lit at full capacity throughout the night.

Research has shown that the Warren Footpath is a good bat habitat with green spaces adjoining the river, veteran trees for roosting and vegetation along the river bank for foraging. The factor impeding the area being used by a more diverse range of bat species could be the levels of light both spilling into the river and into the tree canopies. If the light levels along the footpath were reduced, it may be possible to improve the habitat for rarer bat species that are more light-shy such as Daubenton's and long-eared bats. Both bat species have been recorded in the borough but in the case of Daubenton's bat it was only recorded in low numbers on the Warren Footpath and the brown long-eared bat was not recorded at all.

London's Arcadia has taken the project to two lighting design companies; both have been involved in lights and wildlife projects. The idea is to install a new type of lighting along the Warren Footpath that will be an improvement for both bats and people. By using new LED (Light Emitting Diodes) technology combined with state of the art fixtures and fittings, the light spill into the river and tree canopy (two important foraging habitats for bats) will be greatly reduced. LED technology allows greater levels of control and the ability to direct where the light falls. These characteristics will allow us to focus light onto the footpath creating a more uniform light for people rather than pools of light and darkness as is the current lighting.

We will be working with state of the art software so the lights will be able to be controlled. The plan is to programme the street lights so that they come on when the ambient light level is below 20 lux (much lower than the standard 55 lux) to lesson the disturbance to bats. Furthermore, the street lights will be programmed to be at a lower light level during the critical emerging hours of twilight thus conserving the important dark corridors of the River Thames.

The new LED lights will have a maximum of 30 watts of light as compared to the current street lighting which has a maximum of 70 watts. The new LED lights will have no ultraviolet light (unlike the current street lighting). The LED lights will dramatically reduce the light spill (light pollution) onto the River Thames due to the directional characteristics of the lights combined with the fixtures used. It is also proposed to programme the lights to dim or turn off altogether during the hours when we know the footpath is not being used frequently.

There are many options and variations to the proposed LED lights allowing a flexible system that can balance the needs of people as well as work to enhance the habitat for bats. This will mean the creation of a valuable dark corridor for bats to feed, forage and travel along. In a city where habitats are being fragmented and dissected at an alarming rate, the creation of a dark wildlife corridor connecting up several habitats along the river is vitally important to the conservation of bat species in London.

The lighting designs will go to public consultation in spring 2009 with implementation of the approved lighting in summer 2009.

6.0 References

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7.0 Appendix

1.0 Warren Footpath questionnaire for on site face-to-face interviews

INSTRUCTION TO INTERVIEWER PLEASE COMPLETE THE FOLLOWING PRIOR TO INTERVIEW:

SITE of interview: **Richmond Bridge** **Orleans Road**

Date of interview _____ **Approx** time of interview _____

Note whether the respondent is:

On foot

On a bike

Jogging

Introduction to interview.....

I am working on behalf of Richmond Council. With funding from the *Heritage Lottery Fund* and *Biffaward* the London's Arcadia project is to consider proposals to enhance Warren Footpath. That is the towpath on this side of the river between Richmond Bridge and the foot ferry/Orleans Road.

SHOW MAP OF AREA

A key part of this is possibility of making changes to the lighting. We therefore want to know how the area is used throughout the year when it is dark. Can you please spare 10 minutes to answer some questions on how you use the area.

1. Firstly, would you consider yourself a **regular** or **occasional user** of this towpath or is this a rare visit? **SHOW MAP**

Regular user of this towpath

Occasional user of this towpath

Rare visit **THANK AND CLOSE INTERVIEW**

SECTION 1

1. Do you **usually use** the entire length of towpath (Richmond Bridge to/from Orleans Road) or just a part of the path? **SHOW ON MAP**

The entire length of this towpath

Between Richmond Bridge and Denton Road only

Between Denton Road and the foot ferry (Orleans Road) only

Another part. **PLEASE STATE**

2. Did you know/notice that there is street lighting all the way along this towpath?

Yes
No

If yes, what is your opinion of the street lighting along this towpath

3. Do you ever use any part of this riverside towpath **when it is dark** either on your own or in company?

- No never -> GO TO NEXT QUESTION, Qu 4.
 Yes but always in company -> GO TO NEXT QUESTION Qu 4.
 Yes on my own and also in company-> GO STRAIGHT TO **SECTION 2**
 Yes on my own -> GO STRAIGHT TO **SECTION 2**

4. What are the main reasons you **do not go** along this part of this towpath **alone when dark?** - in order of importance.

First reason

Second reason

Third reason

Other PLEASE STATE.....

5. Do you agree or disagree with the following reasons for not using this part of the towpath during the dark evenings or mornings? Which of these are the two most important reasons for you.

FOR EACH OF STATEMENT

TICK BOX

TICK BOX

	Whether agree or not			The two most important reasons	
	Agree	Disagree	Don't know	First	Second
a. The lighting is not good enough					
b. Feels unsafe because next to a river					
c. Do not want/need to use the area when dark					
d. The area feels too remote/isolated					
e. There are other safer routes when dark					
f. Other reason. PLEASE STATE					

FOR RESPONDENTS WHO **NEVER USE ANY** OF THE TOWPATH
GO STRAIGHT TO SECTION 3 (PAGE 4)

FOR ALL RESPONDENTS **WHO HAVE USED** WARREN FOOTPATH **WHEN DARK**
 including those who are in company, continue to **SECTION 2**

SECTION 2

1. Please give some indication of whether you usually use the entire length of towpath (Richmond Bridge to/from Orleans Road) or just a part of the path **when it is dark**.
SHOW ON MAP

	In the mornings or evenings <u>when dark</u>		
	Never	Frequently	Occasionally
a. The entire length of towpath OR part of the path			
b. Richmond Bridge to Denton Road only			
c. Denton Road to the foot ferry only			

TICK APPROPRIATE BOX

NOTE TO INTERVIEWER PLEASE ASK QUESTIONS ABOUT THE ONE AREA ONLY IN THE NEXT SECTION

WHICH PART OF TOWPATH MOST FREQUENTLY USED when dark

.....

2. Which of the following types of activity do you use this towpath for and how frequently **when it is dark**?

TICK AS MANY BOXES AS NECESSARY

	In the mornings or evenings <u>when dark</u>		
	Never	Frequently	Occasionally
a. Walking			
b. Dog walking			
c. Jogging			
d. On a bike			
Other. PLEASE STATE			

3. Just thinking about the **summer mornings and evenings**, how often and when do you use this area **when it is dark**?

TICK ONE BOX PER TIME PERIOD

Late March to end August when it is dark	Most days	Once or twice a week	Few times over the months	Never
Dark Mornings 5am – 8am				
Dark Evenings 8pm – 9pm				
Night time 9pm – Midnight				
After Midnight				

4. Do you use just use the towpath when dark in the summer months or do you also use it in the winter months when dark?

TICK ONE BOX ONLY

Summer months only when dark	GO STRAIGHT TO QUESTION 6
Both Summer and winter months when dark	GO TO NEXT QUESTION

5. Just thinking about the **winter months when it is dark** which of the following time periods do you use this part of the towpath when dark and how often?

	Most days	Once or twice a week	Few times over the	Never
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			months	
Dark Mornings	5am – 8am			
Dark Evenings	up to 9pm			
Night time	9pm – Midnight			
After Midnight				

6. Are you happy with the current lighting arrangements in this area of the towpath which you use?

Yes

No

Any comments

SECTION 3
TO BE COMPLETED FOR ALL RESPONDENTS
FOR BOTH SECTIONS OF THE TOWPATH EVEN IF NOT USED

1. Do you agree or disagree with the following statements about the different sections of this towpath during the dark evenings/mornings?

FOR EACH STATEMENT TICK ONE BOX

1a. If the lighting was improved I would use this towpath more often when dark

	Agree	Disagree	No opinion
Richmond Bridge to Denton Road			
Denton Road to the foot ferry			

Please give reasons

1b. I would be quite happy if lights were removed as it would not affect my use when dark

	Agree	Disagree	No opinion
Richmond Bridge to Denton Road			
Denton Road to the foot ferry			

Please give reasons

1c. I think it would make sense to switch off the lighting here at certain times of year/the week/ or night

PLEASE STATE where and when

	Agree	Disagree	No opinion	If agree At what times of year /week / night From – To
Richmond Bridge to Denton Road				

Denton Road to the foot ferry				
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Please give reasons

1d. Do you agree or disagree with the following statements about this towpath during the dark evenings/mornings?

	Agree	Disagree	No opinion
Lighting should be removed as it is not good for the wildlife such as bats			
A good reason to remove the lighting is that it would save energy			

2. Do you think that the two different parts of the towpath have different lighting requirements?

Yes
 No
 Do not know

Please give reasons

3. Do you think it would be a good idea to close off part or all of the towpath when it is dark?

a. Yes
 b. No
 c. No opinion

3a. If yes where exactly and whether it should vary during the year?

3b. If not why not

4. Any other comments about this area when dark

SECTION 4 CONTACT DETAILS - Confidential

Name:.....

Address:.....

.....

Postcode:.....

We would be grateful if you could tell us a bit more about yourself to ensure we have representative feedback. The information will be used in a statistical anonymous format only.

Sex

Male

Female

Age

(16-25) (26-35) (36-45) (46-55) (56-65) (66-75) (76+)

Ethnic group

White/
White
British

Black/
Black
British

Asian/
Asian
British

Other
Ethnic
Group

Disabilities

None

Mobility
Problems

Visual
Impairment

Hearing
Loss

A formal consultation will be taking place on lighting in this area towards the end of the year would you like to be consulted?

Yes

No

If yes, we will be sending you a questionnaire in autumn of this year to the address above, unless you state otherwise

Thank you for your time today