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Proposals for Introducing Public Bike Schemes in Regional Cities – Technical Feasibility Study

National Transport Authority

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Executive Summary

The Minister of State at the Department of Transport, Tourism and Sport has requested that the National Transport Authority (NTA) examines *"potential means of introducing public bike schemes to other cities".* As part of this examination, the Minister requested an assessment of the *"potential for partnership with or sponsorship by private sector collaborators to deliver the schemes at the lowest cost to the wider Government system."*

There has been an exponential increase in the growth of bike-sharing schemes in Europe over the last five years largely due to the 'big bang' effect of the hugely successful schemes in Paris and Barcelona. There are now over 50 schemes across Europe, and many more in other continents. This level of activity has resulted in an increasing knowledge-base of the different types of scheme, and the factors which contribute to their success. This study draws heavily on the results of the OBIS bike-sharing research programme which came to an end very recently (June 2011), and has made available a number of research reports as well as an all-encompassing handbook. One of the more relevant key research findings is that the success of bike-sharing schemes in smaller cities has yet to be proven, unlike the schemes in the large cities such as Paris, Barcelona and Lyon.

This study also involved brief site-visits to the four regional cities of Cork, Galway, Limerick and Waterford to gain an understanding of the 'exogenous' factors in each city which would influence the success of any bike sharing scheme. These include current levels of cycling, topography, cost of car parking, amount of general traffic congestion, the extent of any cycle-friendly infrastructure, and the distribution of the major trip attractors throughout the city. Discussions were also held with officers at each of the city councils either face-to-face or by telephone.

This study has found that the regional cities have several of the characteristics that tend to result in successful bike sharing schemes such as very low current levels of cycling and cycle-friendly topography across large parts of the urban areas. However, the cities also display characteristics which suggest that the success of any bike-sharing scheme would be limited due largely to the small size of the cities, the relative lack of congestion and the fact that car travel, rather than public transport, tends to be the dominant mode. There is a little less clarity for some issues such as the impact of the climate. The cities featured in the European research were categorised according to temperature, and none of them had similar climates to the relatively mild and wet conditions of the Irish cities. However, the success of the Dublin scheme shows that the Irish climate does not prevent a scheme from being successful although, for the size of the population, the scheme does currently have a relatively small number of bikes and docking stations.

This study found that although the potential exists for successful schemes in each city, it would appear that schemes in Galway and Cork would be most successful partly due to the background levels of traffic congestion and the high price of car parking in both cities.

Estimates are provided on the number of bikes that a scheme in each city would require, the number of subscribers, and the amount of use each bike would receive per day. These are shown in the table below, and are based largely on a review of equivalent data in other European schemes. For a more robust prediction, primary research would need to be carried out in each city to explore the propensity to use a bike-sharing scheme among local residents, commuters, tourists and other visitors.

Summary of Recommendations & Estimates for each Scheme

	Cork	Galway	Limerick	Waterford
Recommended number of bikes	265-235	200-250	135-165	80-100
Recommended number of docking stations (and docking points)	25 (510)	23 (380)	20 (255)	10 (150)
Average number of docking points per station	20	15-20	10-15	15
Estimated number of subscribers	2250	1500	1500	900
Estimated daily rents per bike	3	2	1.5	1.5

Recommendations are made on the complementary measures which would be needed as a new scheme is introduced. Perhaps the most important one would be an increase in permeability for cycle traffic in the city centres through the provision of two-way cycling on one-way streets, and by opening up pedestrianised areas to cycling where conditions allow.

The capital cost (based on outline estimates encompassing; docking stations, bikes, assessment, maintenance vehicles, a national control room and monitoring equipment) in the four cities is an estimated €6.4 million. The bulk of this is assumed to take place within a 1 year delivery period. The total operating cost (including staff, premises, vehicle maintenance, bike replacement and materials) is estimated at €23 million spread evenly over a 14 year period. This level of expenditure assumes bike rental schemes are delivery as one contract within one year. A lower expenditure would be required if schemes are not progressed in all four cities, however the cost for one national control centre would remain necessary.

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Contents

1 Introduction

1.1 Context

The Minister of State at the Department of Transport, Tourism and Sport has requested that the Authority examine *"potential means of introducing public bike schemes to other cities"*. As part of this examination, the Minister has requested an assessment of the *"potential for partnership with or sponsorship by private sector collaborators to deliver the schemes at the lowest cost to the wider Government system"*. Jacobs has been commissioned by NTA to carry out this feasibility study.

All four cities were visited by Jacobs and meetings were held with the representatives of the City Authorities to gather information and obtain local input to the project.

1.2 Scope of Work

The NTA has requested Jacobs to carry out an initial feasibility report in relation to the introduction of a "Public Bike Scheme", similar to the scheme operated in Dublin City, in the cities of:

- Cork;
- Limerick;
- Galway; and
- Waterford.

The study addresses the following items on a city by city basis:

(1) Description of "Public Bike Schemes" and approaches adopted elsewhere including Dublin City;
(2) Review of existing survey and literature information to gain an understanding of the level of existing cycle usage in the city;
(3) Identification of key demand points in the city;
(4) Assessment of possible area for introduction of cycle scheme – a phased basis of implementation should be considered, with the current report focussing on the first phase in each city;
(5) Some indication of the potential usage that might be anticipated;
(6) Definition of the elements of a scheme – type of bike; stand types, booking arrangements; payment arrangements; maintenance requirements; indicative types of stand locations; and
(7) Order of Magnitude costs for the installation and operation of these schemes assuming no advertising revenue.

1.3 Report Structure

The structure of the report follows the scope defined above with a summary and recommendations included within Section 8.

2 Background to Bike-Sharing Schemes

2.1 Overview of Current Schemes

Authorities seeking to increase the amount of cycling that takes place traditionally treat the bicycle as a private mode of transport which requires individual ownership (or at least access). However, there are some examples of attempts to offer a fleet of bicycles to the public for short journeys in urban areas which go back several decades. The Cycling England publication, 'Public Bikes and Cycle Hire Schemes' categorises the different generations of cycle hire schemes into three groups.

The first was established in Amsterdam in the 1960s. The early schemes were plagued by theft, vandalism and abandonment, and were either unregulated or required users to pay a deposit and return the bike to a fixed location. The second generation of schemes was regulated through a deposit/refund system. These included the Bycyklen scheme in Copenhagen which incorporated a coin-operated locking mechanism which enabled users to remove customised bikes locked to on-street stands. Although a simple and convenient system, many of these schemes also suffered from theft and vandalism mainly because it was not possible to keep track of the bikes and their users. The third (and current) generation of schemes combats vandalism and theft through the use of technology (bicycles can be tracked), and very secure docking stations.

The dominant business model has included the involvement of major advertising firms such as JC Decaux and Clear Channel but other business models have been used including ones which use funding from car-parking revenue. The first automated, self-service, public bike scheme was opened in the French city of Rennes in 1998.

The highest profile international example to date has been the Velib scheme in Paris which opened in 2007. This was based closely on the Lyon scheme introduced in 2005, which was the first large-scale scheme of its kind, with several thousand bicycles, several hundred docking stations, and an average of over 20,000 trips per day. Many of the features of the Lyon scheme were used in Paris and elsewhere throughout Europe including the offer of a free 30 minute hire period, and the option to subscribe for a day, a week or a year. The Lyon scheme was run in conjunction with the advertising company JC Decaux. The Velib scheme in Paris was closely modelled on the Lyon scheme but introduced on a much wider scale with over 20,000 bicycles and nearly 1,500 docking stations. The Velib scheme was the largest one in the world until a new scheme was introduced in the Chinese city of Hangzhou in 2008 with over 60,000 bikes and around 2,500 docking stations.

Dublin introduced its 'dublinbikes' scheme in September 2009. For a city with a population of over one million, the scheme was initially introduced on a relatively small scale with around 400 bikes. Using the ratio of bikes to population from a typical European scheme would have resulted in a bike fleet of 2,000 to 3,000. Perhaps not surprisingly, the bikes have been very intensively used with each one rented an average of 9 times per day, considerably above the rate for Paris and London. As of May 2011, over 55,000 people had subscribed to the scheme, the highest number of trips per day was 6,000, average trip durations were 13 minutes, and 97% of journeys were under 30 minutes thereby attracting no usage fee.

2.2 Specification of a Bike-Sharing Scheme

The current generation of schemes has been described in different ways. However, the term 'bike-sharing scheme' appears to have gained the widest acceptability, and is the term used in the three year European research study, Optimising Bike Sharing in European Cities[1] (OBIS), which lasted from 2008-2011. The OBIS study handbook provides the following definition of a bike sharing scheme:

A self-service, short-term, one way capable, bike-rental offer in public spaces for several target groups with network characteristics.

The OBIS handbook notes that although the bikes used in a typical scheme differ in design and quality, they share the following general characteristics:

- *Robust parts – to minimise vandalism and to facilitate maintenance, operators use parts that are easy to replace including hub gears, drum brakes and plastic mudguards. Some operators develop custom made components to reduce incidences of theft;*
- *Unique design – to avoid theft and make the bikes more visible in public spaces, a unique design helps distinguish them from regular private bikes. The bikes within each scheme are usually the same colour with the same frame, and are recognisable even when stolen and repainted; and*
- *One size for all – an adjustable seat post makes them suitable for most users.*

A Cycling England guidance sheet[2] offers additional advice:

- *Mudguards and chain-guards to enable use in normal clothes, with a basket to make carrying luggage easier; and*
- *Safety - bikes must not pose a safety or health risk to users or non-users, and should be designed so that everyone can ride them subject to a minimum height (e.g. 1.5m). Lights (typically dynamo powered) should be built into each bike and be permanently illuminated. Bells are recommended especially when cycles will be used on surfaces shared with pedestrians.*

2.2.1 Docking Stations

The OBIS handbook notes that the most common type of bike sharing station includes docking stations and a rental terminal, connected with each other. The bike is locked to the electronically controlled docking point. The rental process takes place at the terminal or the docking point itself which can include touch screen display, card reader, printer and keyboard. The stations also offer space for additional advertising and/or information.

2.2.2 Payment Systems

Most of the recent large-scale schemes operate a 'smartcard' type system. Someone wishing to subscribe to the scheme pays for a smartcard (or key) for a fixed period of time (typically a year). Users can pay a one-off access fee for the whole year, for each week, or for each day of use.

[1] http://www.obisproject.com
[2] http://www.ciltuk.org.uk/download/Smarter_Choices_Portfolio_public_bikes_and_cycle_hire_schemes14.pdf

2.2.3 Redistribution of Bicycles

Demand characteristics typically result in an uneven distribution of bicycles in any scheme e.g. towards the bottom of a hill. The imbalance is location specific and can be influenced by time of day (e.g. commuter demand, topography, and one-off events). The fleet therefore needs to be continuously monitored and managed. Bicycles can be redistributed in one of three ways. Natural redistribution (where users leave bikes at their first-choice docking station), forced redistribution (where a user has to go to a different station to find a space), or motor-vehicle assisted redistribution where the scheme operator moves bikes between stations in a van. Bicycles are fitted with radio-frequency identification technology to enable operators to track their location, monitor the status of the bikes, and address any imbalance in distribution.

2.2.4 Maintenance of Bicycles

Good maintenance is essential to ensure safety of users and an efficient use of the fleet. Damaged bikes need to be removed swiftly from the fleet, repaired and then returned. Some systems identify faults if a bicycle is hired and re-docked within two minutes, three times in a row. There is usually a means of alerting the operator to a faulty bike (e.g. a button on the docking point) but it is not known how often these are used. Some users, on returning a faulty bike, turn the saddle 180 degrees so that other people do not also try to take the bike out.

2.2.5 Obstacles to Implementing a New Scheme

One of the outputs from the OBIS research programme 'European Transferability' included a section on the obstacles to implementing a bike-sharing scheme. The key obstacles and potential solutions listed include the following:

- *Cities with high bicycle ownership or high cycling modal share might have a low demand for bike sharing as most regular cyclists prefer to ride their own bike. This problem was obvious in Lower Austria and in Brussels. Their BSS were transformed in order to offer new services;*
- *Underestimation of demand might cause low availability of bicycles. To avoid this, BSS operators increase the number of stations and bicycles. The registration fee might also be increased, like in Barcelona, to control unexpected demand. Excess demand seems to be more common in the early phase of BSS located in large cities;*
- *BSS in tourist areas might compete with traditional bike rental. The Barcelona scheme does not offer daily or weekly registration, and provides information about available bike rental shops in order to avoid this conflict;*
- *Vandalism has been a significant issue for BSS in cities that didn't previously have a cycling culture, i.e. cities with low cycling ownership or low cycling modal share. Cities like Paris, Seville or Brescia reported a large number of stolen bicycles which led to high maintenance costs;*
- *Where there is intensive use of the BSS bicycles (e.g. around 5 rents per bike per day in Paris), breakdowns can occur. This can be detrimental to the scheme's image and, as the bicycle is out of service, the capacity of system decreases. To avoid this problem, operators have typically specified bicycles made of very durable components;*

- *When BSS stations are empty, users cannot rent a bicycle and when they are full, bicycles cannot be returned. In both cases users have to move on to the next station. This causes the user to waste time and, potentially, causes a loss of trust in the system. BSS operators address this problem by redistributing bicycles in order to restore the balance. The unequal distribution can be caused by two factors: topography and commuter patterns;*
- *Registration and rental fees are not enough to fund BSS. External revenues from advertising contracts or public authority subsidies are required. Short-term and insufficient funding compromise the viability of the BSS; and*
- *Public space is normally limited in city centres. Therefore a study of public space availability for fixed BSS stations is required before implementation. Footways and car-parking spaces might be occupied by BSS stations.*

3 Current Cycle Activity

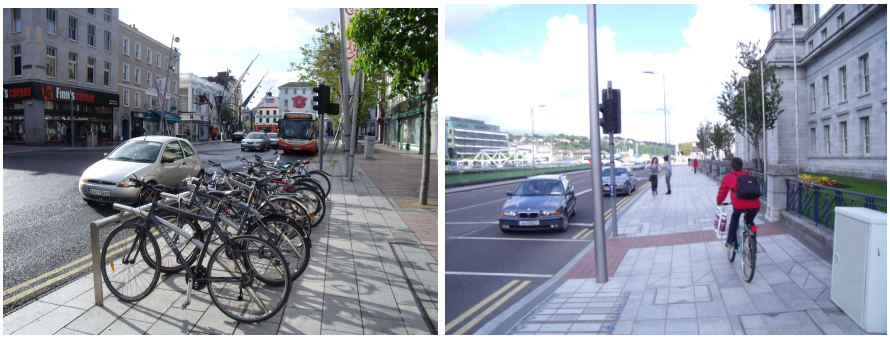
3.1 Data Gathering

Meetings were held with representatives from each city council to gain an understanding of the amount of cycling that currently takes place. A brief site visit was also carried out on a typical working day during June 2011, which included a basic assessment of the current level of cycling activity e.g. the amount (and use) of cycle parking, and brief cycle counts (when the visit coincided with a peak period).

3.2 Cork

From the site visit (mid afternoon to evening peak), Cork appeared to have a high level of cycling, relative to the other cities. Public cycle-parking was provided and generally well used in many locations across the city centre, and there was a fairly constant presence of cyclists on the main streets (during the evening peak). Cyclists were seen on the carriageway mixing with general traffic but there was also some footway cycling, particularly in the contra-flow direction adjacent to multi-lane one-way streets (e.g. below right).

Figure 1 - Cycle parking and contra-flow cycling on the footway in Cork



A short cycle-count was carried out on Michael Collins Bridge for 15 minutes during the evening peak. This indicated a two-way hourly flow of 78 bikes, low by continental European standards (typically several hundred cyclists per hour) but higher than the other regional cities.

According to data provided in the Cork Cycle Study, average cycle flows (at 8 city-centre sites) decreased from 2.3% in 1992 to 1.0% in 1997 and 0.6% in 2002. This trend was explained by an improvement in economic conditions making car ownership easier for a greater percentage of the population, and an increase in traffic flows making cycling less safe. In a meeting with Cork City Council, it was commented that cycle flows were likely to have increased since 2002 and would now be between 0.5% and 1%.

3.3 Galway

A site visit was carried out to Galway in the early afternoon on a weekday. The initial impression of the level of cycling was similar to that of Cork as there was a presence of cyclists in the city centre (fewer than in Cork but the site visit was during the inter-peak when cycling levels drop considerably). Cycle parking was relatively plentiful and well used. Many bikes were also seen parked informally i.e. locked to various items of street furniture. As in Cork, cyclists were seen using the footway in the contra-flow direction adjacent to one-way streets highlighting the need for contra-flow facilities. The streets of Galway appeared to be particularly congested both in the city centre itself (below right) and also on the approaches, even in the inter-peak period.

Figure 2 - Well-used cycle parking and congested streets in Galway city centre

The mode share for cycle commuting at the time of the last census (2006) was 4% - above the national average of 3%. The Galway City and Environs Walking and Cycling Strategy 2010-2017 provides a breakdown of cycle-commuting mode shares in the different parts of the city. This shows that as many as 9% of all residents cycle to work (or education) from some districts (e.g. Salthill).

3.4 Limerick

A site visit to Limerick was carried out in the evening and morning peaks on consecutive weekdays. From the site visit, Limerick appeared to be a city with low levels of cycling. Very few people were seen cycling, and there did not appear to be much in the way of formal cycle parking although some bikes were locked to street furniture in the city centre (below left). A short cycle-count was carried out on Sarsfield Bridge in the evening peak indicating two-way hourly flows of 12 cyclists. A second survey in the following morning peak found no cyclists (although the survey was just 15 minutes long).

Figure 3 - Bikes parked to street furniture in Limerick city centre (left), and a cyclist crossing the Sarsfield Bridge in the evening peak (right)

The cycle-commuter mode share for Limerick was 3% at the time of the last census. This suggests a higher level of cycling than was seen in the site visit. It is possible that there are a small number of large employers away from the city centre (e.g. at University of Limerick) where relatively large numbers of people cycle to work.

3.5 Waterford

The Waterford site visit took place in the early afternoon. The city centre appeared to have fairly low levels of cycling although cycle movements were not observed during the peak hours. The main (Plunkett) rail station had some weather protected cycle parking but only one of ten spaces was occupied. There was some innovative, space-efficient cycle parking in the main retail area of the city centre with half of the 8 spaces occupied (below left), and bikes were also seen chained to trees in The Mall (below right).

Figure 4 - Innovative weather-protected cycle parking (left) and bikes parked informally next to the heavily trafficked Mall (right)

In our meeting with officers from Waterford City Council it was confirmed that cycle flows are generally low. The 2006 census found that just 2% of residents accessed employment or further education by bike.

4 Assessment of Potential Areas for Scheme Introduction

This chapter sets out proposals for the locations of docking stations in each city – the 'deployment area'. These proposals do not specifically include any new developments.

4.1 Cork

Of the four regional cities covered in this study, Cork has the most in common with the major European cities where large scale bike-sharing schemes have already been successfully introduced.

In larger cities, a key aim is to ensure a high density of docking stations across the deployment area. Ideal densities are typically expressed as a number of docking stations per km^2 (8 in Paris) or a maximum distance between stations (typically around 300m). It is suggested that this approach is applied to the main part of the city centre (on the island between the two river channels), and that this part of the deployment area is bounded by the river channels (including the roads on the mainland side of the rivers). To the north of this area, the land rises steeply to between 50m-100m above sea level) – to the south, the land becomes more suburban and residential in character, and this is typically associated with lower demand for bike sharing.

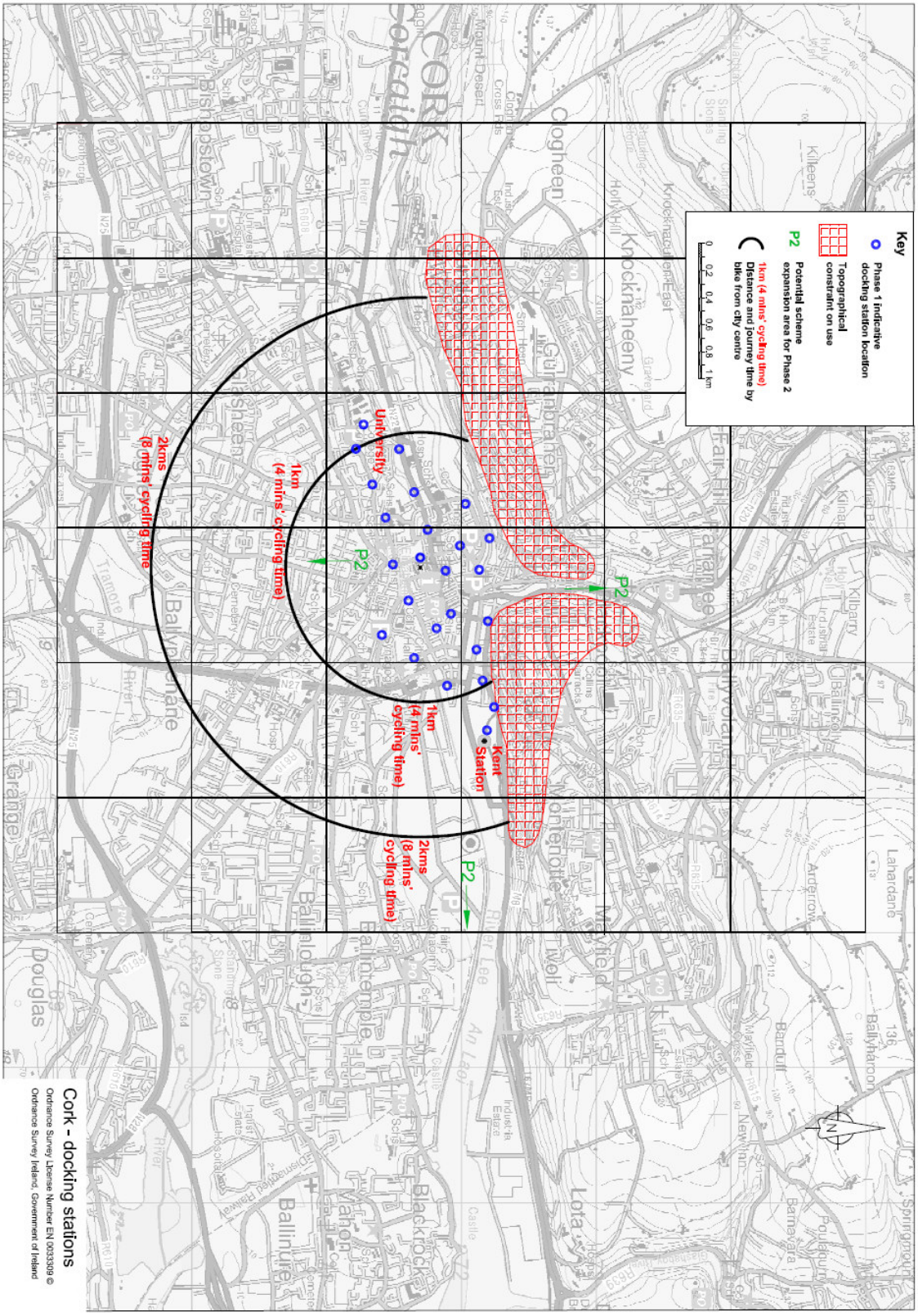
It is suggested that the deployment area extends to the main station in the east and University College Cork (UCC) in the west. Research into the biggest bike-sharing feasibility study to date[3] has shown that, of all those who live in or visit the city, students were the most likely to say they would 'definitely' use a bike-sharing scheme. The largest European bike-sharing schemes such as Paris and London deliberately avoid trying to cater for the after-rail market as, in these cities, tens of thousands of people arrive by train every morning. However, rail is a minority mode for people arriving in Cork in the morning peak with a small number of services. It is recommended, therefore, that the train station is included within the deployment zone.

The inclusion of the UCC and the train station results in a linear shape for the deployment area. It is important that there are docking stations at regular and frequent intervals between these ends and the main island area, so that users have the confidence to know they can leave their bike at a nearby docking station if the closest one is full.

Figure 5 provides an outline of the deployment area for Phase 1 with indicative docking-station locations identified. For any Phase 2 expansion, new stations could be provided to the south if demand is thought to be sufficient. The deployment area could also be extended along the Southern Ring Road corridor - the only area to the north which is relatively flat (below the 30m contour and with gradients of no greater than around 3-5%). A third expansion could include the attractive and popular recreational cycling area to the east of the city on the southern bank of the River Lee on 'The Marina'. This area, however, is not currently well connected to the city centre by a route which is likely to appeal to recreational cyclists.

[3] Feasibility study for a central London cycle-hire scheme (2008)

Figure 5 – Potential locations for docking stations in Cork



4.2 Galway

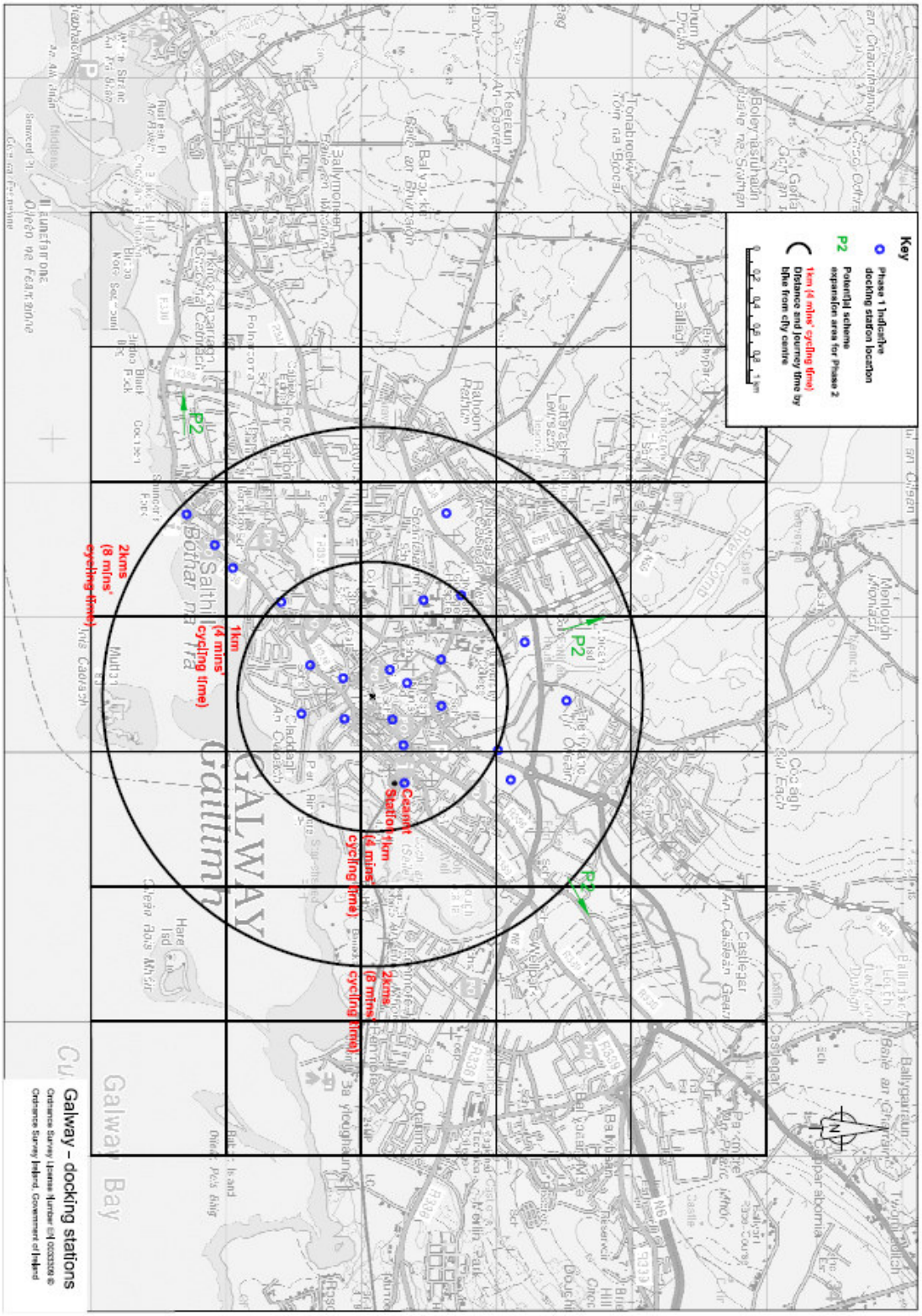
Galway City Council has plotted potential locations for bike-sharing docking stations on a map. There are 23 in total and they cover a large part of the city over an area of approximately 8km^2 with a maximum distance of around 5km between the ends of the deployment area. The density of docking stations is relatively uneven with around 5 per km^2 in some parts of the city and just 1 per km^2 in others e.g. Salthill. The problem with a low density of docking stations is that, if a user arrives on a bike and the docking station is full, they would have a long way to travel to find the next station, reducing confidence in the integrity of the system.

Galway is an attractive and relatively cycle-friendly city, with high levels of traffic congestion and high car-parking costs. It is, therefore, relatively well suited to a bike-sharing scheme. However, it is recommended that the first phase of the deployment area is reduced from the currently proposed 8km^2 to around 4km^2 but with as many docking stations as originally intended. This would increase the density of the docking stations from around 3/km^2 to 6/km^2.

Further surveys and analysis would be required but, based on a desktop review, it would make sense not to include the proposed docking stations on the western side of the city (Salthill Road pier, Pearse Stadium), north east (the three in the Wellpark area), and perhaps the ones to the north of R338 and N6. A greater density would be recommended for the city centre (e.g. to the west of Eyre Square), with additional stations between the city centre and Salthill.

Figure 6 provides an outline of the deployment area for Phase 1, with indicative docking-station locations identified. A Phase 2 could involve adding any of the originally planned docking stations (in the more distant locations), and/or an intensification of the Phase 1 deployment area.

Figure 6 – Potential locations for docking stations in Galway

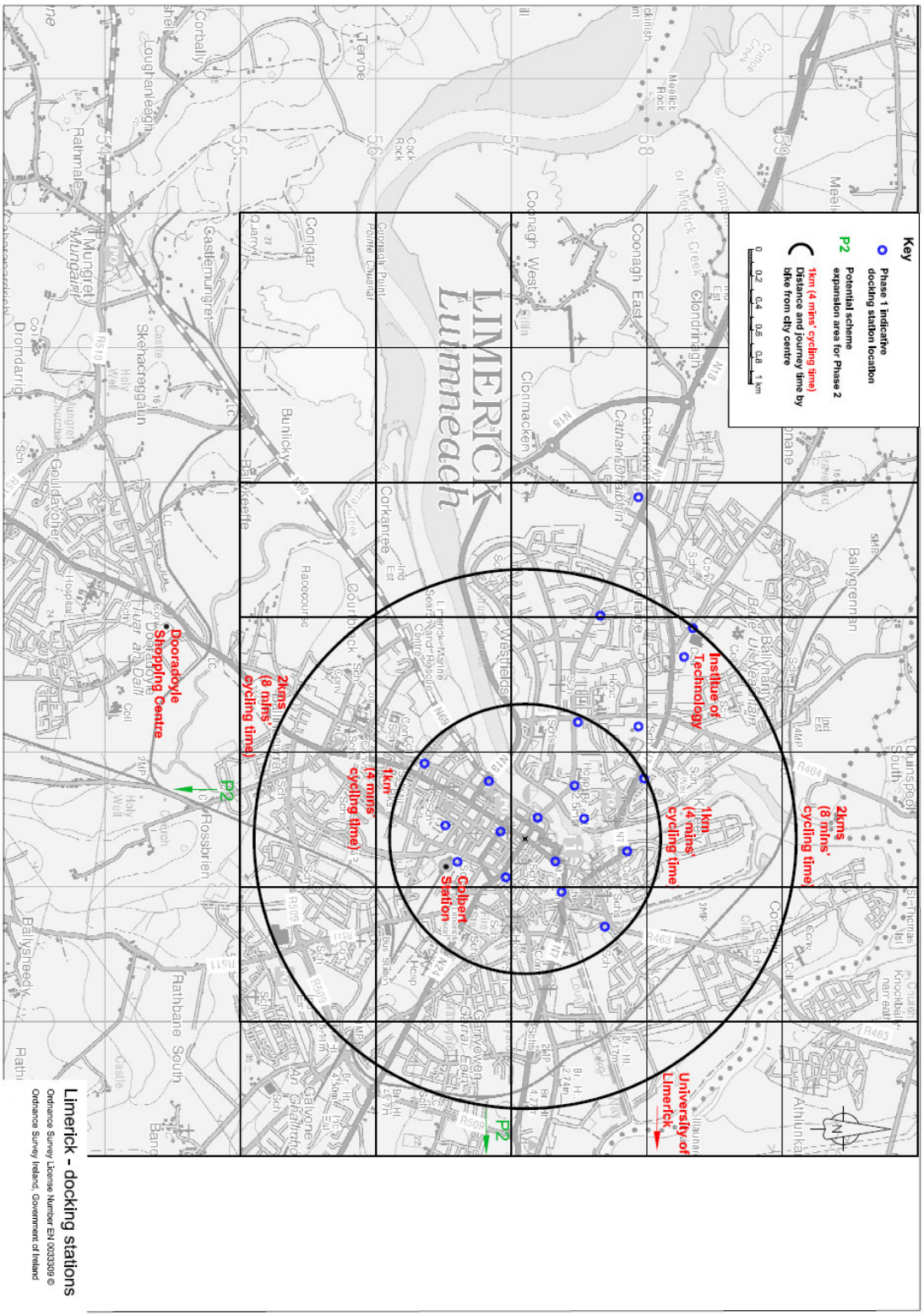


4.3 Limerick

Limerick City Council had not formally put together any proposals for docking station locations. A bike sharing scheme had been considered a few years ago but a decision was made to see how well the Dublin scheme was received. Recommendations are therefore based on discussions with the council, a site visit to the city, and general knowledge of bike-sharing systems. Limerick has a fairly clearly defined city-centre bounded by Colbert Station and People's Park to the south, the Rover Shannon to the west, and Thomond Bridge to the north. A relatively high density of docking stations would be needed in this area, in the order of one every 300m to 400m. Of the two main further education establishments in Limerick, only the Institute of Technology is within a sufficiently close distance of the city centre for it to be part of a bike sharing deployment area, at least in the short term. Pending future detailed survey work, it would appear that the deployment area for phase one would be a rotated and inverted 'L' shape from the city centre stretching out west towards the Institute of Technology, and also including the attractive recreational cycling destination of Shelbourne Park.

Figure 7 provides an outline of the Phase 1 deployment area, with indicative docking-station locations identified. If a scheme was implemented, and an expansion could be justified, the Phase 2 area could include the Dooradoyle shopping centre in the south-west of the city, and the University of Limerick. Jetland shopping centre would be borderline for inclusion in Phase 1, but would be an obvious destination to include in Phase 2.

Figure 7 – Potential locations for docking stations in Limerick



4.4 Waterford

Waterford City Council plotted some potential locations for bike-hire docking stations in the city centre. These are clustered around a relatively small area (approximately 1km^2) in the city centre. A bike sharing feasibility study[4], cited as an example of best practice, suggests that 1km is the minimum realistic distance for a bike-share trip. Anything less than 1km could usually be walked more easily taking into account the time required to access and deposit a bike, and to walk between the docking station and the actual destination or starting point.

In other schemes such as Dublin and Barcelona, typical journey durations are 13 to 15 minutes, a distance of around 3kms. Waterford is a relatively compact city, and most of the obvious city-centre destinations would be covered by the council's proposed scheme. However, to make a scheme worthwhile, the operating area would need to stretch away from the city centre. The most obvious destination is the Waterford Institute of Technology (WIT) which is about 2.5kms from the city centre. Bike sharing schemes usually work best when they are in a compact area with a high density of docking stations, so it is uncertain whether a scheme that includes a 2.5km spine out to the WIT would be as feasible. There would need to still be a relatively short distance between stations so that users would know they can travel to the next one if the closest is full.

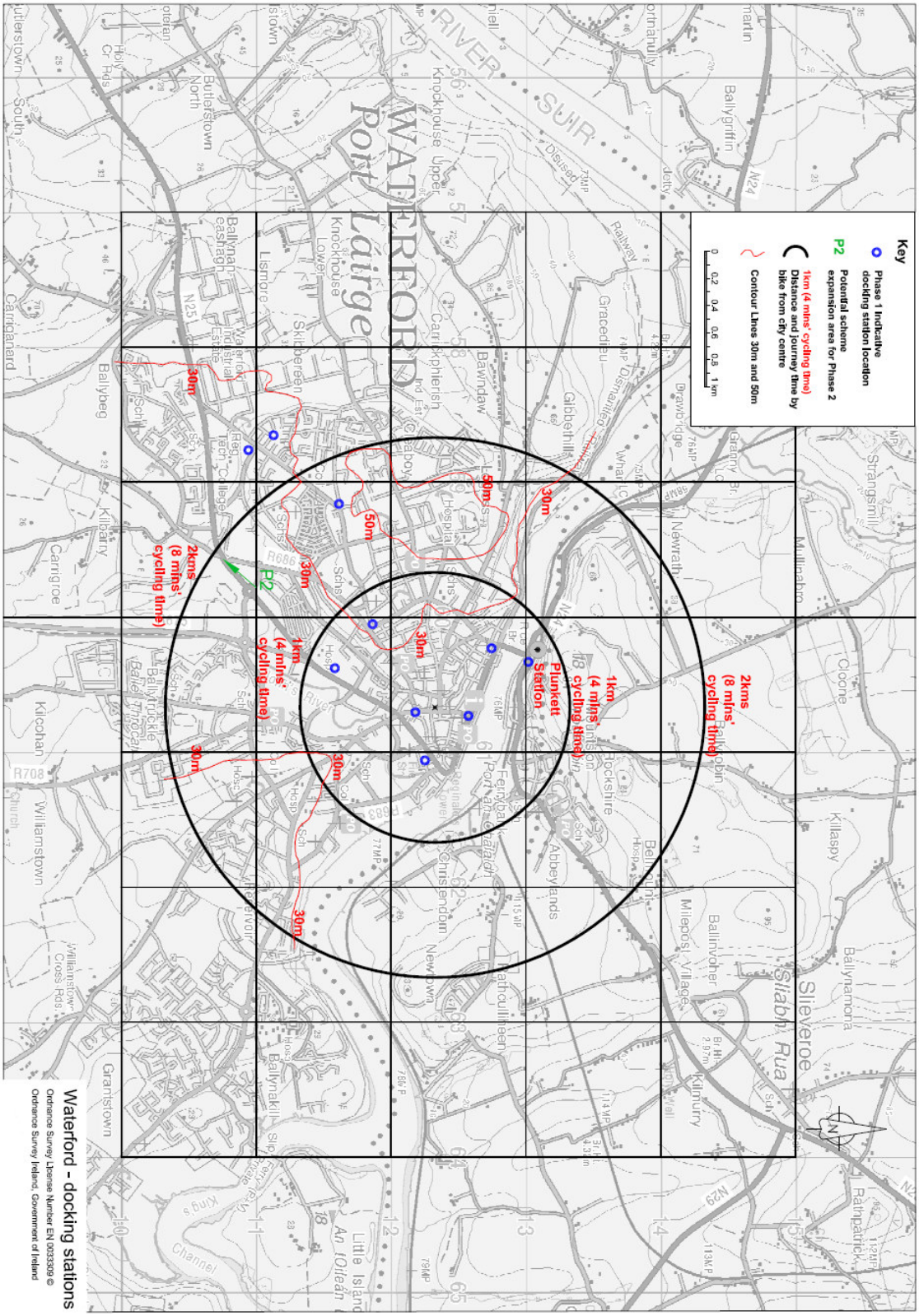
Based on a desktop review, a route (and distribution of docking stations) which follows Tycor Road and Browns Road appears preferable. This would also service the main student residential area of Lismore Park. A first phase of the scheme could potentially just focus on the city centre and the train station although research would be needed to help determine whether the demand for short journeys in this area could justify a scheme's implementation.

The topography in Waterford is likely to exert a stronger influence on the success of a bike sharing scheme than in the other cities (with the exception of the north side of Cork). The land rises steeply to 30m on the western side of the city centre with gradients (5% to 10%) which are likely to be too steep for a typical 23kg hire bike. Extending the deployment area to the top of hills would also lead to the obvious redistribution difficulties. However, much of Waterford is flat or has gentle gradients so the topography should not preclude a scheme from being introduced but would have to be taken carefully in to account in the planning stages.

Figure 8 provides an outline of the Phase 1 deployment area, with indicative docking station locations. A phase 2 expansion could involve intensification of the Phase 1 scheme, or perhaps an extension towards the south west of the city where the topography is most cycle friendly.

[4] Feasibility study for a central London cycle hire scheme (TfL, 2008)

Figure 8 – Potential locations for docking stations in Waterford



5 Demand Estimates for Bike-Sharing Schemes

5.1 General Issues

The recent increase in popularity of bike sharing schemes, internationally, has been rapid – it has been claimed that such schemes represent the fastest growing mode of transport on the planet. The success of the Dublin scheme also shows that there are no specific cultural or climatic obstacles to prevent schemes from working in Ireland.

Many, if not most, of the early schemes were implemented with very little prior research but, over time, lessons have been learned about the factors which influence their success. However, most of the focus has been on schemes in cities with large populations (from 500,000 up to several million).

The evidence base for schemes in smaller cities and large towns remains insubstantial. A report[5] produced as part of the European OBIS research programme notes "the development of bike-sharing schemes in 'smaller' cities will depend on the success of existing BSS which, unlike schemes in large cities, is not proven at present." In providing an indication of the potential usage for schemes, as wide a range of factors as possible have been considered, drawing on both existing literature and site observations.

5.2 Specific Factors

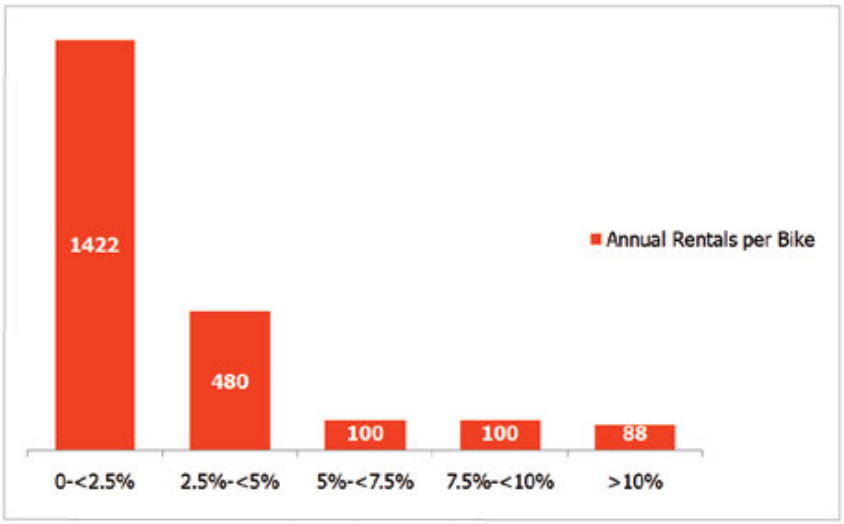
In simple terms, the decision to use a bike-sharing scheme for a typical journey will depend on; a) how easy, quick and cheap it is to make the journey by bike, and b) how difficult, slow and expensive it is to make the same trip by alternative means (public transport, car or on foot). If it is quick, easy and attractive for a large number of people to make the journey by bike, and slow, unpleasant and expensive by other means, the bike-share scheme will attract high levels of use. Each of the factors were examined, generally, before applying them to the four regional cities.

5.2.1 Current Cycling Levels

Research suggests that bike-sharing schemes are more successful in cities where, before the scheme's implementation, levels of cycling were low. This can be seen in the graph below (source OBIS handbook). A reason for scheme failure in some cities has been that most people already own bikes thereby restricting the uptake of the scheme to tourists.

[5] Bike sharing in ten European countries – France (2009)

Figure 9 – The relationship between cycling mode share and the demand for a bike-sharing scheme



Average Annual Rentals per Bike per Cycling Modal Share Group (N=22)

5.2.2 Cycle-Friendly Road & Path Networks

Intuitively, a scheme would be more successful where there is a comprehensive network of cycle-friendly routes. This is not restricted to designated cycle routes but relates to how attractive/safe/navigable etc the whole of the deployment area is for cycling. An example of a cycle-friendly improvement on a city-wide scale is the legislation which permitted two-way cycling in all one-way streets with a 30kmh limit which was passed in France in 2010. As a result, the road network of Paris became a lot more navigable and permeable by bike, with no reported direct increase in casualties. The worst environment for cycling would include dual carriageways, high speed roads (with limits and/or speeds above 50kmh), gyratories and large roundabouts. The traffic mix also influences the environment – high flows of HGVs present a particular hazard to cycle traffic.

5.2.3 General Traffic Congestion & Public Transport Overcrowding

Poor conditions affecting motorised transport such as congested streets and overcrowded buses and trains make alternatives such as cycling a lot more attractive. Monitoring of the large bike-sharing schemes in places like Montreal and London has shown that the main mode switch comes from public transport. Conversely, if streets area not heavily congested, and public transport is attractive and reliable, there is less incentive to switch to the bike.

5.2.4 Cost & Availability of Car Parking, & Car/Cycle Ownership

Bike sharing schemes are likely to have more appeal where car parking is relatively expensive and in short supply or difficult to access. Similarly, if car and cycle ownership is high, this will also detract from the appeal of a bike-sharing scheme. High car ownership, low levels of congestion and cheap car parking would give residents little incentive to use a bike-sharing scheme.

5.2.5 City Size

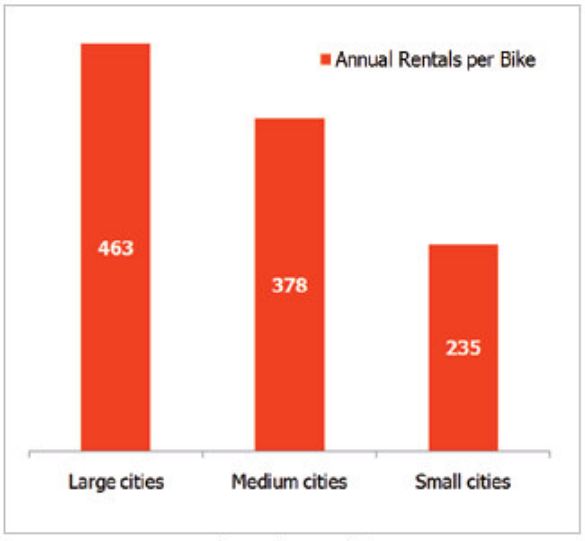
The following reasons for the popularity of bike-sharing schemes in larger cities are taken from the OBIS handbook.

'In general, mobility demand is higher in big cities, because of the higher population and employment density. Therefore, schemes in large cities often offer higher station density, easy-to-use, high-tech schemes, and a higher density of destinations, which influences the number of rentals in a positive way. Additionally, bigger cities often have more problems with congestion and limited parking space, which makes cycling more competitive with the car in terms of speed and flexibility on distances up to five – seven km and therefore attractive for daily usage. In some cities, where public transport is crowded, BSSs provides an alternative mode of transport.'

In addition, research into some of the world's largest bike-sharing schemes such as Montreal and London has shown that the main mode switch comes from public transport – the appeal of a bike-sharing journey may therefore be greater when the alternative is a bus or Metro journey.

The graph below, taken from the OBIS bike sharing handbook, shows how, among the sample of schemes included, the number of rents per bicycle is much higher in larger cities (note that large cities are defined as having a population of over 500,000, and small cities have under 100,000).

Figure 10 – The relationship between city size and the demand for a bike-sharing scheme



Average Annual Rentals per Bike by City Size
(Large N=10, Medium N=9, Small N=4)

5.2.6 Size & Distribution of Student Population

Research carried out during the planning for the London scheme found that, among all resident and visitor groups, students were most likely to use the scheme. This could be due to any number of reasons including the appeal of a virtually free mode of transport, the difficulty of storing a private bike in student accommodation, and concerns about bike theft. The take-up rate by students will obviously be determined

by how well the distribution of docking stations links up with journey origin and destinations. It is unlikely, however, that any initial system would be able to cater for a student campus that was several kilometres from the city centre due to the need for a relatively dense distribution of docking stations within each deployment area.

5.2.7 Passengers Arriving/Leaving by Train in the peak

Large European bike-sharing schemes such as Paris and London deliberately avoided attempting to cater for the 'after-rail' market by keeping docking stations *away* from train stations. This was due to the number of people who arrived by train in the morning peak (tens of thousands), the difficulty of providing enough bikes and docking stations for the demand, and the fact that the bikes would only be used twice a day (to and from the station) as most people do not work in areas where tourists are likely to pass. In the Irish regional cities, the number of people arriving by train is much less so the deployment area could therefore include train stations, and provide a very useful means of travelling between them and the city centre.

5.2.8 Density of Area & Distribution of Trip Attractors

Feasibility research for the London scheme concluded that the ideal distance for a bike-sharing scheme trip was between 1 and 8kms. Anything less and walking becomes more convenient – anything longer and public transport is quicker. In practice, 8kms would be a long journey on a typical (23kg) scheme bike - most trips tend to fall in the 13 to 17 minute range (around 4kms). A range of 1 to 5kms is probably more appropriate. Cities with key attractors that are between 1 and 5kms apart are, therefore, more likely to attract higher levels of bike-sharing use.

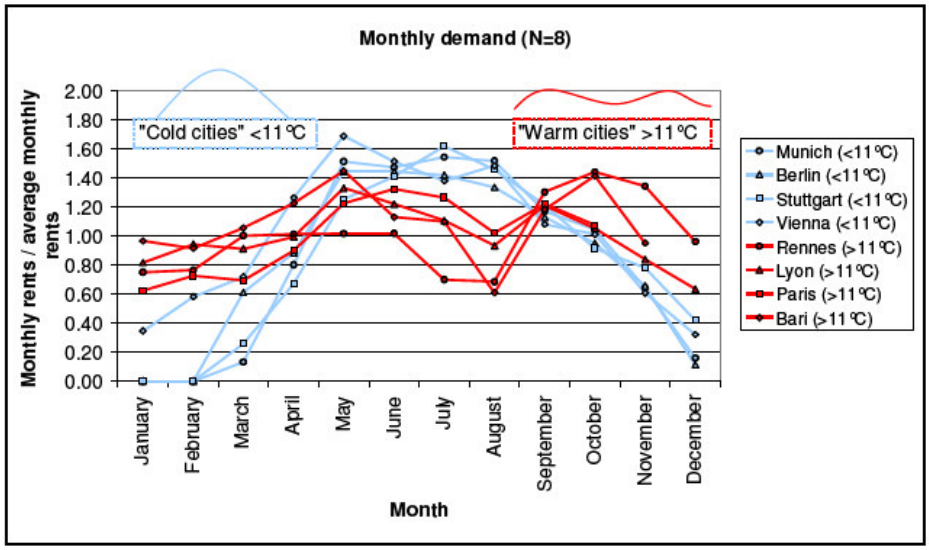
5.2.9 Topography

Topography has two key implications for the success of a bike sharing scheme. The first relates to demand. Hilliness has been found, repeatedly, to be the key determinant of the amount of utility cycling that takes place in an urban area with much higher amounts of cycling in flat cities. Hilly cities also present logistical problems for the redistribution of bikes. The Barcelona scheme is on a much smaller scale to the Paris scheme but requires an equal resource to redistribute bikes due to its topography (a long gradient from the beach up to the main part of the city).

5.2.10 Climate

The cities that participated in the OBIS research project were categorised into 'warm' and 'cold' categories according to whether their annual temperature was above or below 11 degrees. 'Warm' cities such as Lyon and Bari generally experience demand peaks in the spring and autumn – as it can be too hot to cycle in the middle of the summer and too cold in the winter. 'Cold' cities tend to have a more straightforward demand profile with higher flows in the summer months and lower flows in the winter months. There were no obvious examples of places with climates similar to Ireland i.e. relatively mild and wet, with a more pronounced difference in daylight hours between winter and summer.

Figure 11 – The seasonal demand-profile for bike-sharing schemes in warm and cold cities



5.2.11 Tourists & Other Visitors Without Access to Bikes

Bike-sharing schemes are often particularly attractive to tourists seeking a novel way of taking in the sights – the Parisian scheme is promoted by the phrase “La Ville est plus belle a velo” (‘the city is more beautiful by bike’). Schemes need to be set up to enable casual use (rather than long term membership) – in the London scheme it was nearly six months before this functionality was enabled. The number of tourists that a city attracts (especially those who do not arrive by car) the greater the demand is likely to be for a bike sharing scheme. Similarly, cities attracting a large number of other visitors (commuters, people visiting friends and relatives etc), may also expect higher levels of use, especially if many do not arrive by car.

5.3 Basis for Demand Predictions

To predict demand accurately for a bike sharing scheme, market research would need to be carried out among different groups of people in each city (students, residents, tourists etc). However, high-level, approximate estimates have been produced based on the demand in the European schemes featured in the OBIS research programme.

The focus has been on schemes in smaller cities (with populations of under 150,000) as these are more likely to reflect the characteristics of the Irish regional cities. Estimates are based on median averages – for example if there are nine cities in the research category, the figures for the fifth city were used, as this enables us to look at conditions in a typical city, rather than basing the estimates on the mean which would be distorted by disproportionate schemes. An allowance was then made for the factors described above. If it was felt there were more factors which would increase the demand for a bike-sharing scheme, predictions were increased above the typical/median figure. If it was thought that there were more that would decrease the demand, lower figures were produced.

In all the cities featured in the OBIS research with populations up to 150,000, the median ratio of scheme bikes to population size was 1:500. Therefore, in a city with 50,000 people, 100 bikes would be recommended (with an increase or decrease according to the pre-discussed demand factors). The median ratio of scheme members to population in the smaller city schemes was 1:67. A city with 67,000 people might therefore expect to have 1,000 members. The ratio of docking points to bikes is generally between 1.2 and 1.7. Given the uncertain nature of bike-sharing schemes in small cities, 1.7 spaces per bike is recommended to increase the chances of there being enough capacity for people to park bikes at their first choice of docking station.

The amount of docking stations in a scheme's deployment area can be expressed as a figure per square kilometre or as the average linear spacing between each station. The Transport for London (TfL) feasibility study recommended a density of 8 docking stations per km^2 based on the Parisian scheme. Large-scale systems such as the ones in Barcelona, London and Paris offer stations which are usually not more than 300m apart – a relatively comfortable walking distance.

The amount of use that a bike sharing scheme receives can be expressed in a number of ways. The most useful measure is the number of trips per day. This figure ranges from around 5,000 in Dublin and 20,000 in London to over 100,000 in Paris. The number of rents per bike is another way of assessing use although this can often simply reflect the accuracy of the pre-scheme demand predictions. In schemes which underestimate demand and provide relatively few bikes (e.g. Barcelona) rents per bike are typically very high (9 to 15 per day). In schemes which overestimate the demand (e.g. London) rents per bike are lower, approximately 3 or 4 per day.

5.4 Demand Predictions by City

5.4.1 Cork

- *Cork has a population of 150,000 (including students). A typical city of this size would have a bike-sharing fleet of approximately 300 bikes with 2,250 registered members;*
- *The assessment of Cork is that demand would be close to average for a European scheme, so a bike fleet of 265 to 335 is recommended. There are problems with permeability in the city centre with lots of multi-lane one way streets making cycling inconvenient and more hazardous. However it is considered that these issues are out-weighed by, a combination of factors, which make cycling an appealing mode for short, local journeys, including cycle-friendly topography and both considerable congestion and high parking charges;*
- *It is estimated that each bike will get used an average of 3 times per day. This is more than our estimate for the smaller cities but not as high as the schemes in the major European cities of Paris, London, Barcelona etc where bikes are typically used from 6 to 15 times per day; and*
- *It is suggested that something in the region of 25 docking stations are provided. The recommended ratio of docking points to bikes is 1.7. This gives 510 docking points. Over 25 stations there would be an average of 20 bikes per docking station.*

5.4.2 Galway

- *Galway has a population of approximately 100,000 including 25,000 students. A typical city of this size would have a fleet of 200 bikes, and around 1500 registered members;*
- *The assessment of Galway is that it is generally well suited to a bike sharing scheme. It clearly attracts a large number of tourists, the topography is either flat or quite gentle, there is a significant level of congestion in the city (even during the inter-peak), and car parking is relatively expensive, and time-consuming to access. Although the one-way streets and pedestrianised areas make it awkward to navigate by bike, there are not many high-speed, multi lane sections are found in some of the other cities. The existing network, therefore, mainly poses a navigational, rather than safety, challenge to cyclists. It is considered that a Galway scheme would therefore attract an above-average number of users a fleet of 200 to 250 bikes;*
- *It is estimated that each bike will get used an average of 2 times per day. This is below Cork (as it is a considerably smaller city and therefore intrinsically less suited to bike sharing) but higher than Waterford and Limerick; and*
- *It is suggested that somewhere in the region of 23 docking stations. The recommended ratio of docking points to bikes is 1.7. This gives 380 docking points. Over 23 stations there would be 15-20 docking points per station.*

5.4.3 Limerick

- *Limerick has a population of 100,000 including 20,000 students. A typical city of this size would have a fleet of 200 bikes, and around 1500 registered members;*
- *The assessment of Limerick found that it is a relatively flat city with a dense city centre. However, the road network has a large number of multi-lane, one-way systems making it often difficult and unpleasant to travel by bike. There is also relatively little congestion, and it is comparatively easy and cheap to park a car in the city centre. A smaller scheme than average for a city of Limerick's size is therefore recommended with approximately 150 bikes;*
- *It is estimated that each bike would be used an average of 1.5 times per day – less than Cork and Galway, reflecting the city's lower expected demand for such a scheme; and*
- *It is suggested that approximately 20 docking stations are provided with 10-15 docking points per station, making a total of around 255 docking points.*

5.4.4 Waterford

- *Waterford has a population of 60,000 including approximately 14,000 students. A typical city of this size would have a fleet of 120 bikes, and around 900 registered users;*
- *Waterford was considered to be a mixed city in terms of its current suitability to utility cycling. There are some flat areas, and some attractive routes but the main road through (with its very high proportion of HGVs) would deter many people from making local trips by bike. The lack of congestion and the relative low cost and high supply of car parking also make cycling less of an obvious choice. It is therefore suggested that, given current conditions, the demand for a bike sharing scheme is likely to be lower than average for a city of Waterford's size. A scheme of 80-100 bikes is therefore recommended;*
- *It is estimated that each bike would get used an average of 1.5 times per day – less than Cork and Galway reflecting the city's lower expected demand for such a scheme; and*

- *It is suggested that approximately 10 docking stations with an average of 15 docking points per station (a total of 150 docking points) is provided.*

Table 5-A Summary of recommendations and estimates for schemes in each of the cities

	Cork	Galway	Limerick	Waterford
Recommended number of bikes	265-235	200-250	135-165	80-100
Recommended number of docking stations (and docking points)	25 (510)	23 (380)	20 (255)	10 (150)
Average number of docking points per station	20	15-20	10-15	15
Estimated number of subscribers	2250	1500	1500	900
Estimated daily rents per bike	3	2	1.5	1.5

6 Recommendations for Key Elements of the Scheme

6.1 Background

There has been an exponential growth in the number of bike-sharing schemes in Europe (and further afield) over the last five years. This has resulted in a considerable improvement in the quality of schemes (in terms of the bikes and the docking stations), the operating systems, and the reduction in theft and vandalism. A clear example is provided by the Paris and London schemes, implemented three years apart. The Parisien scheme issues users with their own lock so they could park a bike away from a docking station e.g. outside a shop. These parked bikes have been very easy to steal by thieves as the locks are easy to break. The London scheme did not provide locks. Users could, therefore, only leave their bikes in a docking station, and these have proved to be 100% secure. As a result, whereas tens of thousands of bikes have been stolen in Paris, fewer than ten have gone missing in London. It has also been observed that theft and vandalism has been extremely low in the Dublin scheme. The following recommendations are taken form the OBIS handbook, which has brought together international best practice, published in June 2011.

6.2 Bicycles

The bicycles used in a bike-sharing scheme should have the following qualities:

- *A unisex design with an adjustable saddle usually so that people over 1.5m tall can use them;*
- *Hub brakes and hub gears – these components are user friendly and low maintenance. Some schemes have opted for 7-speed bikes but most are 3 speed. 3-speed bikes are recommended as they are cheaper, and likely to be easier to maintain, and discourage users from cycling at high speeds;*
- *Mudguards and chain-guards – these enable people to use the bikes in normal clothes including office wear without the need for cycle clips or any specialist equipment;*
- *Front rack/basket – many scheme bikes have baskets but it has been found that these tend to attract litter. A front rack, as used in the London scheme, appears to be an effective solution; and*
- *Dynamo lights which are always on when the bike is in use (and stay on for 90 seconds when stationary as a safety precaution for stopping at signals etc).*

The OBIS manual offers the following advice regarding the cost of bikes:

"The lifespan, quality and costs of the bikes as well as maintenance costs have to be considered when wanting to choose one or another type of bike. Big operators usually use one type of bike at all of their sites to realise economies of scale. Most of the BSSs tend to have bikes with up to three gears and without suspension; only some offer up to seven gears and suspension. However, experience shows that many operators of BSSs with a high number of bikes and a high usage rate per day/bike tend to choose less costly bikes for their systems at the beginning. As a result, broken frames or handlebars occurred; in some BSSs, most of the bikes had to be replaced. At the end of the day, the choice of bikes and parts is a trade-off between purchase costs and maintenance costs over the lifespan of the bikes. Bikes of better quality and with easy maintenance processes might be more expensive at the beginning, but their longer lifespan will pay off in the long term."

6.3 Docking Stations

Earlier bike-sharing schemes often used locks to secure bikes at docking stations. However, the current generation of docking stations has a number of docking *points* per station with a rental terminal. The rental process takes place at the terminal or the docking point itself which can include a touch-screen display, card reader, printer and keyboard.

The implementation of docking stations can be a time consuming and complicated process. A recent innovation from a scheme in Berlin involves the use of 'concrete cuboid' docking stations with solar power. These require no ground work and, with the solar panels, no connection to the mains (see the figure below). They enable docking stations to be installed in just two hours rather than two weeks, saving a considerable amount of time and money.

Figure 12 The disruption caused by conventional docking station implementation (left) and a potential low impact, low cost, solar-powered, concrete alternative (right)

It is recommended that this option is considered for any schemes in the regional cities. The main disadvantage is likely to be their physical appearance. Docking points which use keys, rather than cards, are considered to be more durable.

Low-tech schemes have been used in some locations. These generally require no elaborate groundwork, cabling or communications technology. They are less expensive to install but provide no monitoring opportunities. Also, running costs can be higher due to limited monitoring opportunities.

6.4 Booking & Payment Arrangements

There are fundamentally two types of booking arrangement in modern bike sharing schemes. Subscription-based arrangements require users to register with the scheme usually via the internet or by phone. Subscribers are offered a number of different options such as daily, three-day, weekly or annual membership. The second option is for casual users who can access the bikes without the need for a key. Some cities do not allow casual use, such as Dublin and Barcelona. This can be in order to control the total number of scheme users, or to avoid abstracting tourist demand from using conventional cycle hire operations.

In the regional cities, demand is likely to be relatively low so it is recommended that any schemes are opened to casual users. In order to minimise the impact on conventional cycle hire operations, the pricing structure could rise rapidly after the free first 30 minutes as it does in Paris in London. The cost increases from £1 to £4 after 1 hour in London but from just 0.50 to 1.50 Euros after the first hour in Dublin).

The OBIS handbook recommends that registration/subscription is fast and convenient, and only includes the information that is necessary for the operator-customer relationship. The costs for subscription are substantially lower than public transport ranging between 30 and 50 Euros for most schemes. Some schemes require a deposit from a credit card which prevents theft and vandalism but does stop some potential customers from using the bikes.

6.5 Stand Locations

The OBIS handbook advises that a detailed municipal plan should be used to help determine station locations. This would include the size of available spaces, traffic and safety aspects, expected demand, monument conservation, ownership structure, and relevant surface and cabling conditions.

Experience from the Barclays cycle hire showed that it had been very important to design a scheme which was distinctive and recognizable, yet fitted into the varied urban setting around the city, particularly in conservation areas. Reducing street clutter as far as possible was a key priority, so the terminal design incorporated parking signage where necessary, and also served a dual purpose by providing two faces for Legible London mapping, the pedestrian way finding system that is being rolled out in central London. Anecdotally, it would seem that the Dublin scheme has been similarly well designed although there were no specific comments about in the OBIS handbook.

Safety audits will be needed to ensure that users can access and leave the docking stations safely either on foot or by bike.

7 Estimated Installation & Operation Costs

In order to establish the outline capital and operating costs, a number of assumptions were made on the basis of available information. Data was gathered for two major European cities where bike sharing schemes have been successfully implemented. The publicly available data is included in Table A1, which can be found within Appendix A.

Specific cost information is treated as extremely sensitive by existing operating companies, and therefore it has proven difficult to obtain accurate figures. However, as the costs are intended to provide an order of magnitude for a high level feasibility review, it is considered that they provide a reasonable level of accuracy. In order to have a more robust financial assessment of the implementation and operational costs, these assumptions and figures will be investigated further at the next stage of the project.

Tables 7-A and 7-B provides the anticipated capital costs associated with the set up and operation of the schemes in each of the cities, over a typical 15 year period. In addition, a control room would also be required. The cost associated with the control room, included within the tables, is expected to encompass the running of all four schemes assuming that they progress as one contract. Should a lower number of schemes progress there would be a marginal decrease in the cost of the control centre. Conversely should the schemes be taken forward on an individual basis the cost for a control room would be required for scheme, located within each city.

All figures are present day values (2011) and in millions of Euros. These figures are therefore undiscounted and do not take account of inflation.

Table 7-A Outline Capital Costs

Total Estimated Capital Costs (Real - €m)				
	Year 1	Year 6	Year 11	Total
Cork	1.83	0.13	0.13	2.09
Limerick	1.26	0.06	0.06	1.38
Galway	1.55	0.06	0.06	1.68
Waterford	0.70	0.06	0.06	0.83
One overall control room	0.21	0.03	0.13	0.37
Total	5.55	0.35	0.45	6.35

Table 7-A indicates an expected overall capital cost of approximately €6.35m with the bulk of the spend required within the first year of delivery. These figures aim to take cognisance of the following elements:-

- Planning and Assessment;
- Docking stations;
- Bikes;
- Purchase of maintenance vehicles;
- Control room fit out; and
- Monitoring equipment.

Table 7-B Outline Operating Costs

Total Estimated Operating Costs (Real - €m)			
	Cost per Year		Total Over 15 years
	Year 1	Years 2 through 15	
Cork	-	0.52	7.24
Limerick	-	0.27	3.80
Galway	-	0.27	3.83
Waterford	-	0.27	3.78
One overall Control Room	-	0.32	4.51
Total	-	1.65	23.16

The operating cost within Table 7-B, at approximately €23million, would be spread evenly over the assumed contract period of 14 years following the 1 year set up period. No operation costs would be incurred within year 1 during the scheme set up. The operating cost includes the following elements:-

- Staff costs;
- Premises;
- Vehicle maintenance;
- Bike replacement; and
- Materials.

8 Summary, Recommendations & Next Steps

8.1 Summary

This feasibility study has involved an assessment of current best-practice in the bike sharing world, and a specific focus on the four regional cities of Cork, Galway, Limerick and Waterford. A good understanding has been gained of the potential for bike-sharing schemes to succeed in each of the four cities. Although each city shows considerable differences in terms of the factors which influence the potential take-up of a scheme, there are a number of similarities which apply to all four.

The cities' climates are similar i.e. relatively mild and wet compared with the continental European cities where most schemes have been implemented. Research has shown that bike-sharing schemes are particularly sensitive to variations in weather on both a daily, and a seasonal, basis. Most of the European cities experience a drop in demand over the winter period. The cooler ones have a peak in the summer, and the warmer ones have a decrease as it becomes uncomfortably warm to travel by bike. The profile for the Irish schemes is likely to be similar to the cooler European cities with a decrease in the winter, and a peak over the summer. There will be marked daily fluctuations linked to heavy rain, and this could affect both overall demand and present logistical problems for the redistribution of bikes.

The current levels of cycling are relatively low in each of the four cities compared with those in continental European countries. This has proved to be a positive factor in the success of bike-sharing schemes in countries such as France and Spain where there is much less of a cycling culture than in the northern European countries of Germany, Denmark and the Netherlands (where demand for bike-sharing schemes has been much lower). The reasons for this are obvious as most people already have bikes, and both residential properties and main trip attractors are designed to accommodate cycle parking. It is also likely that levels of cycle *ownership* are similarly low across the four cities – another factor which increases the potential for bike sharing to succeed.

Other similarities between the cities include topography. Hilliness presents a particular challenge to bike-sharing schemes as it can both suppress demand, and cause logistical problems for bike redistribution. Hilly cities such as Barcelona have had to spend a lot more money on addressing the challenges of redistribution than flatter places like London and Paris. The topography in most parts of the regional cities is relatively cycle friendly. Large parts of the cities are within a vertical height difference of 30m and gradients are quite gentle (under 5%). The exceptions are the northern side of Cork, and the south west of Waterford.

Each of the cities has large student populations, and research has shown that students are the most likely group to use bike-sharing schemes.

Other bike sharing demand-related aspects of the cities differ considerably. These include what could be termed the transport 'climate'. The propensity for people to use a bike-sharing scheme depends fundamentally on how expensive, slow and inconvenient it currently is to travel by alternative means, and how attractive, convenient and quick it would be to travel by bike. In each of the cities, it appears that the car is the dominant mode of transport for most trips. However, in two of the cities (Galway and Cork), the streets appear to be considerably more congested, and car-parking more expensive which would provide a good incentive to use a bike-sharing scheme. Conversely, in Limerick and Waterford, there is relatively little congestion, and car parking is considered low and in good supply, so the incentive to switch to bike share would be reduced.

The cities also vary in how suitable they currently are for local cycle trips. Galway appears to be the best suited due to a lack of multi-lane, high-speed roads and hazardous junctions, whereas Limerick and Cork have a more intimidating network. Dedicated cycling facilities in all cities are relatively few although this does not tend to be a strongly limiting factor in the success of the schemes. The road network in Waterford is relatively well suited to cycling but the main problem is the very high flow of HGVs on the main road through the city centre. However, this is likely to be addressed by new traffic management schemes due to be implemented in the next 12 months.

Bike-sharing schemes typically act as a catalyst or a 'shot in the arm' to the local cycling culture usually resulting in an overnight increase in the visible presence of cyclists on a city's streets. Cork and Galway are currently the cities with the highest levels of cycling. It would appear that Galway is the most cycle friendly but Cork has more of the big-city characteristics (density of trip attractors, congestion, parking problems etc) that help to make bike-sharing schemes a success. However, a bike sharing scheme in Limerick and Waterford would perhaps have the biggest impact on the local transport mix as levels of cycling are currently low in these cities.

The relatively small population sizes suggest that none of the cities would attract the large number (or percentage) of cycle trips that the schemes in major European cities have achieved. Whereas appropriate-size schemes in large cities can see bikes being used 5 to 15 times per day, schemes in the Irish regional cities would be likely to attract perhaps around 1 to 3 trips per day (judging by comparisons with schemes in other smaller cities). The Dublin scheme bikes are used approximately 9 times per day. This is likely to be considerably higher than schemes in the regional cities because a) the number of bikes in Dublin was small for such a large city and b) as a large, congested city, there is likely to be an intrinsically higher demand for bike sharing. However, new technology means that smaller schemes are becoming more viable as costs begin to fall. The most promising recent development relates to solar-powered, concrete docking stations that require no ground work or electricity connections, slashing installation and running costs. Schemes in smaller cities that were not viable one or two years ago may now have become viable as a result.

It is worth noting that, although much research has been carried out into schemes in large cities (e.g. Barcelona, Paris, and London), the success of bike-sharing schemes in smaller cities has yet to be proven (as noted in the OBIS research programme). The recommendations for docking station density (e.g. 8 per km^2) and frequency (one every 300m) are based on the schemes with thousands of bikes covering tens of square kilometres. It is possible that the demand for schemes in smaller cities may not justify such a density/frequency of docking station, and that their location may be determined by specific trip attractors such as retail centres and train stations. The temptation to spread docking stations out too thinly must also be

avoided, however, as this increases the inconvenience and delay in having to use the second nearest station if the immediate one is empty or full.

The total capital cost (docking stations, bikes, assessments, maintenance vehicles, control room fit-out and monitoring equipment) in the four cities is an estimated €6.4 million over 15 years. The total operating cost (staff, premises, vehicle maintenance, bike replacement and materials) is estimated at €23 million for the same time period.

8.2 Recommendations

- *Bike-hire schemes have already been introduced in cities with arguably more hazardous and intimidating cycling conditions than any of the four regional cities. From this initial high-level study, it is concluded that schemes in each of the four regional cities would succeed in boosting the amount of cycling that takes place;*
- *Of the four, it is estimated that Galway and Cork are the best suited as they have more of the characteristics of the cities where bike-sharing schemes are successful;*
- *An exploration of complimentary measures is recommended to increase the impact of any bike-sharing scheme. The key focus is likely to be the need to improve cycle-traffic permeability in the city centres particularly in one-way streets and pedestrianised areas. This will have the twin advantage of making cycle trips more advantageous over other modes, as well as making journeys more navigable;*
- *A review of demand management measures (e.g. increasing car parking costs) as these have also been shown to be a very important factor in influencing the success of a bike sharing scheme. Increased revenue from car parking has been used by some cities to help fund bike-sharing schemes;*
- *A thorough review of the bikes and docking stations used in the Dublin scheme to determine their technical suitability for use in the regional cities; and*
- *It is recommended that published cycle maps are developed alongside proposals for bike sharing schemes. These would be particularly useful in the cities where very few people cycle, to help residents view their local area from a cycling perspective, and understand how quickly journeys can be made by bike (through the use of journey time isochrones on the map).*

8.3 Next Steps

- *For a clearer view of the potential success of a bike sharing scheme in any of the cities, more detailed survey work is needed including research among the local population to assess the likely take-up rate, a review of the characteristics of each city's road and cycle network, and an assessment of potential locations for docking stations on footways and carriageways, and in other public spaces;*
- *Further liaison with the relevant councils, in order to discuss the issues and recommendations to assess impact on ongoing strategies and any infrastructure works; and*
- *Although the cost estimates are suitable for a high level feasibility review, closer examination of costs is necessary to provide more accurate information for a detailed financial review.*

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Appendix A Supporting Cost Information

Table A1 Background figures for London and Paris

	London	Paris
Assessment costs	£80m in first year start-up costs (Source Internet Article)	Capital (start-up) cost of programme for Decaux approximately €80-€90 million (Source Internet Articles)
Detailed review	£0.95M spent on management consultancy services (Source FOI letter – Corporate Services, TfL)	
Planning costs	To Jan 2011 £0.5M spent on legal and planning related services and £0.15M on planning application fees (Source FOI letter – Corporate Services, TfL)	
Operating cost	£18M p.a. (Source TfL, David Brown MD letter)	
Four depots		An unusual feature is Vélib's main repair facility, which floats on a barge on the river Seine. The barge floats between 12 stops along the Seine (Source Transport Canada)
Staff costs (all levels)	£10m TfL staff costs only (Source TfL, David Brown letter)	Four hundred workers serve the Vélib' system part time, 300 full time (Source Internet Article) 52 bike per staff. 3.6 stations per staff (Source Transport Canada)
Docking station costs	£70,000-£100,000 to plan and install (25 stands), £40,000 to operate and maintain (source - response to Mayor's Question Time)	
Bike costs	£900 (source, article in the Independent)	€400
Number of vehicles to move bikes around	20 (source – response to Mayor's Question Time)	20 natural gas powered redistribution vehicles. 130 electrically assisted bicycles with trailers for station maintenance and light on-site bicycle maintenance and 10 electric powered service vehicles which carry water and supplies for cleaning stations and bicycles.
Cycle training	Budget £800k to provide 17,500 hrs of training (Source TfL, David Brown MD letter)	
Bike maintenance costs	Included in the docking station costs	1,500 daily repairs
Advertising & Revenues	£1.355M spent on advertising and publicity up until launch on 30 July 2010 (Source FOI letter – Corporate Services, TfL)	
Construction of the panel on site	£3,000 estimated	
Cost of the actual advertising board	Varied depending on the size and location	
	£25M sponsorship deal over 5 years with Barclays Bank	The combined advertising contract and revenue sharing returns estimated €24 million per year. JC Decaux expects €600 million in advertisement turnover over the course of the 10-year contract. The program could bring about €30 to €50 million in rental receipts (Source Internet Article)
Revenue	The scheme generated £323,545 in revenue from journeys in the first 96 days (Source Wikipedia). Income from fares £119M over 7 years	